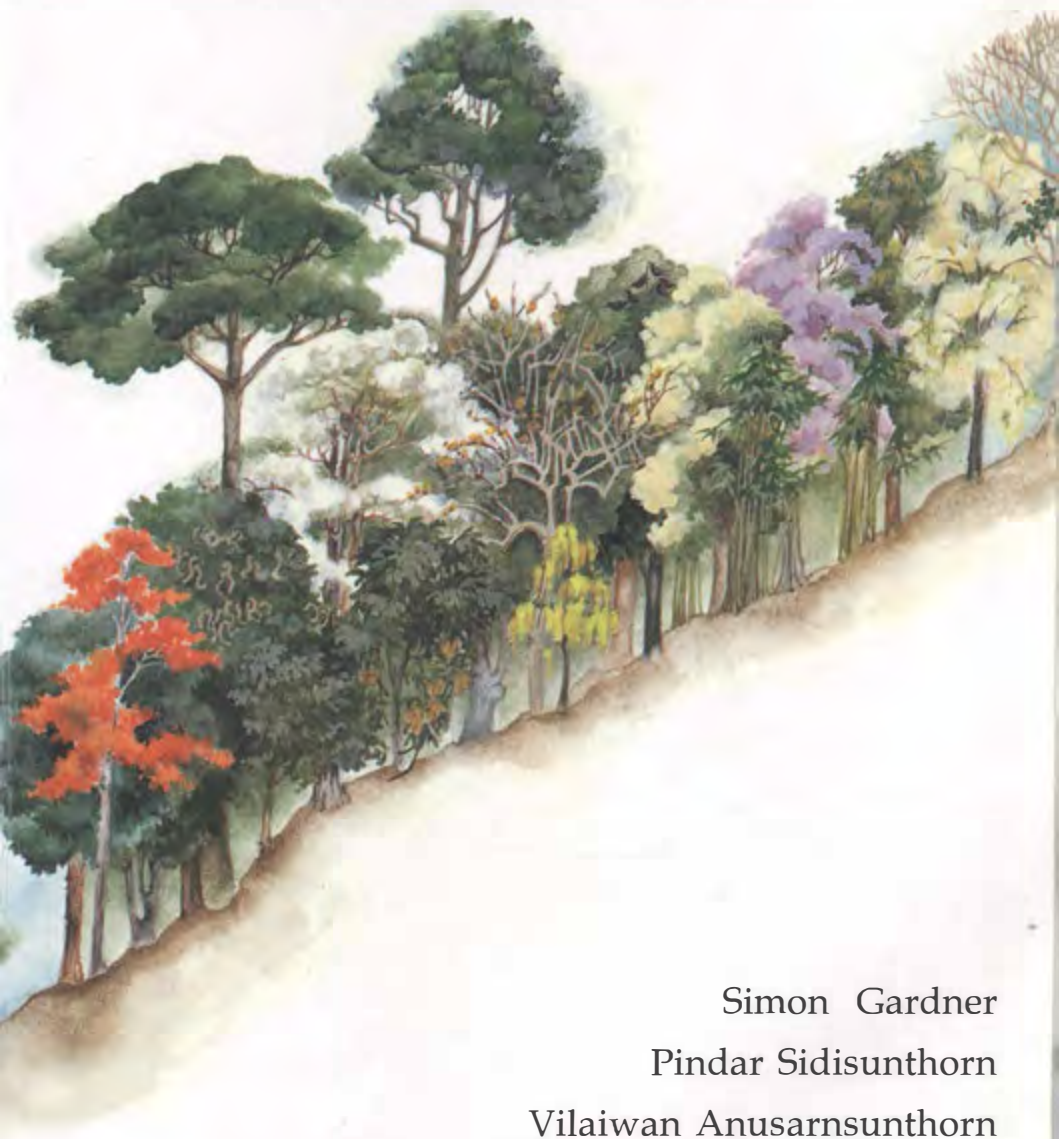
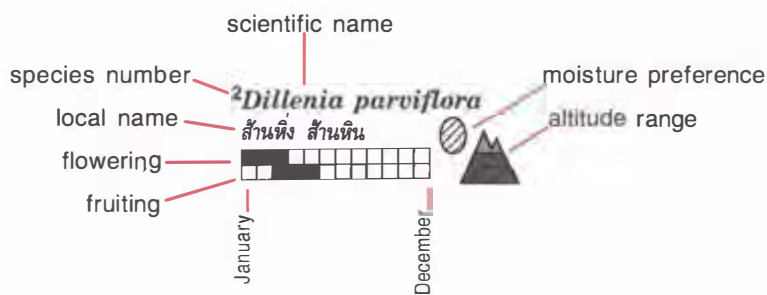
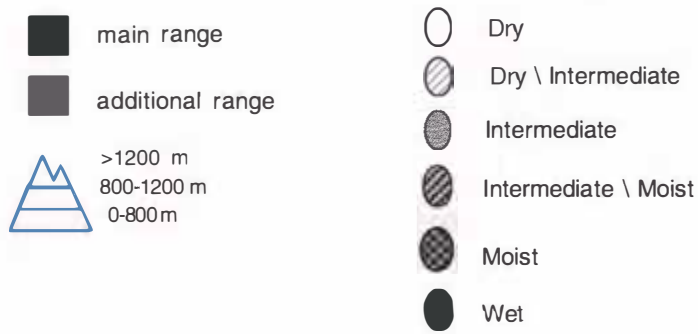


A FIELD GUIDE TO
FOREST TREES
OF NORTHERN THAILAND



Simon Gardner
Pindar Sidisunthorn
Vilaiwan Anusarnsunthorn

Explanation of Symbols



Abbreviations

alt	altitude
bk	bark
dec	deciduous
evg	evergreen
fw	flower
fws	flowers
ft	fruit
fts	fruits
lf	leaf
lvs	leaves
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

Species number

(²*Dillenia parviflora*)

If the number is before the species name you are at the main entry for that species.

(*Dillenia parviflora*²)

If the number is after the species name, you should go to the number indicated

All species are included in both part 1 and part 2, using the same number in each part.

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Vilaiwan Anusarnsunthorn

CMU Herbarium
Biology Department
Science Faculty
Chiang Mai University

Funded by
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October 2007



World Bank

IUCN

The World Conservation Union



**A FIELD GUIDE TO
FOREST TREES OF NORTHERN THAILAND**

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The information provided concerning medicinal or other uses is strictly for general interest only. No plant should be used for any purpose without the advice of an experienced practitioner.

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Finally, we would like to thank our friends and families who encouraged and supported us throughout the process of preparing this book.

Genesis of Water and Life

Amidst changes and development in many fields, Thailand faces an alarming environmental crisis. In the last decades, the forest areas have been exploited at a fast rate which is one of the important causes of flooding, droughts and unpredictable climate.

Conflicts over the management of natural resources have been an unavoidable part of life for our generation.

The “Genesis of Water and Life” project was formed as a knowledge-based response to these issues. In 1994, a project was initiated by the Ministry of Agriculture to protect the watershed area by using more than 10 years of experience working at Kao Sammoen with the support of the UN. Our aim has been to promote harmony between humankind and nature by encouraging people to conserve natural resources through sustainable resource management and integrated agriculture.

We are developing a variety of media in vernacular languages for communication amongst local peoples in the watershed areas. Additional equipment including motorcycles, televisions and portable video players have been provided for the convenience of Forestry Department officials.

From 1997, we have cooperated with Chiang Mai University and “Gong Tun Chum Chon Rak Pa” (Forest Lovers’ Community Fund) to support forest restoration by building firebreaks in the protected forests of the upper Ping and Wang watersheds which cover an area of more than 120,000 rai (19,200 hectares). By this means, we hope to save the watershed areas without changing the local people’s lifestyle or faith.

We also promote academic activities, arts and culture in the urban community to improve relationships in a joint effort to protect and conserve the natural environment.

The book “A Field Guide to Forest Trees of Northern Thailand” is one of our recent project activities. We sincerely wish that this book will be a bridge that passes on knowledge, compassion and a sense of ecological awareness and conservation of trees in the forest area of Northern Thailand.

His venerable Phra Dhamma Pitaka (P. Payutto) has admonished us that: “People in this generation have exploited a great amount of natural resources of the world. They have no awareness of our environment and have depleted the land, so it is necessary that they revolutionize themselves now together with creating an awareness of restoring the natural environment amongst new generations”. His advice should be heeded by us all.

Watersheds are the source of forests, water and life. We must all work together to conserve what is left of our natural heritage for future generations.

Toyota Thailand Foundation
March 2000



Toyota Thailand Foundation

Toyota Thailand Foundation –TTF was established in October 1992 on the occasion of the 30th anniversary of Toyota Motor Thailand, Co., Ltd. The Foundation operates independently from the Company, understating its assigned tasks using the interest gained from the 250 million baht endowment as follows:

1. to promote and support education at all levels
2. to enhance the quality of life of the Thai people and to promote environmental conservation.
3. to collaborate with other philanthropic organizations for the benefit of the public.

Toyota Thailand Foundation has been highly honored by distinguished professionals in its Board of Directors who have taken active part in providing guidelines and vision for the Foundation.

The Foundation believes that a strong community and society is based on consolidated education and quality of life of people. Such an important mission can be done together with development of other areas. Since the Foundation was established, it has organized various activities and provided support to governmental and non-governmental organizations for social benefit. Furthermore, the Foundation is truly honored to be able to work with highly respected educational institutions in pursuing altruistic academic activities. Our support is indicative of the Foundation's awareness, which is crucial for meaningful and stable social development, conducive to a better and more humane society.

Activities of Toyota Thailand Foundation (1993-1999)

1. Core Project

- ◆ Support the Royal Projects
- ◆ Standard Classroom Project
- ◆ Used Books Donation Campaign
- ◆ New Books Donation
- ◆ TTF Award
- ◆ Genesis of Water and Life Project
- ◆ Practical Nurse Project
- ◆ We Love Green Vegetables Project

2. Cooperate with Philanthropic Organizations for social benefits

- ◆ Foster Parents Project, Dr. Sem Pring Puangkeo Foundation
- ◆ Bann Tawan Mai Project; Narcotics Control Foundation
- ◆ Scholarships and Occupation Training, Department of Corrections
- ◆ Scholarships for Urban Poor Student, Thammasat University
- ◆ Scholarships of Sirindhorn International Institute of Technology.

Following His Majesty's Wishes

Toyota Family, including Toyota Thailand Foundation, Toyota Motor Thailand Co., Ltd., Toyota Dealer Club, Toyota Cooperation Club, and Toyota Motor Corporation of Japan launch 7 social contribution projects under a campaign “Following His Majesty’s Wishes” to celebrate the auspicious marking the 6th Cycle Anniversary of His Majesty the King’s Birthday.

The “Following His Majesty’s Wishes” campaign consists of:

1. Rachamongkol Rice Co., Ltd.

The community rice mill is initiated by royal advice at Gateway City Industrial Estate in Chachoengsao Province

2. Presentation of processed rice to His Majesty the King for the Fund for Development of Children and Youth in Remote Areas, under the patronage of H.R.H Princess Mahachakri Sirindhorn.

3. Used Books Donation Project

4. Book in the King’s Honor: *Handbook on Nutrition Improvements*

5. Book in the King’s Honor: *His Majesty’s Speeches on Children and Youth*

6. International seminar *Ayutthaya and Asia* and book in the King’s Honor : *From Japan to Arabia: Ayutthaya’s Maritime Relations with Asia*

7. The Toyota Classics Charity Concert

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Kobfai Publishing Project

A book can be divided several ways: between price and quality, printing and writing, or between its cover and content.

Most publishers would think that a book's cover is important because it could be the first point of physical contact between the book and its potential reader. A good cover should stand out so that it could attract people, inviting them to pick it up, browse through and finally walk with it to the cashier.

The cover of the very book you are now holding is a fascinating painting by an accomplished artist which could capture the imagination of beautiful Northern Siamese forest.

It should be noted, however that both the book and its cover do exist in a specific social context.

Contemporary Thailand is a society plagued with all kinds of conflict, most visible and prevalent, perhaps, are those which deeply concern the relationship between nature and humans.

In what ways could, or should, humans coexist with nature which has suffered from the development direction which has long emphasized material importance over and above kindness and respect towards nature? This question, while difficult, could be seen as a basis of existing conflict which reflects the ways in which nature is treated, or in some cases, managed.

Some believe in the sacredness of nature such that it should not be contaminated by human touch. People should therefore be separated from the mountains and the forests where land nurturing water springs forth. Others maintain that some people live with nature for so long that the two are inseparable. Nature sustains them and they, in turn, respect spirits of the forests. Unlike some industries with nothing but profit motive, these people do not seek to destroy the forests because deep down they know that they have to depend on nature. Human beings, in the final analysis, is also a part of nature.

At the dawn of the new century, the ecological problematique becomes more complicated. The question is no longer whether humans can coexist with nature because while the latter has been eroded by economic interests, humans, though living with nature for so long, has also undergone important changes.

"Kobfai" does not seek to answer this question. Instead, it is doing its duty in lighting the fire of ideas to ward off darkness and harmful insects. "Kobfai" strongly believes that when darkness fades, the planet that we call home could be clearer seen from a beautiful kaleidoscopic perspective. When insects are gone, problems concerning relationship between human beings and nature could better be contemplated. This is indeed necessary if we are to search for a healthy way to live in a world characterized by differences, human and otherwise.

Dr. Chaiwat Satha-Anand
Director
May 2000

Preface

Introduction

I am honored by the invitation of Kobfai Publishing Project, Foundation for Democracy and Development Studies, to write an introduction to A Field Guide to Forest Trees of Northern Thailand prepared by Simon Gardner, Pinda Sidisunthorn and Vilaiwan Anusarnsunthorn.

In thinking about trees and flowers, people would think of me as in this case. Everything in nature could be seen from two perspectives. In looking at trees, human nature cannot be neglected. In truth, everything is caused by human beings.

To write an introduction to such a manual, one should go beyond the perimeter of trees in the North because, most fundamentally, the objective of this introduction is to address both the writers and those interested in searching for knowledge from findings in this volume.

The intentions of the writers and the readers' hope for knowledge can be well bridged if both understand nature in its core. It should also be noted that the classification of trees, focussing only on trees in the Northern forest is the result of human conception designed specifically for imparting knowledge. Looking at things from a holistic perspective, two basic points can be seen.

First, information in this book should be a natural media connecting the writers with the readers for the benefits of all. I would emphasize that the spiritual basis of human beings influence their practices which could be for better or for worse. This book as a bridge would be possible if based on sincerity and openness. The writers' sincerity would naturally be met with the readers' genuine longing for knowledge about nature. It is in the course of nature that people with common fundamental consciousness would find ways to come together.

Second, though the focus of this book is with trees in the Northern forest, I believe that the more we approach the essence of nature, the less we will adhere to this regional framework, extend it to flora from all regions, and perhaps to all regions of the world.

In thinking through the popular notion of globalization, I seek to emphasize spiritual globalization, underscoring morality and ethics, which would rise from a world without superficiality, a world where all could freely find truth from one's own heart.

To appreciate a book in its fullest, one should be aware of the fact that its content is the product of human thoughts. A book disseminates humanized knowledge, trying its best to imitate nature. But as a product of fallible human, the content of the book is therefore compromised in terms of proximity to Truth.

Classifications of things, trees included, are normally contested knowledge even among academics. The truth is it is the human mind that creates conditions for such classifications so that others could accept. In nature, there is no classification, but connected into a web of reasons that constitute the Whole. Adhering to illusory classification could curtail the possibility of human search for Truth.

I strongly hope that those in search of knowledge could better benefit from this book if the holistic and interrelated perspective is used. In the final analysis, however, such a possibility depends on the natures of human mind on both sides, the writers and readers which, in turn, could be seen from Truth rooted in the same earth, connected to trees and all other lives.

I believe that this book will contribute to those with independent minds, who value their dignity, would use knowledge gained for peace and happiness both inside oneself and for society as a whole.

Rapee Sakrik

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GENERAL KEYS

- | | |
|---|---|
| A general leaf key | D alternate, simple untoothed leaves |
| B opposite, simple leaves | E alternate, pinnate leaves |
| C alternate, simple toothed leaves | |

DISTINCTIVE CHARACTER KEYS

Crown & trunk characters

- 1 growing on other trees or on rocks
- 2 narrowly conical or cylindrical crown
- 3 layered crown or branches in whorls
- 4 unbranched crown (lvs cluster near top of trunk)
- 5 buttressed trunk
- 6 fluted trunk

Bark characters

- 7 thorns, spines or prickles
- 8 latex, colored sap or resin
- 9 deeply cracked bark
- 10 plated, peeling or flaking bark
- 11 fibrous bark, ripping in strips
- 12 aromatic inner bark

Leaf characters

- 13 large simple leaves (>30cm long)
- 14 unusually shaped simple leaves
- 15 leaves with peltate base
- 16 several veins from base
- 17 side veins straight & parallel with each other
- 18 side veins very faint
- 19 scales or whitish below

20 glands

- 21 star-shaped, branched or tufted hairs
- 22 old leaves bright red or orange
- 23 winged stalk or rachis
- 24 unusual stipules
- 25 narrow conical leaf buds
- 26 twigs ridged or square in cross-section

Flower characters

- 27 flowering on trunk or main branches
- 28 flower in catkins or appearing so
- 29 large white or yellow flowers (>5cm)
- 30 pink, red or orange flowers (all sizes)
- 31 asymmetric corolla
- 32 fringed petals

Fruit characters

- 33 large fleshy fruits (>5cm)
- 34 winged or broadly ridged fruits
- 35 spiny or thorny fruits
- 36 fruits splitting open when ripe (not winged)
- 37 compound fruits
- 38 seeds with aril or sarcotesta

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Polyalthia	42		158	Apocynaceae	257
Guttiferae	49	Bauhinia	168	Bignoniaceae	265
Flacourtiaceae	53	Cassia (yellow fws)	170	Labiatae	274
Theaceae	56	(pink fws)	173	Lauraceae	285
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How to use this book

The aim of this book is to help people with no formal botanical training to identify in the field the trees that they are likely to find in the forests & national parks of N.Thailand. We have concentrated on characters that can be readily observed in the field and have avoided the use of technical terms as much as possible.

The 880 species covered in the book represent over 75% of trees native to Northern Thailand, including all of the common forest species and many others that are easily recognised or ecologically important. We have also included a small number of introduced species that have become naturalized or are easily mistaken for native species.

Layout

Part 1 contains all the information you need for identification, including descriptions, local names, habitat & flowering/fruiting months. The text is fully illustrated with over 1600 color photographs & 330 watercolor drawings. All larger families & genera have keys to help you distinguish between closely related species. There are 3 types of species entry:

430 main species are fully described & illustrated, except if a character is shared by all members of the family/genus and so has already been mentioned in the introduction to the group.

340 similar species are those which closely resemble one of the main species & are included on the same page. Only some of these species are illustrated and the descriptions are limited to characters which are significantly different from the main species.

110 additional species are included within the keys but are not described elsewhere - refer to the sources listed in part2 for further information. If the family has a comparison table, additional information will be available in the table.

Part 2 provides additional information of interest including full scientific name, synonyms, references, distribution range outside Thailand and a selection of medicinal, timber & other uses. All species listed under part1 are covered, including additional species.

Identification keys Over 100 keys have been developed to make identification easier, including both general keys based on leaf & bark, keys for particularly distinctive characters & keys to specific families / genera.

Illustrated glossary of technical terms, including all botanical & ecological vocabulary used in this book.

Comparison tables for some of the larger & more difficult genera. The tables allow easier cross-checking of closely related species and include many additional species not covered in the main text. The "all families" table summarizes the diagnostic characters of all the families in the book, which helps you to quickly compare 2 or more possible families.

Bibliography & further reading, including all references used in this book & listed in part2.

Indexes 4 separate indexes ordered by Thai name, English name, scientific species (including synonyms) & scientific family.

Order of species & families

All species are grouped into botanical families which are arranged in the order followed by the major floras of the region - Flore Generale de IndoChine & Flora of British India. The families at the beginning are those which are presumed to have the most "primitive" floral structure, while those at the end have the most "complex" or "derived" structure. As a general rule, large & colorful flowers that are "perfect" (ie. have all parts - calyx, corolla, stamens & pistils in a single flower.) are more likely to be considered "primitive", and are therefore near the front of the book. Inconspicuous flowers that are imperfect are usually considered more "derived" and are nearer the end of the book. In the middle are a group that have large flowers with irregular corollas (fused in an asymmetric fashion), such as Leguminosae.

Numbering system

Every species has been given an arbitrary number based on its order in the book. All parts of the book use the same species order & numbering system, so the species number can be used to cross reference easily between parts without looking in the index. In the keys or under the "similar" section of the text, a species number after the name (*Dillenia indica*⁵), indicates that the species is described & illustrated in the main text elsewhere in the book. If the number is before the name (¹*Dillenia hookeri*), there is no entry in the main text, although where the family has a comparison table there will be more descriptive information in the table. All species are also included in part 2, which indicates references where you can find more information.

Identifying your tree

There are several ways to use this book to identify a tree, depending on your prior familiarity with botany and the local flora. The simplest way is simply to flick through the pictures until you see one that seems similar to your tree, and then read the corresponding description to check if it could be that species. If you find one that you think may be your tree, check other species in the same family as well as species listed as similar.

The second method is to ask a local person the name they use for the tree & check if it is listed in the Thai index. If you use this method, always cross-check with the description carefully since the same local name is often used to refer to several different species. The index includes only the more well-known central or northern Thai names.

The third method is to use the identification keys to help you arrive at the correct species. The advantage of this method is that you become familiar with the characters that make a species unique & are less likely to confuse it with closely related species. There are 3 types of key:

general keys using mostly leaf & bark characters. These are the keys to use if your species does not have any particular distinctive characters and you cannot guess the family. Start with key A & continue to subkeys B-E as indicated. Most of the main groups are included, but since there are 880 species altogether, it will often not be possible for you to pinpoint a particular species without flowers or fruit. If your shortlist from the key still has too many species, the family comparison table on p 476 may help you decide.

distinctive character keys unlike the general key, these keys only include a small proportion of species, but are much quicker than the main key if your species has any of the characters listed on page 2.

family/genera keys included in part 1. All of the main families & larger genera have their own separate keys. Most of these keys rely on flower or fruit characters since it is often impossible to distinguish closely related species based only on the leaves. See page 2 for a listing of all family/genera keys.

Using the keys

Each key presents you with a series of choices that successively narrows down the number of species that your tree could possibly be. Within each key, start with the set of options on the left side of the page (with **1.** in front of them). The keys in this book are different from standard botanical keys because there are sometimes more than 2 options at each stage. If any of these options match your tree, go to the set of options immediately below your choice and repeat the procedure until there are no further options - you will then have narrowed down your possibilities to a short list of all species which match your criteria. You must always go to a line with a number that is **higher** than your present one. For example, if you reach line **4.** and the next line is **1.**, then do not continue - go back to the beginning & try again. The number after each species refers to the species number - turn to this for a full description & illustration. For families & genera, the number is the first species in the group - it does not necessarily mean that you have that particular species.

If you cannot key out a species, there are several possible explanations:

1. your sample is not typical of the whole tree. Young shoots, coppice regrowth or leaves close to the flower clusters are often atypical. You should choose fully mature leaves on non-flowering parts of the tree & check that they look the same as the rest of the tree
2. the tree may be atypical of the species. This may happen if the tree is growing in a stressful environment, such as on a rock, in very poor soil or at high altitude - sometimes you may not be able to tell this as the level of stress depends on the normal environment of the species. Check the surrounding area to see if you can find other trees of the same species.
3. If the tree is growing beside a road or in a field it could have been planted & may not be native to N.Thailand. A few introduced species which are very similar to native ones have been included, but the majority of planted trees will not be found in this book.
4. you may be in the wrong family. Check the family description or comparative table 1. Otherwise go to the main key at the front of the book & try to find the correct family. Remember that this book covers only 75% of the native flora so there are many less common species which are not included.

In the field - equipment, note-taking & collection techniques

Equipment

Observing trees needs very little equipment. The most essential item is a **10x handlens**. Many species are superficially very similar & only differ from each other in the structure of the flower, which is often too small to see with the naked eye. None of the features mentioned in this book are too small to be seen with a 10x lens. **Binoculars** are also extremely useful - 8 or 10x magnification is usually sufficient. The only other piece of equipment you will need to start with is a good stout **pocket knife**, strong enough to penetrate thick outer bark. For collecting specimens, you will also need plastic bags, alcohol, 1.5m tape measure; gardening secateurs & an altimeter or detailed topographic map.

Field notes

Wherever possible, you should always try to identify with the tree still in front of you - that way you will be able to cross-check any details of the description or points that come up in the key. If you cannot do this, you must make good field notes so that you can confidently identify your tree later. Make sure to observe the following:

- 1. Habitat** - altitude, topography, forest type, canopy cover & structure, signs of burning or other forms of disturbance.
- 2. Habit** - height of the crown, degree of deciduousness (in dry season).
- 3. Bark** color & degree of cracking of the outer bark, presence of latex or distinct odor in the inner bark. Check for thorns or spines (often restricted to smaller branches in old trees).
- 4. Leaf arrangement** alternate, opposite or whorled ; spirally arranged, all in same plane, 2 planes or clustered (see p473). Even if your tree is completely deciduous it will still be possible to see the leaf arrangement from the placing of leaf scars on the twigs.
- 5. Leaf type** simple or compound (see p473). If compound, count the number of leaflet pairs - are they alternate or opposite & is there an unpaired terminal leaflet ? If you have picked up a leaf from the floor, make absolutely sure that it is the whole leaf & not just a single leaflet from a larger, compound leaf. A true simple leaf will always have a bud in the angle between its stalk & the twig, whereas buds in compound leaves are only found at the base of the main stalk.
- 6. Other vegetative features** stipules (free, fused in pairs, between pairs of leaf stalks)
hairs (solitary or in star-shaped clusters)
veining (how many veins from base, raised/sunken above)
- 7. Flower/fruit arrangement** always at the end of the twigs, in the leaf axils or behind the leaves on old branches
- 8. Flower detail** both calyx & corolla or only a single, undistinguishable layer? Fertile stamens & pistils in the same flower, separate male & female flowers on the same or on different trees? Stamens free, fused to the petals, fused in bundles or in a column?
- 9. Fruit** is there a persistent calyx at the top or base of the fruit? Does the fruit split when mature? Are the seeds enclosed in a stone? Do the seeds have a fleshy or colored coating?

Drawings

Quick field sketches are very useful for recording plant characters and may be less time-consuming and more accurate than a fumbling description. Don't hesitate to combine descriptive notes & colors onto your sketches. Concentrate on the arrangement of leaves & flowers rather than the details of leaf shape & flower structure - for these it is usually better to collect a sample that you can examine later at leisure. For individual leaves, the old technique of "rubbing" is very effective - place the leaf on top of a hard flat surface, cover it with a piece of thin paper & rub a soft pencil over the surface. This requires no artistic talent & produces an exact copy of the leaf's shape & prominent veining.

Photography

If you intend to photograph a tree for later identification, you should do at least two shots for each tree - the first showing the whole bunch of flowers/fruits, together with some leaves to show the arrangement, the second a close up of individual flowers/fruits. Although a standard lens is adequate for larger flowers, its usefulness is severely restricted with smaller ones. If you develop an interest in this type of photography you will need to purchase either an extension tube or macro filters of some sort. If you already have a good standard lens, then go for extension tubes - they are more difficult to use but preserve the optical integrity of your lens better than filters. The best option is a special macro lens, which is rather expensive but definitely worth the investment in the long term. In order to maintain a good depth of field in close-up photos, you must close down the aperture as much as possible, which reduces the amount of light available. The use of a flash is difficult in closeup photography because

at such small distances the flash causes strong shadows, which are particularly problematic in very 3-dimensional objects such as flowers. Another more fundamental problem is that many flowers are semi-transparent, so that the color which we naturally perceive is a result of both reflected & transmitted light, whereas a standard flash only produces reflected light. A better option is to use a tripod & a long shutter speed, which is relatively easy with objects such as plants that do not move on their own. The choice of tripod is of crucial importance - try to buy one where the legs can be set at different angles to each other. If you are intending your photographs to act as a scientific record, you need to have some means of recording the scale. Most macro lens have an inbuilt scale measure on the focus knob - alternatively, place a ruler or a coin in the photo.

All the photos by the authors in this book were taken with Nikon F3 & FM2 cameras using a variety of Nikkor lens, principally a 55mm Micro f3.5. They were all taken in natural daylight conditions without the use of a flash.

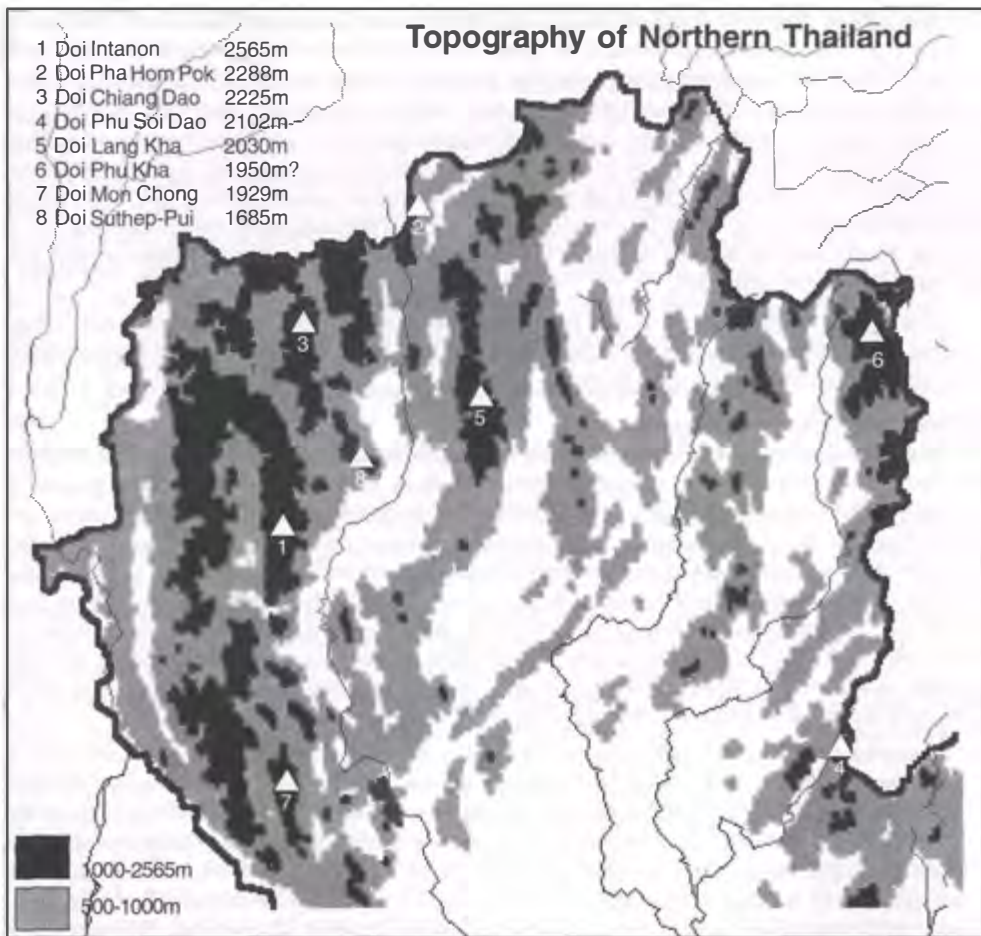
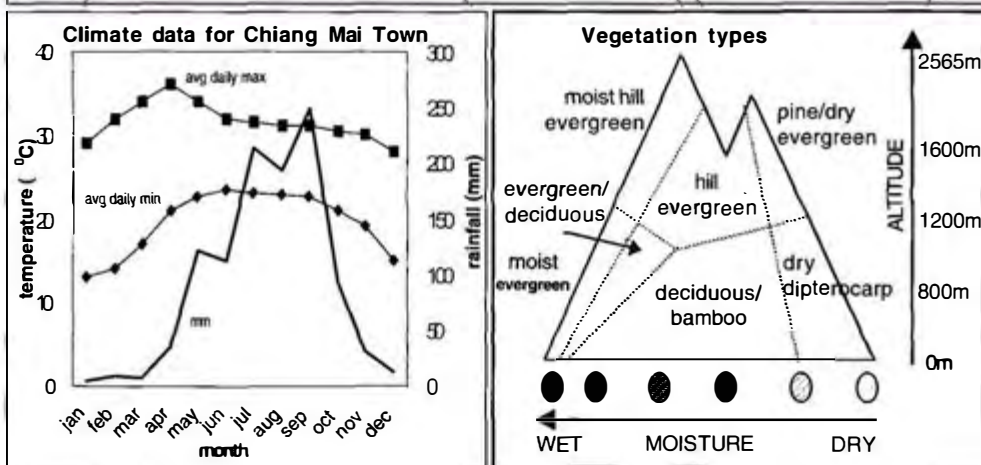
Collecting specimen samples

The only sure way of cross-checking your identification at a later date is to collect a sample. If you do not intend to keep a permanent specimen, a few dried leaves from the ground & a couple of flowers or fruits will be quite sufficient provided that you have already made good field notes. If there are no handy fragments lying around on the ground, a well-aimed stone thrown at a flowering/fruiting branch will normally succeed in dislodging a few - make sure to check that there are no birds or nests that you may harm by doing this - be particularly on the look out for wasp nests! It may be difficult to tell at a distance which clusters have open flowers, but if some of them have any insects flying around them then go for those ones first. If you pick up fallen leaves from the ground, make absolutely certain that what you have is really a whole leaf rather than just a leaflet of a much larger compound leaf.

The leaves can be kept pressed flat in a dry place such as in a note book, but the flowers are better kept in plastic bags. If you only need the sample until the evening, then simply blow into the bag & close it tightly - the moisture from your breath will keep most flowers in good state for a few hours, although they may lose some of their color. If you need to keep the sample for longer then put some 70% alcohol in with them - just enough to cover them completely. If the sample is large & full of water, such as a fleshy fruit, you will need to replace the alcohol when you return home because the alcohol becomes too diluted. Remember that alcohol will remove or modify most colors so you need to make a note of the original colors before doing this.

If you wish to have your samples cross-checked by a professional botanist then you should try to make a proper specimen. The first step is to collect a representative (not atypical) section with flowers or fruits together with some leaves on the same section. Place the specimen inside a piece of folded newspaper and press it between 2 hard, flat surfaces. You can keep fresh specimen like this for several hours, but in the evening of the same day you should take it out of the boards, but still in the newspaper, & put it in a large plastic bag together with a little 95% alcohol. This will keep for several weeks provided the bag is tightly sealed and has no holes. If you need to keep the specimen for longer than this, you will need to dry it thoroughly, which is difficult without proper equipment.

Note: remember that if you are in a national park or wildlife sanctuary, any form of collecting is strictly forbidden without prior permission. Also be aware that local people often have spiritual or other associations with particular places and should be consulted beforehand.



Physical geography of Northern Thailand

The area covered by this book includes the 9 provinces of the upper northern region of Thailand - Chiang Rai, Mae Hong Sorn, Chiang Mai, Lamphun, Lampang, Phayao, Nan, Phrao & Uttaradit. Reference is sometimes made to species which are known in the immediately adjacent provinces of Tak, Sukhothai & Pisanolok since these species may also occur in N.Thailand.

Topography

The bulk of N.Thailand falls within the upper reaches of the Chaopraya watershed which is divided into 4 main tributaries - the Mae Ping, Mae Wang, Mae Yorn & Mae Nan. The western provinces of Mae Hong Sorn & Tak are the only provinces in Thailand which drain into the Salween river, whilst the northernmost province of Chiang Rai drains into the Mekong river. The dividing ranges between these rivers include all of the highest peaks in Thailand (Doi Intanon 2565m, Doi Phahom Pok 2288m, Doi Chiang Dao 2225m, Phu Soi Dao 2102m, Doi Langka 2030m).

Climate

The climate of N.Thailand is strongly seasonal and is more similar in character to the monsoon climate of Central India than to the "everwet" climate of S.Thailand. There are 3 distinct seasons - a cool dry season between November & February; a hot dry season from March to May and a warm wet season between May & October. The annual rainfall varies from 1100 to 1500 mm, with over 80% of the annual rainfall falls within the 6 month rainy season whilst the months of December, January & February are virtually without rain. This pattern is rather uniform across the whole of the northern region, although the rainfall tends to be higher & more prolonged in mountainous areas and in the western provinces of Tak & Mae Hong Sorn.

Vegetation types of Northern Thailand

The seasonal climate of N.Thailand coupled with the complex topography has resulted in a natural vegetation pattern consisting of an intricate mosaic of both evergreen & deciduous forest patches which has been further complicated by a long history of human interaction. The balance of tree species in a particular forest patch depends on 3 main factors - moisture, altitude & disturbance.

Moisture

The moisture of a forest is determined by the difference between the rate of water input & the rate of water loss. In highland areas light showers may continue throughout the year, but in lowland areas the only significant water input during the dry season is ground water flow, which is strongly correlated with topography & geology. In valleys & concave slopes the rate at which ground water arrives at a site is faster than the rate at which it leaves the site, resulting in a build up of ground moisture which can be used by plants. In ridges & convex slopes, the reverse is the case and only those species which can tolerate dry conditions will survive. The rate at which water is lost will depend on temperature, exposure & soil quality. Under the hot sunny conditions prevailing in lowland areas, evaporation & transpiration rates are higher than in more cloudy & slightly cooler highland areas. Steep north facing slopes are in shade for a longer period of time than south facing ones & tend to be slightly moister as a result.

The best soils for retaining moisture available to plants are those with a large proportion of organic matter and an equal balance of sand, silt and clay. Soils with too much sand have

very low water storage capacity, whereas clay soils are capable of holding large amounts of water but the very small soil particles bind the water so strongly that most of it cannot be used by plants. Soils with large amounts of organic matter can hold more water for longer periods than soils with low organic matter content. In highland areas this is particularly important as lower evaporation rates & scattered dry season rain showers make it possible for sites with good soil to be almost permanently moist. In lowland sites soil quality alone is not sufficient to maintain moisture levels without significant ground water input, restricting moist forests to areas along streams & in concavities. In areas with a continual supply of ground water, mature forests can develop on very poor soil because the plants do not depend on the soil to maintain moisture levels.

Plants that are not confined to areas with permanent supplies of water must develop some mechanism to avoid excessive water loss. The main approaches which have developed through evolution are:

1. **deciduous habit** - losing some or all of their leaves in the dry season
2. **sclerophylly** - thick leaves with a waxy coating that reduces water loss

In lowland areas the majority of plants tolerant of dry conditions adopt the first strategy, whereas in highland areas the second strategy is the more common. The degree of deciduousness of a forest is usually a good indication of the dryness of a site in lowland areas but is much less useful in highland areas.

Altitude

Highland areas have lower temperatures & higher moisture levels than lowland areas. Freezing temperatures, which can cause sharp transitions in vegetation in temperate areas, only occur for a few hours per year at the very summit of the highest mountains. However, each species has an optimal temperature range for germination, growth, flowering & setting seed so very few species are equally abundant throughout the whole altitude range.

In highland areas, not only is the total amount of rainfall greater than in the lowlands, but it is spread more evenly throughout the year, with a significant proportion falling in the dry season. Lower temperatures at higher altitudes result in lower transpiration & evaporation rates which in turn create moister ground conditions. In addition, the cooler temperatures result in slower decomposition rates, which allow a greater build up of organic matter in the soil, with beneficial effects on soil moisture levels. All these factors in combination contribute to the generally moister conditions of highland areas, although topography continues to play a significant role, with exposed ridges and shady valleys supporting different vegetation than intermediate areas.

Disturbance

All forests are naturally subject to various forms of disturbance which prevents or slows down the development of the climax type which could occur on a particular site. Such natural forms of disturbance include landslips, fires caused by lightning, flooding etc. Nevertheless, the vast majority of disturbance to the forests in N.Thailand at the current time are the result of human activities. N.Thailand has been inhabited by people for at least 7000 years, possibly considerably longer. In certain habitats, such as moist lowland sites, this has led to the virtual elimination of any natural forest cover, but even apparently intact highland forests are rarely completely without some history of human-induced disturbance.

The most widespread form of disturbance at the current time is the deliberate starting of forest fires. In areas which we have surveyed, almost 80% of all forested areas show signs of recent burning, and this is probably typical for most of the region.

Although the impact of commercial logging drastically alternated forests in the past, the

logging ban of 1989 has been fairly effective in reducing large scale operations. Small scale logging continues to have an effect because it is highly species-selective. Most high value timbers occur in mixed deciduous/bamboo forests - called "mai Ben ja pan" in reference to the 5 most valuable of these - *Tectona grandis* (mai sak, teak), *Pterocarpus macrocarpus* (mai pradu), *Xylia xylocarpa*, (mai dhaeng), *Azelia xylocarpa* (mai makha) & *Lagerstroemia* spp. (mae tabek).

How disturbance affects a forest

As a primary forest becomes disturbed, several changes take place which depend on the initial site conditions & the type of disturbance.

1/ forest structure. The main layer of trees which is open to the sky is the **canopy** layer. The average height & density of the canopy layer is the most obvious indication of the maturity & condition of a forest patch, but the structure of the canopy is equally important. A mature, undisturbed forest typically contains trees of all different ages & microhabitat preferences, which usually results in an uneven main canopy & a multi-layered structure. Large trees that stand out well above the general canopy are known as **emergents**, whereas trees which live in full or partial shade below the main canopy are referred to as the **understorey layer**. Moist sites will usually support a 3-layered forest, whereas drier sites mostly support only a 2-layered forest. Sites with a very even canopy and/or only one main layer are likely to be immature or highly disturbed forests that have not yet reached their full potential.

2/ Tree species

Disturbance to a forest over a long period will ultimately change the species composition. All natural forests contain small gaps which are created when individual trees die. Such gaps contain a large proportion of **pioneer species** which are fast growing but intolerant of shade and usually die out as the gap matures. In disturbed forests, pioneer species become increasingly common at the expense of climax species. An important group of pioneer species are the bamboos, which often become dominant in disturbed lowland sites.

In the long term, disturbance leads to the expansion of dry forest species into areas with a higher moisture potential. A forest with a mature canopy may not necessarily be the climax forest type which could develop on that site. Only by comparing the physical potential of a site with the current species present is it possible to gain a true evaluation of the degree of disturbance.

3/other indicators of disturbance

Apart from the effects on the canopy structure & species composition, disturbance also leads to changes in the non-tree components of the ecosystem. Less disturbed forests tend to have a well-developed shrub layer and a considerable volume of deadwood rotting on the ground. By contrast, fire-prone forests have very few shrubs or deadwood and the herb layer is typically dominated by grasses & sedges.

LOWLAND FORESTS (<800m)

Profile 1

Moist areas (moist evergreen forests, gallery evergreen forest)

Moist lowland areas support the richest forest type in N.Thailand in terms of tree species diversity. Species densities of 150 spp/ha are not uncommon in less-disturbed areas. In mature sites, the largest trees can reach 40m or more in height, whilst the main canopy is at 25-30m, with a well developed understorey layer. Although the understorey & canopy layers are typically almost entirely evergreen, many of the emergent trees are briefly deciduous during the cold season. Common emergent trees include *Acrocarpus fraxinifolius*

(Leguminosae), *Erythrina* spp. (Leguminosae), *Toona* spp. (Meliaceae), *Hopea odorata* (Dipterocarpaceae), *Dipterocarpus alatus* (Dipterocarpaceae), *Pterocymbium* spp. (Sterculiaceae), *Dracontomelon dao* (Anacardiaceae), *Duabanga grandiflora* (Sonneratiaceae), *Tetrameles nudiflora* (Datiscaeeae), *Morus macroura* (Moraceae), *Ficus* spp. (Moraceae). Several of these species exhibit buttressing but this habit is never as common as in tropical rainforests such as those found in S.Thailand

The canopy layer is extremely diverse, with no clear dominance by any group of species. Common families include Annonaceae, Sapindaceae, Meliaceae, Anacardiaceae, Leguminosae, Myrtaceae and Euphorbiaceae. Lauraceae are often present but less common than at higher altitudes. The understorey layer is equally diverse, including such common species as *Baccaurea ramiflora*, *Cleidion spiciflorum* (Euphorbiaceae), *Knema* spp. (Myristicaceae), *Garcinia* spp. (Guttiferae), *Trevesia palmata* (Araliaceae) as well as many palm species. Bamboo species are usually uncommon but include the enormous *Gigantachloa* with stems up to 30m tall. The shrub layer contains an abundance of young tree saplings, together with palms & gingers. Grasses are almost absent.

Extensive tracts of such forests are virtually non-existent in N.Thailand as they have long since been converted to wet-rice agriculture. Remnant patches can still be found along rocky, inaccessible streams & in well-protected or sacred sites but the future of these forests is far from certain as many of them are outside or along the borders of officially protected areas.

Intermediate moisture (deciduous/bamboo forests)

In areas away from permanent streams or access to ground water, the vegetation suddenly changes as species have to adapt to seasonal shortages of water. Species densities are lower than in moist sites, although 100 spp/ha can still be expected in good sites. The stature of such forests can be almost as grand as the evergreen forests - we have seen sites with emergent trees of 40m & average canopy of 30m height but such areas are uncommon. Canopies of around 70% cover and a mean height of 25m are more usual. The structure tends to be simpler than evergreen forests, with fewer emergent & understorey trees. A small proportion of trees are evergreen, but the majority are at least partly deciduous during the dry season. Most sites nowadays contain a substantial proportion of bamboo, which becomes increasingly dominant in more disturbed sites.

This site type supports the most commercially valuable forests of N.Thailand, including the magnificent teak (*Tectona grandis*) forests which were once an important source of revenue. Teak-dominated forests have been eliminated from almost all of N.Thailand, although it is still possible to find areas with a promising number of young teak trees. Other important timber trees which would naturally be abundant in this forest type include *Pterocarpus macrocarpus*, *Xylia xylocarpa* and *Azela xylocarpa* (Leguminosae). Their position has been replaced by a wide range of less valuable species such as *Canarium subulatum*, *Garuga pinnata* (Burseraceae), *Schleichera oleosa* (Sapindaceae), *Spondias pinnata*, *Lannea coromandelica* (Anacardiaceae), *Cassia fistula* (Leguminosae), *Terminalia* spp. (Combretaceae), *Lagerstroemia* spp. (Lythraceae) and *Gmelina arborea* (Labiatae). Smaller trees are equally diverse, with the families Sterculiaceae, Tiliaceae, Anacardiaceae, Leguminosae, Labitae & Euphorbiaceae being among the commoner groups.

Dry sites (dry dipterocarp forests)

On exposed ridges and steep south facing slopes there is almost no ground water input during the dry season and the soil is often too thin to maintain water reserves. Only those plants which are adapted to dry conditions can survive. The natural vegetation in such areas is often referred to as dry dipterocarp forest because it is frequently dominated by 4 species

of Dipterocarpaceae - *Dipterocarpus tuberculatus*, *D. obtusifolius*, *Shorea obtusa* & *S. siamensis*. These forests have a poorer canopy structure than other lowland forests - 60 % cover & 15m mean height are typical, with very few emergents or understorey. The tree species diversity is also much lower, with less than half the total number of species found in deciduous/bamboo forests. Other common species include *Lophopetalum wallichii*, (Celastraceae), *Walsura* spp. (Meliaceae), *Gluta usitata*, *Buchanania* spp. (Anacardiaceae), *Dalbergia cultrata* & *D. oliveri* (Leguminosae), *Lagerstroemia macrophylla* (Lythraceae), *Diospyros mollis* (Ebenaceae), *Wrightia arborea*, *Holarrhena pubescens* (Apocynaceae), *Strychnos* spp. (Loganiaceae), *Aporosa villosa*, *Phyllanthus emblica* (Euphorbiaceae). Rubiaceae are one of the most common families, with a wide variety of species particularly in the lower stratum, including *Morinda tomentosa*, *Gardenia sootepensis*, *Ceriscoides* spp. & others. A few species of Fagaceae, such as *Quercus kingiana*, *Q. kerrii* & *Castanopsis argyrophylla*, may also be present.

Under natural conditions the extent of dry dipterocarp forest would probably be very limited, but widespread disturbance over several millenia has resulted in a great increase in the extent of this forest type, which now dominates the lowland vegetation throughout much of N.Thailand. This situation is maintained by annual fires, which prevents species typical of higher moisture levels from becoming established even in moderately moist sites.

MID-ELEVATION FORESTS (800-1200m)

The zone between 800 and 1200m is transitional between lowland & highland forests. Most forests at this altitude contain a proportion of both lowland & highland species, resulting in some of the most species-rich forests in N.Thailand.

Moist areas

Moist forests at this altitude are very similar to their lowland counterparts in terms of both canopy structure & tree species composition. However, many species which have become rare or extinct in lowland areas due to habitat degradation continue to survive in this zone.

Intermediate areas

Intermediate sites in this altitude range support a complex mix of both highland & lowland species. It is not uncommon to find areas with both hill evergreen & deciduous/bamboo growing side by side. In general, more disturbed sites tend to contain a higher proportion of lowland species (particularly bamboo), whereas in less-disturbed sites hill evergreen species predominate.

In the transitional area between intermediate & moist sites, a mixed evergreen/deciduous forest type often develops which reaches its maximum extent at around 1000m, although it is also found in favorable sites at lower altitudes. This diverse forest type is characterized by the huge crowns of *Dipterocarpus costatus* & *D. turbinatus* (Dipterocarpaceae), which often occur in gregarious stands. Other species which are typical of this area include: *Balakata baccata* (Euphorbiaceae), *Nyssa javanica* (Cornaceae), *Irvingia malayana* (Irvingiaceae) & *Shorea roxburghii* (Dipterocarpaceae). Although these species are also found in other areas, many of them reach their maximum abundance under these conditions. Under more disturbed conditions, the understorey layer becomes increasingly dominated by bamboo.

dry areas

At these altitudes, an intermediate forest type consisting of both pine/dry evergreen species and dry dipterocarp species is often found. Such forests are frequently dominated by *Dipterocarpus tuberculatus* & *Pinus merkusii*.

Moist sites (moist hill evergreen forest)

The distinction between moist & dry forest types is less clear at higher altitudes due to the generally moister conditions. In contrast to lowland areas, moist forests are not restricted to gullies but can be found in a wide variety of situations, particularly in saddles and on north facing slopes. Above 1800m, moist forests are probably the natural dominant type in all but the most exposed areas. Even at lower altitudes, moist hill evergreen forests were probably much more extensive in former times but have been gradually replaced by drier forests.

The canopy of mature moist hill forests can be as dense & high as lowland forest but is usually less structurally diverse - the understorey layer is less pronounced & there are less large emergent trees. Almost 100% of the trees are evergreen. The tree species diversity is slightly less than at lower altitudes, but still considerably more diverse than in drier forests. The families Lauraceae, Magnoliaceae & Theaceae are often common, although there is rarely any clear dominance by individual species. *Acer* spp. (Aceraceae), *Aesculus assamica* (Hippocastanaceae), *Fraxinus floribunda* (Oleaceae), *Livistona speciosa*, (Palmae), *Cephalotaxus griffithii* (Cephalotaxaceae) & *Podocarpus neriifolius* (Podocarpaceae) are sometimes present but never common. The understorey layer frequently contains species of Theaceae, Symplocaceae & Oleaceae. Above 1400m, *Rhododendrons* (Ericaceae) make their appearance. The shrub layer includes *Pandanus* (Pandanaceae), *Pinanga sylvestris*, *Areca triandra* (Palmae) & *Cyathea* (tree ferns). Epiphytic *Schleffera* spp. (Araliaceae) are a distinctive feature of this forest type.

Intermediate sites (hill evergreen forest)

The most widespread forest type between 1000 and 1800m is hill evergreen forest. The structure of these forests is simpler than moist forests, with very few emergents and poorly developed understorey/shrub layers. The main canopy is almost entirely evergreen and can reach 90% cover with a mean height of 20-25m. The herb layer is often dominated by grasses & sedges - a sure sign of past fires. Trees of the family Fagaceae often form at least 50 % of the main canopy layer. Other common species include *Schima wallichii*, (Theaceae), *Engelhardtia* spp (Juglandaceae), *Carpinus loudonii* (Betulaceae), *Gluta obovata*, *Choreospondias axillaris* (Anacardiaceae), *Nyssa javanica* (Cornaceae) *Tarennoidea wallichii* (Rubiaceae), *Syzygium albiflorum* (Myrtaceae), *Phoebe lacleota* (Lauraceae) as well as several species Elaeocarpaceae & Lauraceae. *Betula alnoides* (Betulaceae) is locally abundant, sometimes forming almost single-species stands. Smaller trees include *Archidendron clypearia* (Leguminosae), *Maesa* spp., *Ardisia* spp. (Myrsinaceae), *Styrax benzoides* (Styracaceae), *Vernonia* spp. (Compositae), *Aporosa* spp., *Antidesma* spp., *Glochidion* spp. (Euphorbiaceae), *Turpinia* spp. (Staphyleaceae).

Dry sites (pine-dry evergreen forest)

Exposed ridges and steep south facing slopes support a drier forest type than the surrounding hill evergreen forest. In areas with extremely sandy soils, such as in Mae Chem district, the whole landscape can become dominated by this forest type, intersected by narrow strips of moist forest in the gullies. Long term disturbance, particularly fire, has led to a considerable expansion of this forest type beyond its natural limits.

Dry hill forests contain less tree species than any other forest type in N.Thailand and are often dominated by less than 10 species. The canopy is almost entirely evergreen and usually very open (less than 50% cover). Shrubs are very scattered and are composed mainly of stunted trees rather than distinct shrub spp. Bamboos & palms are absent except for the drought tolerant species *Phoenix loureiri* (Palmae). The herb layer is usually rather sparse and contains grasses & deciduous herbs.

Pine forests typically contain of 2 well defined layers. The upper layer consists almost exclusively of *Pinus* spp., with a lower layer of *Vaccinium* spp., *Craibiodendron stellatum* (Ericaceae), *Helicia* spp. (Proteaceae), *Tristaniopsis burmanica* (Myrtaceae), *Myrica esculenta* (Myricaceae), *Anneslea fragrans* (Theaceae). Other species include *Mahonia nepalensis* (Berberidaceae), *Sterculia villosa* (Sterculiaceae), *Cycas* spp. (Cycadaceae), *Ochna integerrima* (Ochnaceae), *Rhododendron* spp (Ericaceae), *Memecylon plebejum* (Melastomataceae), *Dillenia aurea* (Dilleniaceae). The commonest species of pine at higher elevations is *Pinus kesiya* whilst below 1000m *P. merkusii* often predominates.

Limestone forests

Limestone outcrops occur in many areas in N.Thailand, ranging from small pockets less than 100m across to the enormous massif of Doi Chiang Dao - Thailand third highest mountain. Although there are very few tree species which are restricted to limestone, these outcrops often support interesting forest formations and contain many species which are uncommon in other areas. Limestone forests at lower altitudes tend to be extremely deciduous due to the dry conditions created by the high permeability of the limestone bedrock. The tree species are very similar to those found in deciduous/bamboo forests, but because of the difficulty of logging on limestone outcrops, these areas often provide a last refuge for valuable timber species which have been eliminated from the surrounding area. It is not uncommon to find dry dipterocarp species almost absent even in the driest sites, probably because the extensive patches of bare rock prevents the spread of fires which are a crucial factor in maintaining dry dipterocarp forest.

An interesting feature of limestone areas are the small depressions known as sink holes. These sink holes provide moist & shady fire-free conditions, allowing many uncommon species to flourish which are otherwise restricted to undisturbed moist evergreen forests. The geological border between limestone & an underlying impermeable rock (eg. shale) is another area to look for less common tree species. Ground water which has been percolating freely downwards in the permeable limestone is forced close to the surface, thus creating moist conditions. The base of Doi Chiang Dao mountain provides an excellent example of this effect.

Villages, towns & gardens

The purpose of this book is to provide a guide to native tree species, so the majority of cultivated species are not included. However, a number of native species are widely cultivated as fruit trees, such as *Sandoricum koetjape* (Gatorn, Meliaceae), *Dimocarpus longan* (Longan - Sapindaceae), *Aegle marmelos* (Bael fruit, Rutaceae) & *Cleistocalyx nervosum* (Myrtaceae). *Camellia sinensis*, the tea bush, is widely cultivated throughout NT both for dried tea & fermented "miang". Several species have been in cultivation for so long that the original wild distribution range has been obscured. *Mangifera indica* (mango), *Litchi chinensis* (Lychee) & *Borassus flabellifer* (sugar palm) may once have been native to N.Thailand but cannot be found growing in the wild today.

Many native species are grown for their ornamental value, including *Michelia champaca* (Magnoliaceae), *Cananga odorata* (Annonaceae), *Mesua ferrea* (Guttiferae), *Hibiscus* spp. (Malvaceae), *Murraya paniculata* (Rutaceae), *Cassia* spp. (Leguminosae), *Prunus cerasoides* (Rosaceae), *Lagerstroemia* spp. (Lythraceae), *Holarrhena pubescens*, *Alstonia scholaris* (Apocyanaceae), *Oroxylum indicum* & *Millingtonia hortensis* (Bignoniaceae).

KEY A: GENERAL LEAF KEY

characters refer to leaves unless specified otherwise

1. whorled *

2. simple

3. bark with white latex – *Alstonia* ⁵⁹⁴, *Rauvolfia* ⁵⁸⁸

3. bark without latex – *Actinodaphne* ⁶⁵⁶, *Syzygium formosum* ⁴²², *Pinus* ⁸⁷⁰

2. pinnate – *Heterophragma* ⁶²⁸, *Santisukia* ⁶¹³

1. opposite

4. simple - KEY B

4. trifoliate

5. toothed – *Turpinia* ²⁸⁵

5. untoothed – *Euodia* ¹⁸⁹, *Vitex* ^{key p279}

4. digitate – *Vitex* ^{key p279}, *Aesculus* ²⁸³

4. once-pinnate

6. 5-7 pairs of leaflets, citrus smell - *Euodia meliaefolia* ¹⁸⁹

6. 2-4 pairs of leaflets, no citrus smell - *Turpinia* ²⁸⁵, *Sambucus* ⁴⁷², *Fraxinus* ⁵⁷⁸
Schrebera ⁵⁷⁹, *Bignoniaceae* ^{key p265}

4. 2-4x pinnate – *Bignoniaceae* ^{key p265}

1. alternate

7. simple

8. toothed - KEY C

8. untoothed - KEY D

7. trifoliate

9. bark thorny *Erythrina* ³⁵⁷, *Aegle marmelos* ¹⁸⁷, *Zanthoxylum evodiaefolium* ²⁰⁰

9. bark not thorny

10. toothed - *Allophyllus* ²⁶² (hairy), *Bischofia* ⁷⁰¹ (smooth)

10. not toothed

11. scaly - *Aglaia* ²²⁸

11. hairy – *Heritiera* ¹³⁴, *Brucea* ²⁰⁵, *Walsura* ²¹⁷, *Lepisanthes* ²⁷³,
Sandoricum ²⁷⁷, *Butea* ³⁵⁵

11. smooth – *Crateva* ⁴⁰, *Brucea* ²⁰⁵, *Dysoxylum* ²²³, *Xerospermum* ²⁶⁴

7. digitate

12. bark thorny – *Bombaceae* ¹¹⁴, *Brassiopsis* ⁴⁶², *Trevesia* ⁴⁶⁰

12. bark not thorny – *Sterculia* ^{key p78}, *Schleffera* ⁴⁵⁴ (± epiphytic), *Macropanax* ⁴⁵⁵

7. once-pinnate - KEY E

7. 2-4x pinnate – *Leguminosae* ^{key p156}, *Melia* ²²⁰ (toothed), *Chukrasia* ²³², *Aralia* ⁴⁵⁶
(thorny), *Heteropanax* ⁴⁵⁹, *Palmae* ^{key p367}, *Cyathea* ⁸⁷⁵ (tree ferns)

* many leaves are clustered but not truly whorled, which often becomes more obvious on older twigs as the space between the leaf scars lengthens, eg: *Terminalia*, *Rhododendron*, *Baccaurea*.

KEY B: SIMPLE, OPPOSITE LEAVES

1. bark with white or yellow latex
2. with pairs of stipules between leaves
Apocynaceae key p 257
2. not so
3. leaves distinctly hairy
Ficus hispida 779
Broussonetia 754
Morus macroura 753a
3. leaves smooth or nearly so
Guttiferae key p49 (yellow or cream latex)
Apocynaceae key p257 (white latex)
Sarcosperma 548 (sunk glands in vein axils)
1. bark without latex
4. with pairs of stipules between leaves
Rubiaceae key p217 (sometimes thorny)
Fagraea 605 (faint side veins)
Carallia brachiata 388 (conical leaf buds)
4. not so
5. leaves with glands or scales
6. few large glands, mostly at base of leaf
7. leaves broadly ovate/triangular
Gmelina arborea 630 ($\pm$ smooth)
Trewia nudiflora 747 (star-shaped hairs)
Mallotus key p314 (smooth or hairy)
7. leaves oblong or elliptic
Terminalia key p187
Mallotus key p314
Cleidon spiciflorum 709
6. scattered small glands on margin
Hiptage 180
(*Terminalia*) key p187
6. dense silvery scales below
Nothaphoebe 677
Combretum quadrangulare 400
6. tiny translucent or blackish glands below
8. leaves hairy
Eugenia bracteata 407 (shrub to 2m)
Decaspermum parviflorum 433
8. leaves smooth
9. leaves toothed
Glyptopetalum sclerocarpum 255
9. leaves not toothed
Syzygium key p194
Acronychia pedunculata 182
5. leaves without glands
10. leaves hairy
11. stems squarish, leaves in 2 rows
Labiatae key p274
11. stems rounded, leaves planar/spiral
12. leaves toothed
13. 3 basal veins, with stipules
Urticaceae key p 345
13. 1 basal vein, stipules absent or minute
Olea oblanceolata 584
(*Buddleja asiatica*) 604
(*Viburnum*) 469
12. leaves not toothed
Lagerstroemia key p 202
Terminalia key p 187
Olea rosea 584
(*Buddleja asiatica*) 604
(*Viburnum*) 469
(*Wightia*) 612 (often epiphytic)
10. leaves smooth
14. leaves with teeth
Euonymus 252 (lvs 8-15(22)cm, elliptic)
Careya arborea 435 (lvs 15-30cm, obovate)
Barringtonia 436 (lvs 7-20cm, narrow obovate)
Olea salicifolia 586 (lvs 7-15cm, lanceolate)
Olea dioica 587 (lvs 6-13cm, lanceolate)
14. leaves without teeth
15. side veins parallel to main vein
Conifers key p 374
15. side veins forming a network
16. 3-5 main veins from base
Acer 277 (lvs whitish below)
Strychnos 607 (3-5 basal veins)
Wightia 612 (often epiphytic, pink fws)
Cinnamomum iners 669
16. 1 main vein from base
17. leaves planar
18. twigs ridged
Duabanga grandiflora 452
Memecylon 438 (veins faint)
18. twigs not ridged
Lagerstroemia key p202 (young lvs pink-brown)
Crypteronia 451 (young lvs bluish)
Cratoxylum 47 (young lvs pink)
17. leaves spiral
Bouea oppositifolia 289
Oleaceae key p254
Viburnum cylindricum 470
Litsea salicifolia 662 (subopposite)
Beilschmiedia 681 (subopposite)
17. leaves spiral or planar
Microtropis 249, *Lophopetalum* 256, *Mastixia* 468

KEY C: SIMPLE, ALTERNATE LEAVES WITH TEETH

1. branches thorny

Maytenus ²⁵¹

Zizyphus ²⁵⁸

Flacourtiaceae key p 53

Trevesia ⁴⁶⁰ (lvs large, deeply lobed)

1. branches not thorny

2. bark with latex or colored sap

3. bark with white latex

Moraceae key p325

3. bark with red sap

Mallotus key p314

Macaranga ⁷²⁶

Ostodes ⁷³⁶

(*Gordonia*) ⁷⁹

2. bark without latex or colored sap

4. leaves with scales

5. silvery scales

Homonoia riparia ⁷²⁵ (lvs lanceolate)

Croton key p308 (lvs broader, not lanceolate)

5. orange-brown scales

Saurauia ⁸⁹ (pointed teeth, no glands)

Ardisia key p308 (rounded teeth with glands)

4. leaves with glands

6. rounded glands on stalks or base of leaf

Ostodes ⁷³⁶ (3 basal veins, glands on teeth)

Aporosa ⁶⁹⁸ (glands on stalks, scattered teeth)

Prunus ³⁷⁹

6. glandular dashes

Casearia ⁶⁹ (translucent dashes)

Maesa key p241 (dark dashes)

6. tiny dark glandular dots

Rapanea yunnanensis ⁵³⁵

Betula alnoides ⁸⁰⁷

Myrica esculenta ⁸¹⁰

Prunus phaeosticta ³⁸²

Prunus javanica ³⁸³

4. leaves without scales or glands

7. mature leaves obviously hairy

8. leaves with 3-7 basal veins

9. no stipules

Alangium ⁴⁶⁴

9. stipules fused in pairs

Urticaceae (not *Boehmeria*) key p345

9. stipules free

Tiliaceae key p87

Trema orientalis ⁷⁴⁸

Boehmeria ⁷⁹¹

8. leaves with 1 basal vein

(no stipules except *Salix*)

10. leaves mostly ≥ 20 cm long, coarsely toothed

Vernonia ⁵¹¹

Helicia formosana ⁶⁸³

10. leaves mostly ≤ 15 cm long, finely toothed

11. leaves lanceolate

Salix tetrasperma ⁸⁴²

Eurya acuminata ⁸⁷

11. leaves elliptic or oblong

Symplocos key p250

Camellia connata ⁷⁴

Pyrenaria garrettiana ^{80a}

(*Elaeocarpaceae*) key p94

(*Fagaceae*) key p351

7. mature leaves smooth or minutely hairy

12. leaves with 3-7 basal veins

Celtis ⁷⁴⁹ (leaves narrowly ovate)

Eriolaena ¹⁴⁴ (leaves broadly ovate)

12. leaves with 1 basal vein

13. bark deeply cracked

Vaccinium ⁵¹⁴

Schima wallichii ⁷⁸

Fagaceae key p351

(*Salix tetrasperma*) ⁸⁴²

13. bark smooth or shallowly cracked

14. leaves with tapering tips

15. deciduous stipules, flowers without petals

Ulmus lanceifolius ⁷⁵²

Salix tetrasperma ⁸⁴²

15. no stipules, flowers with petals

Theaceae key p56

Ilex englishii ²⁴⁸

Ehretia ⁶⁰⁹ (6-9 pairs of side veins)

Carpinus ⁸⁰⁸ (doubly toothed, 10-13 pairs of side veins, fluted trunk)

Symplocos key p250 (5-11 pairs of veins)

14. leaves with blunt or slightly pointed tips

Siphonodon ²⁵⁷

Ochna ²⁰⁹

Helicia nilagirica ⁶⁸²

Dillenia key p31

Theaceae key p56

Homalium ⁶⁵

Hydnocarpus ⁶⁴

Elaeocarpus key p94

(*Symplocos*) key p250

KEY D : SIMPLE, ALTERNATE LEAVES WITHOUT TEETH

NOTE: over 50% of all species fall into this category, so you will often be unable to identify your tree without flowers or fruit

1. inner bark with latex or colored sap
2. inner bark with red or pinkish sap
 - Myristicaceae* ⁶⁴⁵
 - Miliusa* ²⁶
 - (*Gordonia*) ⁷⁹
 - (*Mallotus*) key p314
 - (*Macaranga*) ⁷²⁶
2. inner bark with white latex
 - Moraceae* key p325
 - Sapotaceae* key p242
 - (*Euphorbiaceae*) key p 297
1. inner bark resinous or aromatic
3. large stipules; prominent side veins
 - Dipterocarpaceae* key p64 (except *Vatica*)
3. no stipules; less obvious side veins
 - Anacardiaceae* key p142 (lvs smooth or hairy)
 - Lauraceae* key p285 (lvs usually smooth)
 - Styrax* ⁵⁷⁵ (lvs with white star-shaped hairs)
 - Aquilaria crassna* ⁶⁸⁵ (lvs smooth or nearly so)
1. inner bark without resin, latex or color sap
4. leaves with scales
5. silvery scales
 - Platlea latifolia* ²⁴¹ (broad leaves)
 - Homonoia riparia* ⁷²⁵ (lanceolate leaves)
 - Croton* key p308
5. orange-brown scales
 - Heritiera macrophylla* ¹³⁴
 - Ardisia* key p238
 - Rhododendron* key p235
4. leaves with glands
6. glands on stalks or at base of leaf
 - Euphorbiaceae* key p297
 - Prunus arborea* ³⁸¹
 - Parinari* ³⁷⁸
6. glands on surface, usually tiny
7. pale or translucent dots
 - Acronychia pedunculata* ¹⁸²
 - Atalantia* ¹⁸³ (spiny)
 - Tristanopsis burmanica* ⁴³⁴
 - (*Lauraceae*) key p285
7. dark dots
 - Rapanea* ⁵³⁵ (many side veins)
 - Ardisia polycephala* ⁵³¹
 - Ardisia attenuata* ⁵²⁸
 - Myrica esculenta* ⁸¹⁰
7. dark stripes
 - Maesa* key p241
4. leaves without scales or glands
8. mature leaves distinctly hairy
9. star-shaped or tufted hairs
 - Sterculiaceae* key p78
 - Nothapodytes foetida* ²⁴⁴
 - Solanum verbascifolium* ⁶¹¹
 - Sumbaviopsis albicans* ⁶⁸⁹
9. simple hairs
10. 3-7 basal veins
 - Alangium* ⁴⁶³
 - Lindera* ⁶⁶⁶
 - Neolitsea* ⁶⁶⁵
 - Dendrocnide stimulans* ⁷⁹³ (stinging hairs)
10. 1 basal vein
11. leaves leathery, dark green
 - Rhododendron arboreum* ⁵²²
 - Fagaceae* key p351
 - (*Diospyros*) key p245
 - (*Antidesma*) key p299
 - (*Glochidion*) key p309
11. leaves thinner, mid-green
12. with stipules (but often tiny)
 - Rosaceae* ³⁷⁸
 - Antidesma* key p299
 - Bridelia* key p305
 - Glochidion* key p309
12. no stipules
 - Vernonia* ⁵¹¹
 - Gochnatia* ⁵¹⁰
 - Nyssa javanica* ⁴⁶⁷ (glaucous)
 - Diospyros* key p245
 - Litsea* key p286
8. mature leaves smooth or nearly so
13. with stipules
14. stipules branched
 - Microcos* ¹⁶³ (3 basal veins)
 - Rosaceae* ³⁷⁸ (1 basal vein)
14. stipules not branched
 - Magnoliaceae* key p33 (stipule scar on leaf stalk)
 - Casearia flavovirens* ⁷¹ (tiny stipules)
 - Irvingia malayana* ²⁰⁸ (conical buds, ring scar)
 - Euphorbiaceae* key p297 (stalks swollen at top)
 - Holoptelea integrifolia* ⁷⁵¹ (5-7 pairs of side veins)
 - Fagaceae* key p351

13. no stipules

15. leaves with parallel veining

Nageia wallichianus (leaves 7-15(20)cm)

Dracaena ⁸⁴⁴ (leaves (22)50-80cm)

15. leaves with 3-7 basal veins

Alangium salvifolium ⁴⁶³

Cinnamomum iners ⁶⁷⁰

Cinnamomum caudatum ⁶⁷¹

Neolitsea cassia ⁶⁶⁵

Aquilaria crassna ⁶⁸⁵

15. leaves with 1 basal vein

16. deeply cracked bark

Cinnamomum porrectum ⁶⁶⁸

Xanthophyllum ⁴⁵

Gochnatia decora ⁵¹⁰

(*Ilex*) ²⁴⁶

Craibiodendron ⁵¹⁶

16. smooth or shallowly cracked bark

Annonaceae key p36 (±planar, septate pith)

Pittosporum ⁴³ (terminal buds scaly)

Anacolosia ²³⁹ (planar, arched veins)

Schoepfia ²³⁸ (planar, arched veins)

Icacinaceae key p124 (arched veins)

Ilex ²⁴⁶

Theaceae key p 56

Lauraceae key p285 (old leaves yellow)

Diospyros key p245

Helicia ⁶⁸²

Nyssa ⁴⁶⁷ (narrow leaf buds)

Lyonia ovalifolia ⁵¹⁷

Rhododendron molumense ⁵²¹

KEY E : PINNATE LEAVES, ALTERNATELY ARRANGED

1. leaflets with teeth

2. with leafy stipules or pseudostipules

Mahonia nepalensis ³⁹¹ (pseudostipules)

Pometia pinnata ²⁶⁶ (pseudostipules)

Picrasma javanica ²⁰³ (true stipules)

2. no leafy stipules or pseudostipules

3. side leaflet stalks >5mm

4. 2-5 pairs of leaflets

5. sap resinous or blackish

Protium serratum ²¹⁰ (no stipules)

Canarium ²¹⁴ (with stipules)

5. sap not resinous or blackish

Engelhardtia serrata ⁸⁰⁶

Meliosma pinnata ²⁸⁸ (no dots)

4. 6-13 pairs of leaflets

Choerospondias axillaris ³⁰⁶

(*Meliosma pinnata*) ²⁸⁸

3. side leaflet stalks <5mm

6. leaf rachis winged

Rhus chinensis ³⁰³ (plant not thorny)

Harrisonia perforata ²⁰⁷ (plant thorny)

6. leaf rachis not winged

7. sap resinous

Garuga ²¹¹

7. sap not resinous

Azadirachta indica ²²² (leaflets curved)

(*Engelhardtia serrata*) ⁸⁰⁶

1. leaflets without teeth

8. leaflets thick & rigid; parallel veining

Palmae ³⁶⁷

Cycadaceae ³⁷⁷

8. leaflets thinner; network veining

9. crushed leaves with "citrus"

smell; plants often thorny

Rutaceae key p 99

9. crushed leaves without citrus

smell; plants never thorny

10. bark with colored or aromatic sap

11. bark with reddish sap

Ailanthus triphysa ²⁰²

Pterocarpus ³⁶⁰

Callerya atropurpurea ³⁷²

11. cut bark with turpentine smell

Anacardiaceae key p142

(leaflet stalks <1cm)

Protium serratum ²¹⁰

(leaflet stalks ≥1cm)

11. cut bark with sweet smell

Toona ²³⁴

10. without colored or aromatic sap

12. leaflets typically blunt-tipped

with faint side veins, usually smooth; leaflet stalks swollen (pulvinate); crushed green parts often with "bean" smell

Leguminosae key p156

12. leaflets often with pointed tip

& distinct side-veins, smooth or hairy; leaflet stalks not pulvinate; without "bean" smell

Meliaceae key p114

Simaroubaceae ²⁰² (bitter bark)

Bretschnerideraceae ²⁸⁴

(Doi Phu Kha)

Meliosma pinnata ²⁸⁸

Pentapanax (Aralia) ⁴⁵⁸

Engelhardtia spicata ⁸⁰⁵

Sapindaceae key p 131

(usually even-pinnate with "free-ending")

DISTINCTIVE CHARACTER KEYS

Crown & trunk characters

KEY1: Growing on other trees or rocks

1. **alternate simple leaves**
2. **with white latex**
Ficus key p 332
2. **no latex**
Tetrameles ⁴⁵³ (broadly ovate leaves)
Rhododendron vietichianum ⁵²⁰
1. **opposite simple leaves**
Wightia ⁶¹²
Fagraea ceilanica ⁶⁰⁵
1. **digitate leaves**
Schefflera ⁴⁵⁴

KEY 2: Narrow conical or cylindric crown

1. **dense, dark green, evergreen crown**
Garcinia ⁵⁶
Annonaceae key p36
Mesua ferrea ⁵⁹
Aquilaria crassna ⁶⁸⁵
(Crypteronia paniculata) ⁴⁵¹
(Xanthophyllum) ⁴⁵
(Alstonia) ⁵⁹⁴
1. **semi-open, paler, deciduous crown**
Dolichandrone ⁶¹⁸
Pterocymbium ¹³²
Anogeissus acuminata ⁴⁰⁶
(Fagraea fragrans) ⁶⁰⁵
(Lagerstroemia) key p202

KEY 3: Crown in layers or branches in whorls

1. **digitate leaves**
Bombacaceae ¹¹⁴
Sterculia key p78
1. **simple, opposite leaves**
Alstonia ⁵⁹⁴
Duabanga grandiflora ⁴⁵²
(Tarennoidea) ⁵⁰³
1. **simple alternate leaves**
Terminalia key p187
Garcinia key p49
Macaranga ⁷²⁶

KEY 4: unbranched crown (lvs clustered near top of single trunk, like a palm)

1. **evergreen**
Palms & Cycads key p367
Draceana ⁸⁴⁴
Pandanus ⁸⁴⁶
Cyathea ⁸⁷⁵ (tree ferns)
1. **deciduous**
Oroxylum indicum ⁶²⁶

Aralia ⁴⁵⁶

Heteropanax fragrans ⁴⁵⁹

Eurycoma longifolia ²⁰⁴

KEY 5: Buttressed trunk

1. **simple leaves**
Tetrameles nudiflora ⁴⁵³
Parashorea stellata ⁹⁵
Pentace burmanica ¹⁴⁶
Ficus key p332
(Elaeocarpus prunifolius) ¹⁷⁹
1. **pinnate or bipinnate leaves**
Dracontomelon dao ³¹⁰
Acrocarpus fraxinifolius ³³²

KEY 6: Fluted trunk

1. **opposite leaves**
Lagerstroemia key p202
Acer ²⁷⁷
(Terminalia mucronata) ³⁹²
(Crypteronia paniculata) ⁴⁵¹
1. **alternate leaves**
Carpinus ⁸⁰⁸
Alphonsea ¹⁹
(Terminalia mucronata) ³⁹²
(Diospyros mollis) ⁵⁵⁹

Bark characters

KEY 7: thorns, spines or prickles

1. **spines (long, not swollen at base)**
2. **simple opposite leaves**
Cratogeomys ⁴⁷
Combretum quadrangulare ⁴⁰⁰
Lagerstroemia key p202
Rubiaceae key p217
2. **simple alternate leaves**
Alangium salvifolium ⁴⁶³
Anogeissus ⁴⁰⁶
Bridelia key p305
Diospyros montana ⁵⁶¹
Rutaceae key p99 (crushed lvs often smell of citrus)
Flacourtiaceae key p53 (leaves often
spines often branched toothed.)
Streblus ⁷⁵⁵ (white latex)
Zizyphus ²⁵⁸
Carissa spinarum ⁵⁸⁹
Maytenus ²⁵¹
Euphorbia key p686 (plants cactus-like)
Capparis ⁴⁰ (scrambling shrubs)
Solanum ⁶¹¹ (spines on leaves)
(Livistona) ⁸⁴⁷ (large fan-like leaves)

2. pinnate leaves

Cassia javanica 351

Acacia 313b

Mimosa 313a

Caesalpinia 312b

(*Albizia*) key p158

(*Phoenix*) 863

1. prickles stout & curved with swollen base

3. trifoliate leaves

Erythrina 357

3. digitate leaves

Bombax 114

Trevesia 460

Brassiopsis 462

3. once-pinnate leaves

Zanthoxylum 200

Harrisonia perforata 207 (winged rachis)

3. 2-3x pinnate leaves

Aralia 456

3. simple leaves

Falconeria insigne 744

KEY 8: Latex, colored sap or resin

1. white or cream latex

2. opposite simple leaves

3. with stipules

Rubiaceae key p 217

3. no stipules

Guttiferae key p49

Ficus hispida 799

Apocynaceae key p257

Sarcosperma 548

2. alternate simple leaves -

Moraceae key p325

Sapotaceae key p242

Euphorbia 686 (cactus like)

Falconeria insigne 744

2. pinnate leaves

Rhus chinensis 303 (winged rachis)

Aglaia 228

1. yellow latex

Guttiferae key p49 (simple leaves)

Rhus chinensis 304 (pinnate leaves)

1. red or orange sap

4. simple leaves

Myristicaceae 645

Miliusa 26

(*Macaranga*) 726

(*Mallotus*) key p314

(*Ostodes*) 736

(*Gordonia*) 79

4. trifoliate leaves

Bischofia 701

Butea 355

4. pinnate leaves

Pterocarpus 350

Callerya atropurpurea 372

(*Pometia* 266)

Ailanthus 202

1. brown or blackish sap

(often only darkening slowly after cut)

5. simple opposite leaves

Cratoxylum 407

Bouea 289

5. simple alternate leaves

Diospyros 550

Anacardiaceae key p142

5. pinnate leaves

Burseraceae 210

Rhus rhetsoides 305, *R. succedanea* 304

1. resin

6. simple leaves

Anacardiaceae key p142

Dipterocarpaceae key p64

Styrax 575

Gardenia 505 (opposite lvs, yellow buds)

Pinus 870 (fascicled lvs)

6. pinnate leaves

Burseraceae 210

Aquilaria crassna 685

KEY 9: Deeply cracked bark

1. bark pale, soft & corky

2. simple leaves

Xanthophyllum 45

Gochnatia decora 510

Xantolis 546

2. pinnate leaves

Mahonia nepalensis 39

Millingtonia hortensis 627

1. bark dark, hard & brittle

3. simple leaves

Dipterocarpaceae key p64

Fagaceae key p350

Vaccinium 514

Craibiodendron 516

Pinus 870

Fagraea fragrans 606

Terminalia alata 396

Schima wallichii 78

Cinnamomum porrectum 668

(*Anneslea fragrans*) 86

(*Ilex*) 246

3. pinnate leaves

Protium serratum 210

KEY 10: Plated, papery or peeling bark

1. plated bark (thick pieces)

- Lagerstroemia* key p202
- Pinus kesiya* 870
- Terminalia mucronata* 390
- Dipterocarpus costatus* 96, *D. turbinatus* 97
- (*Azela xylocarpa* 333)

1. papery bark (very thin pieces)

- Dillenia indica* 6
- Cryptocarya pallens* 679
- Betula alnoides* 807
- Prunus cerasoides* 379
- Cratogeomys cochinchinensis* 48
- Gardenia turgida* 508
- Chisocheton siamensis* 226

1. peeling bark (thin vertical strips)

- Tristanopsis burmanica* 434
- (*Mesua ferrea*) 59
- (*Tectona grandis*) 631
- (*Wendlandia*) 499
- Aquilaria crassna* 685

KEY 11: Fibrous bark, ripping in thin strips (collectively known as "Por" trees)

- Malvaceae* 109
- Tiliaceae* key p 87
- Sterculiaceae* key p77
- (*Aquilaria crassna*) 685

KEY 12: Aromatic inner bark

- Toona* 234 (sweet smell)
- Betula alnoides* 807 (spicy smell)
- Lauraceae* key p274 (spicy smell)
- Miliusa* 26 (foetid smell)
- Platanus latifolia* 241

NB: many species with resin smell of turpentine when cut (see key7)

Leaf characters

KEY 13: Large simple leaves (>30cm long)

1. leaves <2x as long as wide

2. leaf base peltate

- Ricinus communis* 687
- Macaranga* 726
- Mallotus barbatus* 731
- Pterospermum acerifolium* 138
- Brownlowia peltata* 147

2. leaf base not peltate

- Tectona grandis* 631
- Dipterocarpus tuberculatus* 100
- Sterculia* key p78
- Trevesia* 460
- Hibiscus macrophyllus* 110
- Ficus auriculata* 768

Ficus hirta var. *roxburghii* 778

Ficus fulva 774

Palmae key p367 (fan palms)

1. leaves >2x as long as wide

3. leaves toothed

- Dillenia* key p31
- Saurauia* 89
- Helicia formosana* 683
- Vernonia* 511

3. leaves not toothed

- Meliosma simplicifolia* 287
- Magnolia* 12
- Barringtonia* 436
- Knema* 645
- Semecarpus* 302
- Syzygium megacarpum* 421
- Actinodaphne* 656
- Phoebe* 673

KEY 14: Unusually shaped simple leaves

1. palmately lobed

2. leaves distinctly hairy

- Malvaceae* 109
- Sterculia villosa* 125 & *S. hypochra* 126
- Mallotus barbatus* key p314 (peltate base)
- Broussonetia* 754
- Ficus hirta* var. *roxburghii* 778

2. leaves smooth or nearly so

- Acer* 277 (opposite leaves)
- Sterculia urena* 124
- Firmiana* 130
- Macaranga gigantea* 727
- Trevesia* 460
- Ricinus communis* 687

1. heart-shaped, triangular or circular

often with several distinct tips but not deeply lobed

3. leaves opposite

- Strychnos* 607
- Premna* 634
- Gmelina arborea* 630
- Trewia nudiflora* 747
- (*Nothapodytes foetida*) 244
- (*Mallotus*) key p 314
- (*Broussonetia*) 754

3. leaves alternate

4. bark with white latex

- Morus* 753
- Broussonetia* 754
- Ficus auriculata* 768
- Ficus fulva* 7674
- Ficus hirta* var. *roxburghii* 778

4. no white latex

- 5. leaf base often peltate, usually with glands, often with red sap
- Mallotus* key p 314

Aleurites moluccana 688

Macaranga 726

5. leaf base not peltate (except

***Brownlowia*), no glands or red sap**

Cananga latifolia 30

Pterocymbium 132

Colona floribunda 152

Brownlowia peltata 147 (peltate base)

Berrya 161

Eriolaena 144

Malvaceae key p109

Dipterocarpus tuberculatus 100

Nothapodytes foetida 244 (translucent dots)

Tetrameles nudiflora 453

Alangium 463

Palmae key p367 (fan palms)

1. linear or lanceolate, >3x as long as wide

2. parallel veining

Dracaena 844

Pandanus 846 (spiny teeth)

Conifers key p374

2. network veining

Grewia key p89

Knema 645

Litsea salicifolia 662

Cinnamomum iners 670

Homonoia riparia 725

Phyllanthus 737

Urticaceae key p345

Salix 842

1. irregularly shaped

Colona winitii 149

Pterospermum 135

Ficus semicordata 787

Bauhinia key p 168

KEY 15: Leaves with peltate base

Pterospermum key p83

Brownlowia peltata 147

Ricinus communis 687

Macaranga 726

Mallotus key p314

Balakata baccatum 742

KEY 16. several main veins from base

(parallel veining, palmate veining or trinnerved)

1. all veins parallel to main vein(s)

Dracaena 844

Pandanus 846 (spiny teeth)

Conifers key p374

1. smaller veins not parallel to main veins

2. basal veins > 2/3 length of leaf

Cinnamomum 668

Neolitsea 665

Lindera 666

Urticaceae key p345

2. basal veins < 2/3 length of leaf

3. opposite leaves

Strychnos 607

Acer 277

Trewia nudiflora 747

3. alternate leaves

Cryptocarya 679

Sterculiaceae key p77

Tiliaceae key p87

Tetrameles nudiflora 453

Bauhinia key p168

Ficus key p332

Zizyphus 258

Macaranga 726

Mallotus key p314

Aquilaria crassna 685

Alangium 463

Ficus key p332

Ulmaceae key p323

KEY 17: Side veins straight & parallel with each other

1. side veins conspicuous & raised below

Dillenia key p31

Dipterocarpus 96

Polyalthia key p42

Cyathocalyx martabanicus 38

Cananga odorata 31

Saurauia 89

Pometia pinnata 266

Knema 646

Bridelia retusa 704

1. side veins faint, close together

2. with white or yellow latex

Calophyllum 61a

Alstonia 594

Ficus key p332

Garcinia key p49

Sapotaceae key p242

2. no latex

Rapanea yunnanensis 535

Aquilaria crassna 685

Syzygium cumini 426

Ardisia nervosa 533

Diospyros coatanea 564

KEY 18. Side veins very faint

1. with latex

Garcinia key p49

Mesua ferrea 59

Ficus key p332

1. without latex

Fagraea 605 ($\pm$ epiphytic, fleshy leaves)

Memecylon 438
Anneslea 86
Ternstroemia 81
Syzygium key p194

KEY 19: Leaves scaly or whitish below

1. leaves with scales

2. silvery scales

Combretum quadrangulare 400 (twigs ridged)
Platelia latifolia 241
Aglaia 228 (pinnate)
Croton 710
Homonoia 725

2. orange-brown scales

Rhododendron key p235
Ardisia key p238
Heritiera macrophylla 134

1. leaves whitish below but not scaly

Anisoptera 91
Acer laurinum 277
Brownlowia 147
Callicarpa 632
Mallotus paniculatus 733
Fagaceae key p351
Knema 645
Mesua ferrea 59
Pterospermum key p83
Styrax 575
(*Trema orientalis* 748)
Schoutenia ovata 166

KEY 20: Leaves with glands

1. glands on leaf margin

Hiptage 180
Terminalia key p187
Ardisia key p238

1. glands on leaf stalk or at base of leaf

Terminalia key p187
Euphorbiaceae key p 297
Gmelina arborea 630
Rosaceae 378

1. glands on leaf surface

2. large obvious glands

3. simple leaves

Terminalia key p187

3. pinnate leaves

Bignoniaceae key p265
Ailanthus triphysa 202

2. glandular stripes

Casearia 69 translucent stripes
Maesa key p 241 dark stripes

2. minute "dot-like" glands

4. translucent glands

Nothapodytes foetida 244

Rutaceae key p99 crushed lvs with citrus smell
Myrtaceae key p193
Celtis 749
Engelhardtia serrata 806

4. dark glands

Carallia brachiata 388
Ardisia key p238
Rapanea yunnanensis 535
Craibiodendron stellatum 516
Pavetta indica 501
Prunus phaeosticta 382 & *P. javanica* 383
Glyptopetalum sclerocarpum 255
Betula alnoides 807
Myrica esculenta 810

KEY 21: Star-shaped, branched or tufted hairs

1. simple opposite leaves

Buddleja asiatica 604
Callicarpa arborea 632
Premna 634
Lagerstroemia key p202
Trewia nudiflora 747
Viburnum 469

1. simple alternate leaves

Sterculiaceae key p77
Alangium 463
Solanum verbascifolium 611
Croton 710
Homonoia riparia 725
Hydnocarpus 64
Mallotus key p 314
Malvaceae
Hopea odorata 102
Styrax benzoides 575
Tiliaceae key p87
Nothapodytes foetida 244
Sumbaviopsis albicans 689
Carpinus 808

1. pinnate leaves

Aglaia grandis 230 (branched hairs)
Aphanamixis 231
Heterophragma 628
Lannea coromandelica 309
Litchi chinensis 271

KEY 22: Old leaves bright red or orange

1. simple leaves

Elaeocarpaceae key p94
Croton key p308
Acer 277
Shorea siamensis 105

1. trifoliate leaves

Sandoricum koetjape 227
Bischofia javanica 701

KEY 34: Winged or broadly ridged fruits

1. simple opposite leaves

*Acer*²⁷⁷

Combretaceae key p187

Hiptage 180

1. simple alternate leaves

Tiliaceae key p87

Heritiera 134

Kydia 109

Ulmus 752

Holoptelea 751

Dipterocarpaceae key p64

1. trifoliate leaves

Butea 355

1. pinnate leaves

Pterocarpus 360

Cassia key p170

Derris robusta 377

Ailanthus triphysa 202

Arfeuillea arborescens 274

Engelhardtia 805

Fraxinus 578

KEY 35: Spiny or thorny fruits

Castanopsis key p351

Mallotus key p314

Sindora siamensis 334

Nephelium 263a

Sloanea 171

Ricinus communis 687

KEY 36: Fruits splitting (not winged)

1. seeds winged

2. simple, alternate leaves

Gordonia dalglieshiana 79

Schima wallichii 78

Pterospermum key p83

Pterygota alata 120

Tristaniaopsis burmanica 434

Eriolaena candollei 144

Reevesia pubescens 143

2. simple opposite leaves

Crypteronia paniculata 451

Lagerstroemia key p202

Lophopetalum wallichii 256

Wendlandia 499

Wightia speciosissima 612

Hymenodictyon 478

Euonymus 253

2. pinnate leaves

Bignoniaceae key p265

Schrebera swietenoides 579

Toona 234

Chukrasia 232

Leguminosae key p 156

Zanthoxylum 197

*Mischocarpus pentapetalus*²⁷⁶

Bretschneidera sinensis 284

Aesculus assamica 283

Euodia 189

Sisyrrolepis muricata 263b

1. seeds not winged

3. simple leaves (mostly alternate)

Camellia key p57

Rutaceae key p297

Tetrameles nudiflora 209 (opposite lvs)

Sloanea 171

Sterculia key p78

Eriolaena 144

Euphorbiaceae key p297

Anthocephalus chinensis 481

Euonymus 252

3. pinnate leaves

Meliaceae key p114

Sapinadaceae key p131

KEY 37: Compound fruits

1. fleshy fruits

Magnoliaceae key p33

Morinda 489

Nauclea orientalis 482

1. dry fruits

Anthocephalus chinensis 481

Mitragyna 483

Haldina cordifolia 480

Anogeissus 406

Compositae 231

Artocarpus 761

Ficus key p332

KEY 38: Seeds with aril or sarcotesta

1. red/orange aril or sacrotesta

Sloanea 171

Meliaceae key p114

Myristicaceae 645

Bhesa robusta 250 (yellow aril)

Tabernaemontana 591

Euonymus 252

Glyptopetalum sclerocarpum 255

Harpullia 268

Arytera littoralis 265

Mischocarpus pentapetalus 244

(*Semecarpus cochinchinensis*) 302

(the fleshy covering is in fact a hyopcarp)

1. white or colorless aril or sacrotesta

Sapindaceae key p131

Maytenus 251

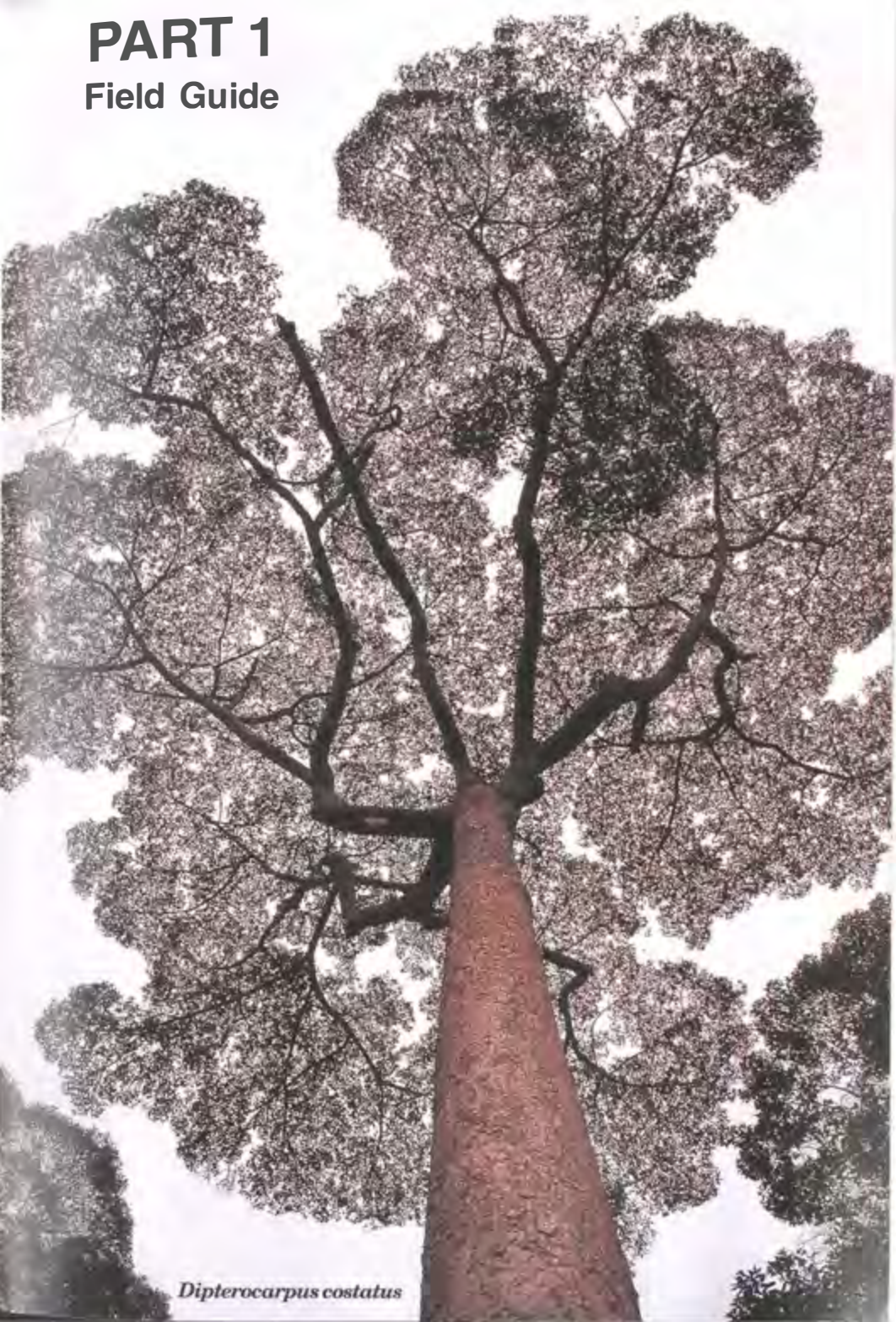
Garcinia key p49

Walsura 217

Trichilia 237

PART 1

Field Guide



Dipterocarpus costatus

อันดับของวงศ์ SYNOPSIS OF NATURAL ORDERS

based on Bentham & Hooker 1883

Division **ANGIOSPERMAE**

Class **DICOTYLEDONAE**

Sub-class **Polypetalae**

flowers mostly bisexual with both
calyx&corolla, petals usually free

1. **Thalamiflorae** page

Ranales (=order)

Dilleniaceae	31
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Annonaceae	36
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(Capparidaceae)	

Polygales

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Guttiferales

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Guttiferae	49

(Clusiaceae)

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Sapindaceae	131
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Umbellales

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(Nyssaceae)	

Sub-class **Gamopetalae**

flowers mostly bisexual with both
calyx & corolla, petals fused in
asymmetric corolla

Caprifoliales

Caprifoliaceae	216
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Asterales

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(Strychnaceae)

(Gentianaceae)

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(Verbenaceae)

Sub-class **Monochlamydeae**

flowers usually unisexual, no corolla

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Class **MONOCOTYLEDONAE**

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(Agavaceae)

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(Areceaceae)

Division **GYMNOSPERMAE**

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Division **ANGIOSPERMAE**Class **DICOTYLEDONAE****DILLENIACEAE**

300 species, concentrated in tropical Asia & Australia. 1 genus & 6 species in NT. Evergreen or deciduous trees with simple, alternate leaves usually clustered near the ends of branches. Easily recognized by the straight, parallel side veins which end in small marginal teeth. Large yellow or white flowers with many stamens in 2 whorls & the carpels clustered on a central cone. Opening early in the morning but quickly losing their fragile petals, leaving the fleshy sepals which become larger & completely cover the fruits.

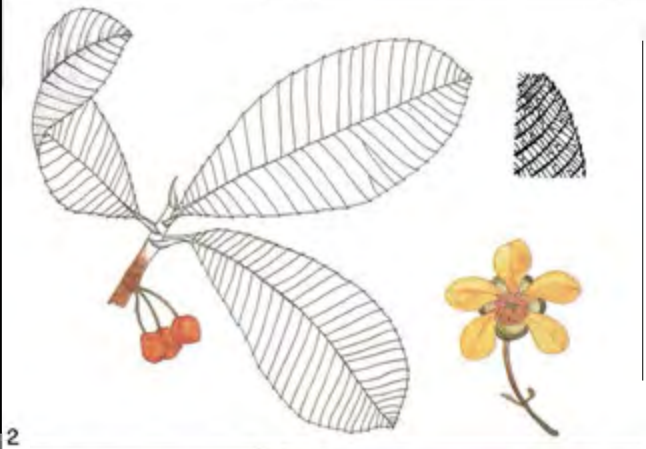
1. flowers 10-20cm, yellow or white; fruits 3-10cm
2. flowers white, fruits 8-10cm *D.indica* ⁶
2. flowers yellow, fruits 3-6 cm
3. terminal fws with short stalks (0.5-1.7cm); fts 5-6cm *D.ovata* ⁵
3. axillary fws with long stalks (5-12cm); fts 3-4cm *D.aurea* ⁴
1. flowers 2.5-5cm, yellow; fruits 1.5-2.5cm
4. flowers terminal, solitary or in pairs. *D.hookeri* ¹
shrub or small tree to 15m; leaves 17-25x7-10cm, velvety at least below; flowers 4-5cm, stalks 1.5-4cm, sepals densely silky outside, stamens 8-10mm, 6-7 carpels; fruits 2-2.5cm. Pisanolok province, open dry areas
4. flowers axillary, in clusters of 2-7
5. flower stalks 2.5-6cm, sepals without hairs on outside; mature leaves usually smooth below *D.pentagyna* ³
5. flower stalks 0.5-3cm, sepals with silky hairs on outside; mature leaves rough below *D.parviflora* ²

²*Dillenia parviflora*

ล้านหิ้ง ล้านหิน



Deciduous tree to 40 m, with a rather open, straggly crown & drooping branches when mature. **BARK** pale brown, smooth or slightly flaking. **LEAF** 15-25 cm on mature trees, but often much larger (to 100 cm) on young shoots, narrowly obovate to elliptic with blunt tip & tapering base. Young shoots silky, mature leaves with **scattered rough hairs** below. 22-35 pairs of side veins. Stalks 1-3.5 cm, winged, deeply grooved, swollen & grasping twigs at base. **FLOWER** 3-5 cm, bright yellow, in clusters of 2-7 flowers along leafless twigs, stalks 0.5-3(6) cm. 5 overlapping sepals with **silky hairs outside**. 5 free petals, rounded with narrow base. 150-200 stamens in 2 whorls, inner ones 11-14 mm long. 5-8 carpels, ± 5 mm, styles ± 7 mm. **FRUIT** 1.5-1.8 cm, yellow to pale orange, fleshy, not splitting. **NOTE** common in a wide variety of both semi-open & dense forests throughout NT. 2 varieties -var.*kerrii* มะลิวัน แคว้ง with hairy carpels, var. *parviflora* with smooth carpels.

³*Dillenia pentagyna*

ล้านช้าง ล้านนาแปด



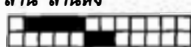
Similar to *D.parviflora*, but leaves 20-50cm, finely hairy when young but usually smooth when mature. >>

DILLENIACEAE

Flowers 2.5-3.5 cm, stalks 2.5-6 cm, **sepals without hairs**. ± 100 stamens, inner ones 6-9mm, styles ± 4 mm. Common, often growing together with *D. parviflora* but preferring slightly moister areas.

⁴*Dillenia aurea* var. *aurea*

ล้าน ล้านทั้ง

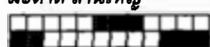


Small deciduous tree to 14 m with short trunk & gnarled crown. **LEAF** 20-35x10-20 cm, obovate with blunt tip & blunt or slightly pointed base, often asymmetric. 30-40 pairs of side veins. Stalks 3-6 cm. **FLOWER** 10-12 cm, bright yellow, **solitary or paired on short side branches in leaf axils, stalks 5-12 cm**. 10-12 carpels, style 2 cm. **FRUIT** 3-4 cm, orange-yellow. **NOTE** scattered in semi-open forests, often with pine, Chiang Mai southwards.

SIMILAR ⁵*D. ovata* ล้านใบเล็ก evergreen or deciduous tree to 30 m with smaller leaves, 10-20 x 7-12 cm, 18-25 pairs of side veins & slightly longer stalks, 3-4.5 cm. Flowers very large, to 16 cm, bright yellow, solitary or in pairs at end of twigs with short stalks, 0.5-1.7 cm. Fruits 5-6 cm. Locally common in semi-open forests, up to 1200 m, Chiang Mai southwards.

⁶*Dillenia indica*

มะตาด ล้านใหญ่



Evergreen tree to 25 m with dense, irregular crown & short, stout trunk. **BARK** orange-brown, papery-flaky, shiny, inner bark pink. **LEAF** 15-35x6-14 cm, oblong, blunt or pointed both ends, shiny bright green above, scattered soft hairs on veins below. Veins & stalk as *D. parviflora*. **FLOWER** 15-20 cm, **white, solitary at end of twigs**, hanging face downwards, stalks 4-8 cm. >500 stamens, 14-20 carpels. **FRUIT** 8-10 cm, bright green to yellowish-green, **seeds hairy**.

NOTE: locally common, usually close to streams.



MAGNOLIACEAE

223 species worldwide, 3 genera & 9 species in NT. Evergreen or briefly deciduous trees with simple, alternate, spirally arranged leaves without teeth. The young leaf buds are covered with long, narrow stipules which soon fall leaving characteristic **ring-like scars on the petiole & stem**. Large showy flowers with indistinguishable sepals/petals in whorls of 3, many free stamens & the carpels clustered together on a central cone (gynoecium). Aggregate fruits with many seeds. One of the oldest families of flowering plants.

7 *Magnolia champaca*var. *champaca*

จันทน์หอม



Evergreen tree to 35 m with a narrow, regular crown. **BARK** pale grey or brown, fairly smooth, inner bark pale cream, quickly turning dark ochre when cut. Wood with resin. **LEAF** 10-20 x 4-9 cm, narrowly ovate with tapering or pointed tips. Young leaves silky, mature leaves smooth or with scattered hairs especially on veins below. Stalks 2-4 cm, **stipule scar** > 1/2 length. **FLOWER** 4-5 cm, bright yellow-orange, solitary in leaf axils, buds narrowly conical. 8-12 narrow sepals/petals, central cone with obvious stalk at base, carpels smooth. **FRUIT** 1.5-2 cm, pale brown often with large cream spots, hanging clusters of 2-5 loosely connected fruits. Seeds dark brown, covered with thin pink pulp, hanging out on slender white strings when mature.

NOTE commonly planted for its beautifully fragrant flowers. Much reduced in the wild due to selective logging for its excellent timber.

SIMILAR ⁸*Magnolia X alba* จันทน์ Small tree with white flowers & leaf stalks with **stipule scar only near base**, very rarely producing fruit. Frequently cultivated, of uncertain origin, possibly a hybrid between *M. champaca* & *M. montana*. Photo p34

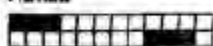
1. flowers terminal, central cone without stalk
 2. lvs 30-45 cm, widest above middle with blunt tip, fts breaking up large white fws to 15cm, buds with purple bracts *Magnolia liliifera* ¹²
 2. lvs <30cm, widest in middle with pointed tip, fts not breaking up
 3. large purple flowers to 18cm, fts ovoid *Manglietia garrettii* ¹⁴
 3. smaller white flowers to 5cm, fts cylindric *Magnolia henryi* ¹³
1. flowers axillary, central cone with distinct stalk
 4. fws yellow, stipule scar > 1/2 length of leaf stalk *Magnolia champaca* ⁷
 4. fws white, stipule scar < 1/2 length of leaf stalk
 5. lvs 11-12cm wide, densely hairy below *Magnolia rajaniana* ¹⁰
 5. lvs 4-9cm wide, smooth or slightly hairy below
 6. lvs usually widest below middle, fws with 8-12 sepals/petals very rarely with fruit. cultivated in lowlands *Magnolia x alba* ⁸
 6. lvs usually widest about middle, fws with 12-18 sepals/petals persistent skeletal remains of fruits. hill forests *Magnolia baillonii* ¹¹
 5. lvs 2-4 cm wide, smooth & glaucous below *Magnolia floribunda* ⁹



MANOLIACEAE

⁹*Magnolia floribunda*

จำปาศักดิ์



Evergreen tree to 20 m. **LEAF** 9-12 x 3-4 cm, narrowly elliptic to oblong-lanceolate with tapering tip, covered with a **whitish powder** (glaucous) below. Stalks 1-1.5 cm, with **stipule scar for about 1/2 of length**, **FLOWER** white or pale yellow with 10-12 sepals/petals, ± 3 cm. Buds 2.5-3 cm, bracts densely coated with golden hairs. **FRUIT** clusters 3-7 cm, >5 fruits per cluster.

NOTE rare, less-disturbed forests, usually above 1500 m.

¹⁰*Magnolia rajaniana*

จำปาศักดิ์

Evergreen tree to 25 m with broadly ovate leaves, 17-26 x 11-12 cm, rounded or slightly heart-shaped at base, **densely covered with short pale brown hairs below**, **stipule scar < 1/2 length of stalk**. Flowers white or pale yellow, carpels densely covered by golden-brown hairs. Rare, evergreen forests > 1000 m.

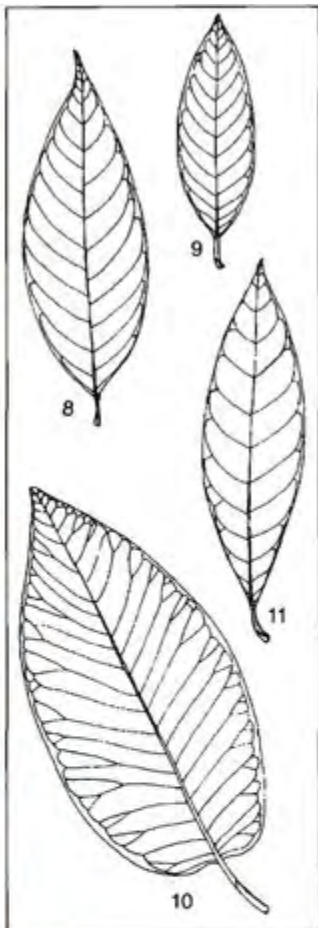
¹¹*Magnolia baillonii*

จำปาศักดิ์



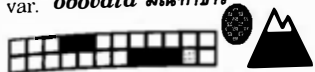
Briefly deciduous tree to 40 m. **LEAF** 15-22x5-8 cm, narrowly elliptic or oblong, pointed or tapering at both ends. Buds narrow & pointed, young leaves with dense silvery-silky hairs, mature leaves smooth or nearly so. 10-15 pairs of side veins with dense network of smaller ones. Stalks 2.5-3.5 cm, **stipule scar < 1/2 total length**. **FLOWER** white, 12-18 sepals/petals, outer ones lanceolate, 2-2.5 x 0.5 cm, inner ones linear. Stamens 7-8 mm, carpels densely grey-hairy. **FRUIT** 5-8 cm, yellow-green with pale spots, irregularly knobbly, breaking up when mature, leaving characteristic **skeletal husks** which often remain on the tree throughout the year. **Seeds bright red**.

NOTE common in hill evergreen forests throughout NT.



12 *Magnolia liliifera*

var. *obovata* มณฑลพิจิตร



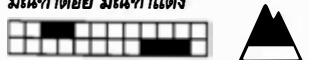
Evergreen tree to 15 m with open, irregular crown and smooth, pale brown bark. **LEAF** 20-50 x 7-15 cm, narrowly obovate with blunt tip & tapering base. Mature leaves dark green, smooth or with scattered hairs on midvein below. 9-15 pairs of widely spaced side veins. Stalks 5-7 cm, swollen at base, stipule scar $> \frac{1}{4}$ total length. **FLOWER** up to 15 cm, white, solitary at end of twigs with stout stalks, 1.5-3 cm. Buds 3-4 cm, globular, covered by a purple bract. Sepals/petals 5-7 cm, thick & fleshy, inner ones narrower, falling soon after opening. Differs structurally from *Magnolia* by the absence of a stalk on the central cone. **FRUIT** woody, oblong, 10-15 cm, **splitting up when mature** into with 30-50 separate portions each with a **bright red seed**.

NOTE locally common, restricted to less disturbed areas.

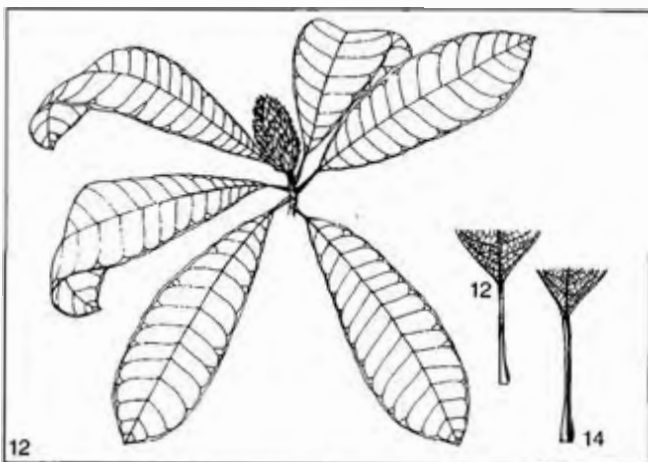
SIMILAR ¹³*Magnolia henryi* จำปาศักดิ์ evergreen tree to 40 m, leaves 14-40 x 6-15 cm, narrowly elliptic, completely smooth, 14-15 pairs of side veins. Flower buds narrow, stalks to 10 cm sepals/petals up to 5x2 cm, inner ones narrower, $\pm$ 1 cm wide. Rare.

14 *Manglietia garrettii*

มณฑลตากอย มณฑลพิจิตร



Partly deciduous tree to 25 m with smooth, greyish bark. **LEAF** 18-30 x 8-12 cm, narrowly elliptic with $\pm$ tapering tip & blunt or slightly pointed base. Mature leaves dark green above, greyish-green below, smooth or nearly so. 15-25 pairs of side veins. Stalks 3-5 cm, swollen at base, **densely brown-hairy especially when young**, stipule scar $\frac{1}{2}$ total length. **FLOWER** up to 18 cm across, **dark pink-purple**, buds narrowly ovoid, structurally very similar to *Magnolia*. **FRUIT** 4-8 cm, ovoid, **not breaking up**. **NOTE** locally common on Doi Suthep & Doi Intanon.



ANNONACEAE

Tropical family with over 2000 species worldwide, at least 10 genera and 22 species in NT. **BOTANY** crown typically narrowly conical with a single main stem. Bark smooth, twigs often hairy when young but nearly always smooth when mature often with faint interlaced ridges like trellis-work on the surface and fine transverse lines in the pith (septate). Leaf simple, alternate, often planar or drooping, no teeth or stipules, usually with short stalks. Flower usually opposite the leaves or on old leafless stems, often hanging face-down, usually with 3 sepals & 6 petals in 2 rows, the inner row often arching inwards & covering the sexual organs like a hood. Stamens minute, densely clustered in a central circular clump surrounding the stigmas. **Fruit** fleshy, not splitting, usually in clusters radiating from a common woody stalk.

ECOLOGY Most species in this region are evergreen understory trees of moist lowland forests, where they are good indicators of disturbance since they are generally intolerant of fire.

USES Several species are cultivated for their ornamental, often sweetly fragrant flowers, but otherwise the family is of little commercial value.



1. inner petals pressed together, forming a dome
2. inner petals much narrower at the base
3. inner petals larger than outer ones; flowers <2cm

Orophea ²⁰

3. inner petals smaller than outer ones; flowers 3-5 cm

Mitrephora ¹⁸

2. inner petals not narrow at base

4. inner petals much smaller than outer ones

Goniiothalamus ²⁴

4. all petals more or less same size

5. inner petals with spreading tips. evergreen forests

Alphonsea ¹⁹

5. tips of inner petals not spreading. Introduced.

¹⁵ *Melodorum fruticosum*

lvs 9-12x3-4.5cm, oblong-lanceolate, smooth, stalks <0.7cm fws solitary, axillary or terminal, stalks 2cm, petals ±1cm, cream, stamens flat-

topped, receptacle

sunken in centre, ovaries hairy. fts <1cm, smooth, stalks 1.8-2.5cm, 1-2 seeds.

1. inner petals spreading, not forming dome

6. outer 3 petals much smaller, as long as sepals

Milusa ²⁶

6. all 6 petals of similar size, at least 2X as long as sepals

7. base of petals closely pressed over sex parts

Cyathocalyx malabaricum ³⁸

7. petals spreading from base, not hiding sex parts

8. lvs broadly ovate or circular; petals 2-2.5cm wide

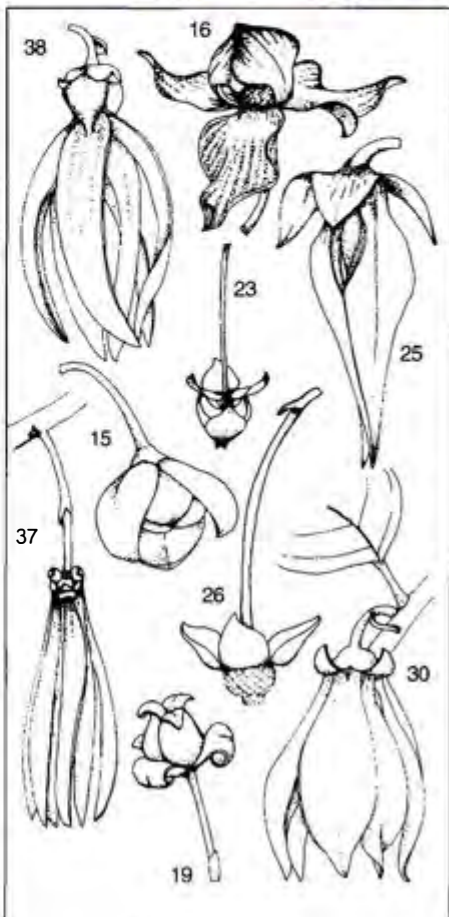
Cananga latifolia ³⁰

8. lvs narrowly ovate to lanceolate; petals <1.5cm wide

9. anthers flat-topped, fts usually with >5 seeds

Cananga odorata ³¹

9. anthers pointed, fts with 1-2 seeds *Polyalthia* ³²



16 *Mitrephora maingayi*

မျိုးစေ့



Briefly deciduous tree with dense, narrowly cylindrical crown to 28 m. **BARK** dark brown, smooth or slightly cracked. **LEAF** 9-25 x 4-8cm with short stalks (0.4-0.7 cm), usually narrowly ovate or oblong with slightly pointed tip and blunt base, slightly asymmetric. Young leaves very pale green with dense brown hairs, mature leaves dark green above, usually with scattered dark brown hairs at least on veins below. **FLOWER** 4-6 cm, 2-5 large showy flowers clustered together on short (1.5-3 cm) woody stalks opposite or behind the leaves. 3 sepals, densely hairy outside. 3 outer petals 2-3.5 cm long, narrow & twisted, pale yellow with red spots or mostly orange-red with yellow stripes. 3 inner petals much shorter than outer ones, <1 cm, broad at the top but very narrow at the base, white or yellow with dark red spots. **FRUIT** 2-3 cm, pale orange with dense short brown hairs when young, turning dark red then black & much less hairy when fully mature, up to 20 fruits clustered together on woody stalks 1.5-3 cm long, 3-7 flattened seeds in 2 rows. **NOTE** widespread & fairly common in less-disturbed or partially disturbed forests.

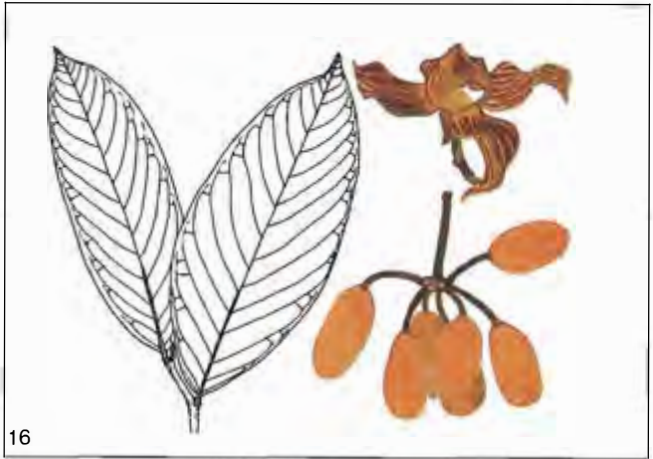
SIMILAR 17 *M.tomentosa* has smaller, paler flowers & leaves densely hairy below. Less common. Possibly conspecific with *M.maingayi*.

18 *Mitrephora wangii*

Evergreen tree to 14 m. **LEAF** 13-20x5-7 cm, narrowly elliptic, completely smooth when mature.

FLOWER 5-7 cm, pure white turning rich yellow with age. **FRUIT** unknown.

NOTE very rare, only known from less-disturbed moist hill evergreen forest at 1400 m in Chiang Rai Province.



¹⁹*Alphonsea boniana*

ดงคำ



Evergreen tree to 25 m with narrow cylindrical crown. **BARK** warm brown, flaking in shallow vertical strips. **LEAF** 8-15 x 3-6 cm, narrowly elliptical, pointed at both ends, bright green, smooth or with scattered tiny hairs below, stalks <0.3 cm. **FLOWER** 1-1.2 cm, yellowish-green, in clusters of 2-3 flowers opposite or behind the leaves. Outer petals spreading with the tips curved sharply backwards, densely covered with brown hairs on the outside. Inner petals narrower, 8-10 x 6-7 mm, **pressed together forming a open mouthed cone with the tips curved slightly back-wards**. **FRUIT** oblong, 3-5 cm, shortly stalked, pale yellow & slightly hairy when young, turning dark orange with age, in clusters of 3-5, rather like stumpy bananas with many seeds in 2 rows.

NOTE scattered in less disturbed forests close to streams.

Orophea กล้วยคำ

Small evergreen trees to 10 m with delicate, small (0.5-1 cm) greenish-white flowers on very long slender stalks. Inner petals pressed together forming a dome with open arches at the base, similar to *Mitrephora* but **outer petals much smaller than inner petals**. At least 3 species in NT, all rare, confined to less disturbed moist lowland forests.

²⁰*O.brandisii* leaves hairy; flowers with 6 densely hairy carpels; fruits & seeds cylindrical.

²¹*O.thorelii* leaves smooth; flowers with inner petals ± 4 mm, 6 stamens & 6 smooth carpels; fruits unknown.

²²*O.polycarpa* จักหัน leaves smooth; flowers with inner petals (4)8-9 mm, only slightly arched, 6 stamens & 12 carpels; fruits spherical, 1-1.5 cm diam., seeds crescent-shaped.

²³*Orophea* sp. unidentified tree with smooth leaves & drooping flowers on slender stalks with strongly arched inner petals, ± 8 mm, 12 carpels. Fruits spherical, smooth. Rare.



²⁴*Goniothalamus laoticus*

นมวัว



Small evergreen tree to 12 m. **BARK** dark grey or black, smooth, thin, inner bark orange. **LEAF** 15-30 x 5-8 cm, narrowly elliptic or oblong, broadly tipped, slightly tapering or blunt at the base, smooth & glossy dark green above, more or less hairy below. Side veins looped, rather faint, stalks 0.8-2 cm, slightly swollen at both ends. **FLOWER** 1-4 drooping golden-yellow flowers opposite the leaves or along older, leafless branches. Sepals triangular, 2.5cm. Outer petals 4-5 cm long, 1-1.3cm wide at base, narrowly tapering towards tips, straight or slightly spreading & ridged outside. **Inner petals much smaller, 0.9-2cm, pressed together in a cone over the sexual organs.** Carpels hairy. **FRUIT** in clusters of 4-8 on a woody common stalk 1-5 cm long, each fruit oblong, pale green, 1-4cm long on very short stalks with persistent sepals. 1-2 seeds.

NOTE scattered in the understorey of less-disturbed forests.



²⁵*Goniothalamus griffithii*

สะบันงาป่า ปาหนันช้าง

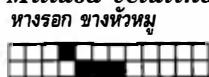


Shrub or small tree to 5 m, similar to *G. laoticus* but with narrow, lanceolate leaves, tapering at both ends, smooth & dark green with yellowish veins above hairy only on veins below. Flowers usually solitary in leaf axils. Outer petals $\pm 1.4 \times 0.9$ cm, pale green. Carpels without hairs. Uncommon, habitat as *G. laoticus*.



26 *Milusa velutina*

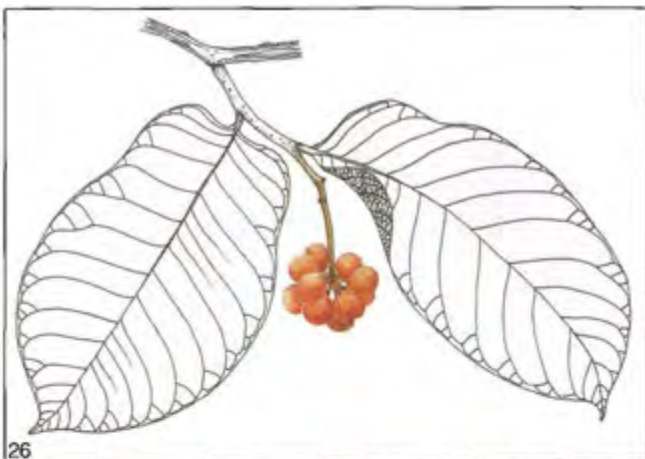
หางรอก ขางหัวหมู



Small deciduous tree 5-16 m with single main stem & open, irregular crown. **BARK** dark brownish-grey, slightly cracked & flaking, quite thick, inner bark pale yellow with **red sap & unpleasant smell**.

LEAF 8-22 x 7-12 cm, usually broadly ovate or elliptic, with blunt or shortly pointed tips and rounded or slightly heart-shaped base, densely covered with silvery hairs below when young. **FLOWER** 1.5-2 cm, pale green, in clusters of 1-3 flowers, stalks slender, 5-8 cm. **Outer petals similar to sepals**, ± 2 mm, inner petals much larger, 6-8 mm, fleshy, triangular, widely spreading, densely hairy outside. **FRUIT** 1-1.2 cm, round or oval, short stalked, bright orange, turning dark red then black when fully ripe, 5-15 fruits densely clustered together on a common stalk up to 8 cm long.

NOTE fairly common in semi-open areas, Chiang Mai southwards.

**27 *Milusa lineata* ปอขี้แฮด**

Shrub to 3m with very dark grey bark & narrowly elliptic leaves, 7.5-12 x 2.5-3.5 cm, tapering at both ends. Widespread but not common in the understorey of moist lowland forests.

**28 *Milusa cuneata* หมากดำ**

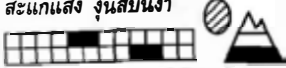
Deciduous tree to 20 m with smooth dark grey bark. Leaves 3-7 x 1.4-2.5 cm, obovate with pointed tips and rounded base. Petals greenish with red lines. Fruits with 4-8 seeds. Uncommon, moist lowland evergreen forests.

**29 *Milusa thorelii* หมากดำ**

Evergreen shrub to 3m with pale brown bark. Leaves 18-25 x 5-10 cm, narrowly elliptic, tapering at both ends. Widespread, locally common.

30 *Cananga latifolia*

สะแกแสง จันทน์แดง



Deciduous tree to 15 (rarely 28) m with an open, oval crown. **BARK** smooth, pale brown. **LEAF** 8-26 x 7-17 cm, **broadly ovate or circular** with a short tip & rounded or heart-shaped base. Young leaves densely covered with short silvery or copper-colored hairs, mature leaves rather thinly & finely hairy below or almost smooth. 9-12 pairs of side veins. Stalks 0.3-1.5 cm. **FLOWER** ± 5 cm, pale yellow-green, slightly fragrant, in **drooping** clusters of 1-3 flowers on short woody side branches **below a bunch of young leaves**, individual stalks 1.5-2 cm, softly hairy with bract in the middle. Sepals ± 1.2 cm, triangular with the tips curling backwards, densely hairy. Petals 3-5 x 1.5-2 cm, strap-shaped, with a narrow base, the inner 3 slightly shorter, finely hairy especially near base. **FRUIT** 1.2-1.5 cm, oblong & slightly asymmetric, smooth, thinly flesh with 2-4 seeds in 2 rows, stalks ± 1 cm. **NOTE** widespread & fairly common in semi-open forests.

31 *Cananga odorata*var. *odorata* กระดังงาไทย สะบันงา

Evergreen shrub or small tree with narrowly elliptic or ovate leaves, 7.5-20 x 3-9 cm, completely smooth or sparsely hairy, often with small hairy glands in the vein axils. **FLOWER** clusters without bunch of young leaves, petals longer & narrower, 5-7.5 x 1 cm. **FRUIT** 1.5-2.3 cm, up to 12 seeds. **NOTE** native to C. & S. Thailand, frequently cultivated for its intensely fragrant flowers.

var. *fruticosa* is a popular sterile dwarf variety to 2 m high with extra petals & smaller leaves.



Polyalthia

The largest Asiatic genus in the family, 7 species in NT. Flowers green or pale yellow with **6 strap-shaped petals which spread from the base, not hiding the sexual organs**. The fruits are usually red or black, in clusters of 4-8 or more radiating from the end of a common, woody stalk. Individual fruits round or oblong, thinly fleshy, often with a single, grooved seed.

Polyalthia cerasoides

กะเจียน คำสามชิก



Small deciduous tree to 8 m. **LEAF** 10-12.5 cm long, lanceolate, **tapering at both ends**, slightly hairy below especially when young. **FLOWER** 1-1.5 cm, pale green, solitary or in clusters of 2-3 flowers on short woody stumps, **individual stalks long & slender**, 1.2-2.5 cm. **Sepals as large as the petals**, 0.6-0.8 cm, stigma rounded, without distinct style. **FRUIT** $\pm$ 0.6 cm, round or ovoid with slight nipple, bright red turning black when full mature, **thinly hairy**, stalks 1-2 cm. **NOTE** widespread, sometimes locally common.

SIMILAR ³⁴*P. evecta* นมน้อย evergreen shrub to 2 m with blunt-tipped leaves, completely smooth or hairy only on veins below. Flowers with sepals much smaller than outer petals. Fruits completely smooth.

³⁵*P. suberosa* กิ่งกล่อม evergreen shrub to 3 m with blunt-tipped leaves, hairy only on veins below. Flowers slightly larger, outer petals 1.6-1.8 cm, stigmas flattened, blade-like, with definite styles. Fruits 1.5 cm, silky-hairy.

1. fws often solitary, petals <2cm; fruits <2cm, round/ovoid; small trees to 8m
2. petals 0.6-0.8cm, stigma rounded, no style; fruits thinly hairy
3. lvs narrowly tipped, hairy below; outer petals as long as sepals
fruits thinly hairy, stalks 1-2cm *P. cerasoides* ³³
3. lvs blunt at both ends, hairy only on veins; outer petals > sepals
fruits smooth, stalks 0.8-1.0cm *P. evecta* ³⁴
2. petals 1.4-1.6cm, stigma with flat blade & distinct style *P. suberosa* ³⁵
1. fws clustered, petals 2-5cm; fts 2-4cm, oblong; larger trees to 30m
4. leaves 10-12x3-4cm *P. littoralis* ³⁶
lvs narrowly elliptic, tapering at both ends, slightly hairy below.
leaf stalks very short; fws $\pm$ 1cm with stalks 2cm, bract in middle
4. leaves 17-33x6-12cm, with obvious parallel side veins
5. petals 2-3cm, fw stalks 1.5-2.5cm with deciduous bracts $\pm$ at the middle; fruits smooth, stalks as long as fruits *P. viridis* ³⁶
5. petals 3.5-5cm, fw stalks 3.5-5cm with bract below the middle; fruits hairy, stalks much shorter than fruits *P. simiarum* ³⁷



36 *Polyalthia viridis*

ยางเอน ยางพ่าย

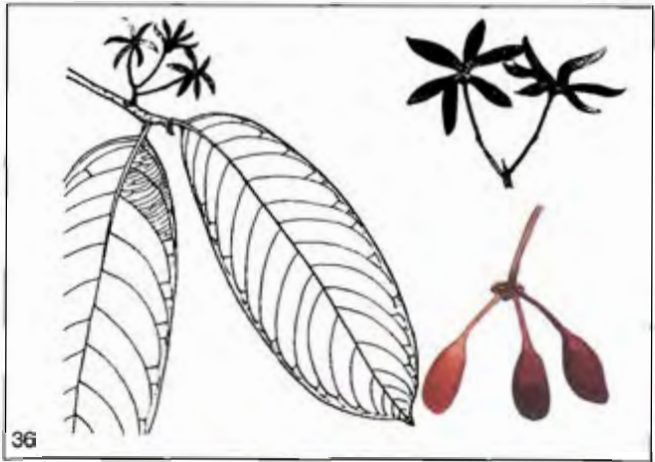


Evergreen tree to 20 m with a very narrow conical crown and a long, straight main stem, usually without branches lower down. **BARK** greyish-brown, slightly cracked, quite thick, inner bark cream turning orange when cut. **LEAF** 20-33 x 8-12 cm, oblong, with short tips & rounded or slightly heart-shaped base, dark glossy green above, paler with scattered hairs on veins below. ± 15 pairs of straight, parallel side veins, faint above but obvious below. **FLOWER** 3-4 cm, greenish-yellow, in clusters of up to 8 star-shaped flowers on older leafless branches, individual stalks 1.5-2.5 cm with a **small deciduous bract at about the middle**. Petals 2-3 x 0.4 cm, narrow & tapering, carpels smooth with distinct styles and a velvety stigma. **FRUIT** ± 3 x 1.5 cm, pale orange turning dark red then black, smooth & slightly glossy, **stalks as long as fruits**.

NOTE locally common, restricted to less disturbed forests.

SIMILAR 37 *Polyalthia simiarum*

ยางเอน Flower stalks 3.5-5 cm with a deciduous bract below the middle, inner petals 3.5-5 cm, carpels & fruits slightly hairy. Fruits stalks much longer than fruits.

38 *Cyathocalyx martabanicus*

สะบันงาแดง



Evergreen tree to 20 m. **BARK** dark brown, smooth, thin. **LEAF** 17-25 cm, oblong, smooth & glossy above, veins as *P. viridis*. **FLOWER** 3-6 cm, pale greenish-yellow, in clusters of 2-4 flowers opposite the leaves. Petals strap-shaped, **closely pressed over sexual organs at base** but with spreading tips. **FRUIT** not seen.

NOTE rare, habitat as *P. viridis*, very difficult to distinguish without flowers.



BERBERIDACEAE

Small family of 680 species worldwide, N. temperate & tropical mountains, only 1 species in NT.

39 *Mahonia nepalensis*

ขมิ้นดิน



Evergreen tree to 8 m with irregular crown & thick stumpy branches, often with a very short main trunk. **BARK** pale brownish-cream, deeply cracked, thick & corky, **inner bark bright yellow**. **LEAF** 30-60 cm, odd-pinnate, alternate, often clustered near end of twigs, 6-12 pairs of opposite leaflets, the **lowest pair usually circular and much smaller than the others**, looking like stipules. Leaflets 5-12 x 3-5 cm, narrowly ovate with sharply pointed tip and strongly asymmetric base. Mature leaves **thick & very hard with sharp teeth**. Leaflets without stalks, main stalk swollen at nodes & at base, deeply grooved & clasping the twigs, leaving prominent scars. **FLOWER** ± 1 cm, bright yellow, in long unbranched clusters, several together at end of twigs in front of leaves. 6 overlapping sepals in 2 rows, 6-9 petals, tightly clustered into a narrow-mouthed bell, almost concealing the bright green, flat-topped stigma. **FRUIT** 1 cm, dark blue with a pale grey sheen, stigma persisting as a shortly stalked nipple at the top. Dark red & juicy inside with one seed.

NOTE uncommon, restricted to exposed rocky areas above 1200 m, sometimes planted for its ornamental value.

SIMILAR the sharply pointed leaflets & thick, corky bark are unmistakable.



CAPPARIDACEAE

800 species worldwide, concentrated in the arid tropics, 2 genera & 4 species in NT.

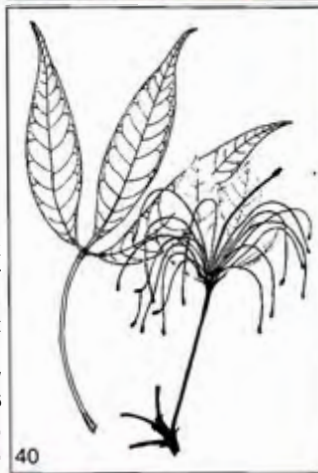
⁴⁰*Crateva magna*

กุ่มน้ำ พักกุ่ม



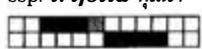
Briefly deciduous tree to 20 m with widely spreading crown and stout, often twisted trunk. **BARK** pale grey with large cream lenticels & horizontal wrinkles. **LEAF** trifoliate, alternate, often clustered near end of twigs, each leaflet 8-18 x 2.5-6.5 cm, at least 2.5x as long as wide, narrowly elliptic or lanceolate with long tapering tips, 12-15 obvious side veins, pale grey-green below. Leaflet stalks 0.3-0.6 cm, end one as long as side ones, main stalk 5-9 cm. **FLOWER** in open, long-stalked terminal clusters with up to 100 flowers, appearing just after young leaves. Easily recognised by the numerous, long pale purple stamens and ovary stalk (gynophore) which stick out far beyond the petals, 4-8 cm. Petals narrowly stalked, small & green at first, becoming much larger, to 4 cm, turning first white then pale yellow as the flowers mature. **FRUIT** 36 cm, round or oval, creamy-grey, hanging on very long thick stalks, 8-13 cm, with a swollen joint in the middle. The scaly skin is thick & leathery, but the inside is soft & fleshy with many dark brown horse shoe-shaped seeds which are fringed with irregular teeth on outer margin. **NOTE** common along open river banks and in wet rice fields.

SIMILAR ⁴¹*C. religiosa* กุ่มบก broadly elliptic leaflets, about 2X as long as wide, rather abruptly tipped, not greyish below, 7-9 pairs of faint side veins, stalks <3 mm. Flowers with only 10-16 stamens, not more than 25 flowers per cluster. Fruits 5-10(20) cm, with pale brown seeds which are wrinkled on outer margin. Habitat as *C. magna*, sometimes planted near temples.



CAPPARIDACEAE

⁴²*Crateva adansonii*

ssp. *trifolia*  

Similar to *C. magna* but with smaller, blunt-tipped leaflets, 5-10 cm, only 5-10 pairs of side veins. Flowers slightly smaller, petals 2-3 cm, stamens & ovary stalk 4-5 cm. Fruits 2-3.5 cm, reddish-brown, smooth & not scaly outside, seeds black. Uncommon, Lamphun southwards, dry areas.



PITTOSPORACEAE

Small family with 200 species ranging from SE Asia to Australia, 1 genus & 2 species in NT.

⁴³*Pittosporum napaulense*

Small evergreen tree to 10 m with crooked trunk. **BARK** pale grey-brown, smooth with dense dark brown lenticels, thin, inner bark pale orange.

Leaf 10-15 x 3-5 cm, simple, alternate, clustered at end of twigs, narrowly elliptic with wavy margin, tapering at both ends. Young shoots with scattered white hairs, mature leaves completely smooth with a dense network of obvious veins. Stalks 1.3-1.5 cm, no stipules.

Terminal buds protected by scale leaves. **FLOWER** ±6 cm, pale yellow,

regular, bisexual, in compact branched clusters at end of twigs. 5 overlapping sepals, 5 spreading petals, 6 mm long, narrow & fused at base, 5 stamens opposite the sepals, 1 style with lobed stigma. **FRUIT** 0.6-0.9 cm, dull yellow turning dark red,

globose with tiny nipple (style) at the top, **splitting into 2 parts with 1-5 red seeds in a slimy pulp**, stalks to 1 cm. **NOTE** scattered in the understory of less-disturbed forests, easily overlooked. **SIMILAR** ⁴⁴*Pkerrii*

leaves 4-10 x 1.5-3.5 cm, with dense brown hairs on young leaves & flower stalks. Fruits obovoid. Rare, only known from Doi Chiang Dao.



POLYGALACEAE

Cosmopolitan family with 950 species worldwide, 1 genus & 2 species in NT.

⁴⁵*Xanthophyllum virens*

ขางขาว มะตอก



Evergreen tree to 30 m with dense & rather narrow crown. **BARK** pale cream, **very thick & corky, deeply cracked**, inner bark grainy, pale cream or orange. **LEAF** 10-23 x 2.5-7.5 cm, simple, alternate, spirally arranged, narrowly elliptic or lanceolate, tapering at both ends, wavy margin. Mature leaves smooth, dark green & slightly shiny above, grey-green below. 7-10 pairs of steeply curved side veins, faintly joined near the margin but with a clear network of finer veins. Stalks 0.3-0.6 cm, no stipules. **FLOWER** 0.8-1.4 cm, white, pink or pale yellow, **shaped like a sweet pea (Legume)**, in open, branched clusters at end of twigs and **5-20 mm above** the axils of the upper leaves. Stalks with scattered minute white hairs. 5 free petals, 6-11 mm long, the lowest one boat-shaped, the upper ones often with a yellow spot on the inside. 8 stamens, partly attached to base of petals. 1 slender style with a 2-lobed stigma, ovary densely hairy. **FRUIT** ± 3 cm, dark yellow-green, globose, not splitting, leathery & wrinkled when ripe, single large seed.

NOTE widespread, not uncommon in less disturbed evergreen forests, where it is one of the few species with deeply cracked bark. Leaves drying greenish.

SIMILAR ⁴⁶*X. flavescens* leaves drying pale yellow, generally rather larger with longer stalks, 0.7-1.5 cm. Flowers terminal & truly axillary (not above the axils), stalks with dense minute hairs, ovaries without hairs. Fruits slightly smaller, ± 2 cm. Both species occupy similar habitats & are not easy to tell apart.



HYPERICACEAE

A small but widespread family with 400 species worldwide, 1 genus & 4 species in N.Thailand. Closely related to Guttiferae (p49), with which it is often united.

⁴⁷*Cratoxylum formosum* ssp. *prunifolium*

दीवखन



Small deciduous tree to 12 m with open crown & slender branches. **BARK** dark grey, cracked & flaking in small irregular pieces. Inner bark with **watery brownish sap**. Young trees often with long woody spines.

LEAF 5-14 x 3-5 cm, simple, **opposite**, **usually planar**, oval or elliptic with slightly pointed tips & blunt or rounded base, no teeth. Young leaves red to pale pink, silky, appearing just after flowers, mature leaves bright green, smooth. 7-12 pairs of very clear side veins which are **joined in loops** near margin. Stalks 0.6-1.6 cm. **FLOWER** delicate pale pink flowers in clusters of 3-5 on old leafless twigs. 5 free petals, ± 1.2 cm, slightly spreading with a narrow stalk and a sticky scale at the base on the inside. Many short yellow stamens, **fused into 3 slender bundles** slightly shorter than the 3 free, pale green styles. **FRUIT** 1.3-1.8 x 0.4-0.6 cm, dark brown, narrowly ovoid with pointed tip, covered by persistent sepals at base, thinly woody, splitting into 3 sections, each with 12-17 seeds which are **shortly winged at one end**.

NOTE widespread & common in open forests. A lovely species, especially in the cold season when the whole crown turns pale pink, reminiscent of a *Prunus* but easily distinguished by the opposite, untoothed leaves.



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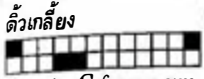
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48 *Cratoxylum cochinchinense*

ตัวเมียเลี้ยง



Similar to *C. formosum* but leaves pale greyish-green below, side veins faint, not joined in loops, stalks <0.3 cm. **FLOWER** crimson or dark red, at end of twigs & in axils of mature leaves, petals without gland at base but with 4 large yellow glands between the stamen bundles. **FRUIT** 0.8-1.2 cm, about 2/3 covered by the persistent sepals.

NOTE Fairly common in semi-open areas & along forest edges.

SIMILAR 49 *Cratoxylum maingayi*

Leaves 3-8cm, leathery, 5-7 side veins, stalks 0.2-0.7 cm. Flowers slightly smaller, white (dark red?). Fruits 0.9-1.5 cm, half-covered by persistent sepals, splitting into 3 section, each with only 6-7 seeds, wings not narrow base. Uncommon.

50 *C. sumatranum* var. *neriifolium*

ตัวเมีย leaves up to 18cm, tips pointed, no stalks, stems with a ringed scar. Flowers only at end of twigs. Fruits almost completely covered by persistent sepals. Rare.

GUTTIFERAE

400 species confined to the old world tropics, 4 genera & at least 13 species in NT.

BOTANY evergreen trees with smooth, thin bark & **white or yellow latex**. Leaves simple, opposite, untoothed, usually thickly leathery & completely smooth, often with many faint, parallel side veins & short stalks, no stipules. Flowers bisexual or unisexual on different trees, usually solitary or in simple clusters at leaf axils. Sepals free & overlapping at base, 3-6 free petals, stamens very short, densely clustered into one or more bundles, stigma often large, ovary superior.

ECOLOGY mostly understory trees of lowland evergreen forests.

USES the only well-known fruit is Mangosteen (*Garcinia mangostana*) which is native to S. Thailand. *Mesua ferrea* provides an excellent timber.



1. leaves pale grey below, flowers 5-7.5cm, fts woody *Mesua ferrea* 59
1. leaves green or yellowish below, fws <3cm, fts fleshy or leathery
2. at least 50 parallel side veins running straight to margin
2. less than 50 side veins, not reaching margin
3. crown irregular, short trunk, ascending branches
3. crown conical, single straight main trunk, horizontal side branches
4. leaves usually <20 cm long; flowers with 4 petals; fruits <5 cm
5. leaves mostly <12 cm long
6. lvs broadly tipped, stamens in central mass *G. cowa* 56
6. lvs narrowly tipped, stamens in 4 bundles *G. merguensis* 55
5. leaves mostly >12 cm long
7. male flowers with stamens on cup-like base *G. propinqua* 57
7. male flowers with stamens in 3 rows *G. thorelii* 51
7. male flowers with stamens in 4 bundles
8. stamen bundles shorter than pistil *G. speciosa* 53
8. stamen bundles as tall as pistil *G. mckeaniana* 52
4. leaves usually >20 cm long; fruits 4.5-10 cm
9. lvs >2x as long as wide; fws with 5 petals *G. xanthochymus* 54
9. lvs <2x as long as wide; fws with 4 petals *G. pedunculata* 58

G. = *Garcinia*

GUTTIFERAE

53 *Garcinia speciosa*

พะวา มะระขี้นก



Evergreen tree to 17 m with **single straight main trunk & horizontal or drooping branches which stick out at all angles like the spokes of a wheel**. **BARK** dark brown, very thin, inner bark with yellow latex. **LEAF** 11-22 x 3-7 cm, usually at least 3X as long as wide, narrow at both ends with >20 pairs of thin but obvious side veins and a marginal vein. Stalks 1-2.5 cm, grooved with clasping base, twigs squarish, slightly ridged. **FLOWER** male & female flowers on separate trees.

Males 3.5-5 cm, pale yellowish-green, 4-5 flowers clustered together in axils of leaves. 4 fleshy sepals & 4 waxy petals, much longer than sepals. Stamens grouped in 4 dense bundles around a infertile mushroom-like stigma on a thick style. Females similar but slightly smaller, solitary, without stamen bundles. **FRUIT** up to 5 cm, bright red, spherical or slightly ovoid with flattened, ring-like stigma at top & persistent sepals at base. Fleshy inside with sticky yellow latex.

NOTE widespread, fairly common in evergreen forests, scattered in moister deciduous forests.

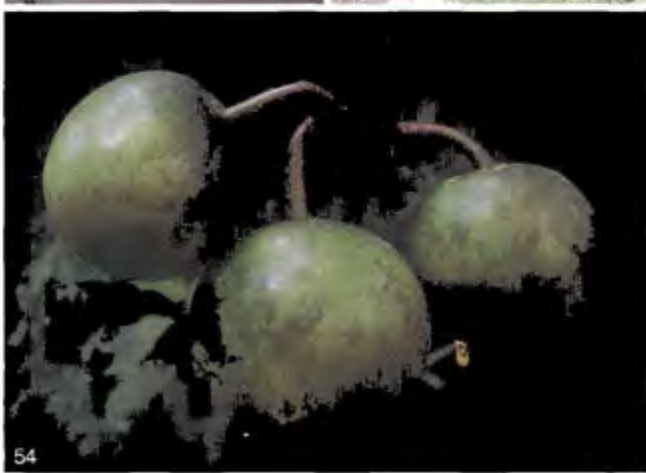
54 *Garcinia xanthochymus*

มะตะหลวง



Similar to *G. speciosa* but with thick, squarish twigs & larger leaves, up to 40 x 10 cm, rounded or blunt at both ends. **FLOWER** 1.5-2.5 cm, whitish, 4-8 flowers clustered together on short woody stumps. 5 sepals, 5 petals, males with 5 bundles of 3-5(10) stamens, females with 5-ridged stigma on very short style. **FRUIT** 4.5-9 cm, dark yellow, spherical with short pointed tip at top. 3-5 large seeds.

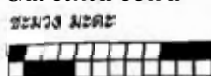
NOTE widespread & common in less-disturbed forests, often near streams.



55 *Garcinia merguensis*

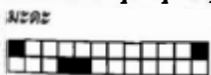
LEAF 5-12.5x1-5 cm, oblong to lanceolate with **tapering tips**, side veins faint, stalks 0.5-1 cm. **FLOWER** 0.6-0.8 cm with slender stalks 0.5-2.5 cm long. 4 sepals & 4 petals, 4-7 mm. Males with **stamens in 4 bundles** around a large circular stigma without a style. Females without stamens, stigma with Stout style **FRUIT** 1.3-1.7 cm, globose or oblong with a clear ring at top.

NOTE scattered in the understory of less-disturbed forests.

56 *Garcinia cowa*

LEAF 6-17 2.5-6 cm, oblong, usually <3x as long as wide with **blunt or slightly pointed tips**. Stalks to 1 cm. **FLOWER** males with no stigma and the **stamens in single squarish mass**. Females with shallowly 4-8 ridged stigma. **FRUIT** 2.5-6 cm, dull orange or yellow with **5-8 shallow grooves** at least near the top. Tip sunken with small black persistent calyx. 4-8 segments, each with a large 3-angled seed.

NOTE widespread & common in most lowland forest types, more tolerant of dry conditions than other *Garcinias*.

57 *Garcinia propinqua*

Tree to 15m. **LEAF** 12-19x4.5-8cm, oval to oblong, blunt or slightly pointed at both ends. Stalks 0.3-1cm. **FLOWER** pale yellow, in open clusters at leaf axils or behind leaves, main stalks 0.7-1.5cm, individual stalks 0.6-0.9cm. 4 sepals & 4 petals. Stamens on **cup-like receptacle** slightly shorter than the sterile pistil. **NOTE** rare, less disturbed forests.



GUTTIFERAE

⁵⁸*Garcinia pedunculata*

Tree to 15m. **LEAF** 16-26x7-10 cm, obovate with blunt or rounded tip, dark green & glossy. **FLOWER** green, males in upright clusters of 8-12 flowers. Sepals ± 8 mm, rounded, fleshy, inner pair narrower. Petals oblong, as long as sepals. Stamens in 4-angled mass on short stalk. Females solitary or in threes at end of twigs, on thick squarish stalk. **Corolla tubular with 4 short recurved lobes.** **FRUIT** 8-10 cm, yellow-orange, fleshy with 8-10 kidney-shaped seeds. **NOTE** scattered in less disturbed lowland evergreen forests.

⁵⁹*Mesua ferrea*

มณฑล



58 ♀

58

Evergreen tree to 30 m with very dense, narrow crown & slender, drooping branches. **BARK** dark brown, flaking, inner bark with **very sparse pale yellow latex.** **LEAF** 5-13x1.2-4 cm, simple, opposite, narrowly elliptic or lanceolate, tapering at both ends. **Young leaves pale pink**, covering the whole tree for just a few days each year, mature leaves dark green above, **pale grey** (glaucous) below. **Side veins very numerous but extremely faint**, stalks 0.8-1.2 cm. **FLOWER** 5-7.5 cm, white, bisexual, solitary or paired in leaf axils, hanging face downwards, stalks <1 cm. 4 free sepals in 2 rows, 1.2 cm, rounded. 4 overlapping petals, broadly obovate, velvety when young, more than 50 bright orange-yellow stamens, single slender white style with small stigma, much longer than stamens. **FRUIT** 2.5-3.5 cm, dark orange or purple-brown, ovoid with pointed tip, not splitting, densely covered with woody fibres, often with drops of resin, base enclosed in fleshy sepals. 1-4 hard, dark brown seeds.



59



59



59



59



59

NOTE a magnificent tree with shapely crown & large fragrant flowers. The heartwood is dark red-brown & extremely hard, good for furniture. As a result, there are very few mature trees left in the wild, although it is often planted especially in temples.

SIMILAR the narrow, opposite leaves with pale grey undersurface & very faint side veins distinguish *Mesua ferrea* from any other wild tree in NT.

60 *Mammea siamensis*

สารภี



Evergreen tree to 20 m with dark green, rather spreading crown & short trunk. **BARK** pale grey-brown, smooth or slightly fissured, inner bark dark red with scant cream or pale yellow latex. **LEAF** 7.5-25 x 2.5-7 cm, obovate or oblong, with blunt or slightly notched tip & tapering base. Young leaves purple, mature leaves dark-green above, yellow-green below, completely smooth. Side veins numerous, slender but clearly visible on both surfaces. Stalks 0.5-1.5 cm.

FLOWER 1.2-2.5 cm, white or pale yellow, male & female flowers on different trees, clustered on old woody twigs behind leaves. Stalks slender, 2 cm. Calyx fused in bud, later splitting into 2 lobes, 0.2-0.7 cm, 4 oblong petals, 0.6-0.8 cm. 60-90 stamens, single short style with 2-lobed stigma. **FRUIT** 2.5-5 cm, yellow/orange, oval with short blunt tip, 2 valved, rind with sparse white latex, single large seed with thin yellow coating (aril). **NOTE** uncommon in less-disturbed forests but often planted for its fragrant flowers.



60



61a



61a

61a *Calophyllum inophyllum* มะทิงี

Evergreen tree to 15m. **BARK** dark brown, becoming fissured with age. **LEAF** 10-17x5-8cm, oblong with blunt or notched tip & slightly pointed base. Mature leaves leathery, dark green & shiny, completely smooth. Many pairs (>50) of close parallel side veins running straight from midvein to margin. Stalks 0.8-2 cm. **FLOWER** white, fragrant, in short branched clusters at leaf axils or end of twigs, > 6 flowers. Individual stalks 0.5-4cm, slender. 4 rounded petal-like sepals, ± 1 cm. 4(8) petals $\pm 1.2 \times 0.5$ cm. Stamens ± 5 mm, fused at very base, obscurely clustered, anthers orange. Style ± 5 mm. **FRUIT** 2-2.5cm, globose, with thick leathery skin but fleshy inside. **NOTE** native to C. & S. Thailand, often planted particularly in temple grounds. **SIMILAR** ^{61b} *C. polyanthum* closely related native species, widespread but uncommon in less-disturbed moist hill evergreen forests.



61a

FLACOURTIACEAE

900 species worldwide, 6 genera & 16 species in N. Thailand.

BOTANY habit very variable, including both spiny deciduous shrubs of open dry areas as well as large evergreen trees of dense forest. Simple, alternate leaves, often planar, usually with shallow irregular teeth & often with tiny stipules which fall early. Flowers small, white or green, sometimes without petals, often with male & female flowers on different trees.

USES *Flacourtia* spp. are cultivated for their edible fruits, but none of the other species are in widespread use.

1. branches with thorns, at least on young twigs
 2. leaf stalk with 2 orange glands at top; flowers with petals, bisexual leaves 7-18x3-8cm, flowers with 4-6 whitish petals & single style 4-6 mm; fruits 1.5-2.5cm, black-purple, 6-20 seeds *Scolopia spinosa* ⁶²
 2. leaf stalk without glands; flowers without petals, unisexual
 3. fruits 0.8-2.5cm *Flacourtia* ⁶
 3. fruits ± 0.4 cm *Xylosma* ⁶³
1. branches without thorns
 4. lvs with translucent dots/dashes; flowers without petals; fruits ribbed, splitting; seeds with colored aril *Casearia* ⁶⁹
 4. lvs without translucent dots/dashes; flowers with petals; fruits not ribbed, not splitting; seeds without aril
 5. leaf stalk swollen at top, leaf base asymmetric ⁶⁴ *Hydnocarpus* petals with basal scale, no style; large hard fruits 4-12cm
 5. leaf stalk not swollen, base symmetric ⁶⁵ *Homalium* petals without basal scale, with style; small dry capsules

FLACOURTIACEAE

⁶⁶*Flacourtia indica*

ตะขบป่า มะแฉกรูป



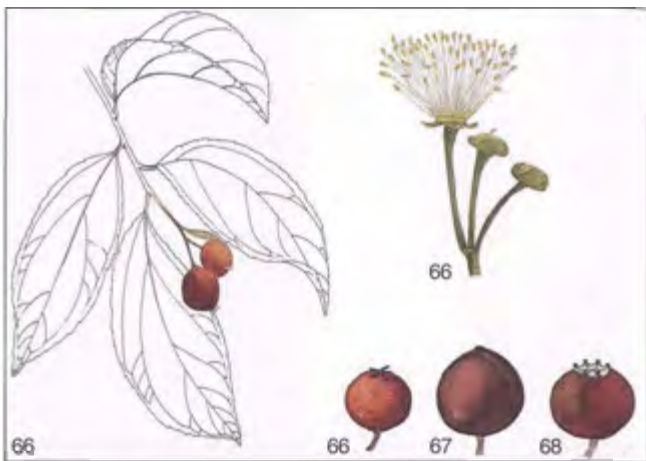
Deciduous shrub or small tree to 12 m with a crooked trunk and straggly crown. **BARK** pale brown, with long sharp spines in pairs. **LEAF** 2.5-5(10)x1.5-3 cm, alternate-planar & regularly spaced on young shoots, densely clustered on older woody twigs, obovate, often with blunt or slightly notched tips, coarsely toothed. Young leaves rose-red, mature leaves bright green & glossy, smooth or with scattered hairs. 4-6 pairs of side veins, steeply curved & widely spaced, the lowest pair very close to base of leaf. Stalks 0.3-0.5 cm. **FLOWER** tiny, pale green, usually in small clusters hidden in leaf axils. 4-6 sepals, ± 1.5 mm, no petals. Male flowers with many white stamens which are hairy at the base. Female flowers with 5-6 spreading pale green styles, more or less joined at the base. **FRUIT** 0.8-1.7 cm, bright red, globose with a tiny 5-6 pointed star at top (the remains of styles). 4-7 seeds in a star pattern. Edible but quite acidic.

NOTE widespread & common, especially in open or degraded areas, often planted.

SIMILAR ⁶⁷*Flacourtia jangomas*

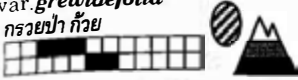
ตะขบควาย leaves, 5-11 x 1.2-5.5 cm, narrowly tipped, 3-6 pairs of side veins. Female flowers with styles fused into a short column, fruits with single unbranched nipple at top.

⁶⁸*Flacourtia rukam* ตะขบไทย leaves 7.5-20x4-7 cm, narrowly tipped, 5-10 pairs of side veins. Female flowers with completely free upright styles, which form a ring at the tip of the fruits. Frequently cultivated but not native in NT.



69 *Casearia grewiaefolia*var. *grewiaefolia*

กรวยป่า ก้วย



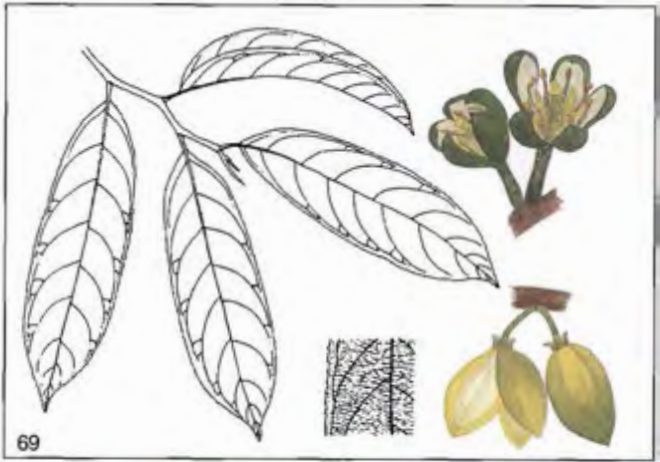
Deciduous tree to 24 m, slightly buttressed when older. **BARK** pale brown, smooth, **without thorns**, inner bark pale orange, gritty. **LEAF** 8-18x3.5-6 cm, narrowly oblong with tapering tip, finely toothed, covered with **short translucent dashes** (only visible when held up to a strong light). 8-12 pairs of side veins with a delicate network of smaller ones. Stalks 0.6-1.0 cm, with small (1.5 mm) triangular stipules which fall early. Twigs smooth, dark brown, zigzagging. **FLOWER** tiny, green, **bisexual**, clustered in leaf axils or on old leafless branches. 4-5 sepals, 2-3 mm, **no petals**, 8-10 fertile stamens, alternating with a smany infertile ones, 1 style. **FRUIT**: 3.5-5 cm, 3-angled, splitting into 3 sections, seeds with bright reddish-orange coat (aril).

NOTE 2 varieties in NT - var. *grewiaefolia* has smooth mature leaves, whereas var. *gelonioides* is distinctly hairy. Both varieties are widespread & common, often occurring together.

SIMILAR ⁷⁰*Casearia flexuosa* มะแตกดิน Shrub or small tree to 4 m. Leaves with blunt tip, regular sharp teeth and persistent linear stipules, 2-4 mm. Fruits $\pm$ 1.5 cm.

⁷¹*Casearia flavovirens* พรว้าเหว leaves 12-22x5-8 cm, asymmetric base, margin entire or with scattered shallow teeth. 12-16 pairs of side veins. Stalk 1-1.5 cm, wrinkled near base.

⁷²*Casearia graveolens* leaves with narrower tips, asymmetric base & more slender stalks, 1-1.2 cm. Tertiary veins forming a fine, clear network. Fruits 1.8-2.5 cm, seeds with a purple coat.



THEACEAE *Camellia* family

Small but widespread family with 600 species worldwide, 10 genera & 18 species in NT.

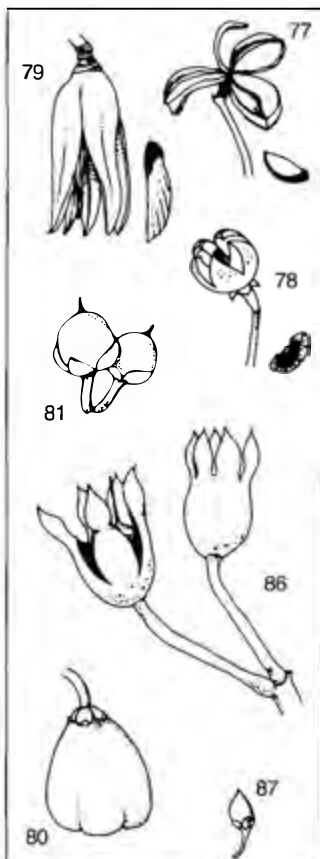
BOTANY simple, alternate, spirally arranged leaves without stipules, usually smooth & rather shiny. Flowers often spectacular with 5 small sepals, 5-6 showy petals & many stamens.

ECOLOGY Most species in our region are small evergreen trees which form a characteristic component of the understory in undisturbed hill evergreen forests. Few of them will tolerate fire or exposed conditions, so they are good indicators of long-term disturbance. The exception is *Schima wallichii* which is a common component of all hill evergreen forests, especially where more valuable timber species have been logged out.

USES the best known species is the tea bush, *Camellia sinensis* which is native to our region and is used to produce both dried tea for drinking and "miang", a chewing paste consisting of fermented green leaves. In tea orchards the bushes are planted close together and are kept very short, relying on regular fertilizer inputs to maintain yields. In miang orchards the plants are allowed to get much larger & are more widely spaced, requiring little or no fertilizer. When the fields are cleared from the original forest, about half of the trees are left standing to provide shade for the miang bushes, which will not produce succulent leaves in the full sun. As a result, miang orchards are less destructive of the forest environment than many other farming systems.

KEY TO FLOWERS

1. leaves planar
 2. flowers small, <1cm *Eurya* ⁸⁷
 2. flowers larger, >1cm *Adinandra* ⁸³
1. leaves spiral
 3. petals pressed together, narrow in the middle *Anneslea fragrans* ⁸⁶
 3. petals spreading, not narrow in the middle
 4. leaves with many fine, sharp teeth all along margin
 5. 5 styles *Pyrenaria garretiana* ^{80a}
 5. 1-3 styles *Camellia* ⁷³
 4. leaves with scattered teeth near tips or without teeth
 6. petals notched
 7. stamens in 5 bundles *Gordonia dalglieshiana* ⁷⁹
 7. stamens not in bundles *Camellia oleifera* ⁷⁷
 6. petals notched
 8. outer stamens fused into a tube *Camellia connata* ⁷⁴
 8. stamens free
 9. leaves clustered, sympodial *Ternstroemia* ⁸¹
 9. leaves not clustered or sympodial
 10. flowers 3.5-5cm, one petal larger than others; leaves usually untoothed, large tree to 35m *Schima wallichii* ⁷⁸
 10. flowers 2-3cm, all petals same size; leaves with blunt teeth; small tree to 10m *Pyrenaria camelliflora* ^{80b}



KEY TO FRUITS

1. dry fruits, splitting
 2. fruits bullet-shaped *Gordonia* ⁷⁹
 2. fruits spherical
 3. 5 sections, seeds with wings *Schima* ⁷⁸
 3. 2-3 sections, seeds not winged *Camellia* ⁷³
1. leathery or fleshy fruits, not splitting
 4. seeds many, small
 5. fruits <0.5cm *Eurya* ⁸⁷
 5. fruits >0.8cm *Adinandra* ⁸³
 4. seeds few (<5), large
 6. calyx at top of fruit *Anneslea* ⁸⁵
 6. calyx at base of fruit
 7. seeds red or pink *Ternstroemia* ⁸¹
 7. seeds brown *Pyrenaria* ⁸⁰

Camellia

Evergreen shrubs or small trees, leaves mostly sharply toothed. Flowers showy, in leaf axils, 5 overlapping petals, many stamens, 3-5 stigmas ± fused at base. Fruits splitting.

1. large flowers, 5-6cm, 11 petals
Rare, Fang district. ⁷³*C. taliensis*
1. smaller flowers, 2.5-4cm, 5-6 petals
2. fw stalks 1-2cm ^{C. sinensis}⁷⁶
2. fw stalks <0.2cm
3. outer stamens fused into tube
lvs with black hairs ⁷⁴*C. connata*
3. stamens free almost to base
4. 3 long styles ⁷⁵*C. tenii*
4. 1 short style ^{C. oleifera}⁷⁷

⁷⁶**Camellia sinensis**

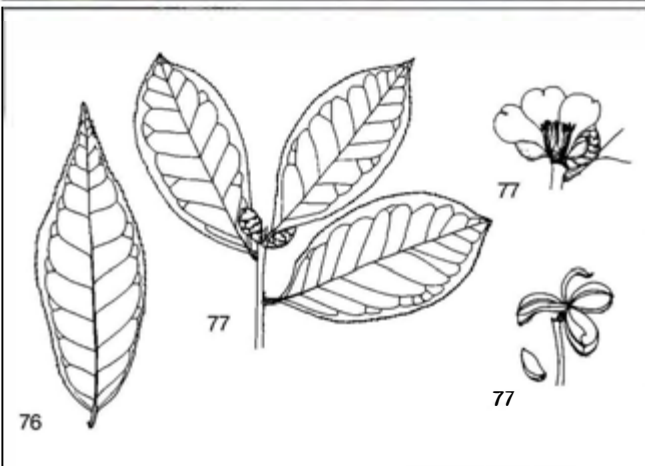
เมี่ยง



Usually a straggly shrub to 5 m, rarely becoming a small tree to 15 m. **BARK** dark brown, smooth, thin, inner bark white. **LEAF** 6-20 x 2-6 cm, dark green, smooth & shiny, elliptic with a slightly pointed or tapering tip, blunt base and fine sharp teeth. Stalks 0.5 cm, twigs dark brown, smooth & shiny. **FLOWER** axillary clusters of 1-3 large white or pale yellow flowers, 3.5-4.5 cm across with 5-6 spreading, rounded petals, many bright yellow stamens & a single 2-3 tipped style. Stalks woody, about 1 cm long. **FRUIT** 1.1-1.5 cm, rounded, splitting into 2-3 sections with many wingless seeds.

NOTE extensively cultivated throughout the region, to such an extent that it is no longer possible to determine its natural range, probably native at least in Mae Hong Sorn & Chiang Mai provinces. The wild variety is var. *assamensis*.

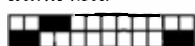
SIMILAR ⁷⁷*C. oleifera* var. *confusa*
เมี่ยงฮาม shrub or small tree to 10 m, shiny green sharply toothed leaves, usually with a slightly tapering base. Flowers slightly larger (3.5-5 cm) with very short stalks and notched petals. Uncommon but fairly widespread in less disturbed forests.



THEACEAE

⁷⁸*Schima wallichii*

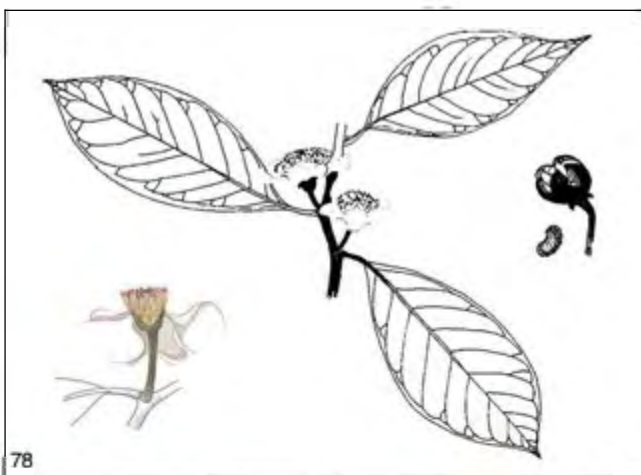
ม้งตาน ทะโล้



Large tree to 35 m with a dense, deep crown & straight, unbuttressed trunk. **BARK** dark grey or almost black, deeply cracked into angular pieces, inner bark often pink or dark red, fibrous. **LEAF** extremely variable, 4.5-18 x 2-8 cm, spirally arranged, broadly ovate, elliptic to lanceolate, usually with a slightly or abruptly tapering tip and narrow or rounded base, mostly without teeth but sometimes with scattered blunt teeth especially near the tip. Young leaves pinkish & densely covered with silky hairs, mature leaves smooth & dark green above, often pale grey-green with silky hairs below. Midvein usually sunken but other veins raised on upper surface. Stalks quite slender, 0.3-3.5 cm long, sometimes slightly winged. Old leaves never turn yellow or red, but fall while still green. **FLOWER** 2-5 cm, white, solitary or clustered in the axils of leaves near end of twigs. 5 rounded petals, the outermost one larger than the others & partly enclosing them. Many yellow stamens fused to petals but not clustered in groups, 1 style with 3-5 short lobes. **FRUIT** 1.5-3 cm, woody spherical capsules **splitting into 5 sections** with many kidney-shaped seeds surrounded by a narrow wing.

NOTE very common throughout the region, forming a characteristic element of hill evergreen forests, but also found more scatteredly in many other forest types. *Schima wallichii* is sometimes split into many varieties, but in the Flora of Thailand they are treated as a single variety.

SIMILAR *Schima wallichii* is the only species of Theaceae in NT that grows to be a large tree. It is easy to recognise by the woody, 5-sectioned fruits which can usually be found on the ground under the tree at any time of year.



78



78



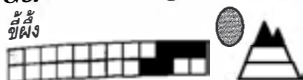
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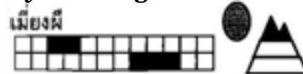
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79 *Gordonia dalglieshiana*

Small tree to 10 m with smooth, thin dark grey-brown bark. **LEAF** 4.5-16 x 2-4.5 cm, spirally arranged, dark green & glossy, without hairs, slightly tapering at both ends, usually without teeth or with a few scattered teeth near the tip. Midvein sunken above, other veins faint. Stalks 0.4-1.0 cm, often tinged pink. **FLOWER** 4-5 cm, white, solitary in axils of young leaves. 4-5 equal-sized petals with slightly notched tips. Many bright yellow stamens, fused into 5 bundles, and a single style with 3-5 lobed stigma.

FRUIT 3-5 cm, bullet shaped, smooth, woody, splitting into 5 sections with many seeds winged only at one end.

NOTE widespread but never common, usually in less disturbed forests.

80a *Pyrenaria garrettiana*

Small tree to 11 m with thin, slightly cracked dark brown bark. **LEAF** 8.5-18 x 2.5-6.5 cm, spirally arranged, well spaced along twigs, narrowly elliptic, more or less tapering at both ends, with fine, sharp teeth. Mature leaves with **scattered short rough hairs below**. Veins **widely spaced**, steeply curved, obvious on both sides, midvein sunken above. Stalk 0.5-1.0 cm. **FLOWER** white or cream in clusters of 1-2 flowers at axils of leaves with sepal-like bracts at base. Sepals densely silky outside, petals rounded with greenish tips, many orange stamens and **5 green styles**. **FRUIT** 3-3.6 cm long, bright green finally turning dark purple, leathery, not splitting, sunken at the tip with 5 rounded lumps. 3-5 large, glossy angular seeds.

NOTE widespread, not uncommon but never gregarious.

SIMILAR ^{80b} *P. camelliiflora* has smooth leaves, flowers with a single style & fruits with rounded tips.



THEACEAE

⁸¹*Ternstroemia gymnanthera*

ไทรแดง



Small or medium tree to 18 m with a clearly sympodial branching pattern. **BARK** thin, dark grey, smooth or slightly cracked. **LEAF** 5-9 x 2-4.5 cm, clustered, dark green, smooth, narrowly elliptic or lanceolate, tapering at both ends, without teeth or with scattered tiny black teeth. Midveins sunken above, side veins widely spaced, joined, smaller veins very faint, stalks 0.8-1.5 cm, twigs smooth, rich dark brown. **FLOWER** 1.5-2 cm, pale yellow flowers on slender, curved stalks, 1.5-2 cm, grouped together slightly behind the leaves. Sepals 3-4 mm, silky outside, with 2 bracts immediately below the sepals. Male flowers with 3 rows of stamens, bisexual flowers with 1 row of stamens & 1 style with 2 branches. **FRUIT** 0.8-1.5 cm, leathery, not splitting, spherical with pointed tip and small persistent style at base. 1-4 large seeds with a thin red coat (aril).

NOTE widespread, not uncommon, lowland & hill forests from 700 up to 2000 m.

SIMILAR ⁸²*T. bancana* ไทรสา larger leaves, 6-16 x 2.5-6 cm, larger yellow or reddish flowers, 2-2.5 cm, with the bracts clearly separate from the sepals, and larger fruits, 3-3.5 cm. Lowland forests, not above 500 m.



81



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⁸³*Adinandra integerrima*

พิทลป่า



Shrub or small tree to 15m. **LEAF** 5-15 x 2.5-5 cm, alternate-planar, narrowly elliptic to oblong, pointed or tapering at both ends, leathery. Stalks 0.3-0.7 cm. **FLOWER** pinkish, solitary or paired at leaf axils, **stalks 2.5-5 cm with 2 deciduous bracts at top**. 5 overlapping sepals, 0.7-1 cm. 5 overlapping petals, narrow & pointed, 1-1.5 cm, fused at base. 30-40 stamens, fused to petals at base. **All parts silky-hairy**. **FRUIT** ±0.8 cm, leathery, not splitting, berry-like, >>



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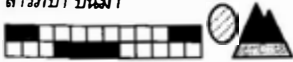
with persistent sepals at base & many small seeds.

NOTE scattered in hill evergreen & semi-open forests.

SIMILAR ⁸⁴*Aoblonga* leaves blunt or pointed at both ends, flowers with shorter stalks (<2cm) & ovate petals. Sukhothai province. ⁸⁵*Alaotica* tree to 25m, leaves to 20x6cm, narrowly oblong-lanceolate with tapering tip & blunt base, stalks 1-2.5cm. Flowers white, stalks 2-2.5cm, bracts some distance below sepals, all parts smooth (except anthers). Doi Intanon, hill forests 900-1300m.

⁸⁶*Anneslea fragrans*

สาหร่ายน้ำ



86

Small or medium-sized tree to 25m.

BARK very variable, typically dark grey with a fine network of deep, narrow cracks, but sometimes creamish & almost smooth.

LEAF 6-15x2.5-5.5cm, spiral, often clustered towards end of branches, dark green, smooth & glossy, narrowly elliptic, blunt or slightly pointed at both ends, usually without teeth but sometimes with scattered blunt teeth. Side veins very thin, usually close together & parallel, tertiary veins almost invisible. Stalks 1.5-3 cm, very slightly winged, usually tinged dark red, twigs dark brown, smooth & shiny. **FLOWER** 3-4cm, in simple clusters (fascicles) near end of twigs. Individual stalks slender, 5-7 cm, with a pair of bracts near top. Sepals 1-1.5cm, petal-like, white or pinkish, spreading, pointed, hairy along the edges. True petals white, **pressed together over the sexual organs, very obviously narrower in the middle**, fused together at the base. Many pale orange stamens and a slender 3-pointed style, projecting beyond petals. **FRUIT** 1.5-5cm, leathery, completely enclosed by the thick reddish-orange which becomes woody & irregularly breaking up when old. 2-9 seeds, each with a red coat (aril).

NOTE very common, especially on open rocky ridges with pine, but also sometimes found in moister forests.



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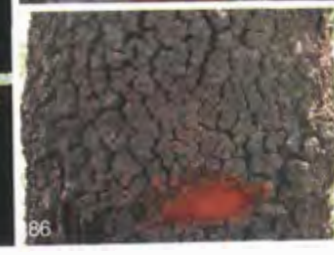
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THEACEAE

⁸⁷*Eurya acuminata*
var. *wallichiana*

ปลายसान แอพันจัน



Shrub or small tree to 12m with a slender, pyramidal crown. **BARK** smooth or finely cracked. **LEAF** 3.5-12.5x1.2-3cm, arranged in flattened sprays, lanceolate with a long, narrow tip and fine, quite sharp teeth. Buds & young leaves densely silky hairy, mature leaves with long pale hairs, especially on veins & twigs. Midvein sunken above, side veins widely spaced, joined together quite far from the margin, stalks very short, <0.5cm.

FLOWER 0.4-0.6 cm, dense clusters of 2-6 small yellow flowers in leaf axils or along bare twigs. Sepals 1-2 mm long, bright green, hairy on outside, petals 2.5-4 mm long, overlapping, fused together at base, not spreading. Male flowers with about 20 orange-brown stamens, female flowers with 3 styles joined together at the base. **FRUIT** 0.3-0.6 cm, spherical, thinly fleshy, not splitting, purple or black when ripe with many tiny wingless seeds.

NOTE common & widespread, especially in clearings in hill evergreen forest. The female flowers often become infected with parasitic insects & form spiny-looking galls.

SIMILAR *E. acuminata* var. *acuminata* leaves smooth, veins not sunken above. Elsewhere in Thailand but not in the north.

⁸⁸*Eurya nitida* แอพันจัน young leaves & buds much less hairy, sepals without hairs on outside. 2 varieties: var. *nitida* has strongly ridged young twigs, completely smooth buds and small leaves, 4-6.5x1.2-2.5cm. Uncommon. var. *siamensis* has weakly ridged twigs, smooth or slightly dark-hairy buds and slightly larger leaves, 8-10x3.5-4.5cm. Widespread, sometimes common. Endemic to Thailand.



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88 var. nitida

SAURAUACEAE

Small family with 300 species worldwide, mainly in S. & E. Asia. 1 genus & 2 species in NT. Simple spiral leaves without stipules or glands & regular, bisexual flowers.

⁸⁹*Saurauia roxburghii*

ลำต้น



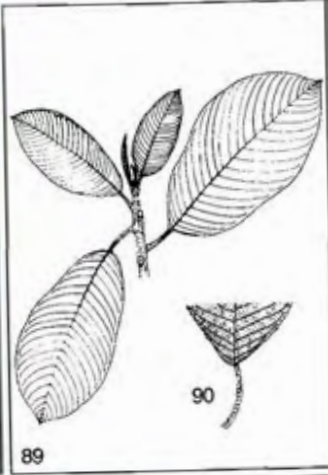
Evergreen shrub or small tree to 6m (rarely 10m) with a short trunk and many thick, spreading branches **BARK** dark brown, finely flaking when young, becoming deeply fissured with age. **LEAF** 18-35x5-9 cm, clustered near end of twigs, dark green, narrowly obovate or lanceolate, with **many fine, sharp teeth**. Veins obvious, 17-25 pairs, parallel & evenly spaced, fairly straight but sharply curved just before the margin. **Lower surface & stalks covered by minute pale orange scales**, intermingled with long pale yellowish-brown hairs, much denser in young leaves. Stalks 2-5 cm, tinged pink, twigs usually hollow. **FLOWER** 0.8-1.3 cm, white or pale pink, in short clusters(cymes) of 3-15 flowers hanging face downwards on old woody stems or on the trunk, **main stalks 0.5-2.5 cm**. Corolla bell-shaped with 5 short sharply curved tips, 35-45 stamens, single white style with 5 spreading stigmas. **FRUIT** ± 1.2 cm, pale greenish-yellow, globose with persistent sepals at the base, fleshy but eventually splitting into 3-5 sections with many tiny seeds.

NOTE widespread & fairly common, usually in moist open places.

SIMILAR ⁹⁰*S. napaulensis* ลำต้น slightly larger leaves with 25-42 pairs of side veins and more regular teeth. Flower in leaf axils close to ends of branches, with much longer common stalk, 20-35 cm. Less common, usually at higher altitudes & flowering & fruiting slightly later in the year.



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DIPTEROCARPACEAE

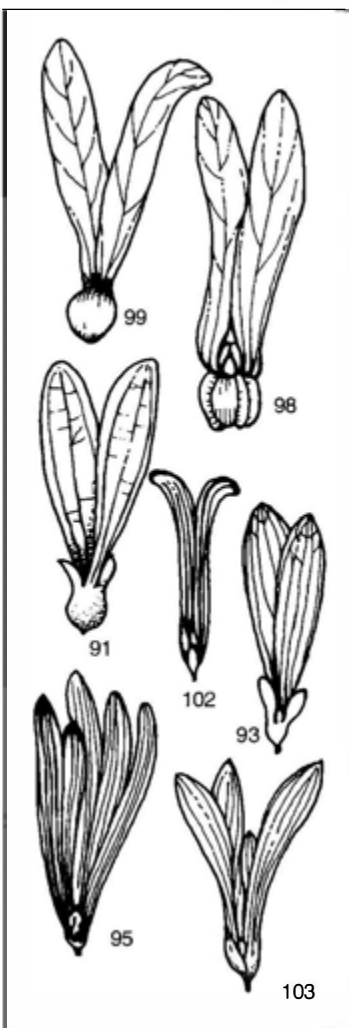
Medium-sized family with 680 species, concentrated in the rain-forests of Malaysia & Indonesia, 5 genera & 16 species in NT.

Botany deciduous or semi-evergreen trees, bark usually with resin. Leaves simple, alternate, spirally arranged, untoothed, often with large stipules which fall early, leaving a scar. Flowers regular, bisexual, usually hanging face-downwards in axillary clusters. 5 sepals fused at base, 5 twisted petals $\pm$ fused at base, 5 to >100 stamens $\pm$ fused into a tube, anthers often with long tips (connectives), 1 style, ovary inferior. Fruits with 2-5 conspicuous wings (enlarged sepals), often fused into a tube at base & enclosing nut.

Ecology almost exclusively a lowland family in NT, very rarely found above 1200m. The species fall into two ecologically distinct groups - semi-evergreen species which are massive trees characteristic of less-disturbed, moist lowland forests, and fully deciduous species which form the basis of dry dipterocarp forests, becoming increasingly abundant in dry or heavily disturbed areas.

Uses only one of our native species (*Hopea odorata*) provides high class timber, although most of the other species are used when better timbers are unavailable. The resin in the bark is used as a varnish & lighting.

1. fruits with two long wings
 2. wings fused together at base, almost completely covering the nut
 3. fruit body with ridges or lumps at least near top
 4. fruit body with 5 long ridges from top to bottom
 5. body spherical, ridges >5 mm wide *D. alatus* ⁹⁸
 5. body elliptical, ridges <2 mm wide *D. costatus* ⁹⁶
 4. fruit body with 5 short ridges/lumps at top only *D. tuberculatus* ¹⁰⁰
 3. fruit body without either ridges or lumps
 6. 3 shorter wings rounded, nut not fused to calyx; If veining open
 7. fruit body longer than wide, <3 cm across, lvs smooth & shiny *D. turbinatus* ⁹⁷
 7. fruit body $\pm$ as long as wide, usually >3 cm across, lvs hairy
 8. fruit wings <15 cm long; lvs blunt, hairy *D. obtusifolius* ⁹⁹
 8. fruit wings >15 cm long; lvs pointed, not hairy *D. retusus* ¹⁰¹
 6. 3 shorter wings narrow & pointed, nut fused to calyx; veining looped
 9. lvs with yellow star-shaped hairs below ⁹¹ *Anisoptera costata* evg tree to 40m, lvs $\pm 15 \times 7$ cm, stalks ± 4 cm; ft wings ± 10 cm. Rare, Tak
 9. lvs completely smooth, no hairs ⁹² *Anisoptera scaphula* as *A. costata* but lvs narrower, dark green.
2. wings free or partly fused & overlapping at base, nut clearly visible
 10. large wings with 7-11 veins from base, other wings very short leaves with pore-like domatia below *Hopea odorata* ¹⁰²
 10. large wings with 5 veins from base, small wings at least 1 cm long
 11. lvs lanceolate with narrow tips; twigs with sparse pale scurf as *Vodorata* but side veins not raised ⁹³ *Vatica harmandiana*
 11. lvs elliptic, blunt-tipped; twigs with rough red-brown scurf evg tree to 20m; lvs $8-14 \times 4-7$ cm, 8-14 pairs of raised side veins, not parallel, stalks $0.8-1.5$ cm; fw clusters 4-6 cm, densely hairy; ft wings $3-7 \times 1-3$ cm. Uncommon, less disturbed forests <600 m ⁹⁴ *Vatica odorata*
1. fruits with 3-5 long wings
 12. All 5 wings of similar length & width ⁹⁵ *Parashorea stellata* large evg tree with buttresses & star-shaped lenticels. Lvs $13-18 \times 4-6$ cm, $\pm$ blunt both ends, smooth, often glaucous, side veins steeply angled; ft wings $5-7 \times 0.7-1$ cm, 5-7 main veins, nut not fused to wings. Moist forests, Tak
 12. 3 wings longer than the other 2 *Shorea* ¹⁰³



Dipterocarpus

Leaves with **straight, parallel side veins**, bending just before margin, strongly raised below. Buds narrowly conical, protected by large stipules which soon fall leaving obvious scars. Flowers with 5 petals, twisted together into an open-mouthed funnel, fused at base & falling as one piece. Stamens with long pointed projections on top of anthers. Fruits with **2 long & 3 much shorter wings (calyx lobes)**, fused together at base & completely covering the nut.

Dipterocarpus costatus

Briefly deciduous tree to 40m with very tall, straight trunk & rather open, spherical crown. **BARK** pale brown, peeling in thin, rounded flakes, leaving a **distinctive swirling pattern**, reminiscent of temple motifs. **LEAF** 8-14x4-8 cm, usually ovate with slightly pointed tip and blunt or slightly heart-shaped base. Young leaves densely covered with star-shaped hairs, **mature leaves with scattered short hairs on veins & lower surface**. 10-14 pairs of side veins. Stalks 1.5-2.7 cm, stout, usually with long shaggy hairs and fairly persistent narrow stipules, 5 mm. **FLOWER** $\pm$ 2 cm, pale orange, in short unbranched clusters of 3-6 flowers at axils of young leaves. **Calyx narrowly ridged**, coarsely hairy. 18-20 stamens. **FRUIT** 2 long wings, 8-12 cm, 3-5 main veins, 3 short wings < 1 cm, rounded & deeply folded. Body of fruit 1.2-1.5 cm, globose with **5 narrow ridges**, < 2 mm wide, roughly hairy. **Young fruits bright red**, standing out clearly against the dark green leaves, often produced in great profusion.

NOTE common and widespread, frequently gregarious & dominating the upper canopy. Larger trees often have deep burnt gouges in the trunk which are made by villagers to collect resin.



DIPTEROCARPACEAE

97 *Dipterocarpus turbinatus*

ดีดง



Easily mistaken for *D. costatus* but with a denser, less spreading crown and thinner bark. **LEAF** 17-24x9-12 cm, larger, **almost completely smooth & glossy when mature**. 14-18 pairs of side veins, stalks 2.5-3.5 cm, stipules 5-15 mm. **FLOWER** 2.5-3.5 cm, pinkish-red, usually on older twigs **behind leaves**. Individual stalks whitish, finely hairy when young, later smooth. Calyx without ridges. **FRUIT** 2 large wings 12-15 cm, body 2-3.5 cm oval or obconical, often pointed at both ends, **without ridges** and usually also without hairs.

NOTE common & widespread, usually occurring at lower altitudes than *D. costatus*, although the 2 species often grow together.

98 *Dipterocarpus alatus*

อีราง

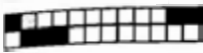


Evergreen or briefly deciduous tree to 45m, similar to *D. costatus*, but with narrower crown. **BARK** pale greyish, quite smooth, peeling in irregular, rounded flakes. **LEAF** 12.5-25x6-14 cm, narrowly ovate or elliptic with slightly pointed tip & blunt base. Young leaves with dense yellowish hairs especially on margins, mature leaves with more scattered hairs, but **never completely smooth or glossy** like *D. turbinatus*. **FLOWER** $\pm$ 4 cm, pale pink, in clusters of 4-5 flowers loosely arranged along hairy stalks up to 12 cm long, slightly above axils of young leaves. Calyx broadly ridged, >25 stamens, style stout & ribbed. **FRUIT** 2 large wings 11-15 cm, body 2.2-2.8 cm, globose, **with 5 very broad ridges**, >5 mm wide. **NOTE** uncommon in the wild, usually close to streams, often planted in temples and along roadsides. The magnificent avenue on the old road between Chiang Mai & Lamphun is all *D. alatus*.



99 *Dipterocarpus obtusifolius*

อย่างเหียง



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Deciduous tree to 28m with an open, bronze-green crown. **BARK** thick, dark grey, deeply cracked. **LEAF** 15-30x10-18 cm, broadly ovate, blunt or rounded at both ends, sometimes with slightly heart-shaped base. Young leaves densely covered by long, bristly hairs. Mature leaves dark green & smooth above except on veins and along margin, bronze-green with short pale brown star-shaped hairs and & much longer whitish hairs on veins below. 10-18 pairs of side veins, stalks 2.5-4 cm, densely covered with long yellow-brown hairs, stipules 7-12 cm, bright pink. **FLOWER** 3.5-5 cm, vivid pink, in short unbranched clusters of 3-7 flowers with a densely hairy, zigzagging axis, individual flowers with very short stalks. Calyx ± 1.4 cm without ridges, densely hairy. ± 30 stamens. **FRUIT** 2 long wings, 10-14x2.3 cm with a single main vein & a dense network of smaller veins, bright red when young. 3 much shorter wings < 1 cm, deeply folded. Fruit body 2.5-3.5 cm, **globose, without ridges or lumps at top**, densely hairy when young, often almost smooth when mature.

NOTE a dominant element of dry dipterocarp forests throughout NT, fire-tolerant but less common in extremely degraded sites. 2 varieties in NT - var. *obtusifolius* has rather densely hairy leaves & is much commoner, whereas var. *subnudus* has almost smooth leaves & is rare.

SIMILAR *D. tuberculatus*¹⁰⁰ has larger leaves with heart-shaped base, usually smooth on both sides. Fruit body with 5 lumps at top.

DIPTEROCARPACEAE

¹⁰⁰*Dipterocarpus tuberculatus*

พลวง ดิ่ง



Deciduous tree to 25m with short, stout trunk & gnarled, twisted branches. **LEAF** 30-45x12-35 cm, broadly ovate with blunt tip & rounded or heart-shaped base, mature leaves usually completely smooth, stipules bright pink, 7-10 cm. **FLOWER** 2.5-3 cm, pale pink-violet, 6-8 flowers per cluster, 28-30 stamens, petals often darker red-violet on one side only. **FRUIT** 2 large wings up to 20 cm, with 3-5 main veins. Body smooth, not hairy, with **5 distinct lumps between wings at the top**, sometimes looking like short ridges.

NOTE extremely common in dry dipterocarp forests, listed by the RFD as the most abundant forest tree in Chiang Mai Province. Often growing in large numbers on very degraded, fire-damaged sites, sometimes with *Pinus merkusii*. 2 varieties in NT - var. *tuberculatus* has smooth leaves & is much commoner, whereas var. *tomentosus* has densely hairy leaves & is rare.

SIMILAR *D. obtusifolius* has smaller & usually hairy leaves, fruit body without lumps.

¹⁰¹*Dipterocarpus retusus*

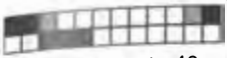
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Deciduous tree to 30m with dense crown and greyish, slightly fissured bark. **LEAF** 19-24x11-14 cm, broadly elliptic with short but distinct tip & rounded base, smooth but not shiny, obviously ridged between side veins. Stalks slender, 3-6 cm, with large deciduous stipules, 7-12 cm. **FRUIT** wings 16-25 cm, body 2.5-3.5 cm, globose, **without ridges or lumps**, slightly hairy.

NOTE uncommon, restricted to hill forests 800-1300m.

SIMILAR *D. obtusifolius*⁹⁹ has hairy leaves & fruits with shorter wings. *D. turbinatus* has glossy leaves & pointed fruits.



102 *Hopea odorata* var.*odorata* ตะเคียนทอง

Evergreen tree to 40m with dense, dark green crown & large spreading branches with slender, drooping twigs. **BARK** dark grey-brown, often deeply fissured, becoming scaly with age, inner bark dull yellow, usually exuding droplets of yellowish resin (dammar). **LEAF** 8-16x3-7.5 cm, narrowly ovate or almost oblong with slightly tapering tip & blunt or rounded base, **often slightly asymmetric**. Young leaves densely covered with grey star-shaped hairs, mature leaves dark green, almost smooth except for **tiny tufts of blackish hairs** (domatia) in or below the vein axils. 11-12 pairs of side veins with ladder-like tertiary veins. Stalks 1-1.8 cm, slender with tiny, triangular stipules. **FLOWER** 0.8-1 cm, yellow, slightly fragrant, in flattened, branching sprays of up to 50 flowers at end of twigs & upper leaf axils, 5-7 cm long. Calyx minute, petals 3-5 mm, spreading with narrow, finely fringed tips, twisted & fused together at base, falling as a rosette with stamens attached. 15 stamens with long pointed tips on top of anthers, style slender, ovary as long as style. **FRUIT** 2 long wings with 9-11 main veins, 4-6x1 cm, slightly narrowed towards the base. 3 much shorter wings <0.5 cm, overlapping but **not completely covering the nut**.

NOTE widespread & fairly common. Much prized for its excellent timber - large trees are rare in the forest except in well-protected or inaccessible places.

SIMILAR *Hopea odorata* is easily recognized at any time of year by the tufts of black hairs on the leaves. *Vatica odorata*⁹⁴ has rather similar fruits but main wings >1 cm wide & smaller wings >1 cm long. Leaves without hair tufts, tertiary veins not ladder-like.



102



102



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102



102



102

Shorea

Leaves with $\pm$ parallel side veins & ladder-like tertiary veins but much less prominent than *Dipterocarpus*. Fruits with **3 longer & 2 slightly shorter wings**, overlapping at the base but not completely covering the nut. *Hopea odorata*¹⁰² is similar but has fruits with 3 wings much shorter than the other 2. *Parashorea stellata*⁹⁵ has fruits with $5 \pm$ equal wings.

1. petals broad, closely twisted into a globose rosette *S. siamensis*¹⁰⁵

1. petals linear, loosely twisted together

2. petals fused at base, falling together

3. fw clusters 7-10 cm long, lvs without domatia *S. roxburghii*¹⁰³

3. fw clusters 10-20 cm long, lvs with domatia *S. farinosa*¹⁰⁴

2. petals not fused together at base, falling separately

4. leaves with blunt tips, common tree of dry forests *S. obtusa*¹⁰⁶

4. leaves with pointed tips, rare trees of moist forests

5. lvs with 16-26 veins. anthers hairy *S. guiso*¹⁰⁷

5. lvs with 10-15 veins. anthers smooth *S. thorelii*¹⁰⁸



103

103 Shorea roxburghii

WUEN



Briefly deciduous tree to 30m with large main branches and a fine network of slender twigs. **BARK** dark grey, 2-5 cm thick, deeply fissured, **LEAF** 8-15x3-7.5 cm, narrowly elliptic or oblong with blunt or slightly pointed tip and blunt or rounded base. Mature leaves thin, dark green, smooth or very slightly hairy. 14-18 pairs of curved side veins. Stalks slender, 1-2.5 cm, twigs dark brown & glossy.

FLOWER 1.5-3.5 cm, white or cream, sometimes tinged pink, in slender, branched clusters near end of twigs, 7-10 cm. Petals twisted in a spiral & fused at base, **falling together in a rosette**. 15 stamens in 3 whorls, anthers smooth with long tips (awls), slender style as long as ovary with 3 minute stigmas. **FRUIT** 3 larger wings 6-8x0.6-1.0 cm, often narrow & pointed, drying a rich chestnut-color with prominent veining, 2 shorter wings 3-4x0.3-0.4 cm, nuts 1.2-1.4 cm with long, narrow tip.

NOTE common in less-disturbed forests, but often scarce elsewhere due to logging pressures. A magnificent sight in full bloom, with the entire crown covered with a mass of fragrant white flowers.

SIMILAR see page 71.

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SIMILAR ¹⁰⁴*S. farinosa* กระบากดำ has shallowly fissured bark, thicker leaves with tufts of hairs (domatia) in the vein axils. Flower clusters 15-19 cm, petals ± 1.2 cm. Lowland evergreen forests. C.Thailand, possibly extending into Tak province.

¹⁰⁵*Shorea siamensis*

ชิงเภา



Deciduous tree to 25m but usually much smaller. **BARK** grey, very thick & hard with deep cracks, inner bark red-brown with pale yellow-brown resin. **LEAF** 10-22x7-16 cm, broadly ovate or oval with rounded or slightly pointed tips & a heart-shaped base. Young leaves pale red-brown with star-shaped hairs, mature leaves usually dull green & almost smooth, rarely densely hairy. 9-16 pairs of side veins. Stalks 3-5 cm, slender & slightly flattened, often tinged red. Stipules 1.5-2 cm, narrowly ovate, curved, falling early. **FLOWER** 1-2 cm diam., bright yellow often with red tinge, in slender, branched clusters of 5-20 flowers near end of twigs, 15-25 cm, usually appearing just before young leaves. **Petals closely twisted together into an open mouthed globe with recurved tips**, fused at base & **falling together as a rosette** with stamens attached. 15 stamens in 2 whorls, 10 in the outer & 5 in the inner whorl, anthers smooth with long narrow tips & short filaments, style as long the ovary with single stigma. **FRUIT** 3 larger wings with blunt tips, 5-8x1-1.5 cm, 2 smaller wings 2-5x1 cm, nuts 1.4-1.6 cm with long tip.

NOTE extremely common, often gregarious, very resistant to fire & so becoming increasingly dominant in degraded areas. Easily recognized in the cold season, when the **old leaves turn bright red** before they fall. 2 varieties in NT - var. *siamensis* mature leaves smooth or nearly so, very common, var. *tomentosa* mature leaves with dense brownish hairs below, rare.



DIPTEROCARPACEAE

106 *Shorea obtusa*

เต็ง งามะ



Deciduous tree to 27m but usually much smaller. **BARK** red-brown when young, blackish when older, deeply cracked, inner bark yellowish-brown, fibrous, with yellow resin (dammar).

LEAF 8-15x3-7.5 cm (up to 22x12 cm in young trees), narrowly elliptic or oblong, usually **blunt or rounded at both ends**, sometimes slightly heart-shaped at base. Young leaves with greyish star-shaped hairs, mature leaves dull green, almost smooth or with scattered hairs, usually rather thick & leathery. Stalks 1-2 cm, **short & quite stout**, with small (5-6 mm) hairy stipules which fall early. **Old leaves yellow**. **FLOWER** 1.5-2 cm, white or creamy yellow, in drooping, branched clusters, 6-12 cm, individual flowers with short stalks, buds oblong. Petals narrow & pointed, twisted & overlapping but **not fused together at base, falling separately**. 22-29 stamens in 3 rows, anthers hairy with short tips, style much shorter than ovary. **FRUIT** 3 larger wings 5-6x12-1.5 cm, 3 shorter wings 1.5-3 cm, nuts 0.6-0.8 cm with short tip.

NOTE extremely common, especially in dry degraded areas, often in association with *S.siamensis* but also at higher altitudes up to 1400m with *Pinus kesiya*. Old leaves yellow.

SIMILAR 2 other species with free petals but with shiny, slightly pointed leaves, rare trees of moist evergreen forests below 800m.

107 *S.guiso* เต็งตานี leaves with 14-26 pairs of side veins, flower buds linear, 20-40 stamens with smooth anthers.

108 *S.thorelii* ตะเคียนเตี้ย leaves with 10-15 pairs of side veins, flower buds narrowly ovoid, 30-48 stamens with hairy anthers.



MALVACEAE Hibiscus family

Widespread family with 1800 species worldwide, mostly herbs. 2 genera & 3 species of trees in NT, but many more shrubs & herbs.

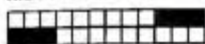
BOTANY shrubs & small trees with **smooth bark that rips in thin vertical strips when torn**. Leaves simple, alternate, spirally arranged, with palmate veining & deciduous stipules. Flowers regular, mostly bisexual with 4-5 fused sepals, 5 free petals & many **stamens fused into tube around the style**. Fruit a dry capsule.

USES prized for the excellent rope that can be made from the outer bark.

NOTE the local name "Por" is also used for some species of Sterculiaceae & Tiliaceae.

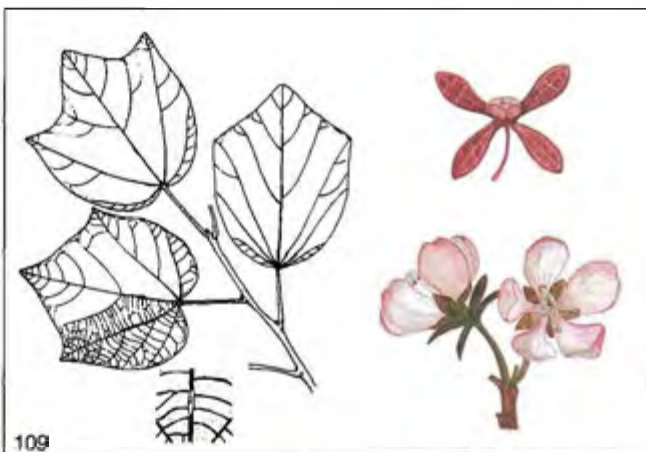
109 *Kydia calycina*

เลี้ยงผ้า เลี้ยงขาว



Deciduous shrub or small, much-branched tree to 10m. **BARK** thin, grey, wrinkled or bumpy, inner bark greyish, fibrous. **LEAF** 7.5-14 cm, circular or broadly ovate with blunt tip & heart-shaped or broadly tapering base, often slightly lobed with short teeth at end of larger veins. Young leaves densely covered with silvery star-shaped hairs, mature leaves with scattered rough hairs above & denser, softer hairs below. 5-7 main veins from base, **midvein with a linear gland (3-7 mm) in middle**. Stalks 2.5-6.5 cm. **FLOWER** 1.2-1.7 cm, pink or white, bisexual or male only, in large branched clusters at end of twigs or upper leaf axils. Petals very thin, spreading, much narrower at the base. **Stamen tube divided into 5 branches**, each with 3 or more anthers, style with 3 stigmas. **FRUIT** 2-3 cm, with 4 bright pink or pale green wings (enlarged bracts), spreading at right angles to each other. The centre of the fruit consists of a globose 3-seeded capsule, ± 5 mm across, hidden by the persistent papery calyx.

NOTE common in open areas.



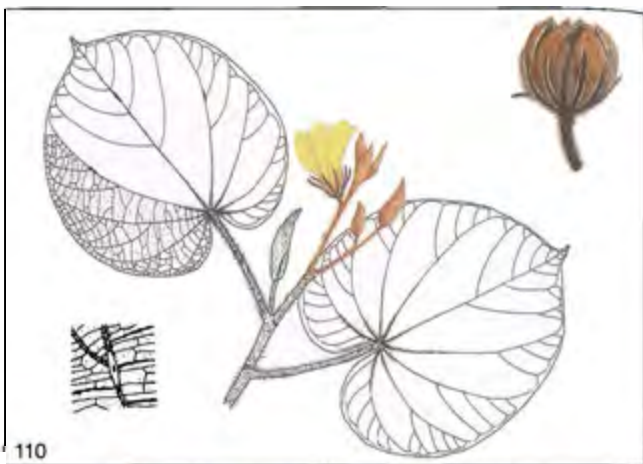
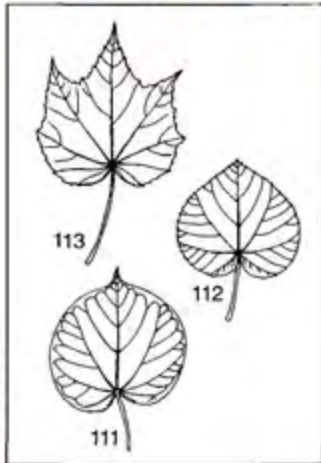
¹¹⁰*Hibiscus macrophyllus*

Evergreen tree to 25m with an open, sparsely branched crown. **BARK** thin, pale cream, almost smooth or shallowly cracked with large lenticels. Inner bark pinkish-brown, firmly fibrous. **LEAF** 15-35 cm, large, almost circular with distinct tip and heart-shaped base, untoothed or with fine, shallow teeth. Young leaves densely covered with star-shaped hairs, mature leaves slightly hairy, especially on veins. 7-9 main veins from base, with **long glands (3-20 mm) in upper half**. Stalks 10-26 cm with very large deciduous stipules, 6-12 cm, densely covered with **long yellow sticky hairs**. Twigs stout, very hairy, with obvious ring-like stipule scars. **FLOWER** 5-7.5 cm, **bright yellow with a dark purple centre**, turning dull red when old. Calyx 2-2.5 cm, densely bristly outside, silky & **without glands** inside, surrounded by 10-12 linear bracts (epicalyx). Petals obovate with rounded tips, twisted together into an open funnel. Stamen tube 4 cm, **with anthers along the whole length**. Style with 5 spreading disc-shaped stigmas. **FRUIT** 2.5-3.5 cm, ovoid with persistent calyx & bracts at base, densely covered by long, stiff golden hairs outside, smooth & shiny inside, splitting into 10 segments with many hairy, kidney-shaped seeds.

NOTE widespread but not common, naturally favouring gaps in moist forests, often in miang orchards.

SIMILAR ¹¹¹*H. tiliaceus* ไม้พุ่ม tree to 12m, leaves 7.5-15 cm, soft pale brown hairs & long glands on midvein near base. Stipules 1-2 cm. Calyx with glands outside. Fruits ±2 cm with sparsely hairy seeds.

¹¹²*H. glanduliferus* ไม้พุ่ม shrub to 1.5m, leaves 9-15 cm, doubly toothed, with rough hairs & an ovoid gland at base of midvein. ¹¹³*H. mutabilis* ไม้พุ่ม shrub to 3m, leaves 7-13 cm, broadly ovate with 3-5 lobes, softly hairy or nearly smooth, flowers white in the morning, turning pink later in the day. Naturalized.

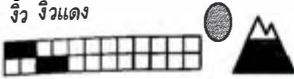


BOMBACACEAE

Small family with 250 species worldwide, mainly in tropical America, 1 genus & 3 species native to NT. Leaves digitate, spirally arranged, 5-7 leaflets, untoothed, with deciduous stipules. Flowers regular, bisexual with 4-5 fused sepals, 5 free petals & very many long stamens. Fruits dry pods, splitting into 5 parts & filled with fluffy silky hairs.

114 *Bombax ceiba*

จ้าว จ้าวแดง



Deciduous tree to 35m with an unmistakable crown. In young trees the side branches are **horizontal & straight**, usually in whorls giving the whole tree a layered appearance. In older trees the base of the trunk becomes buttressed, the side branches curve steeply upward and are often as thick as the central trunk. **BARK** pale grey or cream, studded with **sharp conical thorns** when young, becoming almost smooth with age. **LEAFLETS** 8-15x4-5 cm, narrowly elliptic or lanceolate, tapering at both ends, completely smooth. Individual stalks 1.5-2.5 cm, main stalks 10-19 cm. **FLOWER** 8-10 cm, **bright orange-red**, appearing shortly after the old leaves fall. Calyx 1.5-2 cm, bright green, cup-shaped with 5 short, pointed lobes. Petals thick & fleshy, **spreading**, slightly pointed. At least 50 pale orange stamens in 2 whorls, fused together into **10 bundles** around a long, slender dark red style with **5 short, spreading stigmas**. **FRUIT** 10-17x4-6 cm, oblong, **straight, without ridges but often with 5 shallow grooves**.

NOTE a familiar roadside sight, but rather uncommon in the forest, usually in open areas. Tolerant of temporary flooding & often seen along river banks.



115 *Bombax anceps*

ຈີໂພນ



Deciduous tree to 30m, crown similar to *B. ceiba* when young, but with long straight trunk & flat-topped crown when fully grown. **BARK aggressively thorny when young**, becoming much less so when older but retaining some thorns at least on the branches. **LEAFLETS** 12-16x4-7 cm, narrowly elliptic or obovate, tapering at both ends. Individual stalks 0.5-1.8 cm, main stalks 10-17 cm, **about as long as leaflets**. **FLOWER** 6.5-8 cm, white, in clusters of 2-4 near end of twigs, scattered throughout the leafless crown. Calyx bright green, bell-shaped with 2-4 lobes. Petals **very strongly curved backwards**, often completely hiding the calyx, finely hairy outside. 250-300 white stamens in **5 bundles** which are fused into a single tube at the base surrounding a long, slender pinkish violet style with 5 tiny stigmas **closely pressed together** & appearing as one. **FRUIT** 12-15x5 cm, oblong, **slightly curved with 5 shallow ridges**.

NOTE widespread & common, with a preference for dry deciduous forests on limestone but also found as an emergent in lowland semi-evergreen forests. 2 varieties in NT-var. *cambodiense* has hairs on the styles & lower surface of the leaflets, whereas var. *anceps* is completely smooth.

SIMILAR 116 *B. insignis* ຈີໂພນ has fewer thorns on the main trunk and slightly smaller leaflets, 9-12.5 x 3.5-4 cm. Main stalks usually much longer than leaflets. Flowers 10-15 cm, pinkish-orange with spreading or slightly recurved petals. Fruit 17.5-25 x 3-4.5 cm, longer & much narrower, with shallow ridges. Uncommon in open deciduous forests below 500 m.



115



115



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117 *Ceiba pentandra* 木棉

Deciduous tree to 25m. **LEAFLETS** 6-12x1.5-3 cm, individual stalks 0.3- 0.5 cm, main stalks 8-20 cm. **FLO- WER** 2 3.5 cm, creamy-white, petals fused together at base. 5-6 **stamens**, style with a single tip. **FRUIT** 8-10 cm, straight, with 5 grooves. **NOTE** Introduced to SE Asia at least 1500 years ago.

118 *Pachira aquatica* 黃木棉

Tree to 15m. **BARK** smooth, green. **LEAFLETS** smooth & glossy. **FLOWER** 12-18 cm, petals green, strap-shaped, curled backwards, many white or pale yellow stamens. **FRUIT** 8-10x 5-6.5 cm, 5 shallow grooves. **NOTE** introduced from S.America.



STERCULIACEAE

Predominantly tropical family with 1500 species worldwide, 11 genera & at least 30 species in NT.

Botany mostly deciduous trees without latex or colored sap. Leaves digitate, palmate or simple, alternate, planar or spiral, usually with conspicuous stipules & star-shaped hairs. One group of species has regular flowers with 5 sepals & 5 petals, while the other group has no petals, but 5 colorful petal-like sepals which are usually fused at base. Stamens free or fused into column. Fruits mostly splitting open, not fleshy. **Uses** many local species have fibrous bark which makes excellent rope. The timber is generally of poor quality.

FLOWER KEY

1. flowers without petals, stamens fused into column
 2. up to 10 anthers
 3. stamen column with ring-like disc at base
 4. lvs often scaly; calyx hairy inside *Heritiera* 134
 4. lvs not scaly; calyx smooth inside *Pterocymbium* 132
 3. stamen column without disc *Sterculia* 122
 2. 15 or more anthers
 5. calyx lobes shorter than tube *Firmiana* 130
 5. calyx lobes much longer than tube *Pterygota alata* (see fruit key)
1. flowers with petals
 6. petals with ear-like appendage at base *Helicteres*
 6. petals without appendages
 7. petals white or cream *Pterospermum* 135
 7. petals bright yellow *Eriolaena candollei* 144
 7. petals purple *Abroma augusta* (see fruit key)
 7. petals pink
 8. stamens & pistil fused into a column *Reevesia pubescens* 143
 8. stamens & pistil free *Melochia umbellata* 145

FRUIT KEY

1. fruits winged
 2. fruits not splitting, with woody wing *Heritiera* 134
 2. fruits splitting
 3. fruits split on one side, with thin papery wing
 4. fruits with hook-like spur at the back *Pterocymbium* 132
 4. fruits without hook-like spur *Firmiana* 130
 3. fruits split into 5 sections *Abroma augusta* 119

shrub to 2m; lvs heart-shaped, ±lobed & toothed, hairy; fws purple bisexual, 5 spoon-like petals, 10 stamens fused in 5-lobed crown; fts 3.7-5 cm, obconical, ridged & hairy, many wingless seeds. Open areas
1. fruits not winged
 5. fruits splitting on one side only
 6. seeds whitish, flat, winged *Pterygota alata* 120

large tree; lvs untoothed; fws green, unisexual, in branched clusters, 5 free sepals, no petals; males with 8-20 stamens fused in hairy column; females with 5 short curved styles & 5 groups of sterile stamens; fts 12-15 cm, woody. Rare, Tak.
 6. seeds black or brown, rounded, not winged *Sterculia* 122
 5. fruits splitting into 5 sections
 7. seeds winged; leaves not toothed
 8. fruits widest in middle or near base, >4x1.5 cm *Pterospermum* 135
 8. fruits widest near top, <4x1.5 cm *Reevesia pubescens* 143
 7. seeds not winged; leaves usually toothed
 9. fruits with stiff hairs *Helicteres* 121

shrubs; fws bisexual, with tubular 5-toothed calyx & 5 petals, ±asymmetric & narrow at base. 5-10 stamens fused in column with styles; fts often spirally twisted.
 9. fruits without stiff hairs *Melochia umbellata* 145
5. fruits splitting into 7-10 sections *Eriolaena candollei* 144

STERCULIACEAE

Sterculia

Small to medium-sized deciduous trees with sympodial branching. Leaves digitate, lobed or simple, clustered near end of twigs, untoothed. Stalks usually swollen at the top. Flowers unisexual, **without corolla** but often with a brightly colored calyx. Stamens joined into a slender central column with a head of tiny anthers at top. Fruits leathery or woody, not winged, in star-shaped clusters, usually **bright red & splitting open on one side** with shiny black wingless seeds.

122 *Sterculia pexa*

ปอบ้าน ปอขาว



Deciduous tree to 20m, young trees with horizontal side branches in whorls, mature tree with dense, rounded crown. **BARK** pale cream or metallic grey, smooth or shallowly cracked, inner bark cream with orange stripes. **LEAF** digitate, usually clustered near end of thick, stumpy twigs. 7-9 leaflets, 11-22x3.5-8.5 cm, narrowly obovate with abrupt but long tip & tapering base. Young leaves pink, mature leaves with **short, soft white hairs on lower surface**. Leaflet stalks very short, main stalk 20-30 cm, swollen at both ends. **FLOWER** 0.7-1 cm, bright yellow, orange or red, in whorls of upright clusters just behind end of twigs. Calyx tubular or narrowly bell-shaped with 5 short lobes that **curve inwards & touch each other**. **FRUIT** 6-7 cm, in star-shaped clusters of 3-5 bright scarlet banana-shaped fruits on a long drooping stalk, **densely covered with long, irritating hairs**.

NOTE common in semi-open deciduous forests & around village.

SIMILAR ¹²³*S. foetida* ลำโพง is a larger tree to 30m with smooth leaflets. Flowers 1.8-2.5 cm, similar to *S. urena*, with spreading calyx lobes & an unpleasant smell. Fruits larger & broader, 7.5-10 cm. Sometimes cultivated in NT, common especially along the coast in S. Thailand.

1. leaves digitate
2. lvs/fts smooth, calyx lobes spreading *S. foetida* ¹²³
2. lvs/fts hairy, calyx lobes incurved *S. pexa* ¹²²
1. leaves palmately lobed
3. lvs smooth, calyx divided $\pm$ to base *S. urena* var. *thorelli* ¹²⁴
3. lvs hairy, calyx divided half-way
4. fts spread horizontal *S. villosa* ¹²⁵
4. fts drooping *S. hypochra* ¹²⁶
1. leaves simple, unlobed
5. mature lvs hairy below, trees
6. fws hanging downwards, calyx lobes curved inwards *S. balangas* ¹²⁷
6. fws upright, calyx lobes spreading *S. guttata* ¹²⁸
5. mature lvs smooth, mostly shrubs *S. lanceolata* ¹²⁹



124 *Sterculia urena*var. *thorelii* ปอดฉีก

Deciduous tree to 23m, often with rather twisted trunk & thick, spreading branches clustered near top of crown.

BARK pale silvery grey, flaking in thin papery plates, inner bark fibrous.

LEAF 20-35 cm, palmate with 5-7 lobes & a deeply heart-shaped base, often with the two basal lobes overlapping each other. Young leaves softly hairy, **mature leaves smooth** or with scattered short hairs. 7-9 main veins from base, the bottom pair not usually close to margin. **FLOWER** 0.5-1 cm, yellowish-pink, in **drooping**, branched clusters crowded near end of leafless twigs. Calyx bell-shaped, divided almost to base into 5 spreading lobes with sticky, star-shaped hairs. Stamen column smooth, with a dense mass of anthers surrounding a rather thick ovary stalk, 2-3 mm long. Most flowers are male only, intermingled with a few bisexual flowers in the same cluster. **FRUIT** 6-8 cm, bright orange with long, **irritating** hairs, grouped into star-shaped clusters of 3-5 horizontally spreading fruits.

NOTE widespread & common in semi-open forests, especially at lower altitudes.

SIMILAR 125 *S. villosa* ปอดหุ้ช้าง has larger leaves, 30-48 cm, often with the main lobes further divided into shallow subsidiary lobes. Young leaves densely covered with long pinkish hairs, mature leaves with short rough hairs above & long soft hairs below. Flowers 1.5-2.8 cm, calyx broadly bell-shaped, divided $\pm$ halfway into 5 lobes, stamen tube hairy near top. Fruits **hanging downwards**, with long soft hairs when young. Usually at higher altitudes than *S. urena*.

126 *S. hypochra* ปอดฝ้าย very similar to *S. villosa* but has narrower flowers with calyx lobes much shorter than tube. Fruits densely hairy, spreading out horizontally from the central stalk. Uncommon, usually on limestone up to 2000m.



STERCULIACEAE

127 *Sterculia balangh*

ปอขนุน มีกลิ่นฉุน

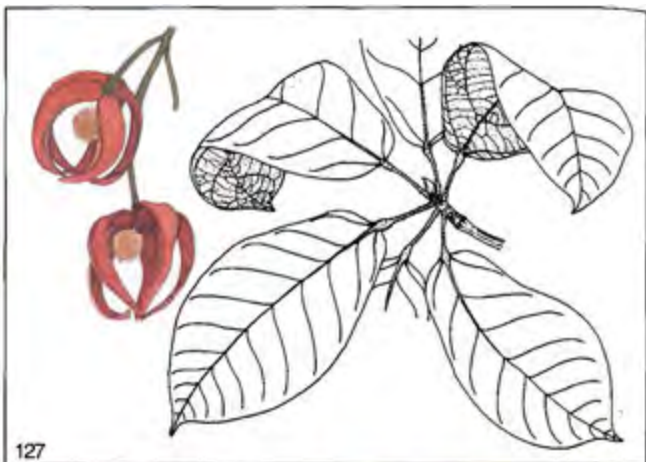
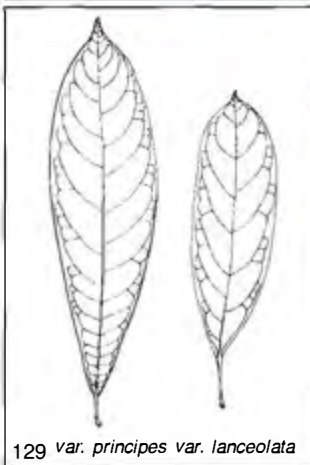


Deciduous tree to 15m with clearly sympodial branching pattern. **BARK** creamy brown with large red-brown lenticels, smooth or finely cracked. **LEAF** 12.5-22x7-12 cm (larger in young trees) simple, but usually **clustered in whorls** & so appearing digitate, oblong or slightly obovate with abrupt tip & rounded or very slightly heart-shaped base. Young leaves densely covered with golden-brown, star-shaped hairs, **mature leaves with scattered short brown hairs** especially on veins. 3 main veins from base, ± 10 pairs of side veins. Stalks 2.5-4 cm, **distinctly swollen at both ends**. **FLOWER** 1-1.5 cm, delicate pink or greenish, hanging like tiny lanterns in slender, drooping clusters from upper leaf axils, 8-10 cm. Calyx split from near base into 5 narrow lobes, **arching inwards & touching at the tips**. **FRUIT** 4.5-9(12)x2-3.8 cm; pale yellow turning brilliant orange-scarlet with a curved tip, velvety outside, usually smooth & pink inside with 1-3 shiny black seeds.

NOTE fairly common in semi-open forests throughout NT.

SIMILAR 128 *S. guttata* ปอพาน ปอขนุน has elliptic leaves with longer stalks, up to 7 cm, flowers in upright clusters as long as the leaves. Calyx pale yellow with dense brown hairs outside, purple inside, lobes with reflexed tips. Uncommon.

129 *S. lanceolata* has smooth, dark green leaves, bright red flowers with spreading calyx lobes & dark red fruits. 2 varieties: var. *principes* สีนาง is a tree to 10m with long, narrow leaves, 20-35x7-12 cm, widest near the top. Uncommon, usually high altitudes. var. *lanceolata* ปอผ้าสาม is a shrub to 3m with smaller leaves, 12-18x4-6 cm, widest in the middle. Common in the understory of dense evergreen forests at all altitudes.



¹³⁰*Firmiana colorata*

ฝ้ายยี่สิบ



Deciduous tree to 17m with twisted trunk & rather narrow, open crown.

BARK pale cream or greyish, smooth or shallowly cracked, inner bark yellowish. **LEAF** 10-30 cm, usually palmate with 3-5 lobes, broadly ovate or almost square with $\pm$ parallel sides & a blunt or heart-shaped base. 5-7 main veins, often tinged pinkish, the bottom pair usually very close to the margin. Young leaves densely covered with star-shaped hairs, mature leaves smooth or slightly hairy especially on veins. Stalks 7.5-20 cm, **not swollen at either end.**

FLOWER 0.6-2.5 cm, **bright scarlet**, in upright branched clusters, 5-18 cm, covering the whole tree when leafless. Calyx narrowly funnel-shaped with **5 short tips**, densely orange-brown hairy outside, no corolla. Stamens & pistil fused into a central column longer than the calyx, hairy all over. **FRUIT** 6-8 cm, in dangling clusters of 3-5 fruits on slender dark red stalks, 3-4 cm with persistent calyx at top. Each fruit consists of a **pink, richly veined, papery envelope with 1 or 2 seeds on the edge.**

NOTE fairly common in open areas & along forest edges throughout NT.

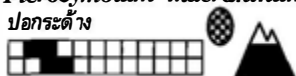
SIMILAR ¹³¹*F. kerrii* is a shrub or small tree to 6m with rather shallowly lobed, thicker leaves, glossy dark green above, side veins strongly raised below. Flowers in dense clusters (cymes), calyx divided nearly to base. Fruits 4-5 cm. Rare, open areas on limestone 900-1800m. *Pterocymbium macranthum*¹³² is a much larger tree with ovate leaves, broadly funnel-shaped flowers & fruits with a hook-like spur at the back. *Sterculia urena* pinkish inner bark, smooth leaves with basal veins far from margin & pinkish-yellow flowers with spreading lobes.



STERCULIACEAE

¹³²*Pterocymbium macranthum*

ปอกระด้ง



Deciduous tree to 35m with narrow crown & very straight trunk, but-tressed when older. **BARK** pale grey, smooth with large corky lenticels, inner bark pink with paler streaks, soft, not fibrous. **LEAF** 8-19x7-14 cm, simple, broadly ovate with shortly tapering tip & rounded or heart-shaped base, slightly 3-5 lobed in youngertrees. **Mature leaves finely hairy below** with 3-7 basal veins. Stalks 3.5-7 cm, slender, not obviously swollen at either end.

FLOWER 2.5-3 cm, **bright orange with red spots**, in branched clusters at end of twigs, covering the whole tree when leafless. Calyx broadly funnel-shaped with 5 **short triangular lobes**, ± 7 mm, smooth outside but hairy inside, no corolla. Stamen column as long as calyx, with tiny pale brown hairs from **top to bottom**. **FRUIT** up to 11 cm, silver-grey, 3-5 fruits together on a single stalk. Each fruit consists of a **thin papery envelope shaped like a boat with a large keel on one side** and a single wrinkled seed tucked at the base.

NOTE uncommon, easily missed in the dense upper canopy when not flowering, magnificent in full bloom.

SIMILAR ¹³³*P. tinctorium* ปออีเก้ง smooth leaves & pale green flowers, ± 2 cm, calyx with narrow lobes as long as tube, stamen column with white hairs at base but smooth near top.

¹³⁴*Heritiera macrophylla*

พอนไผ่ฟ้า

LEAF 17-35 cm, oblong, long-tipped, **densely covered with silvery scales on lower surface**, stalks 5-10 cm, swollen at both ends.

FLOWER 0.8-1.1 cm, pale pink, in branched clusters at axils of young leaves, calyx bell-shaped with 5 short lobes, no corolla. **FRUIT** winged. Less-disturbed evergreen forests above 1000m.

NOTE rare, Chiang Rai Province.



132



132



132



133



134



134

Pterospermum

Mostly evergreen trees, often with an irregular crown. Leaves dark green above but densely covered with whitish or pale orange star-shaped hairs below. Many species have remarkably shaped leaves which are often completely different between saplings & mature trees. Flowers with 5 thick fleshy sepals & 5 very fragile narrow petals, often closely pressed together into a tube but only fused at the base. Fruits woody, often ridged & densely hairy, splitting into 5 sections with many winged seeds.

135 *P. cinnamomeum*

ดองเต๋



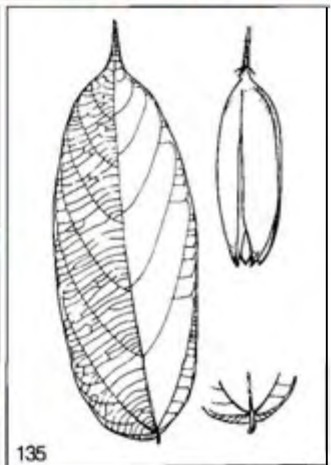
Evergreen or partly deciduous tree to 30m with narrow crown. **BARK** dark brown, thinly flaking, inner bark reddish. **LEAF** 8.5-17x4-5.5 cm, narrowly ovate or oblong with tapering tip & rounded base, weakly asymmetric, sometimes very slightly peltate, **not toothed or lobed**. Mature leaves dark green above, finely yellow-brown hairy below. 4-6 pairs of steeply curved side veins. Stalks 0.2-0.4 cm. Stipules ± 1.3 cm, hair-like, **undivided with a broad & rounded base**. **FLOWER** 4-5 cm, white. Sepals hairy outside, petals narrow & spreading, smooth on both sides, style smooth. **FRUIT** 8-10x2 cm, narrowly pointed at both ends, slightly 5-angled, without calyx or bracts.

NOTE uncommon, less-disturbed evergreen forests.

SIMILAR ¹³⁶*P. lanceaefolium* พลากรวอ leaves with scattered teeth near top, petals hairy outside, style twisted, hairy at base. Fruits smooth, not ridged, with persistent bracts.

¹³⁷*P. littorale* var. *venustum* จำปีแขก leaves untoothed, petals 5-6.5 cm, smooth both sides, style straight, smooth. Fruits with 5 wavy ridges, bracts deciduous.

1. leaves >7 cm wide, irregularly shaped, stalks >1 cm
 2. leaf base strongly peltate, bracts & stipules divided
 3. fruits with 5 ridges *P. acerifolium* ¹³⁸
 3. fruits not ridged *P. grande* ¹³⁹
 2. leaf base not peltate (except saplings), bracts & stipules not divided
 4. leaves oblong, petals hairy, style hairy near base, fruits oblong *P. diversifolium* ¹⁴¹
 4. leaves wedge-shaped, petals & styles smooth, fruits elliptic *P. grandiflorum* ¹⁴⁰
1. leaves <7 cm wide, oblong or lanceolate, stalks <1 cm
 5. leaf base strongly asymmetric
 6. leaf base arrow-shaped on one side, fts not ridged *P. semisagittatum* ¹⁴²
 6. leaf base heart-shaped on one side, fts ridged *P. littorale* ¹³⁷
 5. leaf base $\pm$ symmetric, fruits not ridged
 7. lvs toothed near tip, stipules with 2-3 tips, fruits tubular petals & base of style hairy *P. lanceaefolium* ¹³⁶
 7. lvs not toothed, $\pm$ slightly peltate, stipules with 1 tip, fruits ovoid petals & style smooth *P. cinnamomeum* ¹³⁵



STERCULIACEAE

¹³⁸*Pterospermum acerifolium*

จำปาแขก ปอหู่ช้าง



Evergreen tree to 25m with irregular crown, crooked trunk & thick, steeply ascending branches. **BARK** pale grey, smooth, flaking in thin irregular pieces, inner bark red with white streaks. **LEAF** 15-45x11-28 cm, **irregularly shaped** but usually broadly oval, widest about the middle, more or less lobed but **almost always with several distinct tips**. Base heart-shaped & **strongly peltate**. 3-7 main veins. Stalks 2.5-10 cm, densely dark brown hairy with **deeply divided stipules**. **FLOWER** 8-12 cm, **white**, solitary or in small clusters at end of twigs & leaf axils. 5 narrow, fleshy sepals, as long as petals, densely covered with brown hairs outside & velvety white hairs inside. 5 delicate white petals forming a narrow tube in the centre, slightly spreading at the top. Style with brownish hairs at base only. **FRUIT** 8-15x5-7 cm, oblong, with **5 straight ridges**, densely covered with short dark brown hairs. **NOTE** scattered along open streams & gaps in evergreen forest, often left in tea (miang) orchards.

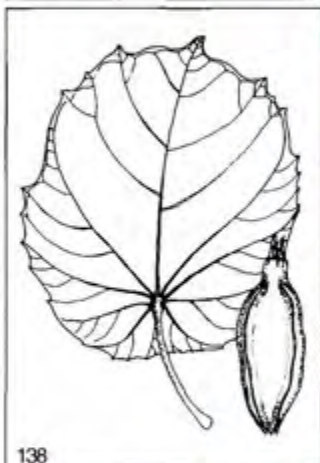
SIMILAR ¹³⁹*P.grande* สามเด้า has slightly smaller leaves & unridged fruits.



138



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138



138

¹⁴⁰*P. grandiflorum*

ดองเด้าชน สะเด้า



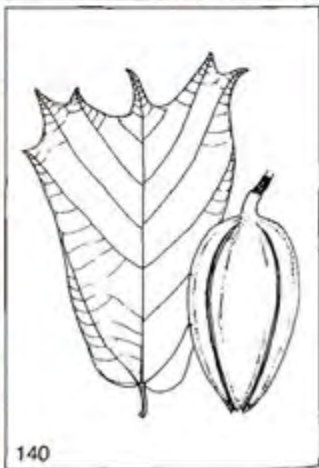
Crown rather similar to *P.acerifolium* but mature leaves usually much smaller, 10-18x7-13 cm, very variable in shape but usually widest near the top with at least 3 distinct tips & **not peltate** at base (except saplings), stalks 1-3 cm with linear, **undivided stipules**. **FLOWER** ±7 cm, with very narrow petals, 5x0.5 cm, not hairy outside. **FRUIT** ±8 cm, ovate or elliptic with pointed or blunt tip & 5 narrow, quite straight ridges, densely brown-hairy.

NOTE endemic to Thailand, fairly common in open areas all over NT.

SIMILAR see page 85



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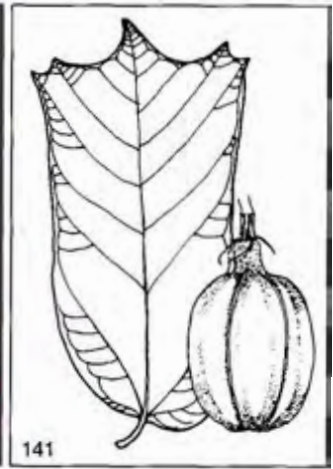
140

SIMILAR 141 *P. diversifolium* ไม้พุ่ม has narrowly ovate or oblong leaves, often lobed, flowers 8-12 cm, petals hairy on outside; style hairy in lower 1/2. Fruits 10-17 cm, oblong. Common in C. & S. Thailand.

142 *P. semisagittatum*



Deciduous tree to 20m with a slightly fluted trunk. **BARK** pale greyish or creamy-brown, peeling in thin flakes. **LEAF** 12-20x3-5.5 cm, oblong or lanceolate with long tapering tip & **strongly asymmetrical base, rounded on one side, arrow-shaped on the other**. Stalk very short, <2 mm long, with **deeply divided stipules**. **FLOWER** 6-8.5 cm, solitary or in small clusters at end of twigs or upper leaf axils, with a **mass of deeply divided bracts** at the base. 5 narrow pale green sepals with brown star-shaped hairs outside, velvety inside. 5 white petals with pale hairs outside, wider & slightly shorter than sepals. Style with brown hairs at base only. **FRUIT** 5-7.5 cm, cylindrical, **not angled**, slightly pointed at both ends, without ridges, densely covered with rusty-brown **NOTE** scattered in semi-open forests, easily recognized by the unique leaf base.



143 *Reevesia pubescens*

var. *pubescens* ไม้พุ่ม



Shrub or small tree. **LEAF** 5-14x 2.5-7 cm, simple, broadly ovate with heart-shaped base, untoothed, densely covered with star-shaped hairs at least below. Stalks 1-2.5 cm. **FLOWER** 2.5-3.5 cm, pink, bisexual, in densely hairy branched clusters at end of twigs, to 5 cm. Petals 1-1.5 cm, narrowed & thickened at base. Stamens fused together with pistil into a tube, **much longer than petals**. **FRUIT** 2.5-3 cm, obovoid, woody, softly hairy, **splitting into 5 sections with winged seeds**. Uncommon.



STERCULIACEAE

144 *Eriolaena candollei*

ปอเลียง เลียงผ้าย



Deciduous tree to 15m with short trunk & bushy crown. **BARK** pale grey or creamy-brown, shallowly fissured, inner dark pale orange or pinkish. **LEAF** 10-17x6-14 cm, simple, spirally arranged, broadly ovate or almost circular, sometimes shallowly lobed with narrow tip & rounded or heart-shaped base, usually **irregularly toothed with shallow, rounded teeth**. Young leaves with orange-brown star-shaped hairs, mature leaves smooth or with scattered hairs. 5-9 basal veins. Stalks 4-8 cm, slender, with narrow deciduous stipules, 8 mm. **FLOWER** 3.5-4.5 cm, bright yellow, in long-stalked cymose clusters at end of twigs & upper leaf axils. Base of each flower enclosed by **3 bright green spiky bracts**, 1.5-3 cm, persisting long after sepals & petals have fallen. 5 narrow sepals, pale green, spreading horizontally. 5 very thin petals which curve strongly backwards & quickly fall. Many yellow stamens fused at base & clustered around a long green style with 5-10 spreading stigmas. **FRUIT** 4-5 cm, narrowly ovoid with 8-10 grooves & a curved tip. Seeds winged.

NOTE common & widespread in semi-open forests & fallow fields.



144



144



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145 *Melochia umbellata*

ปอดำ สาคำ



Deciduous tree to 10m, rather similar to *Eriolaena candollei* but with slightly larger leaves, to 22 cm, blunt-tipped, finely hairy below. Stalks >5 cm. **FLOWER** 0.8-1.3 cm, **pale pink**, in upright branched pyramidal clusters at end of twigs, up to 25 cm, no spiky bracts. Sepals pointed, petals rounded with very narrow base, 5 stamens fused into tube at base. **FRUIT** 0.8-1 cm, angled.

NOTE scattered along edges of lowland evergreen forests.



144



144

TILIACEAE

Very widespread family with 680 species worldwide, 7 genera & 16 species native to NT.

Botany mostly small deciduous trees with fibrous bark. Leaves simple, alternate, often planar, frequently slightly lobed or toothed, usually with star-shaped hairs & deciduous stipules. Flowers regular, mostly bisexual with 5 free sepals & 5 free petals, often with large glands (nectaries) at base of petals. Many stamens with slender filaments, attached in a small thickened ring around the superior ovary. Fruits dry & winged or thinly eathery, seeds without wings.

Uses the bark of many local species makes excellent fibre.

1. fruits winged or ridged

2. fruits with wings

3. fruits with 3-4 wings

Colona 149

3. fruits with 5 wings

Pentace burmanica 146

large forest tree with buttresses. Lvs oblong, often shallowly lobed, not toothed; glossy above, hairy below. Fws small, terminal panicles, petals without glands, fertile stamens in 5 bundles alternating with linear sterile ones. Fts 3.5-4.5 cm

3. fruits with 6 wings in 3 pairs

Berrya 161

2. fruits ridged, surrounded by papery calyx; flowers without petals

4. fruit (inc. calyx) 2-2.5 cm; lvs white below *Schoutenia ovata* 166
tree to 15m; lvs 4-13x2.5-4.5 cm; not toothed; flower bud 5 mm

4. fruit 1-1.5 cm; lvs not white below *Schoutenia glomerata* 165
shrub to 5m; lvs 4-9x1.5-3 cm; not toothed; flower bud 2-3 mm

1. fruits not winged or ridged

5. leaves peltate

Brownlowia peltata 147

large tree to 30m; lvs 18-50x12-30 cm, spiral, oval, not toothed; petals without glands, inner 5 stamens without anthers; fts 2-2.5 cm, 2-lobed

5. leaves not peltate

6. fruits leathery with 1 seed

7. fruits 2-4 lobed, leaves distinctly toothed

Grewia 154

7. fruits not lobed, leaves untoothed or shallowly toothed near top only

Microcos 163

6. fruits fleshy with many seeds

Muntingia calabura 148

148 *Muntingia calabura*

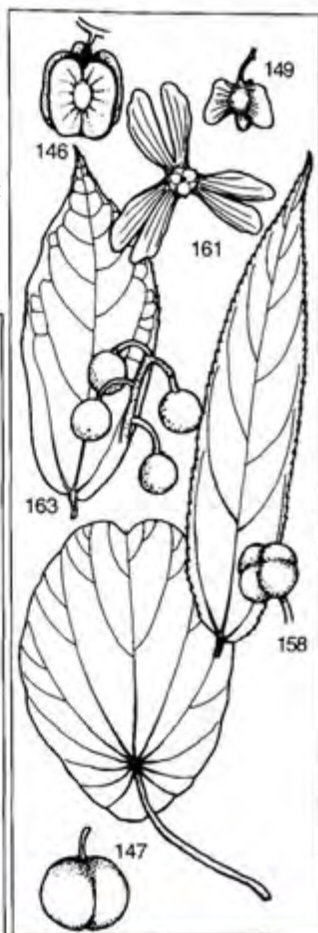
ตะขบฝรั่ง

Small evergreen tree to 12m with spreading, umbrella-shaped crown.

LEAF 6-13x2-4 cm, planar, narrowly ovate or oblong with pointed tip & asymmetric base, toothed. 3 basal veins with sticky hairs, stalks 0.3-1 cm.

FLOWER 2.5 cm, axillary clusters of 1-3 flowers with 5 delicate white petals, no glands, stigma 5-ridged, without style. **FRUIT** 1-1.2 cm, dark red, oval with persistent calyx at base, fleshy & juicy with many seeds.

NOTE native to the Caribbean, but commonly planted for its edible fruits & often naturalized. Fruits superficially similar to a *Prunus* but without a stone.



Colona

1. fts with 5 ridges, $< \frac{1}{2}$ width of body
shrub to 2m *C. auriculata* ¹⁵¹
1. fts with 2-4 wings, as wide as body
2. If base obliquely "ear-shaped"
3. lvs with 3 tips & 5-7 basal veins
fts 1.5-2 cm *C. winitii* ¹⁴⁹
3. lvs with 1 tip & 3 basal veins
fts 3-4.5 cm *C. elobata* ¹⁵⁰
2. If base symmetric, not "ear-shaped"
4. lvs oblong/lanceolate, 3 basal veins
C. flagrocarpa ¹⁵³
4. lvs circular/obovate, 5-7 basal veins
C. floribunda ¹⁵²

¹⁴⁹ *Colona winitii*

ปอติ้นเต่า

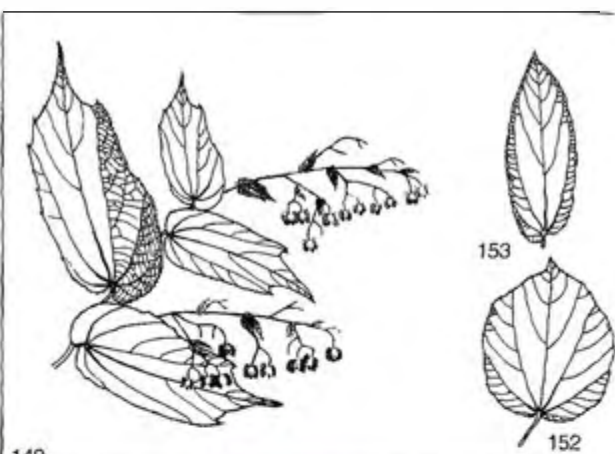


Deciduous tree to 10m. **BARK** pale brown or greyish, thin, smooth. **LEAF** 15-25x8-15 cm, planar, **irregularly shaped with 3 long tips & strongly asymmetric, deeply heart-shaped base**, doubly-toothed. Mature leaves pale green & thin, sparsely covered with star-shaped hairs on both sides. 5 (rarely 7) basal veins, stalks 0.5-1.5 cm, hairy, stipule falling early. **FLOWER** ± 2 cm, **yellow with red dots**, in short clusters (cymes) at end of twigs & upper leaf axils, 3-15 cm. Petals narrow at base, **densely covered with long sticky hairs**. Stamens smooth, ovary densely hairy. **FRUIT** 1.5-2 cm with **4 (rarely 3) wings, more than half as wide as body**, pale green turning reddish when ripe, densely bristly on the body, not splitting. **NOTE** local common in the understory of semi-open deciduous forests.

SIMILAR 2 other shrubby species with obliquely ear-shaped leaf base but only one tip & 3 basal veins:

¹⁵⁰ *C. elobata* ปอแตง leaves 8-15x4.5-8.5 cm, flowers with smaller petals, 3x2 mm, fruits much larger, 3-4.5 across. Phitsanulok province.

¹⁵¹ *C. auriculata* ปอพวง leaves densely soft hairy below, fruits with 5 narrow ridges, less than half width of body.



149



149



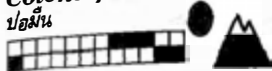
149



149

152 *Colona floribunda*

ปอผี



Shrub or small deciduous tree to 10m with bushy, rounded crown. **LEAF** 8-25x7-14 cm, **circular or oval**, often with 3 small tips, base rounded, sometimes slightly heart-shaped, finely toothed. Young leaves pink, densely covered with silky hairs, mature leaves with rough hairs, 5-7 basal veins, stalks 2-8 cm, slender. **FLOWER** 8-10mm, stamens smooth, ovary hairy, fruit 1.5-2 cm, wings wider than long, with notched tips. **NOTE** very common through NT in semi-open forests & along roadsides. **SIMILAR** *Berrya mollis*¹⁶¹ also has circular leaves but fruits in threes, each with 2 wings.

153 *Colona flagrocarpa*

ยางใบยาว



LEAF 10-19x3.5-7 cm, narrowly **ovate/elliptic or lanceolate** with long, tapering tip & blunt, asymmetric base, finely toothed. 3 basal veins. Mature leaves slightly rough above, densely covered with minute soft silver-grey hairs below. Stalks 0.5-1.5 cm. **FLOWER** 8-10 mm, pale yellow, in branched clusters with zigzagging axis, to 22 cm. Petals $\pm 4 \times 2$ mm. **FRUIT** 1-2.5 cm, wings wider than long. **NOTE** habitat as *C. floribunda*, often growing together. **SIMILAR** some *Grewia* spp. have similar leaves but leathery fruits without wings.

*Grewia*

1. leaves broad, $< 2.5 \times$ as long as wide
2. If base symmetric with 3 basal veins
*G. abutilifolia*¹⁵⁷
2. If base asymmetric, 4-6 basal veins
3. lvs pale grey below, base blunt or rounded
*G. eriocarpa*¹⁵⁴
3. lvs green below, densely hairy, base heart-shaped
4. lvs coarsely toothed *G. winitii*¹⁵⁵
4. lvs finely toothed *G. sessilifolia*¹⁵⁶
5. lvs narrow, $> 2.5 \times$ as long as wide
5. lvs densely brown-hairy below
*G. lacei*¹⁵⁸
5. lvs roughly whitish-hairy *G. hirsuta*¹⁶⁰
5. lvs smooth *G. laevigata*¹⁵⁹



154 *Grewia eriocarpa*

ปอลาย



Shrub or small deciduous tree to 12m with straggling crown & slender, drooping branches. **BARK** pale grey, thin, smooth or slightly cracked. **LEAF** 4-10x3-5.5 cm (up to 15x7 cm on young shoots), planar, **broadly ovate** with slightly pointed tip & asymmetric, rounded base, **finely & quite sharply toothed**. Mature leaves medium green & slightly rough above, **greyish-white** & densely covered with tiny star-shaped hairs below. 4-6 basal veins, the middle two reaching nearly to the top of the leaf. Stalk 0.5-1.0 cm. **FLOWER** 0.8-1.5 cm, greenish-yellow, in upright clusters (cymes) of 3-8 flowers at axils of leaves, 1.5-3 cm. 5 narrow, spreading sepals, much larger than petals, hairy outside. Petals with hairy gland (nectary) at base inside. Stigma 4-5 lobed, slightly wider than style, not hairy. **Ovary densely hairy**. **FRUIT** ± 1 cm, thinly fleshy, dull green, globose or ovoid with a short nipple when young, becoming black & **slightly 2-4 lobed** when ripe.

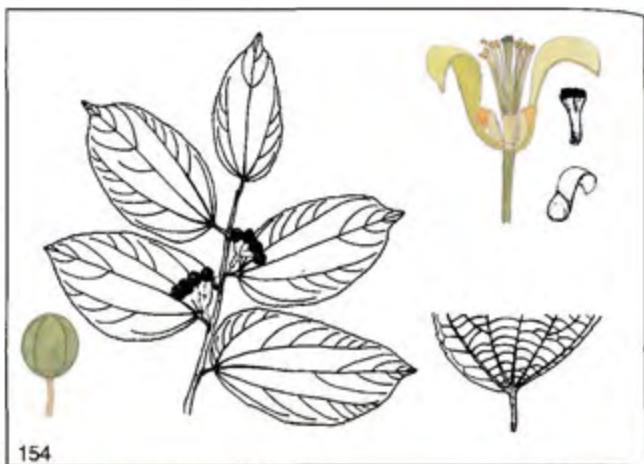
NOTE very common throughout NT in semi-open deciduous forests.

SIMILAR 3 other species with oval or broadly ovate leaves but **pale green below**. ⁵⁵*G. winitii* หนามขมตอ shrub or small tree to 6m, coarsely toothed leaves 8-12x6-8 cm with asymmetric, heart-shaped base & 4-6 basal veins, densely hairy, stalks <0.5 cm. Flowers unisexual, in slender, drooping clusters, stigmas hairy.

¹⁵⁶*G. sessilifolia* เลียนสะคอน shrub to 2m, very similar to *G. winitii*, but with finely toothed leaves, 12-20x4-8 cm.

¹⁵⁷*G. abutilifolia* shrub to 2m, leaves 7-20x5-12 cm with symmetric base & 3 basal veins, slightly hairy, finely toothed, stalks 1-2 cm. Flowers in upright clusters, stigma 2-lobed, not hairy.

(see p 89 for *Grewia* key)



158 *Grewia lacei*

ทางบก



Deciduous shrub to 3m. **LEAF** 11-18x2-4 cm, **lanceolate with long tapering tip** & slightly asymmetric base, finely toothed, **densely covered with very short copper-colored hairs below**. 3 basal veins, short stalks. **FLOWER** unisexual, in small, upright clusters, sepals 4-8 mm, densely coppery-hairy outside, petal gland >1/2 length of petal, stigma hairy. **NOTE** scattered in open areas.

SIMILAR ¹⁵⁹*G. laevigata* พญาดาบทัก leaves almost completely smooth, greenish below. Sepals 12-25 mm, smooth, stigma & ovary smooth.

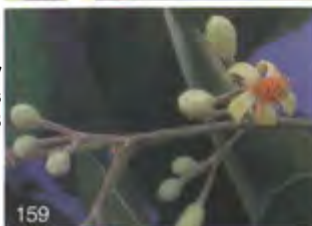
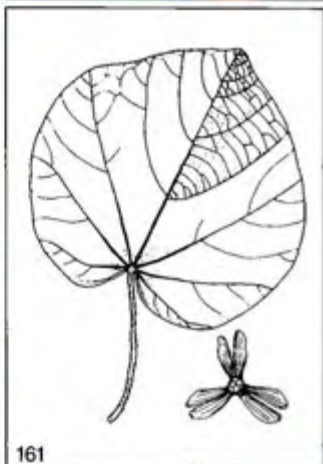
¹⁶⁰*G. hirsuta* leaves strongly toothed, with scattered rough hairs below. Flowers bisexual, sepals 5-8 mm, hairy, stigma hairy.

161 *Berrya mollis*

เลียง



Deciduous tree to 20m. **BARK** pale brown or grey, slightly cracked, inner bark pale yellow. **LEAF** 6-15(30)x7.5-15 cm, spiral, **broadly ovate or almost circular**, sometimes shallowly lobed with blunt or short abrupt tip & **heart-shaped base**, not toothed but often irregularly wavy. **Mature leaves softly hairy below**, 5-9 main veins, stalks 3.5-8 cm. **FLOWER** 1-2 cm, white, in branched clusters at end of twigs, 15-27 cm. Petals slightly longer than sepals, without glands. Stamens numerous, smooth, anthers attached at side, style slender, stigma pointed. **FRUIT** 3.5-5.5 cm, in **3 sections**, each with a pair of wings, thinly hairy & pinkish-brown when ripe. **NOTE** fairly common in semi-open forests, easily recognized by the heart-shaped leaves & large clusters of pink winged fruits. **SIMILAR** ¹⁶²*B. cordifolia* เลียงมัน has smooth leaves, without hairs on either surface. Uncommon. *Colona floribunda* ¹⁵² has similar leaves but usually finely toothed & fruits with 4 wings.



163 *Microcos paniculata*

ดาปลา ปอกตุ้ม



Shrub or small evergreen tree, rarely to 20m, with dense cylindrical crown & slightly fluted trunk. **BARK** pale brown, thin, slightly flaking, inner bark fibrous. **LEAF** 12-20x6-8 cm, planar, oblong or slightly obovate with gradually tapering tip & blunt or rounded base, untoothed or shallowly & irregularly toothed towards the top. Mature leaves dark green & slightly shiny above, thin, **smooth or with scattered hairs on veins below**. 3 basal veins, the side ones steeply angled & about half as long as the leaf, main vein with 4-8 pairs of widely spaced side veins. Stalks 0.5-1.7 cm, usually with scattered, long white hairs & narrowly pointed stipules. **FLOWER** 1-1.5 cm, bright yellow, in **branched clusters at end of twigs** & upper leaf axils, 3-10 cm. 5 free sepals, ± 6 mm, narrowly pointed, hairy outside, 5 free petals ± 2 mm, elliptic or oblong with narrow base & smooth gland inside. Many free stamens, 1 slender style with pointed stigma, **ovary smooth**. **FRUIT** 0.8-1.5 cm, dark green turning black, globose or obovate, not splitting, **smooth** & leathery with single large stone.

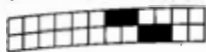
NOTE very common in all lowland habitats, often in waste ground along roadsides. Easily recognized by the smooth, dark green leaves with 3 basal veins & irregular margin near the tip.

SIMILAR 164 *M. tomentosa* พลับพล has leaves & flower stalks $\pm$ densely covered with short, soft hairs (in NT sometimes almost smooth). Flowers with densely hairy ovary & petal gland, usually with thicker, reddish sepals. Fruits slightly larger, to 2.5 cm, pale orange, densely covered with very short, velvety hairs.



165 *Schoutenia glomerata*spp. *peregrina*

รวงผึ้ง สายน้ำผึ้ง



Small evergreen tree to 8m. **BARK** dark grey, slightly cracked. **LEAF** 4-12x1.5-3.5 cm, **planar**, elliptic or oblong with pointed tip & blunt base, sometimes asymmetric, no teeth. Mature leaves rather thick, dark green & glossy above, paler with tiny creamy-brown star-shaped hairs which easily rub off below. **3 main veins from base**, the outer pair reaching $> \frac{1}{2}$ length of leaf, 2-6 pairs of side veins, tertiary veins faint. Stalks 0.2-0.9 cm, finely hairy. **FLOWER** ± 1.3 cm, bright yellow, bisexual, in short unbranched clusters at leaf axils, to 3 cm, sometimes densely flowered & head-like, individual stalks 0.8-1.1 cm. Buds globose, 0.2-0.3 cm. 5 triangular sepals, fused near base into a shallow cup, $\pm$ densely covered with dark orange-brown hairs outside, smooth inside. **No corolla**. Many free stamens, smooth, slightly longer than sepals. Style ± 3 mm with 5-lobed stigma, ovary globose, densely hairy. **FRUIT** 0.5-1 cm, globose with enlarged calyx at base, hairy, dry & not splitting, 1-1.5 cm diam.

NOTE endemic to NT, rare in evergreen forest, sometimes cultivated.

SIMILAR 166 *S. ovata* แดงเหนียว

แดงส้ม tree to 15m, leaves pale grey (glaucous) below, flowers at end of twigs & in leaf axils, flower buds ± 5 mm diam, fruits with larger calyx, 2-2.5 cm across.



165



165



165



165



165



165

ELAEOCARPACEAE TABLE 2

Predominantly tropical family with 540 species worldwide from Arabia through South Asia to Australia & S.America. 2 genera & 12 species in N.Thailand.

BOTANY mostly evergreen trees without latex or sap. Leaves simple, alternate, spirally arranged, **usually toothed**. Stalks often bent & swollen at the top, with deciduous stipules. Old leaves usually turning a **beautiful scarlet red before falling**. Flowers regular, bisexual, grouped in leaf axils (*Sloanea*) or in narrow, unbranched clusters (*Elaeocarpus*) individual flowers **hanging face downwards like tiny lanterns**. 4-5 sepals as long as petals, 4-5 petals, often **fringed**, not overlapping in bud. Stamens numerous, often with long tips (connectives). Fruits oily, with a large stone containing 1-5 seeds, each in its own cavity.

ECOLOGY scattered in both lowland & hill evergreen forests, favouring less disturbed areas in NT.

E. = Elaeocarpus, S. = Sloanea

1. flowers solitary or fascicled, fruits spiny *Stomentosa* 171
2. lvs & twigs hairy, 5 petals, fruit spines 1-2 mm *S.sigun* 172
1. flowers in racemes, fruits not spiny
3. leaves with scabby pustules or pimples ¹⁶⁷ *E.floribundus*
3. leaves without scabby pustules or pimples
4. mature leaves hairy at least on veins below
5. flower stalks not less than 2 cm
6. fws mostly amongst leaves, petals 2-2.7 cm, stamens not hairy; lvs 5-16 cm, lanceolate, blunt teeth, stalks to 1.5 cm ¹⁶⁸ *E.hainanensis*
6. fws mostly behind leaves, petals 1.5-2 cm; lvs 10-45 cm narrowly obovate, sharply toothed, stalks ≥ 1.5 cm ¹⁶⁹ *E.rugosus*
5. flower stalks not more than 1 cm
7. petals ≥ 10 mm, anthers pointed, ft stalk > 10 mm *E.sphaericus* 176
7. petals ≤ 8 mm, anthers blunt, ft stalk < 10 mm
8. petals densely hairy *E.braceanus* 174
8. petals smooth
9. anthers smooth, fruits grey-hairy *E.robustus* 175
9. anthers bearded, mature fruits smooth *E.stipularis* 173
4. mature leaves completely smooth
10. young twigs with resin, lf stalks 3-10 cm, ¹⁷⁰ *E.petiatus*
10. young twigs without resin, lf stalks 0.5-4 cm
11. leaf stalks swollen
12. fws behind leaves, fw stalks ≥ 2 cm, lvs narrowly obovate ¹⁶⁹ *E.rugosus*
12. fws $\pm$ with lvs, fw stalk up to 1 cm, lvs ovate *E.prunifolius* 179
11. lf stalks not swollen
13. fws with current leaves; lvs obovate, blunt-tipped *E.hygrophilus* 177
13. fws behind leaves; lvs elliptic to lanceolate with pointed tips
14. lvs elliptic/lanceolate, anthers blunt *E.lanceifolius* 178
14. lvs oblong-lanceolate, anthers pointed *E.sphaericus* 176

¹⁷¹ *Sloanea tomentosa*

เงาะป่า เสมอชีวาทุ



Deciduous tree to 30 m. **LEAF** 14-20x7-12 cm, short blunt tip & rounded base, untoothed or with scattered shallow teeth, **softly hairy at least in vein axils below**. Stalks 2.5-6 cm, softly hairy. **FLOWER** 1.2 cm, white, solitary, behind leaves. 5 petals, each with 4-5 teeth, many stamens on a flat disc, anthers with long tips. **FRUIT** 4-5 cm, globose, woody, splitting into 4-6 sections, very densely covered with **short bristles, 1-2 mm long**. Seeds black with thin **orange coating** (aril).

NOTE Uncommon, usually in less-disturbed forests.

SIMILAR ¹⁷² *S. sigun* evergreen tree with smooth leaves & twigs, flowers with 4 petals, fruits with much longer bristles, 10 mm long, rather like a *Castanopsis*. Nan province.



171



171

173 *Elaeocarpus stipularis*

Evergreen tree to 30 m with drooping sprays of dark green leaves intermingled with bright red old leaves.

BARK smooth or slightly fissured, inner bark cream to reddish brown.

LEAF 7-25x3-9 cm, spiral or planar, narrowly ovate or elliptic with pointed tips, base pointed or almost blunt, often slightly asymmetrical, usually faintly toothed in upper half with minute dark thorns. Young leaves velvety, mature leaves smooth above except for scattered hairs on midvein, rather densely **velvety-hairy below**, often with tufts of hairs (domatia) in vein axils. Stalks 2-6 cm, slender.

Stipules triangular with 2-3 points, usually persistent.

FLOWER 1.2-1.5 cm, white, in unbranched sprays, usually **behind leaves**, 7-13 cm. 5 petals, fringed for $\frac{1}{3}$ of their length, slightly longer than the sepals, narrowed & **hairy at base inside**. 30-40 yellow stamens on a raised orange disc, anthers with **tuft of hairs**, style short, silky hairy. **FRUIT** 1.5-4 cm, globose or ellipsoid, rounded at both ends, bluish-green, slightly hairy when young, with an oily pulp & a hard, wrinkled stone with 1-3 seeds.

NOTE scattered in evergreen forest.

SIMILAR no other *Elaeocarpus* in NT has persistent, divided stipules, but they may fall off in *E.stipularis* which can lead to misidentification. 2 other species also have short flower stalks & small petals.

174 *E.braceanus* มั่นคง leaves 8-16 cm, blunt or pointed base, ± toothed, smooth or slightly hairy, stalks 1-3 cm. Flower stalks 0.1-0.5 cm, Petals densely hairy, anthers smooth.

175 *E.robustus* กระพ้อรอก leaves 15-25 cm, rounded base, toothed, hairy when young, later smooth. Stalks 3.5-7 cm, swollen at top. Petals smooth, anthers hairy. Fruits 3-4 cm, yellowish.



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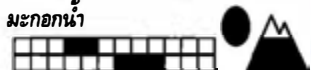
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176 *Elaeocarpus sphaericus*

Evergreen or partly deciduous tree to 25 m. **BARK** brown or grey, thin, slightly flaking. **LEAF** 8-17x2.5-5.5 cm, narrowly elliptic or oblong with pointed tip & blunt or slightly pointed base, finely toothed. Mature leaves **smooth or with scattered hairs below**, often with minute domatia on surface. 10-13 pairs of side veins, stalks 1-2 cm. **FLOWER** clusters **mostly behind leaves**, 4-10 cm, individual stalks 0.7-1 cm. Sepals $\pm 8 \times 2$ mm, hairy outside & along middle inside, petals 10-20x3-5 mm, fringed halfway, long-hairy outside, smooth inside. Stamens ± 8 mm, slightly hairy, **anthers with pointed tips**, style with long hairs near base only, ovary hairy, disc 5-lobed. **FRUIT** 2-3 cm, **blue-green** with bright green pulp, globose, rounded or flattened at both ends, finely hairy when young, later smooth, stalks ± 1 cm, stone ridged & pitted, 2-5 seeds.

177 *Elaeocarpus hygrophilus*

Shrub or small evergreen tree 3-13 m. **BARK** pale creamy brown, smooth or shallowly cracked. **LEAF** 5-12x2-5.5 cm, **obovate** with blunt or rounded tip & $\pm$ pointed base, margin with scattered shallow teeth. Leaf buds silvery silky hairy, mature leaves **completely smooth, glossy** dark green above, usually with hairy domatia in vein axils below, 5-7 pairs of arching side veins. Stalks 0.5-2 cm, with reddish stipules which soon fall. **FLOWER** clusters 2-10 cm, mostly in **axils of current leaves**, individual stalks **0.2-0.7 cm**. Sepals 5-7x2 mm, hairy outside & near base inside, petals 15-25 mm, fringed halfway, slightly hairy. Stamens 3-3.5 mm, **anthers blunt**, with scattered hairs, style slightly hairy near base only, ovary densely silky-hairy, disc 5-lobed. **FRUIT** (1.5)3-4 cm, pointed or blunt at both ends, stalks 0.7-1 cm, stone **smooth**.

NOTE cultivated for its edible fruit.



178 *Elaeocarpus lanceifolius*

พญาใบมะขาม



Evergreen tree to 19(30) m. **BARK** greyish, thin, finely roughened. **LEAF** 8-20x3.5-8 cm, narrowly elliptic or lanceolate, usually pointed at both ends, shallowly toothed. Young shoots silky, **mature leaves** dull dark green & smooth above, smooth or with minute tufts of hairs (domatia) below. 6-12 pairs of side veins, stalks 0.8-2.5 cm. **FLOWER** clusters usually **behind leaves**, 5-17 cm, individual stalks 0.5-1 cm. Calyx 4-6 mm, smooth outside, finely hairy along mid-ridge inside. Petals 5-8 mm, fringed in upper half. Stamens $\pm$ 3 mm, finely hairy, anthers 2x as long as filaments, slightly pointed at top, style hairy only near base, ovary hairy, disc 5-lobed. **FRUIT** 2-4 cm, green turning dull reddish, ovoid-oblong, blunt at both ends, finely hairy when young, later smooth, stalks 0.5-1 cm, 1 seed.



178

179 *Elaeocarpus prunifolius*

มะขาม



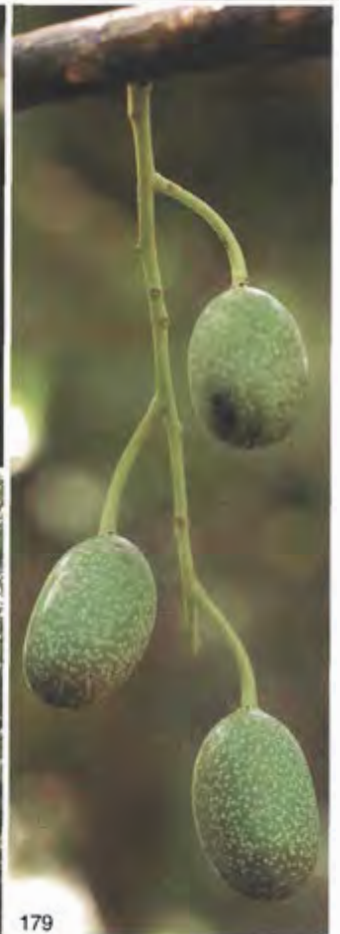
Evergreen tree to 10(18) m, slightly buttressed when older. **BARK** grey, thin, smooth or slightly rough. **LEAF** 9-17x2.5-6 cm, oblong or narrowly elliptic, pointed or blunt at both ends, shallowly toothed or almost untoothed. Mature leaves completely smooth, glossy above. 6-10 pairs of arching side veins. Stalks 1.5-4 cm, slender, slightly swollen at both ends, **young twigs resinous**. **FLOWER** clusters **in axils of current leaves**, 4-8 cm, individual stalks 0.8-1.2 cm. Sepals 5-7 mm, hairy outside, smooth inside, petals $\pm$ 5x2 mm, fringed $\frac{1}{4}$ way, long-hairy on both sides. Stamens $\pm$ 5 mm, hairy, anthers with pointed tips, style with long hairs in lower half only, ovary stiffly hairy, disc distinctly 10-lobed with yellow glands. **FRUIT** 1.4-2 cm, dark emerald green with minute cream dots, ripening purplish. Seeds 1.1-1.6 cm.



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MALPIGHIACEAE

Predominantly tropical family, 1100 species concentrated in S.America only 1 tree species in Thailand but several other species which are woody climbers.

180 *Hiptage benghalensis*

ssp. *candicans*

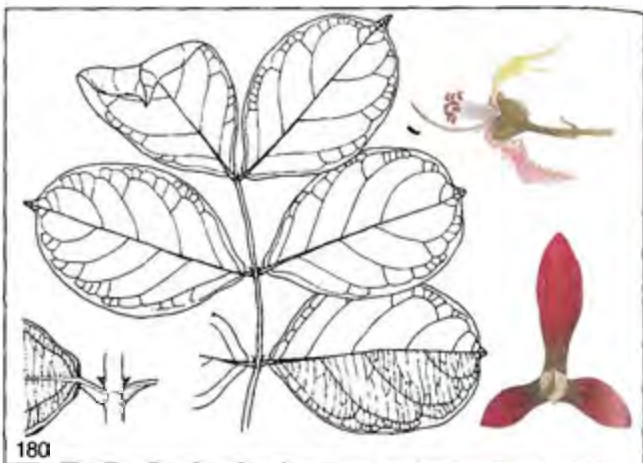
ในทากำลึงช้างเผือก



Small deciduous tree to 10m with a fluted trunk & slender, drooping branches. **BARK** thin, almost smooth, pale brown or greyish. **LEAF** 6-13x4-8 cm, simple, opposite, planar, usually on short twigs with 3-5 pairs of leaves, looking very like a pinnate leaf but with tiny buds in leaf axils. Oval or broadly obovate with short abrupt tip & blunt base, untoothed but with **scattered tiny glands along the margin**, especially towards the base. Young leaves densely whitish-hairy, mature leaves smooth & shiny above but finely hairy below. ± 6 pairs of arching side veins with a fine network of smaller veins, raised on both surfaces. Stalks 0.5-1 cm, with tiny deciduous stipules. **FLOWER** ± 1.5 cm, white with yellowish or pink blotches, in unbranched clusters at axils of fallen leaves, usually flowering when leafless. Individual flower stalks 0.8-2 cm, jointed in middle. Sepals 2-5 mm with a **very large gland** & dense hairs. 5 unequal petals, **fringed at top** & narrow at base. 1 long, curved stamen, nearly as long as style, 9 much shorter ones, 1 slender style, ± 10 mm, with pointed stigma. **FRUIT** 3.5-5.5 cm, splitting into 3 sections, each with a single hairy wing, the central one larger.

NOTE scattered in semi-open forests.

SIMILAR ssp. *benghalensis* is a woody climber with completely smooth leaves. *Englehardtia* spp.⁸⁰⁵ have similar but thinner fruits & pinnate leaves.



RUTACEAE *Citrus* family

1800 species worldwide, concentrated in the dry tropics. 10 genera & approximately 25 species in NT.
BOTANY mostly evergreen shrubs & small trees, often **thorny**, no latex or sap. Leaves simple (unifoliate), trifoliate or odd-pinnate, alternate or opposite, usually with **minute transparent dots** (resin glands) which are visible when held up to the light, often with a **citrus-like smell when crushed**, no stipules. Flowers usually white or greenish, regular, mostly bisexual with 4-5 sepals, 4-5 free petals, 8-12 free stamens & 1 style. Ovary superior, surrounded by thin, ring-like disc at base, usually with 4-5 carpels which may be free but always share the same style. Fruits leathery & splitting or fleshy & not splitting with many seeds, sometimes divided into segments like an orange.

ECOLOGY most species in NT are confined to moist lowland forests, rarely found above 1000 m.

USES an extremely important family, well-known for its fruits trees (lemon, orange, lime, bael etc.) but also providing many flavorings & spices (magrut, citronella etc), as well as a wide variety of herbal medicines. The timber is very hard & durable, with an attractive grain, but the trees are usually too small & slow growing to be of commercial importance.

1. leaves opposite
 2. leaves always simple(unifoliate); fruits fleshy, not splitting
Acronychia pedunculata 182
 2. leaves usually trifoliate or pinnate*; fruits dry, splitting
 3. leaves trifoliate (rarely unifoliate); filaments smooth
 4. mature leaves hairy below; ovary smooth *Euodia glomerata* 192
 4. mature leaves smooth or nearly so; ovary hairy
 5. leaflets without stalks, twigs ridged *Euodia viticina* 191
 5. leaflets with short stalks, twigs not ridged *Euodia triphylla* 190
 3. leaves pinnate, 5-7 leaflets; filaments hairy *Euodia meliaeifolia* 189
1. leaves alternate
 6. leaves simple (unifoliate)
 7. 6-10 stamens; fruits <2 cm; wild trees
 8. anthers $\pm$ as long as filaments; fruits segmented *Atalantia* 183
 8. anthers much shorter than filaments; fruits not segmented
 9. petals not overlapping; style slender, not persistent in fruit
Acronychia pedunculata 182
 9. petals overlapping; style short, persistent in fruit
¹⁸¹ *Glycosmis puberula* & *G. cochinchinensis*
 7. 12 or more stamens; fruits >2 cm, segmented; cultivated *Citrus* spp.
 6. leaves trifoliate or pinnate*
 10. plants with stout prickles; 4-5 stamens; fts <2cm, dry & splitting
 11. leaves trifoliate(rarely unifoliate) *Z. evodiaefolium* 200
 11. leaves pinnate, 2-12 pairs of leaflets
 12. leaf stalk winged, petals like sepals *Z. acanthopodium* 198
 12. leaf stalk not winged, petals different from sepals
 13. flower clusters in leaf axils *Z. nitidum* 199
 13. flower clusters at end of twigs *Z. rhetsa* 197
 10. plants with spines; 8-12 or more stamens; fts >4cm, fleshy, not splitting
 14. leaves trifoliate; 12 or more stamens; fruit skin leathery
Aegle marmelos 187
 14. leaves pinnate; 8 stamens; fruit skin woody *Feronia limonia* 188
 10. plants without spines/prickles; 8-10 stamens; fts <2cm, fleshy, not splitting
 15. flowers in branched pyramidal clusters *Clausena* 196
 15. flowers in flat-topped clusters
 16. fws with short stout style, persistent in ft ¹⁸¹ *Glycosmis* (6 spp.)
 16. fws with slender style, not persistent in ft
 17. petals not overlapping; wild shrubs/trees *Micromelum* 193
 17. petals overlapping; cultivated trees *Murraya* 185



* some leaves may be unifoliate but never all of them. Z = *Zanthoxylum*

182 *Acronychia pedunculata*

กะอวม กริ่ง



Evergreen shrub or small tree to 12 m. **BARK** brown, thin, smooth or shallowly cracked, inner bark cream or pale pink. **LEAF** 13-20x4.5-7 cm, **simple**, alternate or opposite, elliptic or obovate, pointed at both ends, no teeth. Mature leaves thinly leathery, completely smooth, dark green & shiny above with minute translucent glands all over surface. 9-12(15) pairs of side veins, joined at margin, slightly raised above. Stalks 1.2-4.5 cm, **swollen at both ends**, no stipules, **leaf buds narrowly pointed**.

FLOWER 1-1.3 cm, pale green or yellow-green, bisexual & unisexual on same plant, in slender branched clusters at leaf axils, 5-12 cm, individual flowers in threes with the middle one opening first, stalks 0.5-2 cm. 4 tiny triangular sepals, 4 spreading petals, not overlapping, **narrowly pointed**, $\pm$ long-hairy inside. 8 stamens with slender, flattened filaments, hairy at base, the ones opposite sepals slightly longer than ones opposite petals. Anthers knob-like, much shorter than filaments. Ovary & disc densely hairy, disc 8-grooved. **FRUIT** 0.9-1.3(2) cm, bright green ripening yellowish-green, globose or oval, often 4-grooved at top, gland-dotted, not splitting, thinly fleshy with single hard stone containing 3-5 seeds.

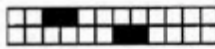
NOTE fairly common in the understory of dense evergreen forests. Leaves & fruits with distinct citrus smell when crushed.

SIMILAR *Atalantia* spp.¹⁸³ have spiny branches, flowers with overlapping petals, anthers as long as filaments & fruits with segments like an orange.



183 *Atalantia roxburghina*

มะนาว



Evergreen shrub or small tree to 10 m. **BARK** grey-brown, **slightly spiny**, thin, inner bark cream. **LEAF** 9-19x2.5-6 cm, **simple**(unifoliate), alternate, spirally arranged, narrowly ovate to elliptic with **tapering tip** & narrow base, no teeth. Mature leaves completely smooth, dark green above with obvious **translucent glands all over surface**. 10-18 pairs of side veins, joined at margin, with a clear network of finer veins. Stalks 0.7-1.2 cm, brown, flattened & slightly swollen at base & usually jointed in middle. Twigs often angular when young, sometimes spiny. Leaf buds narrow & pointed. **FLOWER** up to 1.2 cm, dark green maturing white, bisexual, in **unbranched clusters (racemes)** at leaf axils, 2.5-5 cm, individual stalks 0.5-1 cm. Calyx **regularly divided into 4 blunt lobes**, hairy on margin. 8 **free stamens** with short filaments & yellow anthers. **FRUIT** 1-2.5 cm, dull green, globose, often lobed, fleshy & obscurely segmented, like an orange.

NOTE scattered in the understory of lowland evergreen forests.

SIMILAR ¹⁸⁴*A. monophylla* leaves 2.5-8 cm, blunt & notched at tip, 5-7(12) pairs of side veins, glossy above, smooth or with scattered hairs on midvein below. Flowers in simple clusters (umbels or fascicles), calyx irregularly lobed, split to base on one side, petals rounded, stamens fused into tube. Fruits obviously segmented.

Acronychia pedunculata also has simple leaves but is never spiny & has fruits with a stone, not segmented.

185 *Murraya paniculata*

แม้ว



Shrub or small tree to 10m. **BARK** creamy-brown, smooth, thin. **LEAF** to 17cm, odd-pinnate, 1-4 pairs of leaflets, ovate or elliptic, 3-7x2-3.5 cm, dark green & glossy above, completely smooth. tapering or pointed tip, untoothed or with tiny blunt teeth. 5-8 pairs of side veins. Leaflet stalks 0.2-0.6 cm. **FLOWER** in simple or branched clusters at leaf axils, main stalks 1-4 cm, individual stalks 0.2-0.9 cm. (4)5 sepals, triangular, ±1mm. (4)5 overlapping petals, 1.5-2cm, white, stamens alternately long & short, to 12 mm, filaments broader near base. Style to 10 mm with large 2-lobed stigma. **FRUIT** 1.2cm pink or red, ovoid berry with pointed tip, slightly shiny with many gland-dots. Seeds densely hairy.

NOTE commonly cultivated, reputedly wild at least in C. Thailand.

SIMILAR ¹⁸⁶*M. koenigii* crushed leaves with strong smell curry-like smell Cultivated.



183



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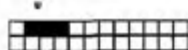
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187 *Aegle marmelos*

มะยม มะยี่น



Deciduous shrub or small tree to 13 m with slender, drooping branches & rather shabby crown. **BARK** pale brown or greyish, smooth or finely fissured & flaking, **armed with long straight spines**, 1.2-2.5 cm, singly or in pairs, often with a slimy sap oozing from cut parts. **LEAF** **trifoliate**, alternate, each leaflet 5-14x2-6 cm, ovate with tapering or pointed tip & rounded base, untoothed or with shallow rounded teeth. Young leaves pale green or pinkish, finely hairy, mature leaves dark green, completely smooth. 4-12 pairs of side veins, joined at margin, raised above. End leaflet with long stalk, 0.5-3 cm, side ones with very short stalks <0.2 cm. **FLOWER** 1.5-2 cm, pale green or yellowish, sweetly scented, bisexual, in short drooping unbranched clusters at end of twigs & leaf axils, usually appearing with young leaves. Calyx flat with 4(5) small teeth. 4(5) petals, 6-8 mm, overlapping in bud. Many stamens with short filaments & pale brown anthers, style short, ovary bright green, disc inconspicuous. **FRUIT** 5-12 cm, globose or slightly pear-shaped with thick, hard rind, not splitting. Inside with 8-15 sections filled with aromatic slimy orange pulp, each section with 6-10 oblong seeds densely clothed with thick, fibrous hairs.

NOTE scattered in dry, open forests. The tree has great religious significance & is widely planted for its edible & therapeutic fruits.

SIMILAR 188 *Feronia limonia*

มะยี่น is also spiny but has odd-pinnate leaves with 2-4 pairs of opposite leaflets, 2-3 cm, blunt-tipped, often with rounded teeth, stalks ± winged. Flowers dull red, 10-12 unequal stamens. Fruits 5-8 cm, greyish with hard rind & slimy pulp like *Aegle marmelos*. Native to S. India, cultivated in NT for its edible fruits.



187



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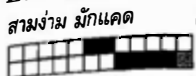
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189 *Euodia meliaefolia*

สามง่าม มั๊กแคด



Evergreen shrub or small tree, rarely to 12 m. **BARK** grey-brown, smooth or finely roughened, thin. **LEAF** 18-35 cm, usually **odd-pinnate**, **opposite**, clustered near end of twigs, 5-7 pairs of $\pm$ opposite leaflets, 7-14x3-4.5 cm, elliptic or narrowly ovate with tapering tip & oblique base, irregularly toothed or almost untoothed. Mature leaves with scattered minute white hairs especially on veins & stalks, 8-12(15) pairs of side veins, usually raised above, not joined at margin. Leaflet stalks 0.6-0.8 cm, main stalks 4-11 cm. **FLOWER** pale green, branched clusters at end of twigs & upper leaf axils, up to 19 cm long & broad. 4 sepals & petals, 4-5 stamens with **hairy filaments**, ovary often reddish. **FRUIT** 0.5-0.8 cm, globose, grooved, pale green ripening dark red, leathery, **eventually splitting into 4-5 sections** with a single glossy black seed. **NOTE** scattered in less-disturbed forests.

SIMILAR 3 other shrubby species of *Euodia* with smooth stamens & trifoliate (rarely simple) leaves, narrowly tapering at both ends.

¹⁹⁰*E. triphylla* leaflets 8-22 cm, smooth or nearly so, with a camphor-like smell when crushed, leaflet stalks $\pm$ 0.3 cm, main stalks 2.5-10 cm, twigs smooth, without raised lines. Flower clusters 2-6 cm, individual stalks 0.5-1 cm, petals pointed, ovary hairy.

¹⁹¹*E. viticina* มะปิ่นดำ leaflets 5-17 cm, middle one much larger than others, smooth or nearly so. Leaflet stalks <0.2 cm, main stalks 1.2-6 cm, slightly winged, twigs with 4 ridges. Flower clusters head-like, <4 cm long, petals blunt, ovary hairy.

¹⁹²*E. glomerata* shrub to 3m, leaflets densely hairy & gland-dotted below, Leaflet stalks <0.2 cm, main stalks 2.5-4 cm, twigs slightly flattened at nodes. Flower clusters head-like, up to 2.5 cm long, petals thick & hooded at tip, stamens & ovary smooth.



193 *Micromelum minutum*

หัตถ์คน จ้อย



Evergreen shrub or small tree to 10 m. **LEAF** 20-50 cm, **odd-pinnate**, **alternate**, 3-6(8) pairs of alternate leaflets, larger ones 7-18x3-5 cm, ovate-oblong or lanceolate with tapering tip & asymmetric base, untoothed or rarely with scattered shallow teeth. Mature leaves smooth & shiny dark green above, smooth or with soft pale brown or greyish hairs below. Leaflet stalks 0.2-1 cm, main stalks 2.5-7 cm. **FLOWER** ± 0.7 cm, greenish-white, fragrant, in dense, **flat-topped clusters** at end of twigs, 10-25 cm. 5 petals, ± 5 mm, curved backwards, not overlapping. 10 free stamens, alternately shorter. **Style slender, narrowed at base**, not persistent in fruits. **FRUIT** 0.5-1 cm, yellow-green ripening scarlet-orange or very dark violet, oblong with short pointed tip & **short but distinct stalk, smooth & shiny**, fleshy with 1-3 seeds.

NOTE scattered in the understory of dense or semi-open forests.

SIMILAR ¹⁹⁴*M. falcatum* tree to 11m, 4-6 pairs of leaflets, narrowly ovate with rounded base, untoothed or finely toothed, smooth both sides. Flower clusters 3-4 cm, petals smooth or with scattered hairs.

¹⁹⁵*M. hirsutum* shrub to 3m, 5-12 pairs of lanceolate leaflets, 3.5-8 cm, usually shallowly toothed & quite densely hairy below. Flower clusters 2-6 cm, stalks, sepals, petals & ovary axes densely coated with rough brown hairs. Fruits ± 1.2 cm, finely hairy, no stalks.

196 *Clausena excavata*var. *excavata* ขี้ผึ้ง

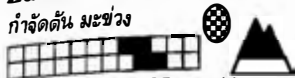
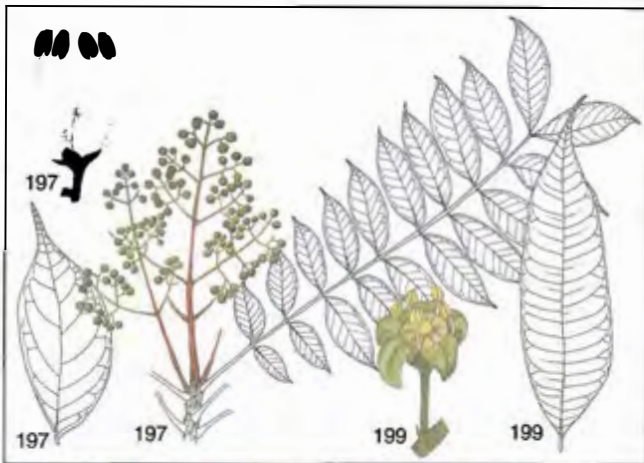
Shrub, rarely to 5m. **LEAF** 20-60 cm, **odd-pinnate**, 7-15(20) pairs of sub-opposite or alternate leaflets, 2.5-12x1.8-4 cm, ovate or lanceolate with tapering tip & oblique base, untoothed or very shallowly toothed. Mature leaves thin, smooth or finely hairy especially below. Side leaflet stalks 0.1-0.2 cm, end one much longer. **FLOWER** 0.7-1 cm, branched pyramidal clusters **at end of twigs** & upper leaf axils, 10-30(45) cm, individual stalks 0.1-0.2 cm, **buds globose**. 4 overlapping petals, 8 free stamens, 1.5-3 mm, alternately long & short, **filaments swollen at base**, style 1-2 mm, stout with tiny stigma. **FRUIT** 0.7-2 cm, white or pale pink, oval slightly hairy when young, later smooth & gland-dotted, fleshy & juicy with 1-2 seeds.

NOTE common in evergreen & less disturbed deciduous forests, crushed leaves have a strong, resinous smell.



197 *Zanthoxylum rhetsa*

กำจัดดิน มะเข้วง



Evergreen tree to 35 m with open, spreading crown & long, straight trunk. **BARK** pale grey, with large stout, woody prickles, 1.2-2.5 cm long with solid conical base, outer bark thin, inner bark pale cream. **LEAF** 15-65 cm, pinnate, alternate, 5-14 pairs of alternate or opposite leaflets, 7-18x2.5-6 cm, end ones largest, narrowly ovate or elliptic with tapering tip & very asymmetric base, untoothed, sometimes wavy. Mature leaves completely smooth, often tinged red along margin & stalks, lower surface densely covered with minute glands, strong smell when crushed. 8-15 pairs of side veins, joined at margin, flat or sunken above, fine network of smaller veins. **Leaflet stalks** 0.1-0.3 cm, main stalks 3-13 cm, swollen at nodes, grooved, usually with thorns, not winged. **FLOWER** ± 0.2 cm, pale green, usually unisexual, in branched long-stalked clusters at end of twigs, 8-20 cm. 4 sepals, 4 petals, 4 stamens, stigma off-centre (eccentric) disc pale yellow. **FRUIT** 0.6-0.9 cm, in broad-based clusters of up to 100 fruits, pale green with darker glands when young but later pink or red, leathery, globose & lobed, covered with tiny pits like a golf ball, splitting into 2-5 sections each with 1 black seed. Crushed fruits smell of lemon drops.

NOTE scattered in moist areas.

SIMILAR 198 *Z. acanthopodium*

scrambling shrub with flattened prickles, leaf stalks winged, leaflets with rounded teeth. Flower clusters very short, in leaf axils, 6-8 indistinguishable sepals/petals.

199 *Z. nitidum* climbing shrub, 2-4 pairs of leaflets, smooth below, glands at teeth. Flower clusters in leaf axils, petals very distinct from sepals, both smooth, fruits very aromatic.

200 *Z. evodiaefolium* leaves trifoliate or rarely simple. 201 *Z. myriacanthum* tree to 20m, 2-11 pairs of leaflets with pointed tips, minutely toothed, stalks 0.5-0.7cm. Flower clusters 15-25 cm, terminal & axillary, 5 sepals, 5 petals, 5 stamens. Fruits 2.5-6.5 mm wide, 1-3 sections, shiny black seeds.

SIMAROUBACEAE

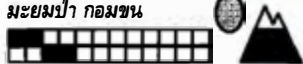
Small pantropical family, 110 species worldwide, 5 in N.Thailand.

BOTANY evergreen or deciduous trees without latex (*Ailanthus* has red resin). Leaves spiral, mostly odd-pinnate with opposite leaflets. Flowers small, unisexual or bisexual, usually in axillary, branched clusters, 3-5 sepals, usually fused at base, 3-5 free petals, 5-10 stamens surrounding a large fleshy disc. Fruits pulpy (except *Ailanthus*), in clusters of 1-5 developing from a single flower.

USES many species have bitter bark which is used in a variety of traditional medicines.

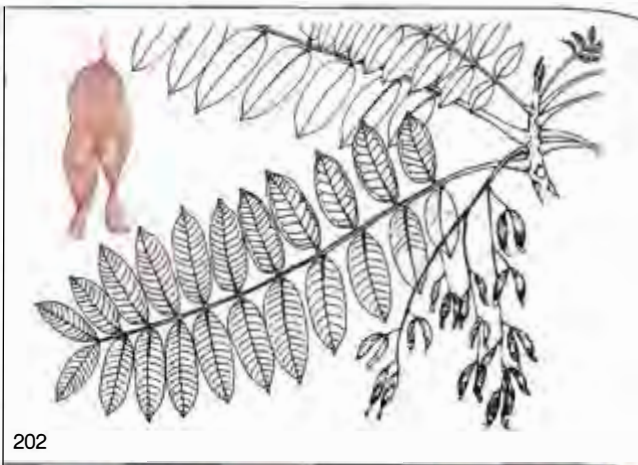
202 *Ailanthus triphysa*

มะยมป่า กอมนขน



Deciduous tree to 30 m with large upright branches and a rather open crown. **BARK** pale grey, smooth, inner bark with **red resin**. **LEAF** 30-70 cm, odd/even-pinnate, clustered near ends of twigs. 9-13 pairs of opposite leaflets, 5-12 x 1.5-5 cm, oblong or curved with tapering tip & asymmetric base, untoothed. Lower surface usually with short soft hairs especially on veins & **scattered glands in vein axils**. Twigs stout with large leaf scars, hairy, no stipules. Old leaves bright **red**. **FLOWER** ± 0.5 cm, yellow-green, in drooping branched clusters at axils of current leaves, densely flowered, 20-60 cm long. Calyx 1 mm, 5(8) triangular teeth, 5(6) free petals without hairs. Male & female flowers on different trees - males with 10 stamens attached below the disc, females with 2-5 styles, fused at the top & often also at the base, each with a large, lobed stigma. **FRUIT** 5-8 x 1.8-2.5 cm, usually in pairs on long slender stalks, oblong with a **very thin wing surrounding a single flat seed**, pink & richly veined when young.

NOTE open forests from Lampang southwards, occasionally planted.



203 *Picrasma javanica*

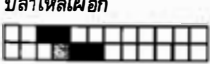
กอมขม ดิ่งต้น



Evergreen tree to 20 m with slender branches. **BARK** dark brown, smooth, very thin. **LEAF** 15-25 cm, odd-pinnate, 2-4 pairs of opposite leaflets, 7-13x2.5-4 cm, abruptly tipped, untoothed, smooth & shiny. 3-8 pairs of steeply curved side veins, Young leaves pink, with **large leafy stipules**, 7-25 mm, falling early but leaving obvious scars. Twigs slender, dark brown, very smooth. **FLOWER** 1-1.5(2) cm, greenish-white or pale yellow, unisexual, in short branched clusters (cymes) hidden in axils of leaves. 4 triangular sepals, 1 mm, 4 free petals, pointed & curved backwards with a conspicuous ridge. 4-5 free stamens, longer than petals in male flowers, shorter & sterile in females, attached around the edge of a hairy, 4-lobed disc. Females with 4 styles, joined at top, pointed stigmas. **FRUIT** 0.9-1.2 cm, white, red or blue, globose, thinly fleshy, 2-4 clustered together on a thick base (torus) surrounded by 4 bright green sepals. **NOTE** locally common, shady areas.

204 *Eurycoma longifolia*

ปลาไหลเผือก



Spindly shrub or small tree with few upright branches each with a rosette of leaves clustered near tips. **LEAF** 50-100 cm, 20-30 pairs of leaflets, 5-12.5 x 1.2-3 cm, silvery glaucous with faint veins below. **FLOWER** ±0.5 cm, dark red/purple, in slender branched clusters dangling from upper leaf axils, stalks densely hairy. 5 petals, pointed, densely hairy. Male flowers with 5(6) stamens, no disc, bisexual flowers with 1 long style & large 5-6 lobed stigma, ovary deeply 5-lobed. **FRUIT** 1.2-2 cm, oblong with short beak, yellow then red, sometimes splitting. Uncommon.



SIMAROUBACEAE

²⁰⁵*Brucea mollis*

ราชคฤ



Shrub or small tree to 8 m. **BARK** red-brown, slightly cracked, inner bark white. **LEAF** 20-60 cm, trifoliate or odd-pinnate, 2-4(6) pairs of opposite leaflets, 5-9(16) x 1-3.5(8) cm, ovate with pointed tips, untoothed, smooth or slightly hairy below. 4-9 pairs of side veins, not parallel & not reaching edge. Side leaflet stalks 0.3-0.5 cm, end one $\pm$ 1.5 cm. **FLOWER** minute, pale green, slender spike-like clusters (thyrses) in leaf axils, much shorter than leaves. 5 petals, hairy near base, 5 dark stamens around disc. **FRUIT** 0.7-1.3 cm, red or orange, 1 or 2(3) together, thin-fleshy with single stone. Stalks 0.4-1 cm.

NOTE fairly common, forest edges.

SIMILAR ²⁰⁶*B. javanica* leaflets strongly toothed, 6-15 pairs of parallel side veins, ending at edge. Fruits smaller, 0.4-0.5 cm, stalks 0.2-0.6 cm.

²⁰⁷*Harrisonia perforata*

คนทา หนามจี



Straggly shrub to 5 m with **large, stout thorns**. **LEAF** 6-20 cm, odd-pinnate, 3-5 pairs of opposite leaflets, 1-3 x 0.5-1.5 cm, slightly toothed, smooth or thinly hairy below. **Leaf stalk with narrow wing**, leaflet stalks < 2 mm, no stipules. **FLOWER** $\pm$ 1.5 cm, bisexual, small clusters in upper leaf axils & end of twigs. 4-5 petals, spreading, pointed, dark red outside, pale green inside. 8-10 stamens, attached to edge of cup-shaped disc. 4-5 styles, 5-8 mm, with knob-like stigmas. **FRUIT** 2-2.5 cm, globose, slightly lobed, leathery with 3-5 flattened seeds (pyrenes).

NOTE very common, open areas & waste ground.



IRVINGIACEAE

Tiny family with only 8 species worldwide, 1 species in Thailand. Often included under Simaroubaceae

208 *Irvingia malayana*

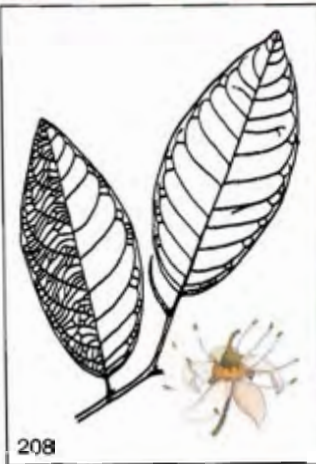
กระบอก มะขี้น



Large evergreen or partly deciduous tree to 35 m with dense spreading crown & massive, buttressed trunk up to 200 cm diam. **BARK** pale grey-brown, smooth, becoming irregularly cracked & flaky when old, inner bark pale orange. **LEAF** 7-12 x 2.5-5 cm, simple, spiral, elliptic with pointed tips & blunt or slightly tapering base, untoothed. Mature leaves completely smooth, dark green & shiny above, usually pale grey-green (glaucous) below. 8-12(16) pairs of side veins. Stalks 0.8-2 cm, slender, twigs smooth, dark brown. **Leaf buds very narrow & pointed**, enclosed in conical stipules which soon fall leaving a distinct ring scar on the twigs. **FLOWER** ± 0.6 cm, greenish-white, short branched clusters hidden in leaf axils, usually appearing just before young leaves, quickly falling. 5 fused sepals, 5 overlapping petals, 3x as long as sepals, 10 free stamens, attached outside & below the central disc, 1 style with inconspicuous stigma. **FRUIT** 4-6 cm, green, eventually turning yellowish with pale orange flesh, pendulous on long stalks, very like **small mangoes** with a single large fibrous stone.

NOTE very common, sometimes becoming semi-dominant in moist deciduous forests after more valuable species have been logged out.

SIMILAR *Mangifera* spp. (true mangoes) have larger leaves without stipules or ring scars on the twigs.



OCHNACEAE

Small family with 370 species worldwide, only 1 species in NT.

209 *Ochna integerrima*

กระแจะ ข้างน้ำ



Small deciduous tree to 10 m with spreading branches & short, twisted trunk. **BARK** pale brown, deeply cracked. **LEAF** 8-18 x 4-7 cm, simple, alternate, more or less planar, obovate with blunt or slightly pointed tip, **finely & irregularly toothed**. Mature leaves dull green, leathery, completely smooth. 7-15 pairs of steeply curved side veins with shorter intermediate ones, not joined. Stalks 0.3-1 cm, stout, with tiny deciduous stipules at base. Leaf buds covered with closely set scales which soon fall leaving rings of scars on the twigs. **FLOWER** 3.5-5 cm, bright yellow, in short, sparsely branched clusters (thyse) near end of leafless twigs, individual stalks 1.2-3 cm, jointed, with convex swelling (receptacle) at the top. 5 free sepals, 1-1.6 cm, 5-6 free petals, 1.5-2.5 cm, obovate with blunt tips & narrow base, very thin & fragile, falling early. 25-60 free stamens, outer ones longer, anthers narrowly oblong, as long as filaments, single slender style **attached to base of ovary**, 10-15 mm, 6-10 tiny stigmas, often on short branches. **FRUIT** 0.7-1.1 cm, **green** turning black, globular or obovoid, thinly-fleshy with a large stone. 1-4 fruits clustered together with the persistent filaments & style on a convex swelling (receptacle), surrounded by the **enlarged, bright red sepals**.

NOTE very common in semi-open areas with dry dipterocarps or pine.



BURSERACEAE

540 species throughout the tropics, 3 genera & at least 5 species in NT. **BOTANY** deciduous trees with **resinous gum** in the bark, sometimes also in the leaves & fruits. Leaves **odd-pinnate, alternate**, often crowded towards end of thick twigs, main stalk swollen at base, with or without stipules, old leaves often bright red. Flowers small, unisexual (except *Garuga*), male & female on different trees. 3-5 sepals & petals, not overlapping, 8-10 stamens, 1 style, ovary with disc. Fruits fleshy or leathery with hard stone, not splitting.

ECOLOGY fairly common in both evergreen & deciduous lowland forests. **USES** good quality timber, also valued locally for the resin.

210 *Protium serratum*

มะลิพิน ๕



Briefly deciduous tree to 30 m with short trunk & large, spreading branches. **BARK** pale grey, turning dark red-brown with age, often deeply vertically cracked, inner bark white with orange-pink sap. **LEAF** 2-4(5) pairs of opposite or sub-opposite leaflets, 6-13x3-4 cm, rarely up to 18x5 cm, narrowly elliptic or oblong with abrupt or tapering tip & blunt or slightly pointed base, untoothed or with scattered shallow teeth near tip. Young leaves with scattered greyish hairs, mature leaves smooth & shiny. Side leaflet stalks slender, 0.9-1.2 cm, end one 2.5-4 cm, **no stipules**. **FLOWER** 0.3-0.4 cm, pale green, slender branched clusters in upper leaf axils, 15-18 cm, **individual stalks 0.6-1 cm**. 5 tiny sepals, ± 0.5 mm, 5 much larger petals with pointed, slightly incurved tips, softly hairy outside. 10 free stamens, style very short, ovary surrounded by flat ring-shaped disc. **FRUIT** 0.6-2 cm, yellow-green, eventually dark red then black, globose & often slightly 2-3lobed, juicy with 1-3 seeds (pyrenes).

NOTE common & widespread in moist evergreen/deciduous forests.



210



210



210



210



210



210

211 *Garuga pinnata*

Deciduous tree to 20(30) m, trunk spreading at the base. **BARK** pinkish-grey or grey-brown, shallowly cracked, inner bark cream with pink stripes & pinkish sap. **LEAF** 30-45 cm, 6-10 pairs of opposite leaflets, 5-10 x 2-4 cm, oblong or lanceolate with pointed tip & asymmetric base, **finely toothed**. Young shoots densely hairy, mature leaflets with scattered short white hairs, esp. below. **Side leaflet stalks very short**, <0.2 cm, end one 1.2-1.5 cm, no stipels or resin ducts. **FLOWER** 0.6-1.0 cm, pale yellow or pink, branched clusters just below end of twigs, 8-25 cm, **individual stalks 0.1-0.3 cm**, main stalks 2-6 cm, usually appearing before young leaves. 5 pointed sepals, 5 pointed petals with spreading tips, 10 free stamens, all attached at the top of a **cylindrical receptacle**, slightly wider at top, 1 style with 5-lobed stigma, hairy ovary with short stalk. **FRUIT** 2-2.5 cm, yellow-green, irregularly globose, juicy, 2-5 hard seeds (pyrenes).

NOTE common in semi-open deciduous forests, often with bamboo.

SIMILAR 2 other species recorded from neighbouring regions:

212 *G. floribunda* var. *gamblei* leaf stalks with resin ducts, sometimes with tiny leaf-like stipels at base of lower pairs of leaflets. Flower 0.4-0.6 cm, clusters (11) 18-37 cm, main stalk (6) 9-14 cm, receptacle cup-shaped, much wider at the top, fruits 0.5-1.2 cm.

213 *G. pierrei* leaves as *G. floribunda* but flowers 0.6-0.8 cm, clusters 6-17 cm, main stalk 1-7 cm, receptacle globose, widest in the middle. Fruits 1-2.3 cm.



214 *Canarium subulatum*

มะกอกเกล็ดอื่น มะเกี่ยม



Deciduous tree to 20 m with rounded crown & straight trunk. **BARK** grey-brown to dark grey, smooth or shallowly fissured, inner bark pale brown with white stripes, exuding a clear sap **which turns blackish**. **LEAF** 20-45 cm, 2-5 pairs of opposite leaflets plus an end one, 6-14(21) x 3-6(12) cm, oblong or lanceolate with pointed tip & oblique base, **finely toothed**. Young shoots densely orange-brown hairy, mature leaflets smooth or sparsely hairy, esp. below. Side leaflet stalks 1-2 cm, end one 2.5-5 cm, main stalk with a **pair of narrow stipules at or near the base**, 10-25 mm. **Old leaves bright red**. **FLOWER** 0.7-1.1 cm, cream, narrow clusters in upper leaf axils, 7-25 cm. Calyx 2.5-3.5 mm, 3-lobed, softly hairy on both sides. 3 petals, 2-3X as long as sepals, fused at base. 6 stamens, **fused into short tube at base**. **FRUIT** clusters 2.5-8 cm, 2.8-3.5 cm, individual fruits yellowish-green, not splitting, exuding a pale orange resin when cut, ovoid or bullet shaped with **pointed tip** & rounded base, persistent hard calyx. Stones slightly triangular in cross-section, very hard with 3(2) seeds.

NOTE common in semi-open forests, often with bamboo.

SIMILAR ²¹⁵*C. strictum* leaflets usually hairy below; stipules 7 mm, falling very early. Flower clusters 15-40 cm, calyx 4-5.5 mm, stamens fused $\frac{3}{4}$ of their length. Fruit 3.2-4.5 cm, clusters 10-20 cm, ellipsoid/obovoid, blunt both ends, stone with 1(2) seeds. Habitat as *C. subulatum* but less common.

²¹⁶*C. euphyllum* leaves 60-90 cm, leaflets shallowly toothed or almost untoothed. Young shoots finely hairy, mature leaves leathery, smooth both sides. No stipules. Fruit stones distinctly 3-angled. Uncommon in hill evergreen forests.



MELIACEAE

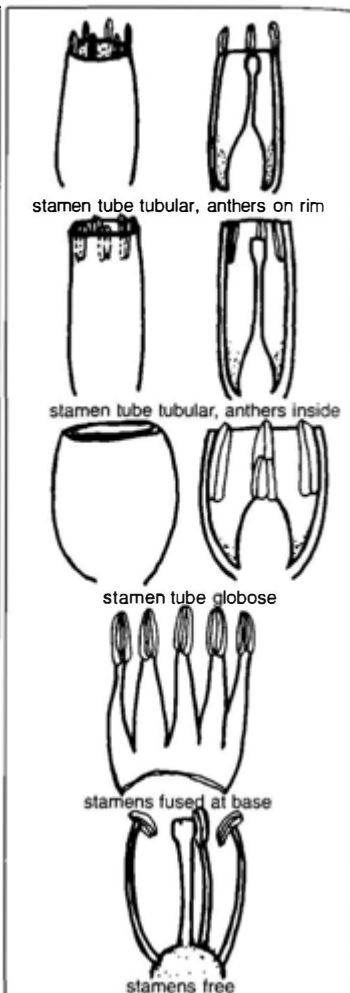
Almost exclusively tropical family with 565 species worldwide, 12 genera & at least 20 species in NT.

BOTANY evergreen or briefly deciduous trees, very rarely with latex or sap. Leaves mostly pinnate, alternate, spirally arranged, leaflets usually $\pm$ opposite with very short stalks, no stipules. Flowers mostly white or yellow, regular, bisexual, in branched clusters at upper leaf axils. Calyx cup-shaped with 3-5 lobes, usually small. 3-7 free petals, narrow & curved backwards. Stamens often fused into a characteristic globular or cylindrical tube with 5-10 anthers borne on top edge or on inside. Ovary superior with 1-5 locules & 1 style, usually surrounded by a ring-like disc. Naturally divided into 2 large subfamilies. *Melioidae*, including most of our species, has leathery fruits with wingless seeds often covered by a fleshy coating (aril) & leaf buds without reduced scale-like leaves. *Swietenioideae* has dry fruits which split open, winged seeds & leaf buds protected by scale-like leaves.

ECOLOGY most abundant in moist lowland forests, becoming much rarer above 1000 m.

USES many valuable timbers belong to Meliaceae, such as Mahogany (*Swietenia*) from tropical America. Some species are used in herbal medicine & as insecticides, the most famous being the Neem tree (*Azadirachta indica*).

1. leaves bipinnate *Melia*²¹⁹
1. leaves pinnate or trifoliate
 2. leaflets toothed, curved *Azadirachta indica*²²²
 2. leaflets untoothed, straight
 3. stamens completely fused into tube
 4. stamen tube tubular, flowers 3-40 mm
 5. leaves trifoliate
 6. leaves hairy on veins below *Sandoricum koetjape*²²⁷
 6. leaves completely smooth *Dysoxylon andamanicum*²²⁵
 5. leaves pinnate, fruits dry, seeds winged
 7. anthers on rim of stamen tube; seeds winged *Chukrasia*²³²
 7. anthers on inside of tube; seeds not winged
 8. flower clusters <10cm; fruits <3 cm, seeds without aril *Dysoxylon cochinchinense*²²³
 8. flower clusters >10cm; fruits 3-8 cm, seeds with red aril
 9. 3-6 pairs of leaflets, fws 10-12 mm, fts 3-5 cm
leaf buds "fish-shaped" *Dysoxylon excelsum*²²⁴
 9. (5)6-13 pairs of leaflets, fws $\leq$ 5 mm, fts 5-8 cm
end of main lf stalk often with bud *Chisocheton siamensis*²²⁶
 4. stamen tube globose, flowers 2-5 mm
 10. leaves & twigs with scales or star-shaped hairs *Aglaia*²²⁸
 10. leaves & twigs smooth or with simple hairs *Aphanamixis polystachya*²³¹
 3. stamens free or fused at base
 11. 6-11 pairs of leaflets, 5 free stamens, large tree
dry dark brown fruits, winged seeds *Toona*²³⁴
 11. 1-7 pairs of leaflets, 8-14 stamens fused at base, small trees
 12. 1-3 pairs of leaflets, smooth or hairy *Walsura*²¹⁷
lvs odd-pinnate, stalks swollen & jointed; fws in branched clusters,
4-5 free spreading petals, stamens longer than petals, style short,
disc ring-like; fts fleshy or leathery, not splitting, 1-2 seeds with aril.
 12. 3-6 pairs of leaflets, smooth *Trichilla connaroides*²³⁷
lvs glaucous below, swollen joints, smooth dark brown twigs
 12. 4-7 pairs of leaflets, usually hairy *Cipadessa baccifera*²¹⁸
leaflets 7-7.5cm; fws with 5 petals, 2.5mm; 10 stamens, 1.5-2.5mm,
pair of pointed appendages, 1 short style with 5 stigmas; fts 0.5-1cm,
pink/red/purple, not splitting, 5-angled, 5 stones, seeds without aril



219 *Melia toosendan*

เกวียน เลียนดอกม่วง



Deciduous tree to 25 m with very open crown & widely spreading branches. **BARK** pale grey or brown with narrow fissures, inner bark cream. **LEAF** bipinnate or tripinnate, clustered near end of twigs, 4-5 pairs of side stalks each with 2-5 pairs of opposite leaflets, 3-7 x 1.2-2 cm, ovate with narrow tips, margin usually with scattered irregular teeth. Mature leaflets smooth, sometimes with whitish powder below (glaucous). Leaflet stalks 0.2-0.4 cm. **FLOWER** 2.5-3 cm, white with violet centre, in large open branched clusters grouped near end of twigs. 5-6 small triangular sepals, 5-6 white petals, curved backwards. Stamen tube violet, cylindrical, as long as petals, 8-10 anthers attached just below rim between teeth. Single slender style as long as stamen tube with unlobed stigma. **FRUIT** 1.6-2 cm, green, thinly-fleshy, 6-8 lobes each with a single small stone.

NOTE common in open areas.

SIMILAR 220 *M. dubia* เลียนดอกขาว leaves untoothed or with rounded teeth. Flower stamen tube 3-4 mm, white Fruit 2.5 cm, 2-4 lobes. Occasionally planted, very fast growing. Possibly a variety of *M. toosendan*.

221 *M. azedarach* เลียนบ้าน young leaves strongly toothed, stamen tube 6 mm, violet. Fruit 1.2 cm, 4-5 lobes. Introduced, commonly planted.

222 *Azadirachta indica*

สะเดา Neem, Nim



Deciduous tree to 25 m, **LEAF** odd or even-pinnate, clustered near end of twigs, 4-6 pairs of opposite leaflets, 4-7 x 1.5-2.5 cm, usually curved with narrowly tapering tips & asymmetric base, distinctly toothed. Young shoots slightly hairy, mature leaves completely smooth, shiny above. **FLOWER** ±0.5 cm, white or pale yellow, sparsely branched clusters >>



MELIACEAE

in upper leaf axils, shorter than leaves. Calyx tiny with 5-6 rounded lobes, 5-6 narrow petals without hairs, stamen tube cylindrical with 10 anthers opposite the teeth, smooth outside, sparsely hairy inside, single long style with 3-6 stigma lobes, ovary surrounded by cup-shaped disc. **FRUIT** 1.3-1.5 cm, 1-2 stones.

NOTE scattered in open areas, particularly south of Lamphun, frequently planted throughout NT. Wild trees are var. *siamensis* which has larger, more symmetric & less pointed leaflets, flower clusters near tips of twigs.

223 *Dysoxylum cochinchinense*

ดาดำ



Evergreen tree to 20 m **BARK** dark brown, shallowly cracked. **LEAF** 18-40 cm, odd-pinnate, 3-5 pairs of alternate or sub-opposite leaflets, 7.5-15 x 2.5-5 cm, long-tipped, no teeth. Buds pointed, densely brown-hairy, mature leaves dark green, smooth or indistinctly hairy. Leaflet stalks 0.4-1.0 cm. **FLOWER** 0.5-0.8 cm, pale yellow, unbranched clusters in or slightly above leaf axils, 3-10 cm. 4 petals, hairy both sides, cylindrical stamen tube with 8 anthers on inside, **style with short disc at base only**. **FRUIT** ± 2 cm, globose with narrow base, leathery. Seed red, without fleshy coating.

NOTE uncommon in less-disturbed forests.

SIMILAR 224 *D. excelsum* leaves odd or even-pinnate, buds 'fist' shaped. Flower 1-1.2 cm, pale cream, clusters 30-100 cm, style surrounded by tubular disc for $\pm 1/2$ its length. Fruit 3-5 cm, orange turning dark red globose or pear-shaped, 4-5 valved, seeds with red coating (aril).

225 *D. andamanicum*

1-2 pairs of leaflets 8-13x3.5-4.5 cm smooth, stalks squarish Flowers ± 8 mm, in spike-like clusters 2.5-5 cm, axes slightly hairy individual flowers without stalks. Ovary densely white-hairy, disc shorter than ovary, style short.



226 *Chisocheton siamensis*

ดาเลื่อ ยมมะกอก



Evergreen tree to 30 m with narrow crown, leaves clustered near the ends of stout twigs. **BARK** dark brown or greyish, shallowly cracked, inner bark cream. **LEAF** 35-70 cm, pinnate, 5-9 pairs of opposite or rarely alternate leaflets, often with a bud at the end rather than a leaflet, 12-28 x 4.5-7 cm, oblong or lanceolate with tapering tip & asymmetric base, no teeth. Young shoots densely brown-hairy, mature leaves smooth or with scattered brownish hairs on stalks & veins below. 10-15 pairs of side veins, joined at margin. Leaflet stalks 0.3-0.6 cm, main stalk 7-10 cm. Twigs stout with large leaf scars. **FLOWER** ≤ 0.5 cm, white or yellow, in narrow branched clusters on long drooping stalks in or slightly above upper leaf axils, 20-50 cm, individual stalks 0.2 cm. Buds narrowly tubular, calyx cup-shaped, 4-lobed, almost as long as petals, 4-6 free petals in 1-2 rows, fused to stamen tube at base, slightly hairy near tips. Stamen tube cylindrical, as long as corolla, with 6 tiny teeth & anthers in-between, anthers with long hairs, style 17 mm, ovary 1 mm with indistinct disc. **FRUIT** 5-8 cm, bright red or dull pinkish-yellow, hanging in **very long-stalked clusters** up to 70 cm, globose, splitting into 2-5 sections each with 1(2) glossy black seeds partly covered with an **orange coating** (aril).

NOTE scattered in moist evergreen forests.



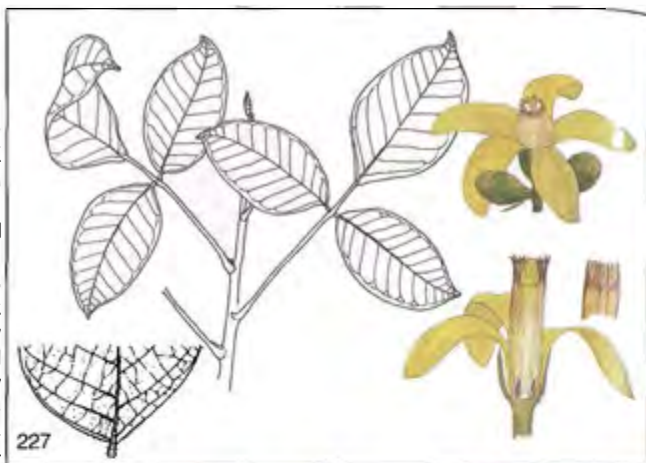
227 *Sandoricum koetjape*

กระพ่อน มะดิน



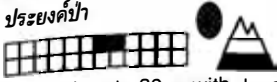
Semi-evergreen tree to 25 m with dense, narrowly oval crown. **BARK** pinkish-brown, smooth or peeling in thin, rounded flakes, inner bark pink. **LEAF** trifoliate, clustered near end of twigs, each leaflet 8-18 x 3.5-9 cm, broadly ovate, no teeth. Young leaves densely velvety, mature leaves dark green & smooth above, usually **softly hairy at least on veins below**. Old leaves bright red, turning only a few at a time, like an *Elaeocarpus*. Side leaflet stalks very short, end one 2.5-5 cm. **FLOWER** 1-1.8 cm, yellow or greenish, branched clusters in leaf axils, to 15 cm, densely-flowered, individual stalks very short, hairy. Calyx with 5 short lobes, densely hairy outside. 5 free, spreading petals, overlapping at base, minutely hairy, cylindrical stamen tube with 10 anthers attached on inside rim opposite minute teeth, single club-shaped style as long as stamen tube with 5 blunt stigma lobes, ovary covered by fringed disc, ± 1 mm. **FRUIT** 5-8 cm, dirty yellow, globose, notsplitting, velvety when young, often wrinkled when mature, thick-skinned, flesh with a **milky latex**, single large stone densely covered with long, matted hairs, 2-5 seeds each with a **translucent jelly-like coating**.

NOTE fairly common in moist evergreen forests, widely planted for its edible fruits.



228 *Aglaia lawii*

ประยงค์ป่า



Evergreen tree to 30 m with dense, rounded crown & slightly buttressed trunk. **BARK** pale brown or red-brown, flaking in large, thin, irregular pieces, inner bark pale orange with sparse white latex. **LEAF** 20-40 cm, trifoliate or odd-pinnate with 1-3 pairs of alternate or subopposite leaflets, 4-30 x 1.5-11.5 cm, narrowly ovate with tapering tip & blunt base, no teeth. Mature leaves dark green & shiny above, usually with **scattered tiny scales** below, especially near veins, often with a tuft of hairs in vein axils. Twigs slender with wavy ridges, densely covered with tiny scales. **FLOWER** 0.2-0.5 cm, pale yellow or orange, globose, slender branched clusters in upper leaf axils, to 20 cm long. 3-4(6) rounded petals, 3x as long as calyx, fused at base to stamen tube. Stamen tube globose, slightly shorter than corolla with 6-16 anthers attached to inside of tube. Stigma <1 mm, no style, ovary densely hairy or scaly. **FRUIT** 1.7-2.8 cm, clusters 3.5-15 cm long with up to 20 fruits, globose, pink or yellow, densely covered with tiny scales, eventually splitting into 3 sections, each with 1 dark brown seed partly covered with a red or white coating (aril), not edible.

NOTE locally common, restricted to less-disturbed forests.

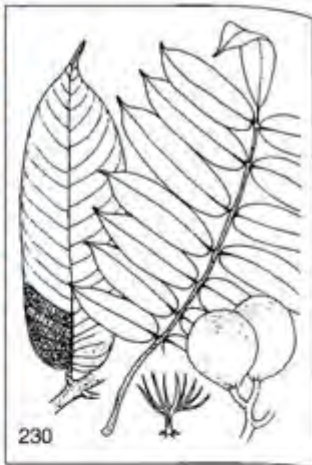
SIMILAR ²²⁹*A. chittadonga* twigs & lower surface of the leaflets densely & evenly covered with tiny pale brown scales. Flowers in shorter clusters, to 10 cm, usually with 5 petals & 7-10 stamens. Fruits ellipsoid, not splitting when mature, usually with only 2 sections, edible. Often growing together with *A. lawii*, not easily distinguished.



230 *Aglaia grandis*

LEAF odd-pinnate, clustered near end of stout twigs, 5-10 pairs of leaflets, 8.5-40 x 4-11 cm, narrowly tipped, leathery, dark green & smooth above, pale orange & **densely covered with very unusual tuft-like hairs below**. 14-36 pairs of straight, parallel side veins. **FLOWER** 5 blunt petals, 5 anthers, ovary & outside of calyx with tuft-like hairs. **FRUIT** 2-5 cm, greyish-yellow, narrowly elliptic or obovoid, densely covered with tuft-like hairs, 3 sections, each with 1 seed.

NOTE very rare, Chiang Rai Province, limestone at 1200 m.

231 *Aphanamixis polystachya*

ดาเลื่อ ตุ่มแดง



Evergreen tree to 25 m with dense, dark green crown. **BARK** reddish-brown, flaking, inner bark reddish or pale cream. **LEAF** 30-50(100) cm, pinnate, 3-7 pairs of opposite leaflets, usually plus an end one, 6-18 x 3-7 cm, abruptly tipped, oblique base, no teeth, mature leaves dark green & shiny above, **smooth or with scattered simple hairs below**, 11-12 pairs of side veins, Side leaflet stalks 4-10 mm. **FLOWER** 0.3-0.4 cm, pale yellow, globose, in long dangling clusters from or slightly above axils of upper leaves, unbranched (females) or branched (males). 3 petals, twice as long as calyx, **stamen tube globular**, not toothed, with 3-6 anthers near top. Style very short, ovary without disc. **FRUIT** 3.5-5 cm, pinkish-yellow, splitting into 2-3 sections each with 1-2 large dark brown seeds partly covered by a bright red coating (aril).

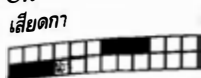
NOTE uncommon, restricted to less disturbed forests. The latex in the fruits is poisonous.

SIMILAR *Chisocheton siamensis*²²⁶ has flowers with cylindrical stamen tube & larger, heavier fruits, to 7 cm, hanging in very long-stalked clusters, up to 60 cm.



232 *Chukrasia tabularis*

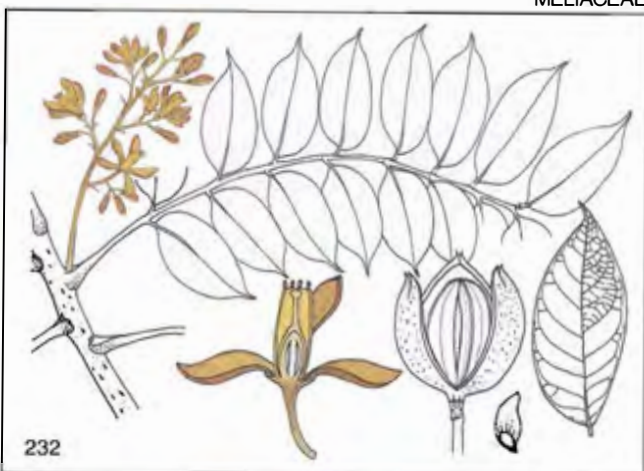
เสียดกา



Evergreen tree to 35 m. **BARK** dark brown, coarsely fissured, inner bark red. **LEAF** 30-85 cm, odd-pinnate (see note), (5)8-13 pairs of alternate or sub-opposite leaflets, 7-13X3-4.5 cm, narrowly ovate or oblong with tapering tips & oblique base, no teeth. Young leaves finely hairy, mature leaves **completely smooth**. 7-10 pairs of side veins. Leaflet stalks 0.3-0.5 cm, main stalk 7-11 cm. **FLOWER** 2.5-3 cm, pale yellow often tinged dull red outside, in spreading branched clusters at or slightly above upper leaf axils, sometimes appearing terminal, individual stalks 0.3 cm, **smooth**. Calyx 1-2 mm, densely brown-hairy, 4-5 narrow petals, 0.7 cm, curved backwards, minutely velvety. **Stamen tube cylindrical**, slightly narrower towards top with 10 anthers on flat or shallowly toothed rim. Ovary smooth, longer than style, surrounded by thin, cup-shaped disc. **FRUIT** to 4 cm, yellow-grey, slightly hairy when young, wrinkled when ripe, splitting into 3 sections, densely packed with **winged seeds**.

NOTE scattered in moist areas. Saplings & young trees often have bipinnate or even tripinnate leaves.

SIMILAR ²³³*C. velutina* ยมพิน deciduous tree to 25 m, mature leaflets with soft white hairs especially below. Flower 2-2.5 cm, stalks softly hairy, ovary shorter than style, softly hairy. Fruit 3 cm, black & shiny, globose with short tip. Common in dry semi-open areas. Considered by many botanists to be conspecific with *C. tabularis* but it is usually easy to distinguish in the field & occupies a very different habitat.



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234 *Toona ciliata*

မြန်မာ



Briefly deciduous tree to 40 m with narrow crown, steeply ascending branches & long, straight trunk with narrow buttresses when fully grown.

BARK grey-brown, vertically cracked, inner bark orange-brown, fibrous, **sweet smelling**. **LEAF** 35-50 cm, odd- or even-pinnate, 6-11 pairs of alternate or sub-opposite leaflets, 6.5-14.5 x 3-4.5 cm, narrowly ovate with tapering tip & asymmetric base, no teeth, completely smooth when mature. Leaflet stalks 0.6-1.5 cm.

FLOWER 0.5-0.8 cm, white, in much-branched clusters (thyrses) at leaf axils & along leafless twigs, usually shorter than leaves. 5 rounded sepals, ± 1 cm; 5 petals, ± 3 mm, fused at base to disc, **smooth inside** with thick triangular mark, hairy along edges. 5 free stamens attached to deeply lobed disc, bright orange-red & densely hairy. **FRUIT** 2.5-3 cm, dark brown or blackish with cream dots, thinly woody, **splitting into 5 sections but not falling apart**, seeds with a **papery wing at both ends**.

NOTE moist areas, a characteristic component of the emergent layer in moist evergreen forests. Easily recognised by the clusters of dry, star-shaped fruits which usually stay on the tree throughout the year.

SIMILAR ²³⁵*T. microcarpa* leaflets with rounded base & short, stout stalks. Flowers with petals hairy inside & pointed anthers. Fruits 1.8-2 cm.

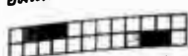
²³⁶*T. sureni* leaflets with pointed base. Flowers 0.3-0.4 cm, with petals hairy inside & notched anthers. Fruits 2.5-3 cm.

Many trees from our region seem intermediate between these 3 species & cannot be certainly ascribed to any of them. See also *Chukrasia*²³² & *Acrocarpus*³³²



237 *Trichilia connaroides*

ขี้เหล็ก



Partly deciduous tree to 10 m. **BARK** dark brown, shallowly cracked, inner bark white or pale pink. **LEAF** 18-40 cm, odd or even-pinnate, (3)4-6 pairs of opposite leaflets, 5-16 x 2-7 cm, narrowly ovate with tapering tip, no teeth. Young leaves red, mature leaves dark green, smooth & shiny above, grey-green (glaucous) below. Side leaflet stalks 0.3-1.5 cm, main stalks swollen at nodes, twigs dark chocolate-brown. **FLOWER** small, white, in spreading, flat-topped clusters at end of twigs & upper leaf axils, 20-50 cm. Calyx cup-shaped with 5 short lobes, 5(4) petals, 8-14 stamens, fused half way, anthers bright yellow, styles fused at base. **FRUIT** 1-1.5 cm, bright red (including stalks), globose or slightly 2-lobed with short nipple, thinly fleshy, splitting into 2 sections each with 1 dark brown seed almost entirely covered by a thin white jelly-like coating. **NOTE** uncommon, open areas in hill evergreen forest.



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OLACACEAE

170 species found throughout the tropics, 2 genera & 2 species in NT. Small evergreen trees without latex. Leaves simple, alternate, no teeth, widely spaced side veins, no stipules. Flowers bisexual, regular, calyx cup-shaped with 5 lobes, 5 petals, 5 stamens opposite petals, with disc.

238 *Schoepfia fragrans*

ขี้เหล็ก



Small evergreen tree to 5 m. **BARK** pale cream, deeply cracked, corky. **LEAF** 5-10 x 1.2-4 cm, simple, alternate, ± planar, narrowly elliptic or ovate with pointed tips, untoothed, dark green & shiny above, completely smooth. 3-7 pairs of irregularly spaced side veins, looped at margin, stalks ± 0.6 cm. **FLOWER** 0.6-0.8 cm, golden yellow, sweetly scented, bisexual, short unbranched clusters in leaf axils, individual stalks slender, 0.8-1.2 cm. Calyx ± 2 mm, cup-shaped with 5 blunt lobes, hairy >>



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OLACACEAE

along margin. Corolla tubular with 5 pointed lobes, curved sharply backwards at tips, tube with a tuft of hairs at the middle. 5 short stamens, fused to middle of corolla tube, single style slightly longer than corolla.

FRUIT ± 0.8 cm, green, globose with shallow ring around a tiny nipple at top, persistent calyx at base, thinly-fleshy with 1 thin stone. **NOTE** uncommon understory tree of hill evergreen forest.

239 *Anacolosia ilicoides*

กุ่มมะขาม



Small evergreen tree to 12 m with short trunk & slender, drooping branches.

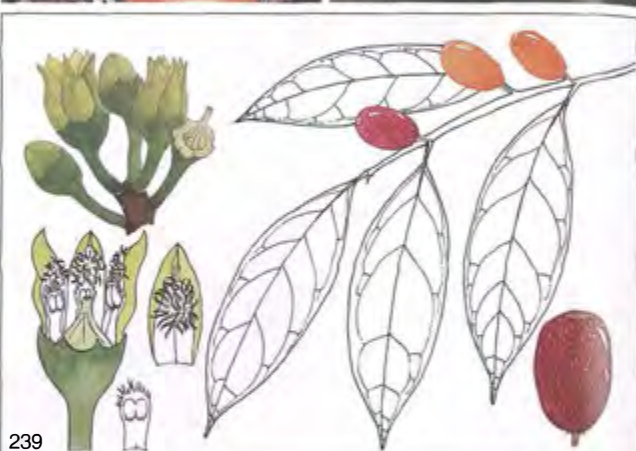
BARK pale creamy-brown, thin, smooth or shallowly cracked, inner bark cream, no latex or sap. **LEAF** 8-20 x 3-8 cm,

simple, alternate, more or less planar, oblong, pointed or blunt at both ends, untoothed, dark green & shiny above, completely smooth. 4-6(8) pairs of steeply curved side veins, stalks 0.5-2 cm.

FLOWER 3-4 mm, pale green, bisexual, very short unbranched clusters in leaf axils & behind leaves, 1-3 cm. Calyx 1 mm, cup-shaped with 5 shallow teeth, 5 free petals, not spreading, fleshy, densely hairy inside. 5 short stamens with 2 large glands, concealed in basal cavity of petals. Single short style with 3-lobed stigma, ovary fused with cup-shaped disc.

FRUIT 2-4 cm, red or orange with white spots, oblong, flat & slightly hollowed at the top, blunt with small persistent calyx at base, fleshy, 1 bony stone.

NOTE very common in shady areas of hill evergreen forest.



ICACINACEAE

Small but very variable family, 300 species throughout the tropics, 6 genera & 6 species in NT. Evergreen trees without latex, leaves simple, alternate or opposite, mostly spirally arranged, untoothed, usually with few, steeply curved side veins, no stipules. Flower calyx cup-shaped with 4-5 lobes, small but often persistent, 4-5 petals (rarely absent), usually not overlapping, always with **pointed tips that curve inwards**, 4-5 stamens, 1 style, ovary with or without disc. Fruit mostly small, thinly fleshy with single stone.

1. leaves without scales

2. flowers unisexual

3. filaments free, fruits 1.2-2 cm, without lateral appendage

*Gomphandra tetrandra*²⁴²

3. filaments fused to petals, fruits 3-4 cm

²⁴⁰*Gonocaryum lobbianum*

Tree to 7(15)m. Lvs alternate, 10-16x3-8 cm, smooth, stalks 1-1.5 cm

Fws 0.6 cm, pale green, clusters to 1.5(3) cm, short style, small stigma.

Fts purple-black, shallowly grooved with a cylindrical appendage at one side.

2. flowers bisexual

4. flowers without disc, fruits with a succulent lateral swelling,

leaves blackish when dry

*Apodytes dimidiata*²⁴³

4. flowers with disc, fruits without swelling, lvs not drying blackish

5. flower clusters at end of twigs

*Nothapodytes foetida*²⁴⁴

5. flower clusters in leaf axils

*Pittosporopsis kerrii*²⁴⁵

²⁴¹*Platea latifolia*

Tree to 30m, inner bark aromatic, bitter. Lvs 10-20x5-11cm, alternate-planar. Fws tiny, pale green, stalked, males with smooth petals, females without petals, large discoid stigma. Fts 2.5-4.5cm, yellow-orange, stone grooved. Rare, evg forests

242 *Gomphandra tetrandra*

1/8M



Tree to 10 m. **LEAF** alternate, 8-20 x 3-7 cm, long-tipped, thin, drying greenish, stalks 0.8-1.4 cm. **FLOWER** male & female on different trees, in short branched clusters at leaf axils. Petals free or fused at base, tips spreading (sometimes absent in females). Males with hairy stamens & inconspicuous disc, females with infertile stamens & large, slightly 4-5 lobed stigma without style. **FRUIT** 1.2-2 cm, yellow-green, shallowly ridged, flattened with raised ring at the top, tiny persistent calyx at base. **NOTE** locally common, shady areas



242



242

243 *Apodytes dimidiata*

หมากพิงคอง จ้าอ่อน



Small tree to 15 m. **BARK** dark brown, smooth, thin, inner bark pale orange. **LEAF** 6-16 x 3-6 cm, alternate, spiral, narrowly ovate or elliptic, more or less tapering at both ends, base often slightly asymmetric, thin, upper surface dark green & shiny with scattered minute hairs on veins, drying black. 6-10 pairs of steeply curved side veins, finer veins faint, stalks slender, 0.5-2.5 cm, twigs dark brown & shiny. **FLOWER** 0.6-0.8 cm, white, bisexual, open branched clusters (corymbs) at end of twigs & upper leaf axils, 3-15 cm. Calyx tiny, petals free or slightly fused at base, narrowly oblong, spreading. Stamens free, alternating with petals, large golden-brown anthers. Ovary with style attached on the side, more or less hairy, no disc. **FRUIT** 0.7-0.9 cm, bright green turning dark purple/black, kidney-shaped, flattened lengthways, with tiny persistent calyx & succulent, scarlet appendage at base, style scar on the side.

NOTE fairly common, shady areas in hill evergreen forest.



243



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244 *Nothapodytes foetida*

จันทน์ผา



Tree to 10 m. **LEAF** 8-18(26) x 4-9(15) cm, subopposite or alternate, clustered near end of twigs, upper surface dark green with minute translucent dots, smooth or with scattered hairs on veins, lower surface pale grey, densely covered with short, curly hairs. **FLOWER** ± 1 cm, white or pale yellow, bisexual, densely branched clusters (corymbs) at end of twigs, petals hairy inside, stamens surrounding cup-shaped disc. Fruit 1-1.5 cm, dark red or black, ellipsoid, blunt, sometimes shortly hairy.

NOTE crushed leaves, flowers & cut fruits with unpleasant smell. Rare.

245 *Pittosporopsis kerrii*

มะขาม



Shrub or small tree to 8 m. **BARK** dark brown with large lenticels, very thin, inner bark pale orange. **LEAF** 10-21 x 4-7 cm, alternate, narrowly oblong or obovate with abrupt tip & tapering base, completely smooth, dark green & glossy above, drying pale brown. 5-7 pairs of widely spaced side veins, steeply curved, margin thickened, vein-like, stalks 1.5-2 cm. **FLOWER** ± 1 cm, white or pale green, bisexual, dense head-like clusters in leaf axils, individual stalks < 0.2 cm, main stalks 1-2.5 cm. Calyx 1.5-2 mm, deeply lobed with spreading tips, hairy outside, petals free or fused at base, strap-shaped, pressed together into a narrow tube with spreading lobes, hairy when young. Stamens with broad filaments, abruptly narrowed below anthers, style with minute stigma, ovary fused to thin disc. **FRUIT** 2-2.5 cm, bright green turning yellowish, flattened at both ends, top with short point, base with enlarged calyx, stone smooth.

NOTE uncommon, shady areas in evergreen forests.

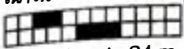


AQUIFOLIACEAE

420 species predominantly in the tropics, 1 genus & at least 3 species in NT.

246 *Ilex umbellulata*

เงาะใบ ไตรรัศมี



Evergreen tree to 24 m. **BARK** pale cream or grey-brown, thin, finely cracked, inner bark brown with pale streaks. **LEAF** 5-15 x 3-6 cm, simple, alternate, spiral, oblong or elliptic, blunt or slightly pointed at both ends, untoothed. Mature leaves completely smooth, dark green & glossy above. Stalks 1-1.8 cm, no stipules.

FLOWER white or pale green, regular, in dense head-like clusters at upper leaf axils or behind leaves, individual stalks <0.2 cm, main stalks 1.5-2.5 cm. Calyx 4-5 lobed, corolla tubular with 4-5 overlapping lobes. Males with stamens slightly adhering to corolla tube & alternating with the lobes, females with 4-6 sessile stigmas. **FRUIT** 0.6-0.8 cm, pale green turning bright red with yellow flesh, globose or ovoid with 4-8 grooves, persistent calyx at base, 4-8 hard stones. **NOTE** widespread but never common.

SIMILAR ²⁴⁷*I. godajam* deciduous tree with minute hairs on veins, leaf stalks & flower stalks, usually with tiny bract-like leaves at base of current year's growth. ²⁴⁸*I. englishii* evergreen tree, leaves with tapering tips & sharp teeth, completely smooth.

CELASTRACEAE

1100 species found throughout the world, 7 genera & 9 species in NT. Evergreen or deciduous trees without latex. Leaves simple, alternate or opposite, with or without teeth, usually without hairs, stipules small & falling early or absent. Flowers regular, calyx with 4-5 overlapping lobes, 4-5 petals, 4-5 stamens alternating with petals, usually with fleshy disc & 1 style with tiny stigma. Fruit woody or fleshy, usually splitting, seeds often with thin aril, rarely winged.



246



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1. leaves opposite
2. leaves not toothed
3. tree to 20m; fws with fleshy disc, petals 4-6mm; seeds winged
Lophopetalum wallichii ²⁵⁶
3. shrub; fws without disc, petals 2mm; seeds with orange aril
²⁴⁹*Microtropis pallens*
Euonymus ²⁵²
Glyptopetalum sclerocarpum ²⁵⁵
2. leaves toothed near top only
2. leaves toothed to base
1. leaves alternate/whorled
4. leaves not toothed, stalks swollen at top
²⁵⁰*Bhesa robusta*
tree to 23m; flowers in spikes with cup-like disc; fruits 2.5-3.8cm, 2 vertical grooves, 1-2 splits, seeds completely covered by yellow aril. Rare, evg forest
4. leaves serrate, stalks not swollen at top
5. tree to 25m, unarmed. fruits 3-6.5 cm, not splitting
seeds without aril
Siphonodon celastrineus ²⁵⁷
5. shrubs to 5m, thorny. fruits 0.8-1.5 cm, splitting into 3 sections
seeds with white aril
²⁵¹ *Maytenus*

CELASTRACEAE

²⁵²*Euonymus similis*

มะหากาหนิง



Small evergreen tree to 14 m. **BARK** thin, creamy-brown with narrow fissures. **LEAF** 8.5-14 x 3.5-6 cm, opposite, elliptic or ovate, narrowed at both ends with **scattered teeth near the top**, dark green & glossy above, no hairs. 7-11 pairs of side veins, joined at margin, raised above. Stalks 0.4-0.9 cm, narrow stipules, falling early but leaving distinct scar, twigs chocolate-brown, shiny. **FLOWER** 1.5-2.5 cm, greenish-white or pink, regularly forked clusters (dichasia) in upper leaf axils, up to 13 cm, individual stalks 0.4-1.2 cm. Sepals rounded, fringed, $< \frac{1}{2}$ as long as petals. Petals free, oblong, **fringed**, spreading. Stamens emerging from **large fleshy disc**, ovary completely covered by disc. **FRUIT** 1.5-2 cm, pink or red, club-shaped, 5-angled, thinly fleshy, splitting into 5 sections, each with 1 glossy black seed, partly covered by yellow/orange coat (aril). **NOTE** fairly common, shady areas **SIMILAR** ²⁵³*E. colonoides* tree to 13 m. Leaves 14-22 x 4.5-7.5 cm, shallowly toothed near top only, stalks to 1.5 cm, flower cream or pale yellow, fruits 1 cm (when dry).

²⁵⁴*E. mitratus* large shrub to 6 m. Leaves 7-15 x 2.5-5 cm, strongly toothed in upper $\frac{2}{3}$, twigs slightly squarish. Flowers smaller (0.5-0.7 cm when dry), yellow-green, stalks & axes very slender. Fruits 1.5 cm (dry), deeply 5-lobed, each lobe thin & pointed, with 2 seeds.

²⁵⁵*Glyptopetalum sclerocarpum*

ช้องนาง คู้ด้าง



Large shrub or small tree to 8 m. **LEAF** 12-22 x 5.5-8.5 cm, opposite, oblong with **fine teeth to base**, **lower surface with black dots**. **FLOWER** 0.8 cm, green-purple, forked clusters **just above** axils of current or fallen leaves, individual stalks slender, 1.5-2.5 cm. Calyx lobes rounded, inner pair larger. Petals rounded, fleshy. >>



3 stamens with sessile anthers surrounding flat, fleshy disc, 1 stigma without style. **FRUIT** ± 1.2 cm, green, globose, roughly warty, $\pm$ slightly 2-lobed, 2 splits, seed with red coating (aril).

NOTE uncommon moist shady areas <1000m.

256 *Lophopetalum wallichii*

เสม็ดทุ่ง เนื้อเหนียว



Deciduous tree to 20 m. **BARK** pale grey, quite smooth, **inner bark dark red-purple**. **LEAF** 7-16 x 4-7 cm, opposite, long-tipped, no teeth, completely smooth, dark green & glossy above, paler (glaucous) below, stalks 1.5-1.8 cm. **FLOWER** 0.4-0.6 cm, pale green, branched clusters at end of twigs & leaf axils, to 12 cm, individual stalks 0.2-0.3 cm. 5 rounded petals, 5 curved stamens emerging from lobed disc, ovary dark red-purple. **FRUIT** 8-10 cm, globose, angular, woody, 3(4) splits, seeds winged.

NOTE fairly common, deciduous forests.



257 *Siphonodon celastrius*

มะดูก



Evergreen tree to 25 m. **BARK** dark grey-brown, smooth or slightly scaly, inner bark yellow. **LEAF** 8-20 x 3.5-8 cm, alternate, **finely toothed**, glossy dark green above, minutely hairy below, stalks 0.8-1.3 cm. **FLOWER** 0.4-0.6 cm, yellow-orange, short clusters of 1-3 on single main stalk, 5 petals with blunt, spreading tips, 5 stamens fused near base & curving inwards, ovary half-covered by disc, **hollowed at the top**. **FRUIT** 3-6.5 cm, orange, globose or obovoid, hollowed at the top, tough, **not splitting**, many hard seeds (pyrenes).

NOTE scattered in less-disturbed forests.



RHAMNACEAE

900 species worldwide, concentrated in arid regions, 2 genera & 4 species in NT.

258 *Ziziphus rugosa* var. *rugosa*

มะขวิด



Straggly deciduous shrub or small tree to 6 m, **armed with individual curved spines**. **LEAF** simple, alternate, planar, 5-15 x 3-7.5 cm, broadly ovate or oval with slightly pointed or blunt tip & oblique, rounded or heart-shaped base, usually finely toothed, rarely untoothed. Young shoots densely covered with pale orange-brown hairs, persisting on lower surface of mature leaves. 3-5 main veins, stalks 0.3-1.5 cm. **FLOWER** ±0.6 cm, pale yellow or greenish, branched clusters with a **distinct common stalk** in axils of upper leaves & at ends of twigs, to 20 cm. Calyx with 5 triangular lobes, ridged inside, densely hairy, **no petals**. 5 stamens surrounding a flat disc, 2 styles, fused at least halfway. **FRUIT** 0.8-1.5 cm, yellow or pale orange, globose or pear-shaped, densely covered with pale brown hairs, thinly-fleshy, stone with 1(2) seeds.

NOTE common & widespread, usually in dry, semi-open areas.

SIMILAR 3 other species, all with much smaller flower clusters, never at end of twigs & 5 short petals.

259 *Z. incurva* **คางคก** large shrub or tree to 20 m, usually without thorns, inner bark dark red. Leaves 5-10 cm, pointed tips, blunt teeth, sparsely hairy. Flower clusters with short common stalks, 0.5(1.5) cm. Fts red-brown. Locally common, rocky areas >1500 m. 260 *Z. nummularia* shrub with thorns in pairs, one much shorter than the other, curved sharply backwards. Leaves 0.8-4.5 cm, circular or oval, rounded both ends, dense pale brown hairs below. Flower clusters without common stalks. Dry areas.

261 *Z. mauritiana* **พุดรายวัน** small tree, usually with thorns in pairs, both straight or one curved. Leaves 1.8-6.2 cm, circular or broadly ovate, dense pale brown or white hairs below. Flower clusters without common stalks. Fruits 1.2-1.8 cm, smooth, edible. Cultivated & often naturalized in NT.



SAPINDACEAE

Large, almost exclusively tropical family, 1450 species worldwide, 11 genera & at least 13 species in NT.

Botany mostly evergreen trees without latex, leaves alternate, spirally arranged, typically **even-pinnate with a minute point at the end of the leaf axis (rachis)**, often with glands or domatia, base of leaf stalk usually swollen with a pit or groove which continues down the stem, no stipules. Flowers inconspicuous, often rather lopsided, typically with 5 sepals, 5 free petals (rarely none), often smaller than sepals, usually with 1 or 2 hairy scales at base, 5 - 8 stamens, frequently surrounded by ring-like disc, ovary superior, usually 3-locular. Many species have both bisexual & male only flowers, either in the same cluster or on different trees. Fruit very variable, mostly capsules or drupes, often 3-lobed & angled but frequently only 1 lobe developing, splitting or not, seeds often covered by fleshy layer (arillode or sarcotesta).

Uses well known for its fruit trees - Lamyai, Litchi & Rambutan. The name of family refers to the chemical saponin which is found in many of the species & is traditionally used as a soap.

1. leaflets toothed
2. leaves trifoliate; no pseudostipules; shrub to 5m ²⁶² *Allophyllus cobbe*
leaflets smooth or softly hairy, stalks very short. Fw 0.5 cm, white or pale yellow, spike-like clusters in upper leaf axils, 4 minute petals with hairy scale, 8 stamens, stigma lobed. Fruit 0.5-1.3 cm, red-orange, leathery, lobed, (often only 1 developing), smooth, seeds without fleshy layer (aril).
2. leaves pinnate, leafy pseudostipules; large tree *Pometia pinnata* ²⁶⁶
1. leaflets untoothed
3. fruits winged *Arfeuillea arborescens* ²⁷⁴
3. fruits not winged
4. fruits spiny or warty; seeds with fleshy layer
5. fruits spiny (like Rambutan)
6. seeds fibrous & dull under fleshy layer *Nephelium* spp.
6. seeds smooth & shiny under fleshy layer
4 pairs of leaflets, hairy below; fw clusters axillary, unbranched, to 32 cm, 5 equal sepals, 4 petals > sepals, with bi-lobed scale, 8-9 hairy stamens with red anthers disc horse-shoe shaped; fts 3.5-4 cm, splitting ²⁶³ *Sisyrolepsis muricata*
5. fruits warty (like Litchi or Lamyai)
7. seeds fibrous & dull under fleshy layer
tree to 25m. 1-2 pairs of leaflets, 8-30x3.5-12 cm smooth or slightly hairy; fws small, green, dioecious; 4 petals 1-3 mm, narrow at base; 6-8 stamens, 1.5-4 mm, usually hairy, fleshy ring-like disc; fts 1.8-5 cm, often lobed, stalks distinctly swollen, 5-7 mm thick. ²⁶⁴ *Xerospermum noronhianum*
7. seeds smooth & shiny under fleshy layer
8. fruits finely warty, yellow-brown *Dimocarpus longan* ²⁷⁰
8. fruits strongly warty, pink *Litchi chinensis* ²⁷¹
5. fruits not warty or spiny
9. seeds at least $\frac{2}{3}$ covered by fleshy layer (arillode)
10. fts yellow-brown, globose, not lobed, not splitting, arilloid white *Schleichera oleosa* ²⁶⁹
10. fts orange-red, 2-lobed, splitting, arilloid orange-red
11. sepals 3-6mm; fts smooth/hairy inside *Harpullia cupanioides* ²⁶⁸
11. sepals ≤ 3 mm; fts with line of hairs inside ²⁶⁵ *Arytera littoralis*
small evg tree. 2-3 pairs of leaflets; fws pale yellow, 5 petals, 0.8-2.5 mm narrow at base, each with 2 scales. 6-8(10) stamens, slightly hairy, much longer than petals; fts 0.7-3.6 cm, hairy around joint inside, 1 seed
10. fts dark purple(red), pear-shaped, slightly 3-angled, splitting *Mischocarpus pentapetalus* ²⁷⁶
9. seeds with fleshy ring at base only, *Harpullia arborea* ²⁶⁷
9. seeds without fleshy layer or ring
12. 1-6(11) pairs of leaflets, usually >4 cm wide *Lepisanthes* ²⁷²
12. 7-15 pairs of leaflets, 2-4 cm wide *Sapindus rarak* ²⁷⁵



266 *Pometia pinnata*

แดงน้ำ



Evergreen tree to 30 m with rather uneven, open crown & slightly buttressed trunk. **BARK** orange-brown, quite smooth, often flaking in thin scales, inner bark pale orange with **red sap**. **LEAF** 30-70 cm, even-pinnate, 4-10 pairs, 6-26 x 3.5-9 cm, narrowly ovate or lanceolate with pointed tip & blunt or heart-shaped base, often asymmetric. 11-26 pairs of prominent side veins, every **alternate one running straight to margin & ending in a distinct tooth**. Young leaves reddish-pink with dense golden-brown hairs, mature leaves bright green with scattered red-brown hairs especially on veins & stalks. Leaflet stalks 0.1-0.4 cm. Lowest pair of leaflets much smaller, 1.2-3 cm, rounded or ear-shaped, **clasp twig like stipules**. Twigs thick with large leaf scars. **FLOWER** 0.3-0.4 cm, orange-green, branched catkin-like clusters hanging from upper leaf axils, to 60 cm, individual flowers on stout, curved stalk, hanging upside down like tiny lanterns. 4-5 triangular sepals, fused at base, hairy outside, 4-5 minute green petals shorter than sepals, 5-6 orange-red stamens, 2-3 mm, single slender style, much longer than all other parts, ovary 2-lobed, densely hairy, surrounded by smooth, deeply lobed yellow disc. **FRUIT** 1.2-3 cm, bright red, finally black, globular, smooth, thick-skinned, not splitting, single large seed more or less covered by thin, yellowish or translucent coat (ariloid).

NOTE restricted range but locally common, moist areas.

SIMILAR *Markhamia stipulata*⁶¹⁵ is the only other species in NT with toothed, pinnate leaves & stipule-like basal leaflets but it has an unpaired end leaflet, very large flowers & long pod-like fruits.



267 *Harpullia arborea*

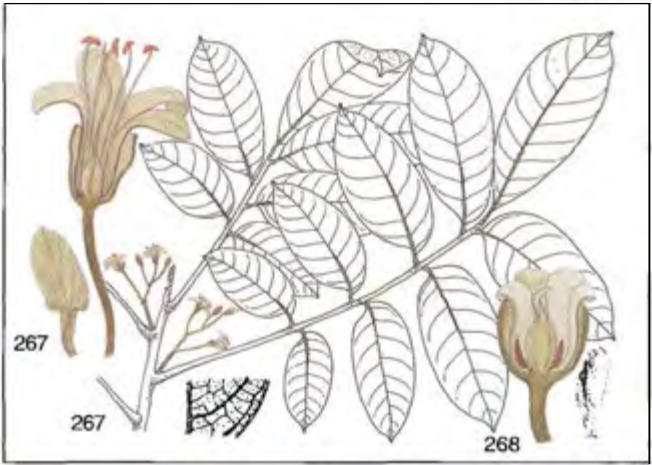
Evergreen tree to 20(33) m, trunk slightly fluted at base. **BARK** cream or grey, smooth or slightly wrinkled. **LEAF** 20-35 cm, pinnate, 2-6 pairs of leaflets, 8-21 x 3-7 cm, narrowly ovate or elliptic with tapering or slightly pointed tips & asymmetric base, no teeth. Young shoots densely golden-brown hairy, mature leaves nearly smooth to densely hairy, **usually with scattered brown hairs at least on midvein above**. Leaflet stalks 0.3-0.8 cm, main stalk 7-12 cm. **FLOWER** 1.1-1.8 cm, yellow-green, branched clusters in leaf axils or behind leaves on old twigs, 10-30 cm, stalks with red-brown hairs. 5 equal sepals, 5-10 mm, 5 free petals, narrowed at the base with "ears", usually hairy especially along margin. 5(7) stamens, 2-4 styles with minute stigmas, dischairy. **FRUIT** 3-6.5 cm, bright orange-red, deeply lobed, lobes broader than high, usually without calyx, splitting into 2 sections each containing 2(1) glossy black seeds with **fleshy orange ring at base**. Stalks 1.2-3(6) cm, clusters to 35(60) cm.

NOTE widespread, locally common in less-disturbed forests < 1000 m.

268 *Harpullia cupanioides*

Similar to *H. arborea* but mature leaves usually completely smooth, sometimes with very scattered hairs below. **FLOWER** in narrower clusters at vein axils or just behind end of twigs, to 85 cm. Sepals 3-7 mm, petals smooth, not narrowed or "eared" at base. **FRUIT** 1.2-3.5 cm, always with persistent calyx, each lobe higher than wide & with only 1 seed which is completely covered by orange-red coat, stalks 0.3-1 cm.

NOTE range & habitat as *H. arborea*, often found together.



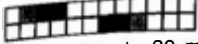
Deciduous tree to 25 m with irregular crown, short trunk & large, spreading branches. **BARK** creamy-brown, slightly flaking, becoming dark grey & more or less deeply cracked with age, inner bark cream or pink, turning brownish when cut. **LEAF** 25-46 cm, odd- or even-pinnate, 1-4 pairs of opposite leaflets, with or without an end one, upper pairs much larger, 7-30 x 4-11 cm, oval or broadly obovate with short tip (rarely notched) & blunt or rounded base, usually slightly asymmetric, no teeth. Young leaves silky-hairy, **dark red-purple**, quickly changing to pale green, mature leaves thin, completely smooth or with hairy glands (domatia) in vein axils below. 10-21 pairs of side veins, not joined or joined near apex only. Leaflet stalks 0.1-0.2 cm, main stalks 5-17 cm. **FLOWER** ± 0.5 cm, pale green or yellow-green, slender branched or unbranched clusters in leaf axils, to 19 cm. Individual stalks ± 0.3 cm. 4-6 triangular sepals, subequal, white-hairy outside, **no petals**. 5-9 slender stamens, 2-3x longer than calyx, usually slightly hairy, disc thin & wavy but not broken, stigma 3-4 lobed. Bisexual & male flowers usually on different trees. **FRUIT** 1.5-2.5 cm, bright green, turning brownish, globose with short tip, not lobed, smooth or with a few soft points, thin-skinned, not splitting. 1-2 brown seeds covered with thin pale yellow or translucent jelly-like coat (sarcotesta).

NOTE very common throughout NT, sometimes subdominant in dry deciduous forests, frequently associated with bamboo. Fruits edible.



270 *Dimocarpus longan*

ลำไยป่า



Evergreen tree to 30 m with very dense, rounded crown. **BARK** smooth or slightly flaking. **LEAF** 28-50 cm, even-pinnate, 2-4(6) pairs of leaflets, 9-18 x 3.2-6 cm, more or less pointed at both ends, base often asymmetric, no teeth, glossy dark green above, paler below, usually with flat, dark glands in vein axils, completely smooth or with scattered minute tufted hairs especially on veins. 14-17 pairs of side veins, not joined, leaflet stalks (0.2)0.4-0.5 (1.0) cm, twigs slightly **grooved**.

FLOWER yellow/brown, in large branched clusters at end of twigs, 8-40 cm, stalks densely hairy. 5 equal sepals 2-5 mm, overlapping, fused at base. 5 petals, 1.5-6 mm, usually almost smooth outside, sparsely wooly inside, no scales. 8-10 stamens, surrounded by flat hairy ring-like disc, not broken, stigma 2-lobed, ovary slightly warty. **FRUIT** 1.2-2.5 cm, brown or yellowish, globular, **warty** (see photo), not splitting, single large glossy dark brown seed with fleshy translucent covering (aril).

NOTE fairly common in fire-free forests, cultivated everywhere for its delicious fruits. Wild trees are spp.

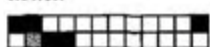
longan var. **longan** which has leaves with flat midvein & raised side veins, flowers with reduced petals. The fruits of wild trees are slightly smaller & more warty than the cultivated varieties, but equally delicious!

SIMILAR 271 *Litchi chinensis* ลิ้นจี่ glossy green leaves without glands, sometimes with 2-branched hairs (papillae) below. Flower white or cream, no petals. Fruits pink, slightly warty. Reputed to be native to NT, widely cultivated.



272 *Lepisanthes rubiginosa*

มะพื่อ

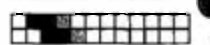


Deciduous shrub or small tree. **LEAF** usually even-pinnate, sometimes odd-pinnate, (2)3-6(9) pairs of leaflets, 3-31x1.5-11 cm, shape very variable, no teeth, more or less woolly-hairy at least below, **FLOWER** white, unisexual, branched clusters (thyrses) at end of twigs & upper leaf axils, to 50 cm. 5 rounded sepals, outer pair smaller, silky outside, 4(5) petals, narrowed at base, usually hairy with single scale with 2 crests. 8 stamens, filaments hairy, style long, smooth. **FRUIT** dark purple or black, deeply lobed when fully mature, smooth both sides, seeds without fleshy covering. **NOTE** common & widespread, usually in open areas.

SIMILAR 273 *L. tetraphylla* มะเฟืองช้าง evergreen tree to 22 m, (1)2-10 pairs of leaflets, 5-55x2-20 cm, mainly elliptic with blunt or pointed tip & rounded or slightly heart-shaped base, completely smooth or silky-hairy. Flower petals, 3-10 mm, obovate, much narrower at the base, usually silky-hairy with 2 scales.

274 *Arfeuillea arborescens*

คางเคียด ช้างเผือก



Tree to 20 m. **LEAF** even-pinnate, 1-4 pairs of leaflets, 3-10x2-5.5 cm, untoothed, veins all joined, tiny star-shaped hairs below, no glands. **FLOWER** red-green, branched clusters in leaf axils or pseudoterminal, to 19 cm. 5 sepals, >5 mm, 2-4 petals, 2.5-4 mm, no scales, 6-9 stamens, filaments smooth, stigma not lobed, ovary smooth, disc flat & separate from petals. **FRUIT** 2-5.5 cm, winged capsule, smooth both sides, seed hairy, without fleshy coating.

NOTE Lampang southwards, sometimes planted.



275 *Sapindus rarak*

มะคำดีควาย



Evergreen or partly deciduous tree to 35 m. **LEAF** 7-15 pairs of leaflets, 4.5-12 x 2-4 cm, sometimes slightly curved, completely smooth, leaflet stalks 0.2-0.6 cm. **FLOWER** ± 0.5 cm, branched clusters at end of twigs, 15-35 cm. 4 petals (**absent fifth petal leaving an obvious gap**), 3-4 mm, outside densely hairy esp. along margin, inside with hairy, **2-lobed scale**. 8 stamens, slightly longer than petals, hairy at base, disc smooth, horseshoe-shaped. **FRUIT** 1.5-3 cm, yellow-brown, smooth, leathery, 3-lobed but often only 1 developing, each lobe with a large black seed enclosed in a hard shell which is **hairy near attachment of seed** (placenta) inside.

NOTE widespread but not usually common.

276 *Michocarpus pentapetalus*

ไม้เกือกคอง



Evergreen tree to 14 m. **BARK** dark brown or creamy brown, quite smooth, thin, inner bark cream or pink. **LEAF** 45-55 cm, even-pinnate, 2-4 pairs of leaflets, 13-26 x 3.5-6.5 cm, **narrowly elliptic or lanceolate**, tapering at both ends, no teeth, dark green above, grey-green below, completely smooth. 8-15 pairs of steeply curved side veins, not joined, leaflet stalks 0.6-1.5 cm, **main stalks** 6-9 cm. **FLOWER** 0.8-1 cm, greenish-white, spiky, branched clusters at ends of twigs, 12-15 cm, individual stalks short. 5 petals with scale. Stamens much longer than petals, widely spreading. **FRUIT** 1.2-1.5 cm, dark green turning dark purple-brown, obovoid, slightly 3-lobed, leathery, splitting in 2 or 3 sections each with single shiny dark red-brown seed completely covered by a thin orange or pink coating (arillode).

NOTE widespread, locally common.

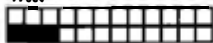


ACERACEAE maple family

Small family centered in E. Asia, 111 species worldwide, 1 genus & 6 species in NT.

277 *Acer laurinum*

กุ่ม



Large semi-evergreen tree to 40 m with dense crown & long straight trunk, often slightly buttressed. **BARK** red-brown, becoming scaly with age.

LEAF simple, opposite, 7-20 x 3-6 cm, ovate or elliptic with pointed tip & blunt or rounded base, **not lobed** or toothed, dark green above, **whitish-grey below**. 3-5 basal veins, stalks slender, 2-7.5 cm. **Flower** ±0.5 cm, white, regular, short branched or unbranched clusters in **axils of fallen leaves**. 5 sepals, 5 petals, male flowers with 5-8 stamens on a flat disc, females with reduced sterile stamens, 2 styles & woolly ovary. **FRUIT** 3.5-7.5 cm, winged, in pairs but often falling separately, pale pink when young. **Nuts flattened, not angular, locules smooth inside.**

NOTE common on Doi Intanon, very scattered elsewhere, restricted to undisturbed evergreen forests.

SIMILAR 2 other species with unlobed leaves but flowers on leafy shoots at ends of twigs & fruits with angular nuts. 278 *A. oblongum* กุ่ม leaves oblong, fruit wings 2-4 cm, locules densely hairy, inside. Scattered in less-disturbed forests

279 *A. chiangdaoense* กุ่มเชียงดาว leaves broadly ovate, fruit wings 1.4-1.8 cm, locules smooth & glossy inside. Endemic to N. Thailand, known only from limestone areas on Doi Chiang Dao & Doi Tung.

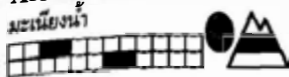
3 species with lobed leaves:

280 *A. thomsonii* leaf stalks 6-14 cm, flowers axillary, fruits with 2 ± parallel wings, 4.5-7 cm. 281 *A. wilsonii* leaf stalks 4-6.4 cm, old leaves yellow, flowers in drooping terminal thyrses, 10-23 cm, fruits with 2 horizontal wings. 282 *A. calcaratum* กุ่มแดง leaf stalks 1.5-4.6 cm, old leaves red, flowers in upright terminal corymbs, 2.4-5.6 cm, fruits with only 1 well-developed wing.



HIPPOCASTANACEAE

15 species worldwide, mostly N. temperate, only 1 species in NT.

283 *Aesculus assamica*

Evergreen tree to 20 m. **BARK** pale greyish, smooth with large lenticels. **LEAF** opposite, digitate, 6-7 leaflets, 12-35x5-12 cm, narrowly obovate with abrupt tip & tapering base, finely toothed. Mature leaves bright green, rather shiny, completely smooth. Main stalks 17-27 cm, pinkish, leaflets without stalks. **FLOWER** 2.5-3 cm, white tinged pink or yellow in centre, in narrow branched clusters (thyrses) at end of twigs, to 70 cm, stalks velvety. 4 unequal petals, narrow at the base, 7 stamens, much longer than petals (3-4 cm), 1 style. **FRUIT** 2.5-3.5 cm, brown, smooth, not spiny, leathery, splitting into 3 sections with 1-3 large seeds. **SIMILAR** *Vitex* spp.⁶³⁷ are the only other native trees in NT with opposite digitate leaves. **NOTE** uncommon in less-disturbed forests.



BRETSCHNEIDERACEAE

Only one species in the world, confined to S. China, Vietnam & NT.

284 *Bretschneidera sinensis*

Tree to 25 m. **BARK** pale grey, smooth. **LEAF** alternate, odd-pinnate, 4-8 pairs of opposite leaflets, 8-25 x 2.5-6 cm, narrowly ovate or oblong with long tapering tip & oblique base, untoothed. Mature leaves smooth or slightly hairy along midrib, pale grey below. **FLOWER** 3.5-4 cm, bright pink, unbranched clusters at end of twigs, to 40 cm. 5 rounded petals, much narrower at the base. 8 stamens, 2.5-3 cm, close together in one group, curved downwards, 1 style, 3.5-4 cm. **FRUIT** 4 cm, elliptic, narrow at both ends, splitting into 3 sections, 1-2 seeds in each section.

NOTE only known from Doi Phu Kha, Nan province.



STAPHYLEACEAE

Small tropical family with 60 species worldwide, 1 genus & 2 species in NT.

285 *Turpinia pomifera*

ਅੰਗਰੇਜ਼ੀ ਨਾਮ



Small evergreen tree to 13 m with irregular crown & short trunk. **BARK** creamy-brown, smooth, becoming dark brown & cracked near base with age. **LEAF** odd-pinnate, rarely trifoliate, opposite in 2 rows (decussate), 2-3(4) pairs of opposite leaflets, 8.5-20 x 3.5-7 cm, oblong, **abruptly tipped, irregularly & often sharply toothed**, completely smooth, dark green & glossy above. 5-10 pairs of steeply curved side veins. Side leaflet stalks 0.3-1 cm, end one much longer. Stipules triangular, falling early but leaving a distinct scar. **FLOWER** 0.6-0.8 cm, greenish-white, branched clusters in upper leaf axils & at ends of twigs, **shorter than leaves**. 5 sepals, outer ones broader, 5 overlapping petals, hairy along margins, 5 stamens with flattened filaments & short anthers surrounding a lobed disc. **3 styles, pressed together but not fused** except at the tips. **FRUIT** 2-4.5 cm, pale yellowish-green, juicy, globose or irregularly lumpy, often with **3 short points (styles) at the top which are sometimes joined together in a fine ridge**. 1-5 seeds (pyrenes), angular, shiny, golden brown.

NOTE very common understory tree in both evergreen & deciduous forests, 350-1700 m. Leaf & flower stalks sometimes tinged dark red or purple.

SIMILAR ²⁸⁶*T. nepalensis* leaflets 7.5-13x3-5 cm, narrowly ovate with tapering tip, more regularly toothed. Flowers <0.4 cm, in larger clusters at least as long as the leaves, stalks & axes slender. Fruit 0.6-1.5 cm, thinly fleshy. Less common, usually in hill evergreen forest >1000 m.



285



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SABIACEAE

Small tropical family, 80 species worldwide, 1 genus & 2 species in NT.

287 *Meliosma simplicifolia*ssp. *fordii* เตือทูลาว

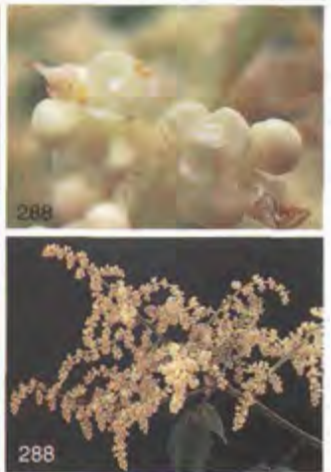
Small evergreen tree to 15 m with irregular crown & short trunk. **BARK** smooth, pale grey or cream-brown. **LEAF** simple, alternate, 7-30 x 3-10 cm, narrowly obovate or oblanceolate with blunt or slightly pointed tip, untoothed or with a few scattered teeth, smooth or with scattered short hairs especially on veins below. **FLOWER** 0.5-0.8 cm, buds 0.15-0.2 cm, white or cream, profusely branched clusters at end of twigs & upper leaf axils, often with small leaves in axils of lower side branches, 10-40 cm. 5 fleshy petal outer 3 larger & rounded, **inner 2 deeply split into 2 narrow, pointed lobes**. 2 fertile & 3 sterile stamens, 1 short style with minute stigma, ovary surrounded by a thin, 3-lobed disc. The stamens fall off soon after opening, so most flowers appear to be female. **FRUIT** 0.3-0.5 cm, green, globose, **not oblique, sometimes with a faint ridge & fine network of veins, eventually splitting open, thinly fleshy with a single hard stone.**

NOTE common, usually in moist, shady areas.

SIMILAR spp. *simplicifolia* leaves to 50x18 cm, often with domatia in vein axils. Fruits usually oblique, nearly triangular in cross-section, always with a pronounced ridge. Intermediate forms also occur.

288 *M. pinnata* spp. *arnottiana*

พะยอมดง evergreen tree to 20 m, leaves odd-pinnate, 3-7 pair of (sub)opposite leaflets, 8-16 x 3-5 cm, with or without teeth, smooth or slightly hairy, often with dark brown glands in vein axils. Fruit globose, usually with distinct ridge. Widespread, locally common >1000 m.



ANACARDIACEAE

875 species worldwide, mostly confined to tropical rainforests & centered in Indonesia. 12 genera & at least 23 species in NT.

BOTANY evergreen or briefly deciduous trees, often with **clear or rarely white sap which smells of turpentine & turns black on exposure to air**. Leaves simple or odd-pinnate, alternate (except *Bouea*), spirally arranged, mostly untoothed, stalks usually swollen at the base, without stipules. Young leaves often violet or red-brown. Flowers small, regular, bisexual or unisexual, usually in branched clusters crowded near end of twigs, individual stalks often jointed. Calyx 4 or 5-toothed, 4-5 free petals, often curved backwards. Stamens free or rarely fused at base, 1-2X times as many as petals, usually **attached under the outside margin of a ring-like disc**, 1-3 (5) styles, superior ovary (except *Holigarna*, *Drimycarpus*). Fruit not splitting, leathery or fleshy, often mango-shaped with a large, hard stone.

SIMILAR *Meliaceae* very rarely have sap & usually have flowers with stamens fused into a tube. *Burseraceae* have stipules & never have sap.

ECOLOGY a common feature of both moist & dry lowland forests in NT but rarely found above 1000 m.

USES best known for its fruit trees - mango, cashew nut, pistachio nut. The sap of some species was traditionally used as a varnish & as a potter's glaze. The heartwood is sometimes hard & durable but many people are allergic to the timber so it is not widely used.

CAUTION! Several of our common species produce a toxic sap which causes severe skin complaints in many people (see *Semecarpus*, *Gluta*, *Rhus*)

1. simple leaves

2. opposite leaves

²⁸⁹ *Bouea oppositifolia*

Leaf 7-12(25)x3-6 cm, smooth, young leaves violet, buds pointed, scaly. Fws 0.2-0.3 cm, pale yellow or green, male/bisexual, 3-5 sepals, slightly hairy, 3-5 petals with ridge outside, 3-5 short stamens, all fertile, disc flat, short style. Fruit 2.5-5 cm, yellow or pink, smooth, stone fibrous, thin-walled, 1 seed.

2. alternate leaves

3. >20 stamens; fruits winged

Gluta usitata ³⁰¹

3. 10 stamens, all fertile; fruits <2 cm, no wings

Buchanania ²⁹⁶

3. 1-5 stamens, often not all fertile; fruits >2 cm, no wings

4. mature leaves completely smooth

5. leaves with marginal vein, ovary inferior.

lvs 10-30 cm, margin strongly wavy; leaf stalks 1.2cm, deeply grooved; fws small, green-white, polygamous, 5 short stamens, disc broad, style very short; fts 2-2.5 cm, obliquely oval, red, crowned with remaining floral parts

²⁹⁰ *Drimycarpus racemosus*

5. leaves without marginal vein, ovary superior

6. calyx with 4-5 teeth, 1-5 stamens, style at top of ovary

Fts mango-like, fleshy

Mangifera ²⁹²

6. calyx split on one side, 5 stamens, style at side of ovary

Fts globose, thinly-fleshy, 5 petals at base *Gluta obovata* ³⁰⁰

4. mature leaves finely hairy, at least on veins below

7. leaf stalks with spur-like appendages at base, ovary inferior

lvs 15-25x4-6cm, glaucous & hairy below; fws minute, polygamous, pale green, axes densely brown-hairy, individual fws without stalks, petals not overlapping, disc smooth, 3 styles

²⁹¹ *Holigarna kurzii*

7. leaf stalks without basal appendages, ovary superior

fts with fleshy orange covering *Semecarpus cochinchinensis* ³⁰²

1. pinnate leaves

8. leaflets toothed, at least when young

9. leaf stalks with leafy ridges or wings, leaflets roughly hairy, small tree

fws white, large terminal clusters, 4-5 stamens *Rhus chinensis* ³⁰³

9. leaf stalks not ridged or winged, leaflets smooth, large tree

fws red-purple, axillary, 8-10 stamens *Choreospondias axillaris* ³⁰⁶

8. leaflets without teeth

10. 3-5(6) pairs of leaflets

11. leaflets with distinct marginal vein

Spondias pinnata ³⁰⁷

11. leaflets without marginal vein

12. leaves without hairs, old leaves red

bark with toxic black sap *Rhus rhesoides* & *succedanea* ³⁰⁴

12. leaves with star-shaped hairs at least when young,

old lvs yellow, bark with clear sap *Lannea coromandelica* ³⁰⁹

10. (6)-12 pairs of leaflets

13. leaflets with tufts of hairs in vein axils, large tree with buttresses

Fts 4-5 cm, hard stone with 5 holes at top *Dracontomelon dao* ³¹⁰

13. leaflets without tufts of hairs in vein axils, trunk not buttressed

14. leaflets slightly hairy on veins below, no glands

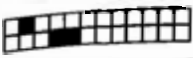
8-10 stamens, red disc; fts pink; sap clear *Spondias lakonensis* ³⁰⁸

14. leaflets smooth, with dark brown glands in vein axils

4-5 stamens; fts yellow-brown; sap black *Rhus succedanea* ³⁰⁴

292 *Mangifera sylvatica*

มะม่วงขี้ใต้



Evergreen tree to 27 m with dense, oval crown & long, straight trunk.

BARK dark brown or grey-brown, more or less irregularly cracked, inner bark pale brown with clear sap. **LEAF** 14-30 x 4-7 cm, simple, spiral, lanceolate, pointed at both ends, no teeth, completely smooth, dark green & shiny above, 16-24 pairs of **thin side veins**, strongly curved & almost parallel, joined at margin, finer veins ladder-like, rather widely spaced, slightly raised on both surfaces. Stalks 3-7 cm, with long basal swelling. **FLOWER** 0.4-0.8 cm, white with yellow or pink blotch or lines inside, fragrant, erect branched clusters at end of twigs, **stalks smooth**. 5 free sepals, 2-3 mm, pointed, 5 free petals, 6 mm, narrow & pointed with 3 ridges on inside, straight at first but quickly twisting backwards. Male flowers have a single fertile stamen with oblong anther, bisexual flowers have 1 fertile & 3-4 sterile stamens, single slender style longer than petals, disc thin, cup-shaped. **FRUIT** 5-7.5 cm, yellow-orange, mango-shaped, pointed, fleshy with a large fibrous stone.

NOTE scattered in less disturbed forests, usually near streams.

SIMILAR *Irvingia malayana*²⁰⁸ has mango-like fruits but narrowly pointed leaf buds & twigs with ring-like stipule scars.



293 *Mangifera caloneura*

มะม่วงป่า มะม่วงกระต่อน



Similar to *M. sylvatica* but leaves usually slightly smaller, 10-22 x 4-9 cm, with fine network of veins, clearly raised on both surfaces. **FLOWER** 0.6-0.8 cm, individual stalks very short, main stalks densely hairy, calyx densely hairy, 4-5 petals <5 mm, males with **5 fertile stamens** of differing lengths, disc fleshy, 5-lobed. **FRUIT** 3-5 cm, blunt-tipped, seed ruminate.

NOTE common in moist deciduous forests, reaching a massive size with trunk up to 200 cm diameter. It is often one of the few mature trees left standing in logged areas, owing to the low value of the wood & to spiritual beliefs.

294 *Mangifera odorata*

มะม่วงจิ้งหรีด

Leaves 10-23 cm, no clear network of veins. **FLOWER** 1.8 cm, jointed stalks, petals 4-6 mm, tips curved sharply backwards, males with **1 fertile & 4 sterile stamens**, disc narrow. **FRUIT** 7-13 cm, yellow-green with pale dots, rather plump, thick skinned.

NOTE first described from Doi Suthep but possibly a hybrid between *M. indica* & *M. foetida*, occasionally cultivated.

295 *Mangifera indica*

มะม่วง

Leaves with thin & sparse veins. **FLOWER** stalks slightly hairy, always with 5 slightly hairy sepals & 5 petals, 4 mm, males with 5 equal stamens, **only 1 fertile**, disc 5-lobed. **FRUIT** 7.5-20 cm, blunt, smooth, with fibrous stone, seed not ruminate.

NOTE the most commonly cultivated mango, probably native of India & Burma. Cultivated trees usually have a short trunk & spreading, often drooping branches, whereas our native species tend to have a long straight trunk.



²⁹⁶*Buchanania lanzan*

มะม่วงหาวมะนาวโห่



Small evergreen tree to 12 m. **BARK** dark grey with a dense network of deep, narrow cracks, inner bark pinkish with clear, harmless resin. **LEAF** 15-25 x 6-10 cm, simple, alternate, usually clustered at end of twigs, narrowly elliptic or oblong with **rounded tip, often notched**, no teeth. Young leaves densely red-brown hairy, mature leaves rigidly leathery, usually **hairy at least on veins below**. 10-17 pairs of side veins, slightly raised above, smaller veins ladder-like, flat above, stalks 1.5-2.8 cm. **FLOWER** 0.4-0.6 cm, white, bisexual, branched clusters at end of twigs & upper leaf axils, 15-30 cm, main stalk stout, >0.4 cm diam, **densely brown-hairy**, individual stalks very short. Calyx 4-5 lobed, hairy outside, 4-5 petals, 8-10 fertile stamens with oblong anthers **shorter than filaments**. Disc yellow, deeply 5-lobed, style short, ovary hairy. **FRUIT** 0.9-1.2 cm, purple, ovoid or mango-shaped with short tip (style) at top & persistent calyx at base, not hairy, thinly fleshy with very hard stone, stalks densely hairy.

NOTE very common, semi-open areas.

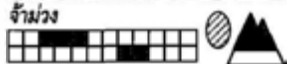
SIMILAR 3 other species with smooth or very slightly hairy leaves.

²⁹⁷*B. glabra* มะม่วงหาว tree to 11 m, leaves 8-17 x 3-6 cm, tip blunt or pointed, veins not raised above. Flower pale green with short, hairy stalks & smooth calyx. Fruit grey-green turning black, smooth, tips eccentric.

²⁹⁸*B. reticulata* shrub or small tree to 8 m, leaves with dense network of veins, raised & clearly visible above. Flower clusters longer than leaves, individual stalks very short. Fruits slightly hairy. Uttaradit Province southwards.



ANACARDIACEAE

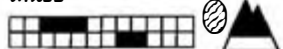
299 *Buchanania arborescens*

Evergreen tree to 27 m. **LEAF** 8-23 x 3-6 cm, narrowly obovate or lanceolate with blunt or tapering tip & narrow base. 15-19 pairs of side veins, fine network of smaller veins, slightly raised above, stalks 1.5-3.5 cm, slightly winged or ridged. Young leaves pink, slightly hairy, buds scaly. **FLOWER** stalks smooth or slightly hairy, calyx lobes & petals rounded, stamens as long as petals, anthers arrow-shaped. **FRUIT** 0.8-1.4 cm, purple-red with thin green flesh & black stone.

NOTE Evergreen forests <1200 m. The whole crown becomes creamy-white in full bloom.

300 *Gluta obovata*

รักน้อย



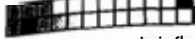
Semi-evergreen tree to 17 m. **BARK** red-brown or greyish, shallowly cracked, slightly flaking, inner bark white or pale pink. **LEAF** 10-25 x 4-10 cm, simple, alternate, usually clustered near end of twigs, elliptic or obovate with blunt or rounded tip & tapering base, untoothed, dark green with pale veins, completely smooth. 13-18 pairs of side veins, fine network of smaller veins, stalks 1.5-5 cm, often narrowly winged near top. **FLOWER** 0.9-1.1 cm, white, branched clusters in upper leaf axils, to 24 cm, stalks with minute hairs. Calyx not lobed, split to base on one side, falling early, 5 free petals, spreading & pointed. **5(6) free stamens** on a thick platform (torus), **style attached to side of ovary**. **FRUIT** 2.5-3 cm, smooth, globose with persistent petals separated by short (2 mm) stalks from the fruits, usually only 1-3 fruits developing in each cluster.

NOTE very common, semi-open forests. Toxic sap (see p142). **SIMILAR** *Gluta usitata*³⁰¹ & *Semecarpus cochinchinensis*³⁰² have the same local name but leaves minutely hairy below.



301 *Gluta usitata*

အိတ်လှေ



Semi-evergreen or briefly deciduous tree to 20 m. **BARK** dark grey, irregularly cracked & breaking up into thin, angular flakes, inner bark pale pink. **LEAF** 15-30 x 7-12 cm, simple, alternate, clustered near end of twigs, oblong or obovate with blunt or rounded tip & tapering base, no teeth. Young leaves densely hairy, mature leaves waxy, dark green & smooth above, **minutely hairy at least on veins below**. 16-30 pairs of side veins, forked at margin, with dense network of finer veins. Stalks 1.2-2.5 cm, **ridged or narrowly winged near top**, usually hairy. **FLOWER** white, turning pink then scarlet, bisexual, densely branched clusters, several together in upper leaf axils, to 30 cm, individual stalks 1-1.5 cm, densely hairy. Calyx 0.3 cm, densely hairy, shallowly 5-lobed, **forming a cap over the bud & falling as the flower opens**. 5-6 spreading petals, narrowly pointed, hairy, overlapping at base. **Stamens >20, densely crowded on a rounded platform (torus)**. Ovary smooth, distinctly stalked, with single **style attached to the side**. **FRUIT** 0.8-1.2 cm, globose, separated by a short stalk from **5-6 spreading, bright scarlet or red-purple wings** (enlarged petals), 5-10 cm, clearly veined.

NOTE very common, favouring dry, open areas along ridges. The cut bark, leaves & fruits contain an **irritating sap** which causes an allergic reaction in many people, typically resulting in skin blisters that may last for several days - be careful! This sap turns black & shiny on drying & is used as a lacquer.

SIMILAR *Gluta obovata*³⁰⁰ & *Semecarpus cochinchinensis*³⁰² have the same local name.



ANACARDIACEAE

302 *Semecarpus**cochinchinensis*

รักขาว รักขี้หนู



Evergreen tree to 20 m. **BARK** creamy-brown, shallow vertical cracks, inner bark pink or orange with clear sap, very toxic. **LEAF** (10)18-30 x (4)7-10 cm, simple, alternate, narrowly obovate with short, blunt tip & tapering base, no teeth. Dark green & shiny above, pale grey-green below, usually with scattered minute hairs (papillae) at least on veins. 10-21 pairs of side veins, raised or flat above, dense network of finer veins, Stalks (0.5)1.5-2.5 cm, finely hairy.

FLOWER ± 0.5 cm (male) or ± 1 cm (bisexual), white or pale yellow-green, large branched clusters at end of twigs & upper leaf axils, 15-50 cm, males without stalks, bisexuals with hairy stalks as long as flowers. Calyx cup-shaped, 4-5 lobed, overlapping, hairy outside, 5(4) petals, narrow & pointed, smooth. 4-5 stamens surrounding flattened ring-like disc with radiating lobes, 3 styles, ovary & disc densely hairy. **FRUIT** up to 2.5 cm, basal part surrounded by **bright orange fleshy appendage** (hypocarp), finely velvety.

NOTE common & widespread, usually in moist areas. Reputed to have the most **irritating sap** of any of our native Anacardiaceae.

SIMILAR *Gluta* spp. are also called, "Ton rak" but petals fused into a cap & fruits without fleshy orange appendage.



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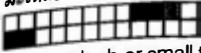
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303 *Rhus chinensis*

มะเกลือมหัน มะผด



Deciduous shrub or small tree to 8 m. **BARK** pale creamy-brown, smooth, often with vertical rows of large red-brown lenticels, inner bark pale cream with **sparse milky or pale yellow sap**. **LEAF** 25-40 cm, odd-pinnate, alternate, 3-6 pairs of opposite leaflets plus an end one, 5-14 x 3-7 cm, **coarsely toothed**, side leaflets narrowly ovate or oblong with tapering tips & asymmetric base, end one broader with blunt base. Young leaves densely pale brown-hairy, mature leaves dark green, rough with short brown hairs on veins above, densely hairy below. Old leaves bright red. **Side leaflets without stalks, central stalk swollen at nodes, often with narrow wing** especially near the top. **FLOWER** small, white, in large pyramidal clusters at end of twigs, 30-50 cm, stalks hairy. Calyx 5-lobed, <1 mm, densely hairy, 5 petals, ± 2 mm, blunt, fused at base, hairy along margin. 5 stamens surrounding a 5-lobed disc, **3 styles**. Unisexual & bisexual flowers on the same or different trees. **FRUIT** 0.4-0.5 cm, white turning pink with sticky, pale grey gloss, obliquely oval, slightly flattened lengthways, single small hard stone, persistent calyx.

NOTE common, open areas.

SIMILAR 2 other species of *Rhus*, both with smooth, untoothed leaves, never with winged stalks (see below).



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304 *Rhus succedanea*

สะเดาช้าง



Evergreen tree with black sap. Leaf 4-8(11) pairs of leaflets, 4-12 x 1-3.5 cm, narrowly tapering tip, **asymmetric base**, no teeth, completely smooth, dark green with dark brown glands in vein axils. Leaflet stalks 0.5-0.6 cm, slender, central stalk not winged, often tinged red. **FLOWER** green, unisexual, in slender, branched clusters

>>

ANACARDIACEAE

hanging from leaf axils, 5-15 cm.

FRUIT 0.6-0.8 cm, olive-green to yellow-brown, shiny, slightly flattened & oblique, **not splitting**, inside with black fibres imbedded in a white wax.

NOTE scattered in hill evergreen forests. Sap can cause skin blisters.

SIMILAR ³⁰⁵*R. rhetoides* is a deciduous tree, leaflets 13-17 cm with symmetrical base. Flower clusters to 32 cm. Fruits splitting when fully mature.

³⁰⁶*Choerospondias axillaris*

มะมือ มะกอกหนัง



Briefly deciduous tree to 30 m. **BARK**

dark grey or red-brown, cracked & peeling in vertical flakes, inner bark red.

LEAF odd-pinnate, (3)5-13 pairs of opposite leaflets, 7-13x3-5 cm, upper ones largest, narrowly ovate or lanceolate with tapering tips & oblique base, young leaves with scattered teeth, mature leaves often without teeth. 8-16 pairs of side veins, often with tufts of hairs in axils, no marginal vein. Side leaflet stalks 0.7-1.3 cm, end one 1.5-4 cm.

FLOWER 0.4-0.5 cm, dark red, males in large branched clusters at end of twigs & upper leaf axils, bisexuals in small groups of 2-3 flowers in leaf axils. Calyx <2 mm, 5 lobed, dark red-purple, smooth outside, glandular-hairy inside. 5 petals, pointed, smooth, overlapping. 10 stamens alternating with disc lobes, bisexuals with 5 very short styles near top of large, globular ovary.

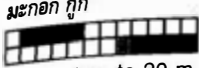
FRUIT 2-3 cm, green or yellow, ovoid with 5 depressions at top, single large stone with up to 5 holes at top & the same number of seeds.

NOTE widespread, fairly common, hill evergreen forest.



307 *Spondias pinnata*

မင်းတုန် ဂျုံ



Deciduous tree to 20 m with open crown & slender, often drooping branches. **BARK** pale grey, smooth or with rounded knobs, thick, inner bark pink, juicy. **LEAF** 30-45 cm, odd-pinnate, alternate, 3-6 pairs of opposite or sub-opposite leaflets, 7-16 x 3-6 cm, elliptic or oblong with abruptly tapering tip & blunt or pointed base, often slightly asymmetric, no teeth, completely smooth. (10) 15-20 pairs of straight, narrow side veins connecting to a distinct **marginal vein**, finer veins faint. Side leaflet stalks 0.3-0.8 cm, main stalk 12-16 cm, twigs stout with large leaf scars. Young leaves pink, **old leaves a beautiful clear golden-yellow**. **FLOWER** 0.5 cm, white or creamy yellow, Bisexual & unisexual flowers on same tree branched clusters in upper leaf axils, 20-30 cm. Individual stalks short, smooth. Calyx cup-shaped with 5(4) triangular teeth, smooth, 5(4) petals, narrowly ovate with curved tips 2.5-3 mm, smooth, **not overlapping in bud**. 8-10 stamens, much shorter than petals, disc shallowly 10-lobed, 5(4) ovaries, pressed together but not fused, smooth, each with a short, curved style. **FRUIT** 3-4.5 cm, green turning dirty yellow, oval, fleshy with a single large stone consisting of a very hard star-shaped core with dense fibrous material between the rays & up to 5 seeds.

NOTE very common, often with bamboo. Fruits & crushed leaves smell of turpentine.

SIMILAR *Lannea coromandelica* ³⁰⁹ has similar leaves but no marginal vein, small red fruits. *Spondias lakonensis* ³⁰⁸ has 9-12 pairs of leaflets, no marginal vein.



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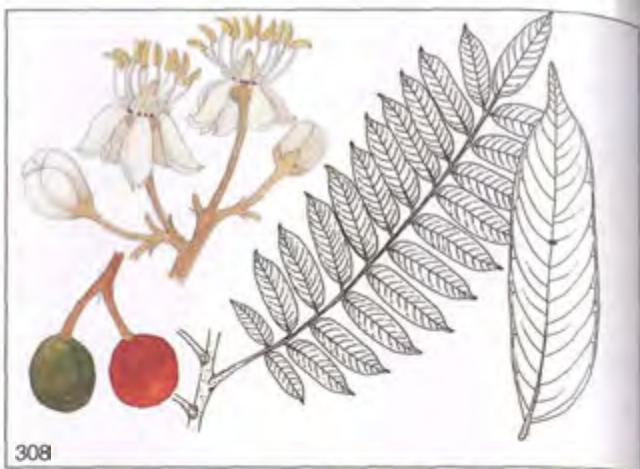


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308 *Spondias lakonensis*

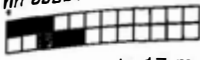
Evergreen to 20 m, open umbrella-shaped crown with spreading branches. **BARK** dark grey, shallowly cracked, inner bark orange-brown or pinkish with clear sap. **LEAF** 30-40 cm, odd-pinnate, clustered near end of twigs, 9-12 pairs of opposite or alternate leaflets, 3-11 x 1.5-5 cm, bottom ones smaller, oblong with tapering tips & strongly asymmetric base, no teeth. Young shoots densely hairy, mature leaves slightly hairy on veins below. 8-13 pairs of steeply curved side veins, **joined but without marginal vein**. Side leaflet stalks very short, <0.3 cm, end one 1-1.7 cm. **FLOWER** ± 0.8 cm, white, branched clusters in leaf axils, 2-14 cm, individual stalks slender, jointed, with minute pale orange hairs. Calyx <2 mm, 5 triangular lobes, hairy, not overlapping in bud. 5 narrow petals with pointed, recurved tips, not overlapping in bud, 8-10 stamens, slightly shorter than petals, anthers blunt, oblong, 1 mm. 4(5) styles, free at base but fused at top, ovaries hairy, surrounded by **bright red ring-like disc**, thin with wavy edge. **FRUIT** ± 1.2 cm, pinkish-orange, ovoid, fleshy with hard, star-shaped stone containing up to 4 oblong seeds.

NOTE locally common, moist areas.



309 *Lannea coromandelica*

ถัก อ้อยช้าง



Deciduous tree to 17 m with open crown & rather slender branches.

BARK cream, smooth or with strips of wrinkled bark, inner bark pink, fibrous.

LEAF 30-50 cm, alternate, odd-pinnate, 3-6 pairs of opposite leaflets, 6-15x3-6 cm, narrowly elliptic with tapering tips & rounded, slightly oblique base, no teeth. Young shoots with tiny star-shaped hairs, mature leaves smooth, thin. 7-11 pairs of side veins, no marginal vein, finer veins faint. Side leaflet stalks short, often narrowly winged on one side only, end one 2-3 cm, slender. Twigs thick with large leaf scars.

FLOWER ± 0.3 cm, pale yellow or purplish-green, narrow unbranched or sparsely branched clusters dangling from leafless twigs, often clustered near tips, 12-30 cm, stalks minutely hairy. Calyx tiny, 4-5 lobed, hairy outside, 4-5 petals, ± 2 mm, overlapping, smooth. 8-10 stamens, longer than petals, surrounding grooved, ring-shaped disc, ovary vivid red with 4 short styles. Male & female flowers on different trees. **FRUIT** 1-1.2 cm, pink turning dark red, slightly flattened lengthways, smooth, thin-skinned, crowned by persistent styles, single hard stone with 1 seed & 12 sunken marks (opercula) at the top.

NOTE common in semi-open deciduous forests, often with bamboo.

SIMILAR *Rhus succedanea*³⁰⁴ is evergreen, with yellow-brown fruits & black sap. *Spondias pinnata*³⁰⁷ has leaflets with a marginal vein & larger, greenish-yellow fruits.



310 *Dracontomelon dao*

พระเจ้าห้าพระองค์ ตะโก



Briefly deciduous tree to 35 m with dense, spherical crown & long straight trunk with **narrow, spreading buttresses**. **BARK** orange-brown, smooth or peeling in thin flakes, inner bark pink, no latex but sometimes with gummy drops. **LEAF** 40-60 cm, odd-pinnate, clustered near tips of twigs, 6-9 pairs of alternate or opposite leaflets, 9-16 x 3-5 cm, oblong or lanceolate with tapering tips & oblique base, no teeth. Leaf buds covered with scales & minute red-brown hairs, young leaves pink, mature leaves bright green, smooth or with scattered hairs on veins & stalks, usually with tufts of hairs in vein axils (domatia). 7-14 pairs of steeply curved side veins. Leaflet stalks 0.1-0.5 cm, main stalks 8-10 cm, grooved at base, twigs stout with large leaf scars. **FLOWER** 0.7-1 cm yellow-green or white, bisexual, slender branched clusters hanging from upper leaf axils, up to 60 cm long, individual stalks ± 0.5 cm, main stalks slightly hairy. 5 sepals, fused at base, triangular, hairy outside but smooth inside. 5 petals, narrow & pointed, slightly longer than stamens/style, smooth both sides, recurved tips, overlapping in bud. 10 stamens, the ones opposite sepals longer than those opposite petals, anthers arrow-shaped. 5 styles, fused together at tips, ovary smooth, surrounded by fringed disc, slightly hairy esp. along margin. **FRUIT** (3)4-5 cm, green turning yellowish, globose with 5 marks around the middle, large very hard stone with **5 holes at top** & up to 5 angular seeds.

NOTE locally common in mature evergreen forests, often emergent.

SIMILAR *Choerospondias axillaris*³⁰⁴ also has fruit stones with 5 holes at the top but the fruits are much smaller (2-3cm).



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LEGUMINOSAE

pea family

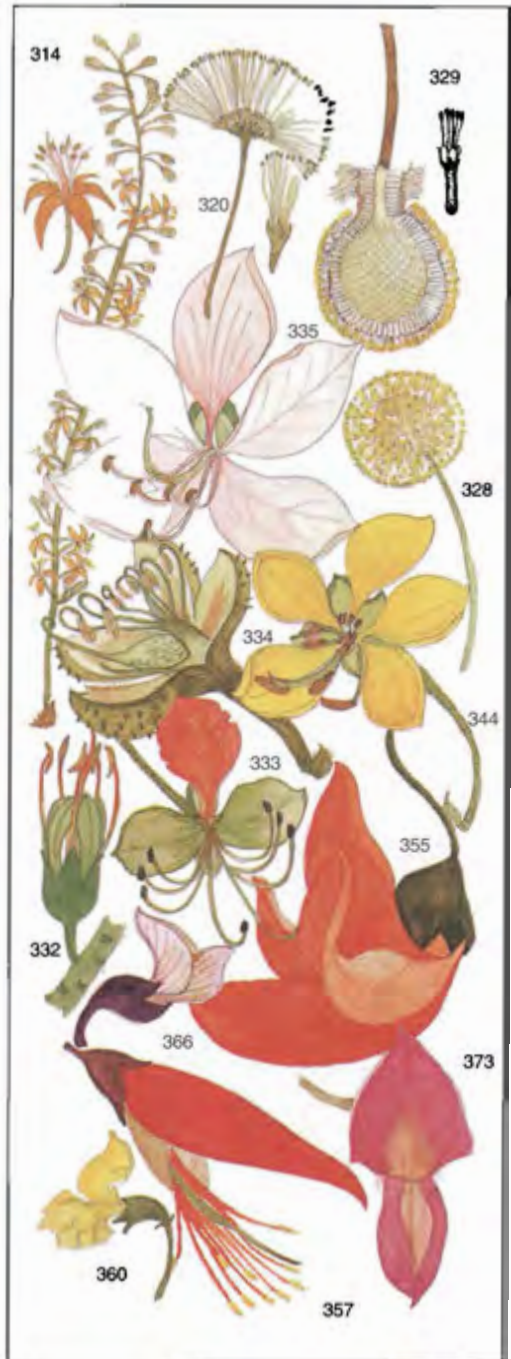
One of the largest & most successful families of flowering plants, forming an important part of the flora on every continent with 18,000 species worldwide. In NT legumes are the most abundant family of trees with 30 genera & 73 species.

Botany mostly deciduous trees, never with latex but sometimes with reddish sap, often with a fresh 'bean-like' smell in the cut bark & crushed leaves. Easily recognised by the alternate leaves, usually pinnate or bipinnate, with **swollen joints** (pulvini) which enable the plants to close their leaves at nightfall or before a storm & thus prevent possible damage. The fruits are always dry pods with the seeds in a single row. The flowers are very varied, falling into 3 distinct groups, usually treated nowadays as subfamilies but sometimes regarded as distinct families.

Mimosoideae have tiny flowers usually clustered into heads. **Caesalpinioideae** have 5 free sepals & 5 (rarely 1) free petals, often large & showy, usually with 10 stamens, but often at least some of these are much smaller than the others. **Papilionoideae**, the largest group, has the well-known "pea" (dok khun) shaped flower, with 4 asymmetric petals & 10 stamens fused into a tube, often with 1 stamen separate from the others.

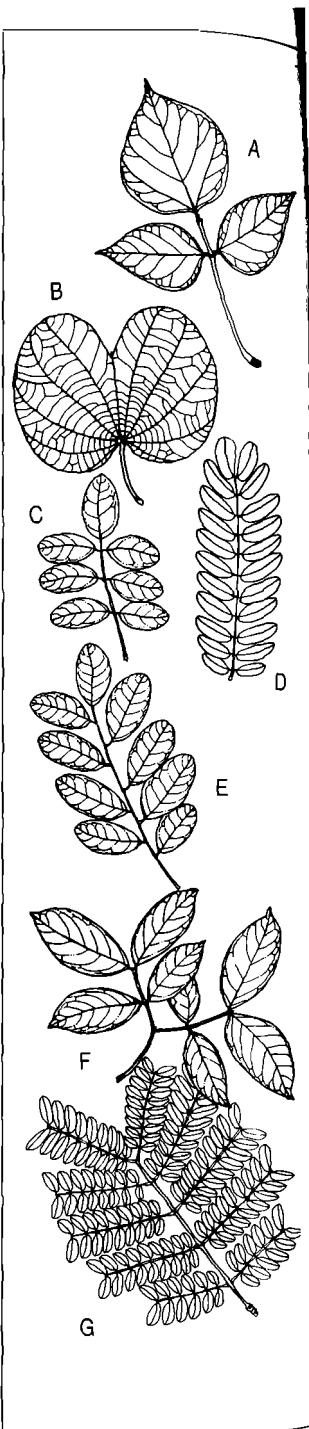
Ecology Leguminosae are found in all habitats, but are particularly abundant in lowland deciduous forests, where many of the most valuable timbers are legumes - mai pradu (*Pterocarpus macrocarpus*), mai daeng (*Xylocarpus xylocarpa*), mai makha (*Azadirachta xylocarpa*), as well as many of the common understory shrubs. Many of the species form a symbiotic relationship with nitrogen-fixing bacteria which enables them to live in poor soil.

Uses Legumes are possibly the most useful family of trees in the world, providing timber, food, medicines as well as countless ornamentals. They are particularly valued by farmers for animal feed & soil improvement due to their ability to fix atmospheric nitrogen.



LEGUMINOSAE

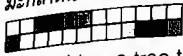
1. simple "leaves" (phyllodes) *Acacia* (introduced spp.)
1. bilobed leaves ^{figB} *Bauhinia* 335
1. trifoliate leaves ^{figA}
 2. bark usually with thorns; terminal leaflet with 1 or 3 main veins
standard petal much longer than others *Erythrina* 357
 2. bark never thorny; terminal leaflet always with 1 main vein;
standard petal $\pm$ as long as others *Butea* 355
1. pinnate leaves
 3. even-pinnate with opposite leaflets ^{figD}
 4. pink or yellow flowers with 5 petals; pods cylindrical *Cassia* 341
 4. greenish flowers with only 1 petal; pods flattened
5. petal <1.2cm; fruits oval, softly spiny; *Sindora siamensis* 334
 5. petal 1.2-2.5cm; fruits oblong, not spiny *Azelia xylocarpa* 333
 3. odd-pinnate with opposite leaflets ^{figC}
 6. stamens free; pods not winged, seeds red ³¹¹*Ormosia sumatrana*
rare evergreen tree to 30m. 3-6 pairs of leaflets, to 10x3.5 cm, abrupt &
notched tip, leathery, velvety below looped veining. Pods pointed both ends
 6. stamens fused; pods not winged, eventually splitting *Milletia* 373
 6. stamens fused; pods winged, not splitting *Derris robusta* 377
 3. odd or even-pinnate with alternate leaflets ^{figE}
 7. leaflets >3.5 cm wide. bark with red sap;
pods $\pm$ circular, seed in centre *Pterocarpus* 360
 7. leaflets < 2.5 cm wide; bark with clear sap;
pods oblong, seeds in a row *Dalbergia* 362
1. bipinnate leaves
 8. leaves with 1-2 pairs of pinnae ^{figF}
 9. flowers in tight heads with 5 free stamens *Xylia xylocarpa* 328
 9. looser heads, > 10 stamens fused in tube *Albizia/Archidendron* 316
 8. leaves with 3-9 pairs of pinnae ^{figG}
 10. plant with thorns
 11. leaf stalk winged ^{312a}*Pithecellobium tenue*
 11. leaf stalk not winged
 12. showy flowers in panicles ^{312b}*Caesalpinia sappan*
 12. tiny flowers in tight spherical heads
 13. flowers yellow, 4-8 stamens; pods cylindrical, segmented
herbs & naturalized shrubs ^{313a}*Mimosa*
 13. flowers pink/white, >15 stamens; pods flat, not segmented
native & introduced trees ^{313b}*Acacia*
 10. plant without thorns
 14. flowers in elongated clusters (racemes or raceme-like)
 15. <8 pairs of leaflets per pinnae, 4-14 cm; fws orange-red,
5 stamens, moist forests *Acrocarpus fraxinifolius* 332
 15. 6-16 pairs of leaflets per pinnae, < 3 cm; fws white/yellow,
10 stamens, deciduous forests & planted trees
 16. leaflets blunt-tipped, flowers tiny, in spike-like clusters
Adenanthera 314
Pettophorum 353
 14. flowers in dense heads *Albizia/Archidendron* 316
 8. leaves with 10-30 pairs of pinnae
 17. leaflets shiny bright green above with small stipules;
fws in solitary heads; moist forests *Parkia leiophylla* 329
 17. leaflets dull green above with large stipules
fw heads grouped into panicles, open areas *Albizia chinensis* 323



MIMOSOIDEAE (Leguminosae)

314 *Adenanthera microsperma*

มะกล่ำต้น มะโหดแดง



Briefly deciduous tree to 20 m with uneven, rounded crown & large, spreading branches. **BARK** dark brown or greyish, flaking, inner bark soft, pale cream. **LEAF** bipinnate, 3-6 pairs of opposite side stalks, each with 5-8 (12) pairs of **alternate leaflets**, 1.5-3.5x1-2 cm, oval or oblong with blunt or rounded tip & asymmetric base. Mature leaflets smooth, dark grey-green above, paler & slightly glaucous below. Leaf stalks without glands, stipules very small, falling early. **FLOWER** ± 0.6 cm, creamy-yellow turning orange with age, in spike-like clusters at upper leaf axils or branched clusters at end of twigs, 7.5-20 cm. Flowers opening gradually from base of cluster upwards, faintly scented of orange blossoms especially in the early evening. Individual flower stalks 1.5-3 mm, **silky hairy**, calyx < 1 mm, 5 petals 2.5-3 mm, fused at very base, narrow with pointed tips. 10 free stamens, as long as petals, anthers without hairs but with a gland at tip. **FRUIT** 15-20x0.8-1.2 cm, strap-shaped, **twisted in a tight coil**, very thin, splitting in two strips. Seeds 5-8 mm, **bright red**, smooth & glossy, remaining in pods a long time.

NOTE not uncommon, usually in gaps or at the forest edge, often planted. Easily recognised by the bipinnate leaves with alternate leaflets & glossy red seeds.

SIMILAR 315 *A. pavonina* has flowers with smooth stalks, slightly larger petals 3-4.5 mm. Pods curved but not closely coiled, 1.2-1.6 cm wide. Native of Sri Lanka, widely cultivated. Possibly conspecific with *A. microsperma*.



Albizia**TABLE 3**

Large genus with 118 species throughout the tropics, 9 species in NT. Mostly deciduous trees with spreading crowns & smooth bark without thorns. Leaves **bipinnate with opposite leaflets & raised glands along the stalks**. Flowers in fluffy heads with many long stamens which are much more obvious than the corolla. The central flower in the head is often very different from the others with much shorter & thicker stamens. Pods straight & flat with thin walls, often swollen over the seeds, becoming completely dry & usually splitting open when ripe. *Archidendron* is very closely related but the flowers are always in branched clusters, with the central flower the same as the others. The pods are often spirally twisted

316 Albizia lucidior

Large deciduous tree to 40 m with dark green crown & thin grey bark with many lenticles. **LEAF** 1-2 pairs of side stalks, each with 1-4 pairs of leaflets, 5-10x2-4 cm (rarely to 14x5 cm), top ones largest, narrowed at both ends, completely smooth, dark green & shiny above. **FLOWER** small heads of 6-10 flowers **gathered into branched clusters at end of twigs**, 10-40 cm. Side flowers with stalks 0.5-2 mm, calyx 1.5-3 mm with shallow teeth, corolla 5-7 mm, stamens ± 25 mm, **central flower different from others**. **FRUIT** 10-30x2.5-3.5 cm, pale yellow or golden brown, very thin, smooth & rather glossy, 2-10 circular dark brown seeds. **NOTE** uncommon, easily missed in the dense upper canopy of evergreen forests, but more noticeable in tea (miang) orchards where it is often left because of its thin crown & soil improving qualities.

SIMILAR several *Archidendron* spp. have similar leaves. *Xylia xylocarpa*³²⁸ leaves similar but slightly hairy below, flower heads not in branched clusters, individual flowers with 5 stamens, pods thick & curved.

Al. = Albizia, Ar. = Archidendron

1. stems with distinct, u-shaped ridges *Ar. clypearia* 324
1. stems without ridges
 2. 1-2 pairs of pinnae
 3. each pinnae with 5-11 pairs of leaflets *Al. procera* 319
 3. each pinnae with 2-4 pairs of leaflets
 4. leaves & branches hairy; shrub to 3m *Ar. glomeriflorum* 327
 4. mature leaves & branches smooth or nearly so
 5. central flower different, with short stalks; pods straight *Al. lucidior* 316
 5. all flowers similar, without stalks; pods spiralled
 6. 4 pairs of leaflets; stamen tube longer than corolla tube pods slightly narrower between seeds *Ar. lucidum* 325
 6. 2-3 pairs of leaflets; stamen tube as long as corolla tube pods much narrower between seeds *Ar. jiringa* 326
2. 3 or more pairs of pinnae
 7. pinnae with <10 pairs of leaflets, >2.5x1 cm
 8. flower heads single/paired, individual flower stalks 2-4 mm stamen tube 1/2 corolla tube; pods yellowish *Al. lebeck* 317
 8. flower heads in branched clusters, individual fws without stalks stamen tube as long as corolla tube; pods brownish
 9. all flowers similar *Al. procera* 319
 9. central flower different
 10. 3-6 pairs of leaflets *Al. crassiramea* 318
 10. 8-16 pairs of leaflets *Al. odoratissima* 320
 7. pinnae with 10 or more pairs of leaflets, <2.5x1 cm
 11. midvein along edge of leaf; large leafy stipules *Al. chinensis* 323
 11. midvein not along edge; small stipules
 12. fw heads single or in pairs, individual flower stalks 4-5 mm *Al. garrettii* 321
 12. fw heads in branched clusters, individual flowers without stalks
 13. central flower different *Al. odoratissima* 320
 13. all flowers similar
 14. 5-11 pairs of leaflets 3-4.5x1.2-2.2cm *Al. procera* 319
 14. 15-25 pairs of leaflets 0.7-2.0x2.5-6cm *Al. lebeckoides* 322



316



316

317 *Albizia lebbekii*

Deciduous tree to 25 m with uneven, spreading crown & large, twisted branches. **BARK** dark brown, densely but shallowly cracked. **LEAF** 2-4 pairs of side stalks (pinnae), larger ones with 3-6(9) pairs of leaflets, 1.5-5.5x0.9-3 cm, rounded or almost flat at both ends, often notched, smooth or with scattered hairs below, main vein slightly asymmetric; stipules tiny. **FLOWER** heads 4-7 cm diam., greenish-white turning pale yellow, 2-4 heads together in upper leaf axils, **not grouped into branched clusters**. Heads with slender stalks, 5-10 cm, individual flowers with **stalks 2-4 mm**. Calyx 3.5-5 mm, corolla 7.5-11 mm with teeth as long as tube, stamens >25 mm, **central flower different from others**. **FRUIT** (10)15-35x3-4 cm, pale yellow, very thin & flat with obvious swellings over seeds, remaining on tree a long time, eventually splitting. 4-12 seeds.

NOTE scattered in open forests throughout NT, commonly planted. The flowers are fragrant of jasmine, especially in the early evening.

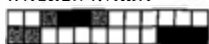
SIMILAR ³¹⁸ *Albizia crassiramea* partly deciduous tree to 20 m with dark brown twigs. Leaves with 3-4 pairs of side stalks, larger ones with 3-5 pairs of leaflets, 2.5-6x1.2-3.5 cm, main vein diagonal. Flowers pure white, heads in branched clusters at end of twigs, stalks 2.5-4.5 cm, individual flowers without stalks, central flower different from others. Pods to 20x3 cm, drying rich pinkish brown. Less common.

³¹⁹ *Albizia procera* ^{กิ่งอ่อน} small tree to 15 m with pale grey branches. Leaves with 2-5 pairs of side stalks, larger ones with 5-11 pairs of slightly pointed leaflets, 3-4.5x1-2.2 cm, slightly glaucous below, large narrow glands 6-10 mm at base of stalk. Flower heads in branched clusters at end of twigs & upper leaf axils, individual flowers without stalks, central flower same as others. Pods 7.5-17 cm, drying pale grey-brown. Less common.



320 *Albizia odoratissima*

ทางซิมอด คางแดง

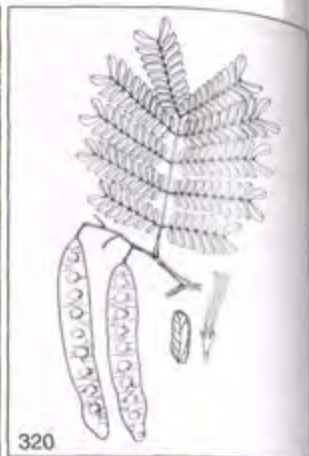


Deciduous tree to 30 m. **BARK** dark grey, slightly cracked, peeling in irregular small flakes, inner bark reddish. **LEAF** 3-8 pairs of side stalks (pinnae), the larger ones with 8-16 pairs of blunt-tipped leaflets, 1-3.5x0.6-1.2 cm, main vein asymmetric but not running along edge of leaflet. Mature leaf 15 mm, central flower different from others. **FRUIT** (7)10-22x2-3.5 cm, dark brown with short but quite sharp tip, narrowed at base with very short stalk, splitting open when mature. 8-12 dark brown seeds, longer than broad.

NOTE very common in open areas, preferring moister sites than *A. chinensis*. Flowers sweetly fragrant in the early evening.

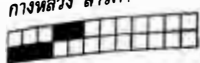
SIMILAR **321 *Albizia garrettii*** leaves with 5-8 pairs of side stalks, larger ones with 10-22 pairs of leaflets, 0.6-1x0.3-0.4 cm. Stipules tiny. Flower heads solitary or paired in axils of upper leaves, side flowers with stalks 4-5 mm, stamens $\pm$ 5 mm, central flower different from others. Uncommon.

322 *Albizia lebbekoides* ทาง leaves with 3-4 pairs of side stalks, larger ones with 15-25 pairs of leaflets, 0.7-2x0.25-0.6 cm, slightly hairy along margins, stipules minute. Flower heads $\pm$ 1.3 cm diam., grouped into slender, much-branched clusters in leaf axils, <15 cm long. Individual flowers without stalks, central one similar to others. Pods $\pm$ 15x1.5-2 cm, dark brown, seeds $\pm$ 7 mm. Uncommon, sometimes planted.



323 *Albizia chinensis*

ก้างพลวง สารคำ

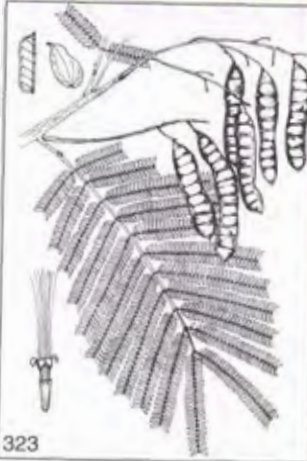


Deciduous tree to 25 m with open, **flat-topped crown** & large spreading branches. **BARK** pale grey, quite smooth with horizontal wrinkles & many lenticels, becoming darker & vertically fissured with age. Inner bark pinkish brown, often with white stripes, usually with red sap. **LEAF** (6) 10-16 pairs of side stalks, (pinnae) larger ones with 15-30 pairs of tiny leaflets, 0.6-1x0.2-0.3 cm, usually curved with pointed tips & a very **asymmetric main vein** which runs along the **upper edge of the leaflet**. Mature leaves dull grey-green, slightly silky hairy on veins & along edge. Young shoots with **large leafy stipules**, 2-3 cm. **FLOWER** heads 2.5-5.5 cm, white or pale yellow, **clustered together in leaf axils or in branched groups at end of twigs**, 10-18 cm. Individual flowers without stalks, head stalks 1-3 cm. Corolla 4-10 mm, 2-3x longer than calyx, stamens 10-25 mm, fused together into a tube at base. Central flower different from others, with much shorter & thicker stamens. **FRUIT** 7-15x1.5-2 cm, very flat, drying yellow or pale brown, **not splitting**. Seeds $\pm$ 0.7 cm, glossy dark brown, flat.

NOTE very common throughout NT, especially in secondary growth.

SIMILAR *Parkia* spp.³²⁹ have shiny bright green leaves & globular flower heads on long drooping stalks. All other *Albizia* have leaves with <10 pairs of side stalks, much smaller stipules & the main vein does not run along the edge of the leaflet.

LEGUMINOSAE (Mimosoideae)



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324 *Archidendron clypearia*spp. *clypearia* var. *clypearia* TABLE 3

ไม้พุ่มหรือไม้ต้นเล็ก

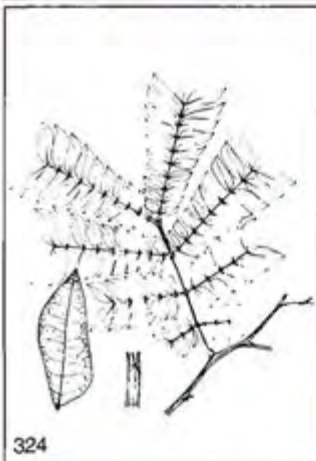


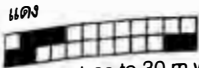
Shrub or small tree to 10 m with smooth, rich red-brown trunk & **angular twigs with U-shaped ridges**. **LEAF** 15-50 cm, bipinnate, 3-10 pairs of side stalks (pinnae) each with 3-12 pairs of opposite leaflets, upper ones largest, 4-7x2-3 cm, **asymmetrically rectangular** (rhomboid) with a diagonal main vein. Mature leaves dark green above, slightly or quite densely brown-hairy below. Stalks with raised cup-shaped glands. **FLOWER** heads 2-5.5 cm, white or pale yellow, in large branched clusters at end of twigs & upper leaf axils, to 50 cm. Head stalks 1-2.5 cm, individual stalks 1-3 mm, corolla 4-8 mm with short teeth, stamen tube as long as corolla tube, central flower similar to others. **FRUIT** up to 20x1 cm, **orange-red both sides, twisted into a open coil with dangling glossy black seeds**.

NOTE common throughout NT in all moister forest types up to 1700 m.

SIMILAR no other species in NT has bipinnate leaves & ridged twigs. 3 much rarer species with smooth twigs & leaves with only **1-2 side stalks** each with 2-4 pairs of long-tipped leaflets. 325 *A. lucidum* tree to 8(13) m, leaflets 7-19x4-8 cm, bottom ones $\pm$ alternate but top ones opposite, smooth or very slightly hairy. Flowers with stamen tube shorter than corolla tube. Pods red-brown inside, slightly narrower between the blue-black seeds. 326 *A. jiringa* tree to 10(20) m, leaflets 8-20x3-7 cm, all opposite, smooth. Flower head stalks $\pm$ 0.3 cm, stamen tube longer than corolla tube. Pods greyish inside, much narrower between the brown seeds.

327 *A. glomeriflorum* ไม้พุ่ม shrub to 3 m, leaflets 4-10(15)x2-4 cm, all opposite, densely hairy (at least stalks). Flower head stalks to 3 cm, stamen tube longer than corolla tube, corolla hairy. Pods orange-red inside, slightly narrower between the blue-black seeds.



328 *Xylocarpa* var. *kerrii*

Deciduous tree to 30 m with straight trunk & slender drooping branches. **BARK** creamy brown or red-brown, thin, peeling in rounded flakes, inner bark pink. **LEAF** bipinnate with a **single pair of side stalks**, 10-30 cm, each with 3-7 pairs of opposite leaflets, top ones largest, 4-15x2.5-6 cm, narrowly ovate or elliptic with slightly pointed tips. Young shoots densely covered with yellowish hairs, mature leaves smooth above, usually with **minute pale brown hairs below**. Leaflet stalks 0.2-0.3 cm, main stalk 3-8 cm, all joints with rounded glands. Young leaves delicate pink, appearing in March-April just after the flowers. **FLOWER** pale yellow, in dense spherical heads, 1.5-2 cm, solitary or in very short, unbranched clusters in axils of fallen leaves. Head stalks 3.5-5 cm, individual flowers without stalks. 5 petals, 3.5-4.5 mm, slightly fused at base, hairy outside. 10-12 free stamens, 5-12 mm, much longer than petals, 5 stamens longer than others, **anthers without glands**. **FRUIT** 10-15x5-6 cm, thick & woody, slightly curved, tapering at base, pale creamy brown at first, later dark brown, splitting suddenly into 2 parts which curl backwards, remaining on the tree for a long time. 6-10 flat, dark brown seeds 2x1.2 cm.

NOTE formerly a major component of mixed deciduous forests, less common these days due to selective logging for its excellent, dark red-brown timber. It regenerates quickly even in fire-prone areas.

SIMILAR var. *xylocarpa* has smooth leaves & anthers with a gland. Not native to NT but sometimes planted. *Albizia lucidior*³¹⁶ & several *Archidendron* sp.³²⁴ also have bipinnate leaves with a single pair of side stalks but leaflets usually smooth, flower heads grouped into branched clusters & pods very thin.



329 *Parkia leiophylla*

สะตอ



Briefly deciduous tree to 35 m with red-brown bark & small buttresses.

LEAF 30-60 cm, bipinnate, 14-20 pairs of side branches, the larger ones with 30-45 pairs of opposite leaflets, 1.2-1.7x0.3-0.4 cm, narrowly oblong, **obliquely curved & pointed at both ends**, completely smooth, bright green & shiny above. Main vein slightly asymmetric, side veins prominent. **FLOWER** creamy-white, tightly packed into **globular heads** on **very long drooping stalks**, 30-45 cm long. 3 types of flower in a single head - infertile ones near the stalk, male ones in the middle & bisexual ones at the top. Corolla 10-12 mm, tubular with 5 tiny teeth, 10 stamens with bright yellow anthers, fused into tube at base. **FRUIT** 30-45 cm, strap-shaped, **straight**, clustered together on a lumpy swelling (receptacle) at the end of long drooping stalks, bright green when young, turning black & glossy when mature, eventually splitting open but not peeling apart. Seeds arranged **horizontally** across the pods & clearly visible from the outside.

NOTE uncommon, always close to streams. The flowers have a milky smell & are pollinated by bats, each pod developing from a single flower.

SIMILAR 2 other spp. from C.Thailand: 330 *P. sumatrana* leaflets 1-2.8x0.3-1 cm, oblong, straight, with rounded or slightly notched tips & slight blunt side bulge at base, Pods spirally twisted, seeds arranged diagonally across pods.

331 *P. timoriana* สะเทวียง smaller leaflets 0.6-0.7x0.2 cm pointed tips, less distinct curved point at base, secondary veins faint, pods straight, only slightly swollen over the seeds. *Albizia chinensis* 323 has similar bipinnate leaves but the leaflets are dull grey-green, with main vein running along margin.

NB. although *P. leiophylla* is reported in Flora of Thailand to be the only native *Parkia* in NT, the fruits of many wild trees we have seen resemble those of *P. sumatrana*.



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Parkia sp.



Parkia sp.

CAESALPINIOIDEAE (Leguminosae)

332 *Acrocarpus fraxinifolius*

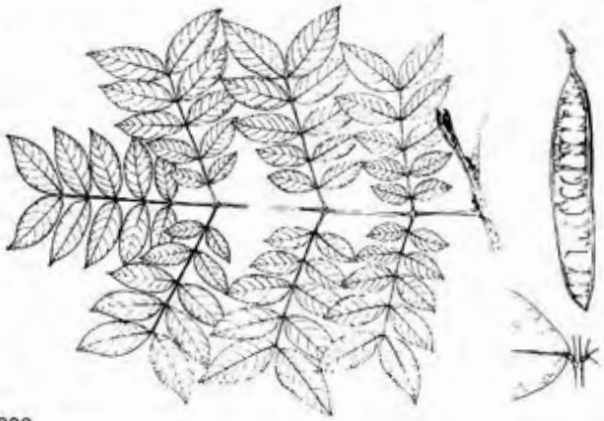
ยมหิน สะเดาช้าง



Very large tree to 50 m, briefly deciduous at beginning of cold season. Crown irregular & rather sparse with steeply ascending main branches & a long straight trunk, often buttressed when older. **BARK** pale grey, sprinkled with large brown lenticels, inner bark pinkish, heartwood dark red. **LEAF** up to 100 cm, **bipinnate** with 3-5 pairs of side stalks, each with 4-9 pairs of leaflets, 4-14x2-7 cm, ovate with long pointed tips & slightly asymmetric base. Young leaves pink & slightly hairy, mature leaves pale green, completely smooth. Main stalks swollen at base, with small triangular stipules which fall early. **FLOWER** 1-1.5 cm, in dense spike-like clusters close to tips of leafless branches, 15-25 cm, main stalks thick & fleshy, individual stalks 0.6-0.8 cm. 5 bright green sepals, 0.3-0.4 cm, rounded, slightly overlapping, fused at base, finely hairy. 5 red petals, 0.6-1 cm, narrow & pointed. **5 yellow-orange stamens, twice as long as petals.** 1 short curved pale green style with small stigma. **FRUIT** 8-16x1-2 cm, black & shiny, flattened, pointed at both ends with a **thick ridge or narrow wing along the top joint**, splitting into 2 sections. 10-18 pale brown, lens-shaped seeds.

NOTE one of the forest giants of NT, a common feature of the emergent layer in moist evergreen forests. Very fast growing, up to 30 m tall & 100 cm diameter in less than 100 years.

SIMILAR *Toona* spp.²³⁴ & *Chukrasia tabularis*²³² are also called "Mai Yom Hin", but both have once-pinnate leaves & white or yellowish flowers. The former has star-shaped fruits, while the latter has very hard globular fruits.



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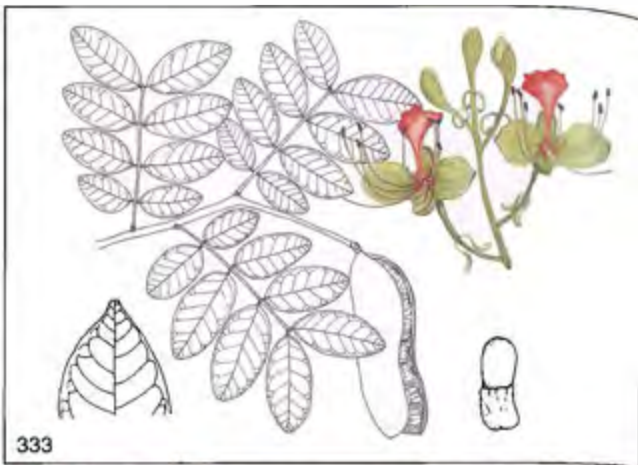
333 *Azelia xylocarpa*

มะค่าโมง มะค่าหลวง



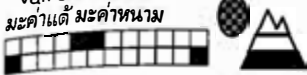
Deciduous tree to 30 m with broad, rounded crown & stout trunk, up to 100 cm diam. or more, usually dividing near base into large, spreading branches. **BARK** pale grey or yellowish, slightly rough. **LEAF** 18-25 cm, even-pinnate with 3-5 pairs of opposite leaflets, 5-9x4-5 cm, elliptic with blunt or slightly notched tips & rounded base. Young shoots slightly hairy, mature leaves completely smooth, sometimes slightly glaucous below. Leaflet stalks 0.3-0.5 cm, **twisted**, stipules minute & falling early. **FLOWER** 2.5-3.5 cm, in branched clusters at end of twigs, 5-15 cm, individual stalks 0.7-1 cm. 4 sepals, 1-1.2 cm, bright green, oblong, finely velvety outside. **Single green or reddish petal with long thin stalk**, much larger than sepals. 7-8 fertile stamens, as long as petal, 3 much shorter infertile ones, single slender style with tiny stigma, ovary hairy with narrow stalk. **FRUIT** 12-20x7-9 cm, thick & woody, dark brown or almost black, splitting into 2 sections. 2-4 seeds, 2.5-3 cm, black with a fleshy orange coat at one end, arranged across the pods with thin partitions between them.

NOTE one of the 5 classic trees of ป่าเบญจพรรณ ("Mai Pen Ja Pan", mixed deciduous forest), much prized for its beautiful reddish timber. Common in the past, but much less so these days - you will be lucky to see a large tree in the forest, although they can still found in ceremonial sites near villages.



334 *Sindora siamensis*var. *siamensis*

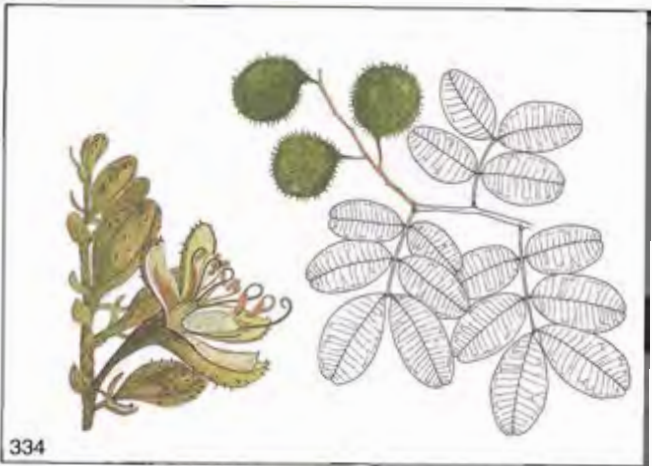
มะค้ำแต่ มะค้ำทาม



Deciduous or semi-evergreen tree to 15 (rarely 25) m with stout trunk, large branches & spreading, rounded crown. **BARK** dark brown, slightly cracked & flaking when older, inner bark pinkish & rather fibrous. **LEAF** 15-25 cm, even-pinnate with 3-4 pairs of leathery leaflets, 5-10x3-6 cm, the top ones largest, broadly elliptic or oval with rounded, slightly notched tips. Upper surface with minute rough hairs, lower surface with tiny soft hairs. Side veins often straight to margin, bottom pair with a **small but distinct gland** near base, dense network of finer veins. Stalks with curved stipules, soon falling. **FLOWER** 0.5-0.7 cm, yellow-green, in narrow branched clusters at end of twigs & upper leaf axils, 10-20 cm. 4 fleshy green sepals with dense golden-brown hairs & **scattered short soft spines outside**. **Single yellow-green or pinkish petal hidden inside the curve of the lowest sepal**. 9 fertile & 1 sterile stamens, the fertile ones joined at base, 2 of them longer than others, 1.8-2.3 cm. 1 slender curved style with tiny stigma, ovary densely hairy & softly spiny. **FRUIT** 4.5-8 cm, dark green, round & flat with a short curved tip, **covered in sticky spines**, 3-5 mm long. 1-3 large black seeds, 1.5-2 cm.

NOTE common in semi-open forests, particularly in the south, becoming much less common N. of Chiang Mai.

SIMILAR *Azelia xylocarpa*³³³ has thinner leaves with more pointed tips, larger flowers with an obvious green or reddish petal & large woody fruits without spines.



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335 *Bauhinia variegata*

เสี้ยวดอกขาว

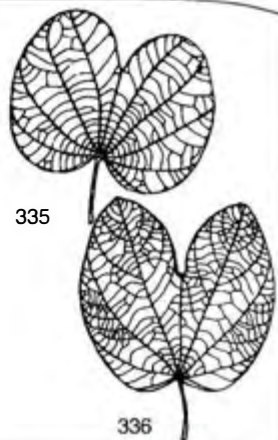


Small deciduous tree to 12 (rarely 15) m with open irregular crown. **BARK** tan-brown to blackish, roughly cracked. **LEAF** 5-12 cm, circular, 2-lobed, with rounded tips & a relatively **wide & shallow cleft**, $\frac{1}{4}$ - $\frac{1}{3}$ length of leaf. Young leaves silky hairy, mature leaves dark green & glaucous above, paler with scattered fine white hairs below. **9-13 main veins**, stalks 1.5-3.5 cm with tiny (1-2 mm) deciduous stipules. **FLOWER** 7-10 cm, white or purple, in short unbranched clusters along leafless twigs, covering the whole tree. **Buds narrow & pointed, without ridges**. 5 delicate petals, 2-3.5 cm wide near the top with a narrow tapering base. 5 (rarely 6) **long fertile stamens** & 5 (4) much shorter sterile ones, single curved style, slightly longer than stamens with a small stigma. **FRUIT** 20-30x2-2.5 cm, splitting lengthways & curling outwards in 2 ribbons, 10-25 seeds.

NOTE common in deciduous/bamboo forests & in open areas, especially on limestone, often planted for its spectacular flowers. Wild trees usually have white petals, often with yellow or pinkish patches on the largest petal. Cultivated trees are very variable, ranging from pure white to pink or dark purple.

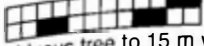
SIMILAR ³³⁶ *Bauhinia purpurea* เสี้ยวดอกแดง ชงโค has pink or purplish flowers with narrower petals, only 3 long stamens & blunt, ridged flower buds. Leaves slightly more pointed, with a narrower & deeper cleft between the lobes, usually with 5-9 main veins. Pods thicker & slightly shorter, up to 25 cm, with fewer seeds. Native of S.America but often cultivated. Flowering throughout the year. The hybrid *variegata* X *purpurea* has 5 stamens but ridged flower buds.

1. 3 large stamens *B. purpurea* ³³⁶
1. 5 large stamens *B. variegata* ³³⁵
1. 10 stamens equal length (or none)
2. flowers in unbranched clusters
3. clusters drooping, > 5 cm long
fw buds curved *B. racemosa* ³³⁷
3. clusters upright, 2-5 cm long
fw buds ovate *B. brachycarpa* ³³⁹
2. flowers in branched clusters
4. fw stalks 1-2 cm
fw buds club-shaped
B. saccocalyx ³⁴⁰
4. fw stalks 0.2-0.4 cm
fw buds narrow & pointed
B. malabarica ³³⁸



337 *Bauhinia racemosa*

ขงโคมา ขงโคใบเล็ก



Deciduous tree to 15 m with broad, dense crown & crooked dark grey trunk. **LEAF** 4-10 cm, with rounded tips & broad, shallow cleft (<¼ length of leaf). Mature leaves leathery, smooth or softly hairy on veins below. 7-9 main veins, stalks 1-3 cm. **FLOWER** 1-1.5 cm, greenish-white or pale yellow, in slender unbranched clusters, 12-20 cm. **Buds distinctly curved, widest near the top** with a short point, 0.5-0.7 cm. 5 narrow petals, 10 hairy stamens in 2 rows, the outer 2x as long, 1 short style with tiny stigma. **FRUIT** 8-25x1.5-2.5 cm, often curved, not splitting. **NOTE** scattered in semi-open forests, occasionally planted.

338 *Bauhinia malabarica*

เสี้ยวใหญ่



similar to *B. racemosa* but leaves usually grey-green (glaucous) below. **FLOWER** unisexual, in short branched clusters, <5 cm. **Buds straight, club-shaped**. Male flowers with 10 fertile stamens in 2 rows, females with 10 very short infertile stamens & a knob-shaped stigma. **FRUIT** 20-30x0.8-2.5 cm, dark red-brown, strap-shaped with a long straight tip & a **fine network of raised veins**, not splitting open. Uncommon.

SIMILAR 2 other species with unisexual flowers & 0 or 10 stamens.

339 *B. brachycarpa* เสี้ยวเรียงดาว
shrub or small tree to 6 m, young twigs with dense reddish brown hairs, leaves with brown hairy glands. Flowers white, in short unbranched clusters opposite the leaves, pods 3-5 cm, splitting. Rare, only known from Doi Chiang Dao.

340 *B. saccocalyx* เสี้ยวป่า small straggling tree to 10 m, leaves narrowly pointed, with scattered hairs & brownish glands on lower surface. Flowers white or pink in dense branched clusters. Pods 7-14 cm, splitting, wider near the top with short curved tip. Tak province.

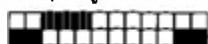


Cassia (Senna) TABLE 4

One of the largest genera of trees in the world with 400 species found throughout the tropics but concentrated in S.America. 6 species native to NT, but several others are widely cultivated & often become naturalized. **Even-pinnate leaves with 3-20 pairs of opposite leaflets**, large bisexual flowers with 5 overlapping sepals, 5 petals & 10 stamens of differing lengths. Pods elongated, cylindrical or flattened with many seeds, often with partitions between the seeds. Many species have recently been transferred to the genus *Senna*.

341 *Cassia fistula*

ขี้เหล็ก กล้วย



Deciduous tree to 20 m with rather narrow, deep crown & slender, drooping branches. **BARK** pale brown, smooth or slightly cracked. **LEAF** 30-40 cm, with 3-8 pairs of leaflets, 7-12(17)x4-8 cm, ovate-oblong, blunt at both ends with silky hairs when young but completely smooth when mature, without glands. Stipules small, falling early. **FLOWER** 3.5-5 cm, bright yellow, in drooping unbranched clusters, 20-40 cm long, usually on old branches appearing just before the young leaves. 3 long stamens with a swelling in the middle of the filaments, 3 cm long, other stamens 5-10 mm long, anthers smooth. Ovary & style with silky hairs **FRUIT** 20-60x1.5-2 cm, black, smooth, usually hanging straight downwards like tubes, not splitting, falling as one piece & breaking up into many small sections on the ground. **NOTE** One of the most spectacular of our native trees, common in deciduous forests & widely planted for its beautiful golden-yellow flowers. Slow growing but flowering at an early age.

yellow flowers (see p 173 for pink fws)

1. flowers in axillary, unbranched clusters
2. flowers in long, drooping clusters. 3 long stamens
*C. fistula*³⁴¹
2. flowers in upright clusters, 1-2 long stamens
3. 3-9 pairs of leaflets with club-shaped glands
*C. surattensis*³⁴⁵
3. 8-20 pairs of leaflets, without glands
*C. timoriensis*³⁴⁴
1. flowers in terminal, unbranched clusters
flower stalks 2-4 mm
*C. alata*³⁴⁸
1. flowers in terminal, branched clusters
4. flowers with 7 long stamens.
5. bottom petal larger & curved
*C. spectabilis*³⁴⁷
5. petals all same size
*C. timoriensis*³⁴⁴
4. flowers with 2 long stamens
6. leaflets blunt or rounded tips
*C. siamea*³⁴³
6. leaflets long pointed tips
*C. garrettiana*³⁴²



342 *Cassia garrettiana*

แสมสาร ชี้เหล็กป่า



Tree to 10 m. **LEAF** 6-9 pairs of leaflets, 5-9 cm, ovate with long tips, no glands. Mature leaves smooth or nearly so, stipules falling early. **FLOWER** bright yellow, in narrow branched clusters at end of twigs, 9-20 cm. Petals 1.5-1.8 cm, 2 stamens longer than others. **FRUIT** 15-22x2.4 cm, flattened, often twisted, smooth or with very scattered hairs, stalks 3 cm. (illustration on p172)

NOTE native to NT, scattered in deciduous forests, sometimes planted

343 *Senna (Cassia) siamea*

ชี้เหล็ก ชี้เหล็กพรวน

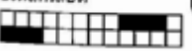


Evergreen tree to 20m, 6-12(15) pairs of leaflets, 3-7.5x1.2-1.5 cm, elliptic with rounded or slightly notched tips, ± finely hairy below, **no glands**, stipules tiny. **FLOWER** yellow, in untidy **branched clusters** at end of twigs, 20-30 cm. Individual stalks 2-3 cm; petals 1.2-2 cm; **2 stamens longer than others**. **FRUIT** 15-30x1-1.8 cm, flattened, often curved with raised ridges, splitting.

NOTE very common in open areas & wast ground, often planted.

344 *Senna (Cassia) timoriensis*

ชี้เหล็กเลือด



Evergreen tree to 10 m, 8-24 pairs of leaflets, 2-6 x 1-1.5 cm, oblong with short, blunt tip, no glands. Young leaves with yellowish hairs below, mature leaves nearly smooth. **Large curved stipules**, 1.5-2 cm. **FLOWER** yellow, in dense **branched clusters** at end of twigs or **upright unbranched clusters** at upper leaf axils. Individual stalks 1-3 cm, petals 1.5-2 cm. **FRUIT** 8-16 cm, yellowish, flattened, not ridged, splitting open when mature.

NOTE scattered in semi-open forests & along forest edges.



³⁴⁵*Senna (Cassia) surattensis*

ทรงบาดาล

Shrub or small tree to 7 m. **LEAF** 4 - 9 pairs of leaflets, 2.5-4x1-1.7 cm, rounded both ends or slightly notched /pointed, sparsely hairy below with **club-shaped glands** on leaf stalk between lowest pairs of leaflets. stipules linear, 5-10mm, $\pm$ persistent. **FLOWER** bright yellow, in **unbranched upright clusters (corymbs) at upper leaf axils**, individual stalks 1-2 cm. Petals 1.5-2 cm, 1 stamen longer than others. **FRUIT** 7-10x1-1.5 cm, flattened, smooth, thin, splitting when mature. **NOTE** introduced from tropical America, very commonly planted, but not normally naturalized.

SIMILAR ³⁴⁶*S. sulfurea* 4-6 pairs of leaflets, 5-10x2-3.5 cm, lanceolate with pointed tips, whitish (glaucous) below. Fruits up to 20 cm long.

³⁴⁷*Senna (Cassia) spectabilis*

สุวรรณพฤกษ์ ชีเหล็กอมรินทร์

Small tree to 7 m. **LEAF** 6-15 pairs of leaflets, 3-7x1-2 cm, elliptic with pointed tips, finely hairy below, **no glands**. **FLOWER** in large **branched clusters at end of twigs**, individual stalks 2-3 cm, petals 2-2.5 cm, **lowest petal larger than others & noticeably curved**. 7 stamens longer than other 3. **FRUIT** 18-25x1 cm, cylindrical, black & glossy.

NOTE introduced from tropical America but widely naturalized.

³⁴⁸*Senna (Cassia) alata*

ชุมเห็ดเทศ ชุมเห็ดใหญ่

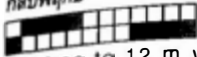
Robust shrub to 3 m. **LEAF** 8-20 pairs of leaflets, 5-15 cm, oblong, rounded at both ends, smooth, **no glands**. **FLOWER** bright yellow, in upright spike-like clusters at top of twigs, individual flower **stalks very short** (2-4 mm), petals $\pm$ 2 cm, 2 stamens longer than others. **FRUIT** 10-20x1.5-2 cm, black, flattened splitting with **4 wide ridges**.

NOTE native of S.America but commonly planted & naturalized in moist, open areas.



349 *Cassia bakeriana*

ก๊อบลพดก



Small tree to 12 m with wide, spreading crown & leaves in flattened sprays. **LEAF** 5-7 pairs of leaflets, 6-8x1.7-2.8 cm, rounded at both ends or with very short tip. Young leaves densely silky hairy, mature leaves with **short velvety hairs below**, no glands. Stipules narrow & pointed, attached in the middle. **FLOWER** in upright, **unbranched clusters**, **usually behind the leaves**, 10-20 cm. Individual stalks dark red-purple, slender, to 6 cm. Sepals 0.9-1.2 cm, hairy, dark red-purple. Petals 3-4.5 cm, **pink fading to almost white**. 3 stamens longer than others, filaments swollen in the middle, anthers very small. **FRUIT** 30-40x1-1.5 cm, brown or grey, narrowly tubular, finely hairy. Stalks $\pm$ 6 cm.

NOTE native to NT, scattered in semi-open forests & sometimes planted.

SIMILAR 3 other species also have pink flowers. ³⁵⁰*C. grandis* tree to 20 m, 10-20 pairs of oblong leaflets, 2.5-6 cm, densely covered with brown woolly hairs below when young. Stipules tiny. Petals 1.2-1.6 cm, red when young, later pink or orange. Anthers hairy. Pods 20-40x3-4 cm, woody, blackish. Introduced.

³⁵¹*C. agnes* ราชพฤกษ์ small tree to 10 m, 6-7 pairs of leaflets, 3.5-5.5 cm, with short blunt tip, softly hairy below. Stipules kidney-shaped. Flowers in branched upright clusters (corymbs) at end of twigs, petals 1.5-2.2 cm. Pods black, cylindrical, smooth. Native to NT but not common.

³⁵²*C. javanica* tree to 20 m, leaflets 2.5-5x1.5-2.5 cm, flowers in upright branched clusters behind leaves. Pods 20-60 cm, black, cylindrical, not splitting. Introduced. 2 Subspecies: ssp. *javanica* has up to 15 pairs of blunt-tipped leaflets, flowers with dark red calyx, trunk often thorny when young. ssp. *nodosa* has up to 12 pairs of leaflets with pointed tips, flowers with green calyx, trunk never thorny.

Cassias red or pink flowers

1. petals 3.5-4.5 cm long

C. bakeriana ³⁴⁹

1. petals 1.2-3.5 cm long

2. 12-20 pairs of leaflets; anthers hairy

C. grandis ³⁵⁰

2.5-15 pairs of leaflets; anthers smooth

3. leaflets 6-7 pairs; terminal corymbs

C. agnes ³⁵¹

3. leaflets 5-15 pairs; lateral racemes

4. sepals dark red, leaflets blunt. trunk & branches often spiny

C. javanica var. *javanica* ³⁵²

4. sepals green, leaflets pointed trunk & branches never spiny

C. javanica var. *nodosa* ³⁵²

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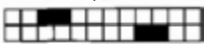
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353 *Peltophorum dasyrrhachis*

ละพราง คางคก

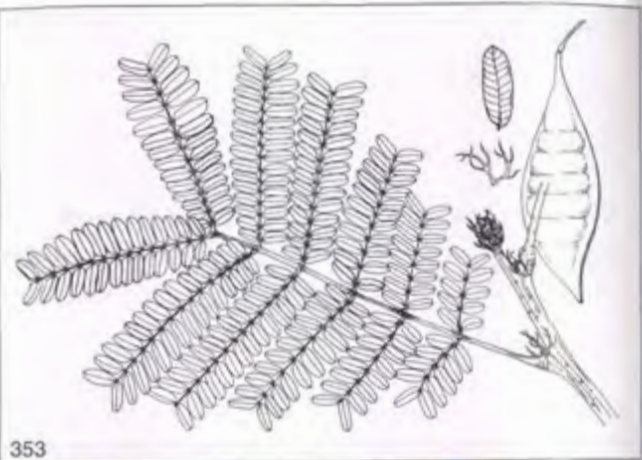


Deciduous tree to 30 m with rather uneven, open crown. **LEAF** 18-25 cm, **bipinnate** with 4-9 pairs of pinnae each with 8-16 pairs of leaflets, 1-2.5x0.5-1 cm, asymmetrically oblong with slightly notched tip. Young leaves with dense red-brown hairs, mature leaves glossy dark green above & slightly brown-hairy below, with remarkable **antler-like stipules**, ± 2 cm. **FLOWER** 1.5-2.5 cm, bright yellow, in **drooping unbranched clusters at leaf axils**, 15-35 cm, individual stalks 1.5-4 cm. 5 overlapping sepals, densely brown-hairy outside. 5 flimsy rounded petals, 10 fertile stamens as long as petals, single slender style with knob-like stigma, ovary hairy. **FRUIT** 10-15x2-3.5 cm, dull brown, tapering at both ends with 2 long narrow wings, 0.4-0.5 cm wide, hanging in bunches behind the leaves, not splitting. 4-8 flat seeds, arranged **horizontally** across the pods.

NOTE native in NT but not common in the forest, frequently planted along roadsides where it seems to flower many times in a year.

SIMILAR ³⁵⁴*P. pterocarpum*

พะนัง has similar leaves but with small (<1 cm) linear stipules which fall early. Flowers in upright branched clusters at end of twigs. Pods with seeds arranged vertically along the pods. Native of S. Thailand but not in the North, very commonly planted. Flowering throughout the year. *Cassia* species have similar yellow flowers but the leaves are only once-pinnate.



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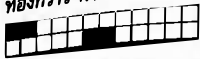


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PAPILIONOIDEAE (Leguminosae)

355 *Butea monosperma*

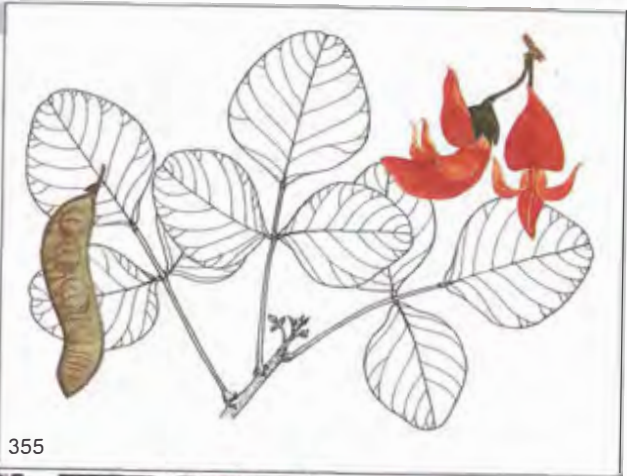
ทองกวาว กำ



Deciduous tree to 15 m with irregular crown & crooked trunk. **BARK** pale brown, smooth or slightly flaking, **exuding a red gum when cut**. **LEAF** trifoliate, central leaflet slightly larger than others, 10-17 cm, broadly obovate with blunt or rounded tips & slightly tapering base, side leaflets narrower, ovate, blunt at both ends. Young leaves with fine silky hairs, mature leaves leathery, smooth above, thinly hairy below with **1 main vein** & 7-8 regularly-spaced side veins. Main stalk 7.5-15 cm, side leaflet stalks $\pm$ 1 cm. **FLOWER** 5-6 cm, **bright orange**, densely clustered on short woody stumps along all the branches, appearing after the old leaves fall. Individual stalks 1.5-3.5 cm, twice as long as calyx. 5 silky petals, similar in size, the lowest one strongly curved & hiding the stamens. 10 stamens, 1 free & 9 fused into a tube, 1 long curved style. **FRUIT** 15-20x4-6 cm, oblong, often slightly curved, rather thick & woody, densely covered with very short silky hairs, abruptly narrowed at base with persistent calyx, stalks 1.2-2.5 cm.

NOTE not common in the wild, usually in very degraded, fire-damaged areas. Frequently planted for its fabulous flame-colored flowers.

SIMILAR ³⁵⁶*B. superba* ทองกวาวเครือ is a massive woody climber with very similar flowers. *Erythrina* spp. usually have thorny trunk & flowers with 1 petal much longer than the others.



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357 *Erythrina stricta*

ทองหลวง ทองเดือนห้า



Large deciduous tree to 35 m with steeply ascending branches & rather open crown. **BARK** pale cream, soft & corky, young trees with **sharp thorns on thick woody bases**, older trees sometimes almost smooth but usually with some thorns at least on branches. **LEAF** trifoliate, central leaflet larger & broader than side ones, 8-12 cm, broadly ovate with pointed tip & rounded base. Young leaves minutely silky hairy, mature leaves smooth or nearly so. **3 main veins**, central leaflet stalk 2.5-3 cm, side ones ± 0.5 cm, main stalk 5-10 cm. **FLOWER** 3.5-4 cm, bright scarlet, in dense spike-like clusters with all the flowers on one side, the bottom ones enlarging & opening first. Calyx 0.6-1.2 cm, smooth, dark purple outside, fused into a tube at base, **pointed & much longer on one side only**, Top petal much more obvious than the others, bright red, straight, narrow & pointed. Bottom petal pale green or white, half as long, curved around stamens. **Two side petals much smaller**, <4 mm, hidden inside others & easily missed. **FRUIT** 5-10 cm, flat, pointed at both ends, smooth, with 1-3 seeds **spaced throughout the pod**.

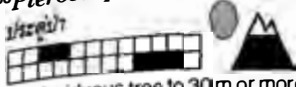
NOTE very common, a distinctive feature of both dry & moist forests, only regenerating in more open areas. The bright scarlet flowers attract lots of birds.

SIMILAR 358 *E. subumbrans*

ทองหลวงป่า is easily confused, but the calyx is split to the base & the side petals are as long as the lower one. Pods much narrower & always without seeds in the bottom half. Common, especially along open streams.

359 *E. suberosa* **ทองหลวงใบมด** has less pointed leaflets with long soft hairs & flowers with calyx deeply split into 2 spreading lobes, uncommon.



360 *Pterocarpus macrocarpus*

Large deciduous tree to 30 m or more with majestic, dome-shaped crown & large, spreading branches. **BARK** pale brown, slightly fissured, becoming darker & scaly with age, inner bark fibrous, red-brown with **sparse drops of red sap**. **LEAF** 15-25 cm, odd-pinnate with 3-6(9) pairs of alternate leaflets 4-7.5x2-3.5 cm, oval with abruptly pointed tip & rounded base. Young leaves densely hairy, mature leaves bright green, smooth above but usually with **scattered brown hairs on stalks & veins below**, greyish when dry. 11-17 pairs of side veins. **FLOWER** 1.4-1.7 cm, bright yellow, in **unbranched clusters at leaf axils**, 5-9 cm long. Calyx $\pm$ 7 mm, bell-shaped with 5 subequal teeth, densely hairy. Corolla pea-shaped with 4 free, crumpled petals. 10 stamens fused in 2 bundles, ovary densely hairy with short stalk. **FRUIT** 4-7(10) cm, circular, with a broad, wavy wing surrounding the central 1-2 seeded capsule & a short point (style) in **lower half**, not splitting, **densely covered with minute pale brown or whitish hairs when young**, less so when mature.

NOTE less common than in the past, extensively logged for its excellent timber, often planted.

SIMILAR ³⁶¹ *P. indicus* ไม้พุ่ม is easily confused but has completely smooth leaflets, 5-10x4-7 cm, with 8-10 side veins, dark brown or black when dry. Flowers in branched clusters at ends of twigs, 15-30 cm long, calyx without hairs. Fruits usually < 5 cm diam., style point in upper half, completely smooth. Native of Malaysia, commonly planted. *Dalbergia* spp. ³⁶² have white or purple flowers, much narrower fruits & no red sap in the bark. *Callerya atropurpurea* ³⁷² has red sap but opposite leaflets.



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Dalbergia **TABLE 5**

110 species worldwide, 10 trees & several woody climbers native to NT. Leaves **odd-pinnate with alternate leaflets**, usually <3 cm wide. Flowers white or purple, 5 fused sepals, with 4 free petals & 10 stamens fused in 1-2 clusters, ovary with distinct stalk. Pods oblong or elliptic, flat, often swollen & veined around seeds, **not splitting**, 1-3 kidney-shaped seeds.

Dalbergias are a common element of deciduous forests, capable of withstanding frequent fires & becoming increasing common in degraded areas where their ability to fix atmospheric nitrogen gives them a competitive advantage. **SIMILAR**

Pterocarpus spp.³⁶⁰ larger leaflets, yellow flowers, circular fruits & bark with red sap. *Millettia* spp.³⁷² similar flowers but opposite leaflets & pods that split open when mature.

364 *Dalbergia rimosa*

กะพืดเครือ



Scrambling shrub or small deciduous tree to 10 m. **LEAF** 15-20 cm, 2-4 pairs of leaflets, 5-7.5(10)x2.5-4 cm, end leaflet larger than others, slightly pointed or almost rounded at both ends. Mature leaves bright green & shiny above, paler & often with **scattered short hairs below**. 15-20 pairs of side veins, finer veins forming a clear network on both surfaces. **FLOWER** 0.3-0.4 cm, white, **branched clusters in axils of upper leaves & at ends of twigs**, 5-10 cm. Calyx tube $\pm$ 3 mm, lower tooth 2x as long as others, top petal broadly obovate, notched, stamens fused into a single sheath. **FRUIT** 5-9x2-3.5 cm, smooth, pale brown when dry, thickened & veined near the seeds. Seeds 22x16 mm, red-brown. **NOTE** fairly common along the edges of hill evergreen forest.

SIMILAR ³⁶⁵*D.ovata* larger leaflets, 5-16x3-6.5 cm, smooth, slightly glaucous below. 8-10 pairs of side veins. Flower 0.5-0.8 cm, white, top petal longer than wide, calyx tube 4-5 mm, lower tooth slightly longer than others. Fruit (4)8-12x2 cm, seeds 11x7 mm.

1. flowers terminal or subterminal
2. flowers white, 4-6 mm long, 2-4 pairs of leaflets
3. fws 3-4 mm, top petal as wide as long
- leaflets 5-7.5(10) cm, fruits 7-9 cm
3. fws 5.5-6 mm, top petal longer than wide
- leaflets (5)8.5-16 cm, fruits 8-12 cm
2. flowers mostly purple/pink, 8-12 mm long, (4)5-9 pairs of leaflets
4. fws 12 mm, top petal as wide as long, fts 9-14 cm
4. fws 7-8 mm, top petal longer than wide, fruits 5-10 cm
5. leaflets pointed, fruits pale brown when dry
5. leaflets rounded, fruits black when dry
1. flowers axillary
6. flowers 5-8 mm
7. all calyx teeth $\pm$ same length
7. lower calyx tooth 2X longer than side ones
8. secondary veins very fine, faint above
8. secondary veins thicker, clear on both sides
6. flowers 9-10 mm

D. rimosa 364*D. ovata* 365*D. oliveri* 366*D. cana* 367362 *D. nigrescens**D. cultrata* 368*D. assamica* 369*D. sericea* 370363 *D. lanceolaria*

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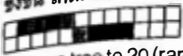
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366 *Dalbergia oliveri*

ชิงวัน เค็ดแดง



Deciduous tree to 20 (rarely 30) m with delicate foliage & open, spreading crown when mature. **BARK** dark grey, rather thick, scaly & flaking in small pieces, inner bark yellow, heartwood dark red. **LEAF** 15-30 cm, 5-7(10) pairs of leaflets, 3-8x1-3 cm, end leaflet only slightly larger than others, blunt or slightly pointed at both ends, vein network clear. Young leaves pale pink with silky hairs, mature leaves dark grey-green, smooth. **FLOWER** ± 1.2 cm, purple in bud, later lilac or white, in branched clusters at or near end of twigs, 10-15 cm. Calyx tube 4-5 mm, dull purple, smooth or nearly so, lower tooth much longer than others. Top petal rounded, as wide as long, bottom petal slightly shorter. Stamens in 2 clusters. **FRUIT** 9-14x2.5-4 cm, narrow & pointed at both ends, smooth, pale brown when dry, much thicker near seeds. Usually 1, sometimes 2 or 3 seeds, 12x9 mm, reddish brown.

NOTE common, semi-open forests but avoiding very degraded areas.

367 *Dalbergia cana*

ชิงวัน ปู่พวง



Deciduous tree to 15 (rarely 30) m. **BARK** pale grey, peeling in small irregular pieces. **LEAF** 15-45 cm, 7-9 pairs of leaflets, 4.5-8x2.5-3.5 cm, abruptly tipped. Young shoots with fine brown hairs, mature leaves smooth or with scattered hairs on main veins. 8-12 pairs of side veins, faint above. Stipules linear, ± 1.5 cm. **FLOWER** ± 0.8 cm, violet, in branched clusters at or near end of twigs, 10-20 cm long. Calyx tube ± 0.4 cm, purple, smooth or nearly so, lowest tooth slightly longer than others. Top petal longer than wide & narrow at the base, bottom petal shorter than side ones. Stamens fused into 2 clusters. **FRUIT** 5-7x2-2.5 cm, straight, oblong, finely brown hairy, slightly veined over seeds, 1-2 dark brown seeds, 10x8 mm. **NOTE** fairly common in semi-open forests.



368 *Dalbergia cultrata*

กระพี้เขาคาย เกิดคำ



Small deciduous tree, rarely to 20m, with straight trunk & open, narrow crown. **BARK** cream, quite smooth with horizontal wrinkles, inner bark red-brown, heartwood dark purple. **LEAF** 10-20 cm, 3-6 pairs of leaflets, 2.5-5x1.5-2 cm, rounded or blunt-tipped & often slightly notched. 9-12 pairs of side veins, smaller veins easily visible. Young shoots with silky white hairs, mature leaves dark green above, usually smooth. **FLOWER** 5-6 mm, white or pink, in branched clusters (cymes) at leaf axils 5-8 cm, appearing before young leaves. Calyx tube 3-5 mm smooth or nearly so, **all calyx teeth ± same length**. Top petal rounded or heart-shaped, as wide as long, narrow at the base, other petals slightly shorter, bottom petal dome-shaped. **Stamens fused into a single, split sheath**. **FRUIT** 2.5-10x1.5-2 cm, oblong, often slightly curved, brown or greyish when dry, smooth, slightly veined at the seeds, stalks 0.5-1.5 cm. 1-3 seeds, 10x6 mm, **closer to one edge of pod**. **NOTE** very common in open, fire-prone areas, often shrubby & coppicing. **SIMILAR**

369 *D. assamica* เกิดคำ 5-10 pairs of leaflets, 2.5-3.5x1-3 cm, rounded tips, slightly hairy below, side veins very fine, faint above. Flowers 7-8 mm, lower tooth 2x as long as others, top petal rounded, as wide as long, stamens in 2 clusters. Pods 5.5-8x2-2.5 cm, smooth, stalks 0.3-0.5 cm, 1-2 seeds, 10x5 mm, in centre of pod. Reported for NT but not seen by us.

370 *D. sericea* flowers very similar to *D. assamica* but leaflets with long silky hairs & thicker side veins, visible on both surfaces. Fruits 3-6x0.5-0.7 cm, seeds 5x2 mm.

371 *D. stipulacea* หนามเครือ scrambling shrub to 5m. 8-10 pairs of leaflets, 2-5x1-1.5 cm, blunt or rounded both ends, thinly hairy below, young shoots with large stipules. Flowers 6-8 mm, pink or bluish-violet, in branched or unbranched clusters (cymes) at leaf axils, 5-10 cm. Calyx tube 3-7 mm, lower tooth pointed, 2X as long as others, stamens in 2 clusters. Pods 7-12x3.5-4.5 cm.



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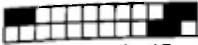
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Millettia

Leaves **odd-pinnate** with 3-10 pairs of **opposite** leaflets, often with tiny points (stipels) at base of leaflet stalks. Flowers similar to *Dalbergia* but usually larger, with the **top petal curved sharply backwards**. Calyx wider than long with 5 short teeth, the 2 upper ones often united. 10 stamens fused into a single sheath, sometimes with 1 stamen free from others, ovary without stalk. Pods flattened, not veined or swollen over seeds, eventually **splitting into 2 sections**, but often not until after falling from the tree.

373 *Millettia macrostachya*var. *teetha*

ชะเผ้าใหญ่ ชะเผ้าหลวง



Deciduous tree to 15 m with open, spreading crown. **BARK** pale brown with shallow cracks. **LEAF** 25-40 cm, 4-5 pairs of leaflets, (5)10-18x5-7 cm, oblong, blunt or very slightly tipped. Young leaves with dense brown hairs, mature leaves smooth or softly hairy below. 9-11 pairs of side veins, straight & almost parallel with a fine network of smaller veins, slightly surken above. Leaflet stalks 4-7 mm, **with tiny points (stipels) at base**. **FLOWER** 2-3 cm, pink or pale purple with yellow patch near centre, unbranched clusters near end of twigs. Petals **silky outside**, top one rounded, as wide as long, curved strongly backwards, side petals straight & narrow, bottom petal curved inwards. **FRUIT** up to 40 cm, thick-skinned with raised edges along the joints & a short point at the top. 1-3 large flattened dark brown seeds.

NOTE scattered in open forests, commoner south of Chiang Mai, easily recognised in fruit when the slender twigs droop under the weight of pods.

SIMILAR ³⁷⁴*M. leucantha* กระพี้เขาควาย deciduous tree to 20m, 3 pairs of leaflets, 5-12 cm, abruptly tipped, completely smooth, stalks $\pm$ 4 mm with persistent narrow stipels. Flowers $\pm$ 1.2 cm, white, petals smooth. Pods 4-10x2 cm, woody, widest near top, rough with many lenticles, edges rounded.

Legumes with odd-pinnate leaves & opposite leaflets (*M. = Milletia*)

1. 3-5 pairs of large leaflets, 5-18cm long
2. leaflet stalks with stipels
 3. smaller leaflets 5-10cm, abruptly tipped, white flowers <1.5 cm, smooth petals, pods <10cm *M. leucantha* ³⁷⁴
 3. larger leaflets 10-18cm, blunt tipped. pink/mauve flowers, 2.5-3.5cm, silky petals, pods to 40cm
2. leaflet stalks without stipels *M. macrostachya* var. *teetha* ³⁷³
 4. smaller leaflets 5-7.5 cm, narrow tip, hairy along veins greenish-white fws <1.5cm, deciduous tree to 8m *M. pubinervis* ³⁷⁵
 4. larger leaflets 7.5-15cm, broad tip, completely smooth dark purple fws, 1.8-2.5cm, evergreen tree to 20m ³⁷² *Callerya atropurpurea*
1. 7-10 pairs of small leaflets, 2.5-6cm long
 5. leaflets smooth, with stipels, pinkish-blue flowers pods flat, not ridged, splitting *M. brandisiana* ³⁷⁶
 5. leaflets slightly hairy below, no stipels, white flowers pods with narrow ridges, not splitting *Derris robusta* ³⁷⁷



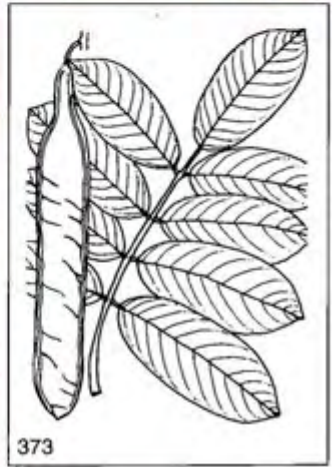
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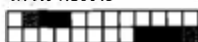
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375 *Millettia pubinervis*

จักจั่น กะเจี๊ยะ

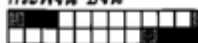


Deciduous tree to 8 m, 3-4 pairs of leaflets, 5-7.5 cm, with narrow tips & scattered hairs along veins below, leaflet stalks 2-4 mm, no stipels.

FLOWER ± 1.5 cm, pale yellow or greenish-white, unbranched clusters near end of twigs opposite the end leaf, 6-10 cm long. Calyx ± 3 mm, red-brown, slightly hairy, blunt-toothed. Petals smooth. Stamens all same length, ovary silky hairy. **FRUIT** woody, ridged, seeds flattened.

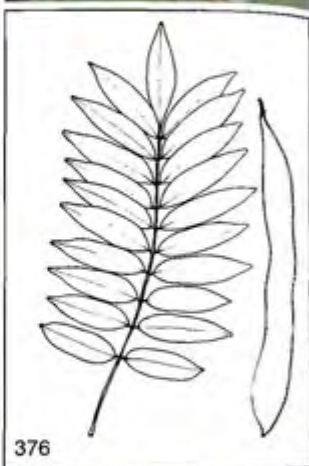
376 *Millettia brandisiana*

กระพั่น บ้าง

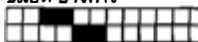


Deciduous tree to 20m. **BARK** rough, dark grey, inner bark reddish. **LEAF** 15-30 cm, 7-10 pairs of leaflets, 2.5-6 cm, slightly pointed. Leaf buds with copper-colored hairs, mature leaves completely smooth. Leaflet stalks 2 mm with tiny stipels at base

FLOWER ± 1.5 cm, **pale blue**, petals silky-hairy. Calyx ± 4 mm, purple, smooth except along edge of teeth, conspicuously toothed, the lower one larger than the others. Stamens equal, ovary silky hairy. **FRUIT** 5-7.5 cm, very flat, often slightly curved with short blunt tip, gradually narrowed towards base, not thickened along edges, smooth & woody. 1-3 flattened seeds.

377 *Derris robusta*

ขี้มอด ขางคาว



Deciduous tree to 15 m, **LEAF** odd-pinnate with 6-13 pairs of opposite leaflets, 2.5-3.7 cm, narrowly elliptic or oblong with blunt or slightly pointed tip. Young shoots brown hairy, mature leaves with minute hairs below. Leaflet stalks ± 1 mm, no stipels. **FLOWER** white, in slender unbranched clusters at leaf axils. Petals smooth, ovary silky hairy. **FRUIT** 3-7.5x0.8-1.2 cm, minutely hairy, linear, dark brown, not splitting, **narrowly winged**, not splitting, 1-5 seeds.



ROSACEAE rose family

2825 species worldwide, mostly in N. temperate regions, 7 genera & 14 species in NT.

BOTANY evergreen or briefly deciduous trees without latex. Leaves simple, alternate, planar or spirally arranged, with stipules. Flowers regular, axillary or terminal, usually with 5 free petals & 5 to many free stamens attached to calyx tube. 2-4 styles, free or fused at base, ovary superior or inferior, surrounded by thin disc. Fruits not splitting, usually thinly-fleshy or leathery with a large 1-3 seeded stone.

USES in temperate regions *Rosaceae* provides many fruit trees (apples, pears, peaches etc.) as well as many ornamental flowers. In tropical regions *Rosaceae* are far less important - most of the native species have inedible fruits & inconspicuous flowers, with the notable exception of *Prunus cerasoides*.

378 *Parinari anamensis*

มะพอก มะมือ



Evergreen tree to 30 m. **BARK** grey-brown, deeply cracked & flaking. **LEAF** 6-15 x 4-9 cm, oval or ovate with slightly pointed or blunt tip & rounded base, no teeth. 12-15 pairs of rather straight, parallel side veins, distinctly raised above. Mature leaves smooth above, **finely hairy below**, stalks 0.7-1 cm, usually with 2 small glands below the middle. **FLOWER** small, white, in slender branched clusters at end of twigs, longer than leaves, to 20 cm. Individual stalks very short, axes densely orange-brown hairy. Calyx 0.3-0.4 cm, with 5 unequal, pointed lobes. 5 petals as long as calyx lobes. 5-12 unequal stamens. Ovary densely hairy, joined at one side to the calyx, **style attached to base of ovary, ± as long as stamens**. **FRUIT** 3-4 cm, brown with grey scabs, thinly fleshy with densely hairy inner layer, 1-2 seeds. **NOTE** both evergreen & deciduous forests, often planted.



379 *Prunus cerasoides*

นางพญาเสือโคร่ง



Deciduous tree to 18 m. **BARK** red-brown, shiny, **peeling in horizontal strips** with large tan lenticels. **LEAF** 5-12 x 3-5 cm, narrowly ovate with tapering tip & blunt or rounded base, **sharply toothed**, with **2-4 orange glands** on margin near base of leaf or at top of stalk. Stalks 0.8-1.5 cm, slender with **large, deeply divided stipules**, soon falling. **FLOWER** 1-2.5 cm, bright pink or rarely white, in clusters with or without a common stalks, often 3-flowered, individual stalks slender, 0.7-2 cm, no hairs, behind young leaves. Calyx pink, with triangular lobes, smooth. Ovary without hairs. **FRUIT** 1-1.5 cm, ellipsoid (ovoid), pink or bright red & shiny, thinly fleshy, with single bony, wrinkled stone (pyrene).

NOTE common in open, disturbed areas, often planted along roadsides due to its beautiful flowers & fast-growing habit.

SIMILAR ³⁸⁰*P. persica* leaves with linear, undivided stipules. Flowers without stalks, calyx & ovary densely hair. Fruits 2.5-3.5 cm, hairy. Native of China, cultivated for its edible fruits

381 *Prunus arborea*

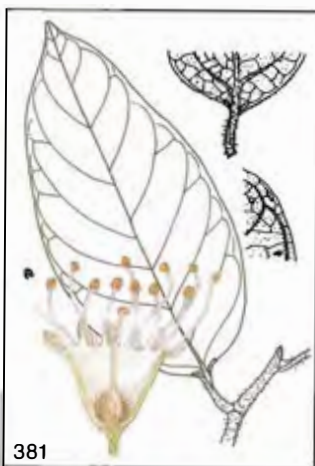
var. *montana* แดงซัง



Deciduous tree to 16m. **BARK** pale grey-brown, quite smooth with many lenticels. **LEAF** 6-20x4-8 cm, narrowly ovate with tapering tip & blunt or slightly pointed base, **no teeth**. Young shoots densely hairy, mature leaves with scattered brown hairs especially on veins above, denser below, usually with **pairs of large glands at base of leaf & smaller ones scattered on surface towards margin**. Stalks 0.5-1 cm with linear, undivided stipules, falling early. **FLOWER** ≤1 cm, pale green or cream, in branched or unbranched clusters at axils of leaves or behind them, individual stalks short & hairy. Calyx tube hairy outside & at base inside, 7-12 ± equal lobes, petals >>



very similar to calyx lobes. 20-30 stamens, ovary usually densely hairy. **FRUIT** 0.6-1.5 cm, globose to hairy. **NOTE** fairly common. seeded stone. **SIMILAR** 4 other species also have inconspicuous flowers & untoothed or slightly toothed leaves. **382P. phaeosticta** leaves with dense black dots below, often slightly toothed, glands on or near margin, stipules not joined together. **383P. javanica** leaves with dense black dots below, always untoothed, glands at top of stalk, stipules fused into a ring. Fruits bullet-shaped. **384P. wallichii** leaves without black dots or glands, sometimes slightly toothed, fruits ovoid. **385P. ceylanica** leaves without black dots but with glands, 5-8 pairs of side veins, no teeth, stalks ≥ 1 cm.



386 Eriobotrya bengalensis

ตะเกรา จำปีดง



Evergreen tree to 12(25) m. **BARK** rich red brown or dark brown, irregularly & coarsely cracked with large lenticels. Inner bark white, quickly turning dark brown when cut, fibrous. **LEAF** 10-20 x 4-8 cm, rarely up to 30x11 cm, narrowly obovate or lanceolate with tapering or blunt tip & narrowed base, **coarsely toothed with quite straight side veins that end at the teeth**. Mature leaves **completely smooth**, dark green above, **stalks 2-4 cm**, with inconspicuous stipules, falling early. **FLOWER** white, sweetly scented, in branched or unbranched clusters at end of twigs, 8-12 cm, individual stalks 0.3-0.5 cm, densely hairy. Calyx 5-lobed, 5 petals, waxy, ± 20 stamens, **2-3 styles fused together at base**, ovary semi-inferior, 5-celled, woolly at the top. **FRUIT** 1.5-3 cm, green, ovoid-ellipsoid, **crowned with large persistent calyx**, more or less fleshy & juicy with 1(2) large seeds. **NOTE** 2 forms in NT- **forma bengalensis** leaves with ± 10 pairs of side veins, fruits 2-3 cm **forma multinerva** has leaves with 14-20 pairs of side veins, fruits 1.1-1.5 cm.

SIMILAR **387 E. japonica** leaves densely hairy below, stalks very short. Flowers with 5 styles. Planted.



RHIZOPHORACEAE

Small family of the old world tropics, best known for its mangrove species although 80% of species are found inland. 120 species worldwide, 1 species in NT.

388 *Carallia brachiata*

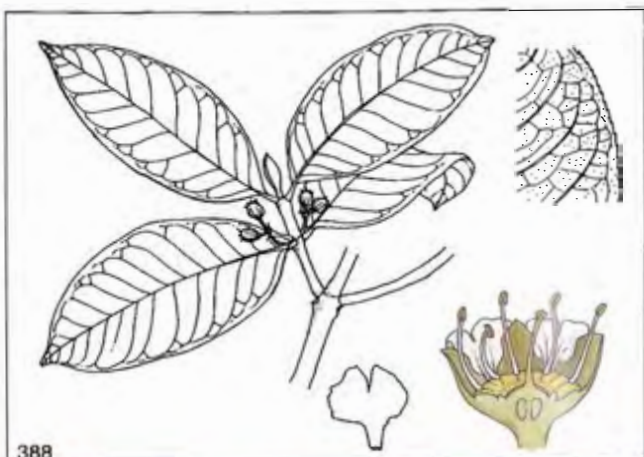
เงี้ยวพรว้านางแอ ส้มป้อม



Evergreen tree to 20 m, usually much smaller. **BARK** pale creamy brown to warm red-brown, quite smooth with many lenticels. **LEAF** 4-17 x 2.5-8 cm, simple, opposite-planar, oval to broadly obovate with blunt or abrupt tip & slightly pointed base, untoothed or with scattered fine teeth. Mature leaves leathery, completely smooth, glossy dark green above, yellow-green with **many tiny dark dots** below. At least 15 pairs of side veins with many intermediate ones, **looped near margin**, midvein sunken above. Stalks 0.4-1 cm, stout. Buds narrowly conical, thinly coated with resin, **enclosed by a pair of large (1-2 cm) stipules which fall early, leaving distinct ring scars**. Twigs dark brown, slightly swollen at nodes. **FLOWER** ± 0.6 cm, white or pale yellow-green, bisexual, in head-like clusters (cymes) at leaf axils. Individual flowers without stalks, main stalks 1-2.5(6) cm. Calyx bell-shaped with 5-8 short teeth, 5-8 free petals with short stalks, 10-16 slender stamens, **petals & stamens attached to top of calyx tube around a thin disc**, 1 slender style with 3-4 lobed stigma, all parts completely smooth. **FRUIT** 0.5-1(1.8) cm, pale reddish-orange to dark red-purple, globose with persistent calyx teeth at top, slightly grooved, fleshy with 1(2) large kidney-shaped seeds surrounded by a thin orange coating (aril).

NOTE widespread & fairly common, usually near streams.

SIMILAR easily mistaken for a *Syzygium*⁴⁰⁸ without flowers, but the growth form is not sympodial.



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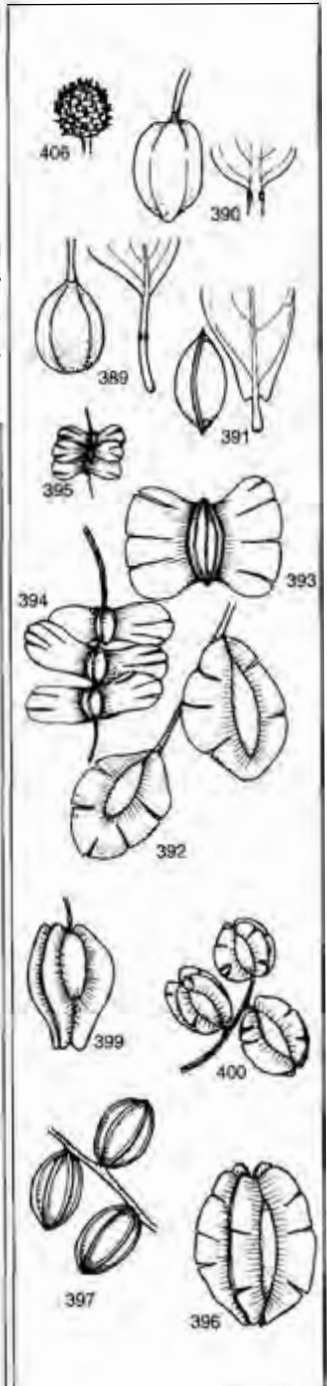


388

COMBRETACEAE

500 species worldwide, mostly woody climbers, 3 genera & 12 species in NT. **BOTANY** deciduous trees without latex. Leaves simple, opposite or alternate, no teeth, **often with conspicuous glands on leaves or stalks**. Flowers inconspicuous, in branched or unbranched spike-like clusters. Calyx 4-5 lobed, 8-10 free stamens, 1 free style with unlobed stigma. 2 main genera in NT - *Combretum* straggly shrubs & woody climbers, rarely small trees, often with scaly leaves. Flowers with distinct individual stalks & 4-5 petals (except *C.apetalum*), fruits mostly 4-5 winged. **Terminalia** medium to large trees, often with a strongly rhythmical (sympodial) branching pattern. Flowers without distinct individual stalks (except *T.franchetii*), no petals. Fruits mostly with 2, 3 or 5 wings, sometimes leathery with a large stone & not winged. **ECOLOGY** *Combretaceae* form an important component of lowland deciduous forests but are rare in evergreen or hill forests. **USES** not much valued as timber, medicine or food, except for *T.chebula* which is a multi-purpose tree.

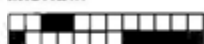
1. flowers & fruits in spherical heads *Anogeissus acuminata* 406
 1. flowers & fruits in long branched or unbranched clusters
 2. fruits without wings
 3. fruits velvety, not ridged, in unbranched clusters. Leaf stalks 3-9cm leaf glands often obscure. wild tree *T. bellirica* 389
 3. fruits smooth, not ridged, in branched clusters. round glands at base of leaf; wild tree, sometimes cultivated *T. chebula* 390
 3. fruits smooth with 2 ridges, in unbranched clusters. glands obscure; crown layered; introduced, often cultivated *T. catappa* 391
 2. fruits with 2 wings, leaves with glands on stalks
 4. flowers & fruits in branched clusters, fruits <1 cm, silky. leaves with stalked glands. *T. myriocarpa* var. *hirsuta* 395
 4. unbranched clusters, fruits >1.3 cm, smooth or sparsely hairy. leaves with rounded glands
 5. leaf stalks <2cm, with glands at top; fruits with wings all around *T. mucronata* 392
 5. leaf stalks >2.5 cm, with glands in middle; fruits with wings on sides
 6. nuts globose, ridged when dry, densely hairy, lvs glaucous below flowers 3-3.5 mm *T. glaucifolia* 393
 6. nuts triangular, not ridged, slightly hairy. lvs not glaucous flowers 1-1.5 mm *T. calamansanai* 394
 2. fruits with 3 wings, leaves with rounded glands on margin
 7. fws/fts in unbranched clusters with distinct individual stalks leaves densely hairy *T. franchetii* var. *tomentosa* 399
 7. fws/fts in branched clusters without individual stalks leaves smooth *T. triptera* 398
 2. fruits with 4-5 wings (sometimes narrow & ridge-like)
 8. young stems squarish with 4 fine ridges, young lvs silvery scaly *Combretum quadrangulare* 400
 8. young stems rounded without ridges, young leaves not scaly
 9. fws&fts in unbranched clusters, fruits 1.2-2 cm, wings 0.2 cm wide leaves with rounded glands *T. cambodiana* 397
 9. fws&fts in branched clusters, fruits 3-6 cm, wings 1-2 cm wide leaves with stalked glands *T. alata* 396
- (*T.* = *Terminalia*)



COMBRETACEAE

389 *Terminalia bellirica*

ส้มขี้เหล็ก

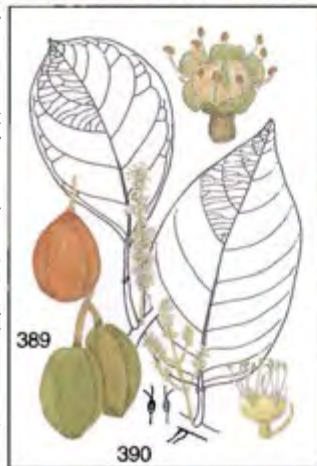


Deciduous tree to 30(40) m with broad oval crown & long straight trunk, slightly buttressed when fully grown. **BARK** grey with narrow cracks, outer bark thin & brittle, inner bark yellow. **LEAF** 7-23 x 3-14 cm, alternate, clustered near end of twigs, obovate or elliptic, usually with blunt or abrupt tip & pointed base. Young shoots densely hairy, mature leaves leathery & smooth. $\pm$ 6-7 pairs of slender side veins, joined far from margin, with a clear network of smaller veins. **Stalks** 2.5-6(9) cm, **slender, usually with 2 inconspicuous glands at or above the middle.** **FLOWER** 0.4-0.6 cm, pale green or yellow, in slender catkin-like clusters hanging from leaf axils, 5-18 cm, not branched, often with male only flowers in upper part & bisexual flowers in lower part. Calyx cup-shaped with 5 broadly triangular lobes, curved backwards at tips, slightly hairy. Stamens 3-3.5 mm, style 4 mm, ovary 2-3 mm, with **densely hairy disc.** **FRUIT** 1.8-3.5 cm, dark brown with silvery or coppery sheen, **densely covered with velvety hairs**, oval or slightly pear-shaped with abruptly narrowed base, **no wings**, sometimes faintly 5-ridged when dry, leathery with a large, hard stone.

NOTE common in semi-open forests throughout NT, usually in flatter areas with deep soil.

390 *Terminalia chebula*var. *chebula* ส้มขี้เหล็ก

Deciduous tree to 20 m with spreading, rounded crown & rather short trunk. **BARK** brown, slightly cracked & flaking in thin plates. **LEAF** 8-20 x 5-10 cm, sub-opposite, broadly ovate or elliptic with blunt or abrupt tip & blunt or rounded base, often slightly oblique. Young shoots densely orange-brown hairy, mature leaves thinly leathery, smooth or sparsely >>



hairy below. 7-12 pairs of straight, $\pm$ parallel side veins. Stalks 1-3.5 cm, with a pair of rounded glands near top of stalk or along margin of leaf.

FLOWER 0.3-0.4 cm, green-white, bisexual, densely clustered along branched or unbranched spikes at end of twigs & upper leaf axils, 3-7 cm, usually appearing with new leaves. Calyx shallowly cup-shaped with 5 triangular lobes, not curved backwards at tips, densely hairy inside. Stamens 3-4 mm, style 2.5-3 mm, smooth, ovary smooth with densely hairy, lobed disc. **FRUIT** 2.5-4(5) cm, greenish-yellow ripening orange-brown, dark red or black, globose or oval with slightly pointed tip, smooth, without wings or ridges, sometimes very slightly 5-ribbed.

NOTE scattered in semi-open forests, fruits occasionally sold in markets. All parts of the tree are useful (see part 2).

SIMILAR var. *nana* is a shrub to 2 m, leaves 3.5-7 cm, tapering tips. Uncommon, Lamphun & Phrae.

391 *Terminalia catappa*

ทุเรียน



Briefly deciduous tree to 20m. Young trees develop a remarkable layered crown with the branches arranged in flat, horizontal tiers. Mature trees tend to lose this habit & develop regular, oval crowns. **LEAF** 12-25 x 8-15 cm, clustered at regular intervals along the twigs (sympodial), broadly obovate with abrupt tip & rounded or slightly heart-shaped base, smooth & glossy, stalks 0.5-1.2 cm with 2 inconspicuous glands at top. **Old leaves bright red.** **FLOWER** in unbranched spike-like clusters in upper leaf axils, upper ones male, lower ones bisexual. **FRUIT** 3-5 cm, bright green, smooth & glossy with 2 narrow ridges.

NOTE native of coastal areas in S. Thailand, widely planted as a roadside tree in NT.



392 *Terminalia mucronata*

ตะแบกเลื้อย



Large deciduous tree to 40 m with narrow, rather open crown, steeply ascending branches & long straight trunk, slightly fluted at base. **BARK** pale creamy brown, **mottled & flaking in thin plates**. **LEAF** 7-17 x 4-9 cm, subopposite, oval or oblong, blunt or slightly pointed at both ends. Young leaves densely brown-hairy with transparent margin, mature leaves leathery, smooth or nearly so. Stalks 1-2 cm, **with 2 rounded glands at the top**. **FLOWER** 0.3-0.5 cm, white, densely clustered along **unbranched spikes** at axils of young leaves, 9-15 cm, axes densely red-brown hairy at first. Calyx slightly hairy, stamens 3-4 mm, style 2-3 mm, ovary 2-3 mm, surrounded by densely hairy disc. **FRUIT** 3-4 cm, pale yellow-brown, oval, completely surrounded by **2 rounded wings**, longer than wide, finely covered with brown hairs, nuts ± 1.5 cm long.

NOTE common in moist deciduous forests, often the only large trees left after logging because older trees are usually hollow inside. "Tabek" also refers to *Lagerstroemias* which may have similar bark but with showy white or purple flowers & unwinged fruits.

SIMILAR 3 other species with 2-winged fruits. **393 *T. glaucifolia*** crown rounded, bark dark grey, leaves elliptic with narrow base, glaucous below, stalks 3-5 cm with glands at or below middle. Flowers +5 mm. Fruits 3.5-5 cm, wings as long as wide, nuts circular in section, ridged when dry.

394 *T. calamansanai* crown flat-topped, bark grey-brown. Leaves obovate with narrow base, stalks 2-4 cm with glands above middle. Flowers 1-1.5 mm. Fruits 4-8 cm, wings wider than long, nuts triangular in section, not ridged.

395 *T. myriocarpa* var. *hirsuta* leaves 10-28 cm, narrowly oblong with rounded base, stalks <1 cm with 2 stalked glands near top. Flowers 1-2 mm, branched clusters, 10-20 cm. Fruits <1 cm, silky.



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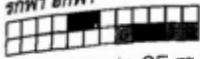
393



395

396 *Terminalia alata*

Terminalia alata



Deciduous tree to 35 m with long straight trunk & ascending branches. **BARK** dark grey, **deeply fissured & scaly**, inner bark red. **LEAF** 10-22 x 5-10 cm, (sub)opposite, usually plan & narrowly ovate or oblong with blunt or slightly pointed tip & blunt base, often oblique. Young shoots densely covered with golden-brown or red-brown hairs, mature leaves smooth or slightly hairy below with 1 or 2 stalked glands on the midrib near base of leaf. 10-16 pairs of obvious parallel side veins. Stalks 1-2 cm. **FLOWER** 0.3-0.5 cm, cream or pale yellow, bisexual, densely clustered along slender **branched spikes** at or slightly above the leaf axils, 6-17 cm. Calyx cup-shaped with 5 triangular teeth, densely hairy. Stamens 3-4 mm, style 3 mm, ovary 1-2 mm with densely hairy disc. **FRUIT** 3-6 cm, bright red finally turning pale brown, oblong with 5 wavy wings, 1-2 cm wide, smooth.

NOTE common in semi-open forests throughout NT.

SIMILAR only 1 other species of *Terminalia* has fruits with 5 wings.

397 *T. cambodiana* 小乔木 small tree to 10 m. Leaves 5-7 cm, stalks with a pair of rounded glands in the middle & another pair at the top. Flowers & fruits in unbranched clusters, 4-8 cm, calyx smooth or hairy only at base outside. Fruits $\pm$ 2 cm with narrow wings, $\pm$ 2 mm wide.

2 other species have 3-winged fruits:

398 *T. triptera* leaves 6-10 x 3-6 cm, smooth. Fruits 1.5-3.3 cm, smooth, without stalks. Widespread but uncommon. 399 *T. franchetii* var.

tomentosa leaves 4-6 x 1.5-4 cm, alternate, densely hairy. Fruits 0.7-0.9 cm, pink or reddish when young, stalks 0.4-0.6 cm, nuts densely hairy. Endemic to Doi Chiang Dao.

Combretum quadrangulare 400 has fruits with 4 wings but silvery-scaly leaves & squarish twigs with 4 ridges.



COMBRETACEAE

⁴⁰⁰*Combretum quadrangulare*

สะแกกว้า พวง



Straggly shrub or small tree to 9(12) m, evergreen or briefly deciduous. **BARK** whitish, smooth or slightly fissured, lower trunk often with short spiny branches when young. **LEAF** 5-19 x 3-8 cm, (sub)opposite, obovate or elliptic with blunt or slightly tapering tip & pointed base. **Young leaves densely covered with tiny silvery scales & dots**, more or less persistent in mature leaves. Stalks 0.4-0.6 cm, no glands. **Twigs squarish, with 4 narrow ridges**.

FLOWER 0.3-0.4 cm, white or pale yellow, densely clustered along branched or unbranched spikes in leaf axils, individual stalks <1 mm. Calyx broadly funnel-shaped with 4 narrow ridges at base & 4 triangular teeth, silvery-scaly outside, densely brown-hairy inside. **4 petals**, 1-2 mm, obovate with pointed tips, fragile & falling early. 8 slender stamens, 3-4 mm. **FRUIT** 2-4 cm, pale green turning yellow-cream with silvery scales, oval with **4 rounded wings** as broad as the nut. **NOTE** Lampang southwards, usually in disturbed areas, frequently planted along roadsides. **SIMILAR** no other tree in NT has leaves with silvery scales & 4-ridged twigs. The other species of *Combretum* are all straggly shrubs or woody climbers without ridges on the twigs. ⁴⁰¹*C. apetalum* ดอกสร้อย

leaves 5-10 cm with yellowish scales & stalked glands. Flowers without petals, fruits with 5 wings. ⁴⁰²*C. winitii* เครือมะถั่วเฒ่า leaves 15-35 cm, often in whorls of 3, with brownish scales & hairs, no glands. Flowers funnel-shaped, 4 petals. Fruits with 4 flexible wings, hairy.

⁴⁰³*C. deciduum* แทนเครือ leaves with red-brown hairs & stalked glands, no scales. Flowers with 5 petals & no disc. Fruits with 5 wings.

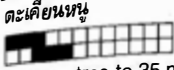
⁴⁰⁴*C. trifoliatum* leaves usually in whorls of 3, no scales. Flowers with 5 petals & hairy disc, no floral leaves. Fruits with 5 narrow ridges, ± 5 mm. >>



405 *C. decandrum* leaves opposite or rarely whorled, with stalked glands & tufts of hairs in vein axils below, no scales. Flowers with 5 petals & hairy disc, large floral leaves.

406 *Anogeissus acuminata*

ตะเคียนหนู



Deciduous tree to 35 m with narrow crown, long straight trunk without buttresses & slender drooping branches. **BARK** dark grey, finely fissured & flaking, young trees with long spine-like projections (aborted branches). **LEAF** 3-8 x 1.5-4 cm, subopposite or alternate, usually planar, narrowly ovate or lanceolate with tapering tip & slightly pointed or blunt base. Young leaves silvery with long silky hairs, mature leaves with scattered hairs at least below. Stalks 0.2-0.6 cm, slender. **FLOWER** 0.7-0.8 cm, yellow-green, bisexual, grouped into dense spherical heads at axils of young leaves, 1.2-1.8 cm diam. Sepals fused into a slender stalk-like tube with 2 wings at base, expanded at the top into a 5-lobed cup, densely brown-hairy. No petals, 10 stamens in 2 rows, much longer than calyx cup. **FRUIT** densely packed into a spherical head, $\pm$ 1.5 cm diam. Each fruit 0.4-0.5 cm with 2 broad wings & persistent calyx tube at top. **NOTE** common in moist deciduous forests throughout NT, often along streams in semi-open forests. **SIMILAR** Young trees could be confused with *Cratoxylum* spp. which also have thorns & silvery, opposite leaves but showy pink or white flowers & fruits which split open.



MYRTACEAE

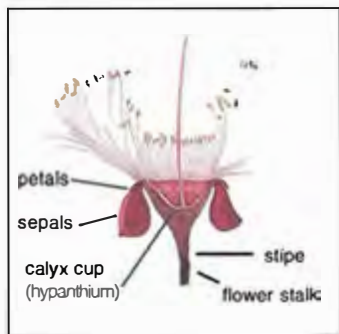
Large tropical family with 4620 species worldwide, mostly woody trees & shrubs. 5 genera & about 40 species in NT.

BOTANY (see under *Syzygium*).

ECOLOGY a common component of lowland evergreen forests throughout NT, less often in drier & hill forests.

USES *Syzygium jambos* 2 *cleistocalyx nervosum* are common village fruit trees.

1. leaves alternate, fruits dry, opening at top *Tristanopsis burmanica* 434
2. stigma head-like (peltate or capitate) *Decaspermum parviflorum* 433
2. stigma not head-like (simple)
3. leaves & flower buds hairy, shrub to 2m 407 *Eugenia bracteata*
3. leaves & flower buds smooth, trees
4. calyx lobes fused together to form hood, no marginal vein *Cleistocalyx* 432
4. calyx lobes not fused together, $\pm$ with marginal vein *Syzygium* 409

**Syzygium****TABLE 7**

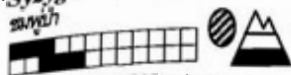
The largest genus of trees in our region, with at least 80 species in Thailand & 35 species in NT.

BOTANY evergreen trees without latex or sap. Leaves opposite, untoothed, completely smooth even when young, **usually with many pairs of closely parallel side veins, often with 1 or 2 marginal veins**, no stipules. Flowers bisexual, usually white, occasionally pink or yellowish. Calyx 4-5 lobed, fused into a cup or funnel-shaped tube at base (hypanthium), sometimes narrowed into a distinct stalk. Petals usually inconspicuous, often fused together into a cap (calyptra) & falling as soon as the flower opens. Many slender stamens, the outer ones larger, much more obvious than the calyx or petals. Single long slender style with inconspicuous unlobed stigma, inferior ovary. Fruits mostly purple-black, globose or oval with persistent calyx & slight depression at top, thinly fleshy or leathery with 1-2 (rarely more) large seeds.

SIMILAR *Leistocalyx*⁴³² has calyx lobes fused into a hood in bud, falling off as flower opens. *Guttiferae*⁵¹ have opposite leaves, but no marginal vein & cream or yellow latex. *Careya*⁴³⁵ have similar flowers but alternate leaves.

NOTE *Syzygium* was only recently separated from the closely related genus, *Eugenia*. Only 1 species of true *Eugenia* is native to our region - *E. bracteata*, a shrub to 2 m with small, hairy leaves.

1. **LARGE FLOWERS** stamens >15mm, style >17mm, calyx cup >10mm
 2. leaf base pointed
 3. flowers white or pale yellow, stamens >30 mm, twigs angled
 - S. jambos*⁴²⁵
 - S. siamense*⁴²³
 3. flowers pink, stamens <30 mm, twigs rounded
 2. leaf base rounded or heart-shaped
 4. with marginal vein, flowers terminal/axillary, calyx without thick ring
 5. petals 15-24 mm, calyx ribbed, twigs angled *S. megacarpum*⁴²¹
 5. petals >14 mm, calyx not ribbed, twigs rounded *S. siamense*⁴²³
 5. petals 9-12 mm, calyx not ribbed, twigs angled *S. diospyrifolium*⁴²⁴
 4. no marginal vein, flowers behind leaves, calyx with thick ring inside *S. formosum*⁴²²
1. **MEDIUM FLOWERS** stamens 5-15mm, style <17mm, calyx cup >5mm
 6. petals fused into a cap & falling when flower opens
 7. calyx club-shaped with long stalk, 7-15 mm *S. claviflorum*⁴³⁰
 7. calyx funnel-shaped with short stalk, <3 mm
 8. some flowers with 4 calyx teeth, others with 5 on same tree
 - S. zeylanicum*⁴⁰⁸
 - S. gratum*⁴⁰⁹
 8. all flowers with 4 calyx teeth
 9. calyx cup longitudinally wrinkled *S. cerasiforme*⁴¹⁰
 9. calyx cup not wrinkled *S. cumini*⁴²⁶
 10. leaves with 2 marginal veins
 10. leaves with 1 marginal vein
 6. petals free, not forming cap, usually more persistent
 11. stalk of calyx cup <2 mm
 12. stalks of flower clusters with flaky surface *S. helferi*⁴¹¹
 12. stalks of flower clusters not flaky *S. thumra*⁴¹²
 11. stalk of calyx cup 2-6 mm
 13. inner sepals larger, stalk of calyx cup 5-6 mm *S. grande*⁴¹³
 13. sepals more or less equal, stalk of calyx cup 2-5 mm *S. glaucum*⁴¹⁴
 14. midvein raised & grooved above
 14. midvein sunken above
 15. 6-9 pairs of side veins, no marginal vein *S. zimmermannii*⁴²⁹
 15. 7-15 pairs of side veins
 16. 2 marginal veins *S. globiflorum*⁴¹⁵
 16. (0)1 marginal vein *S. albiflorum*⁴²⁸
 15. >15 pairs of side veins, with marginal vein *S. angkai*⁴¹⁶
5. **SMALL FLOWERS** stamens <5mm, style <8mm, calyx cup <5mm
 17. style <2 mm
 18. stalk of calyx cup <1 mm *S. cinereum*⁴³¹
 18. stalk of calyx cup >1 mm *S. polyanthum*⁴¹⁷
 17. style 2-8 mm
 19. flower axes winged/angled, leaf veins 1-2 mm apart
 20. leaves with 2 marginal veins *S. winitii*⁴¹⁸
 20. leaves with 1 marginal vein *S. fruticosum*⁴²⁷
 19. flower axes rounded, not angled, leaf veins 2-6 mm apart
 21. stamens 2-2.5 mm, lvs without marginal vein *S. balsameum*⁴¹⁹
 21. stamens >2.5 mm, leaves with marginal vein *S. cumini*⁴²⁶
 22. 19-30 pairs of side veins
 22. 11-20 pairs of side veins
 23. leaves with 2 marginal veins *S. glaucum*⁴¹⁴
 23. leaves with 1 marginal vein *S. ripicola*⁴²⁰

421 *Syzygium megacarpum*

Tree to 20 m. **BARK** pale orange or creamy-brown, smooth or slightly flaking. **LEAF** 20-32 x 6.5-8 cm, lanceolate with tapering or pointed tip & rounded or heart-shaped base. 14-22 pairs of side veins, **double marginal vein**, midvein sunken above. Stalks 0.4-1 cm, twigs slightly squarish. **FLOWER** 3-5 cm, white or pink, in short branched clusters at end of twigs & upper axils, flowers in threes, the central one without stalk. Calyx cup 15-23 mm, funnel-shaped, **ridged outside**, with 5-7 mm stalk & 4 rounded lobes in 2 rows, inner ones larger. 4 free petals, 15-24 mm, rounded with thick base, densely gland-dotted. Outer stamens 24-33 mm, style 31-47 mm. **FRUIT** 4-6 cm, pale green with dark green spots, later tinged pink or purple, globose. **NOTE** scattered throughout NT in the understory of less-disturbed evergreen forests.

SIMILAR 4 other species also have large leaves & flowers but with smooth calyx, not ridged.

422 *S. formosum* ชมพูพาน leaves 23-46 cm, usually in whorls of 3, 10-13 pairs of side veins, joined but no marginal vein. Flowers bright pink, in axils of fallen leaves, calyx cup 15-20 mm, with thick ring inside, petals 9-12 mm, outer stamens 19-20 mm, style 35-38 mm. Fruits 3-4 cm. Moist areas, throughout NT.



423 *S. siamense* ชมพูฉ่ำ leaves 9-27 cm, base pointed or rounded. 7-14 pairs of side veins, 1 marginal vein, twigs rounded. Flowers pink or red, in unbranched clusters, calyx cup 10-17 mm, petals 14-17 mm, outer stamens 23-30 mm, style 37-42 mm. Fruit 2.5-2.7 cm, globose or ovoid. Lampang southwards.



424 *S. diospyrifolium* บ้องขวาน leaves 18-24 cm, 9-14 pairs of side veins. Calyx stalk 1-2 mm, petals 9-12 mm, outer stamens 16-21 mm, style 35-52 mm. Tak province. >>



MYRTACEAE

425 *S. jambos* **rose apple**
 leaves 12-20 cm, base pointed,
 11-14 pairs of side veins, 1 or 2
 marginal veins, twigs flattened or
 squarish. Flowers white or pale
 yellow, calyx cup 12-14 mm, petals
 15-17 mm, outer stamens 33-37 mm,
 style up to 43 mm. Fruits 5-6 cm,
 pale pink, juicy. Widely cultivated.

426 *Syzygium cumini*

๗๓๗



Evergreen tree to 25 m, sometimes
 partly deciduous in drier sites. **BARK**
 grey, slightly flaking, inner bark
 reddish. **LEAF** 6-10(15) x 3-7 cm,
 narrowly elliptic or oblong with slightly
 tapering tip & pointed or blunt base. **19-**
30 pairs of faint side veins, 1
 marginal vein, midvein sunken. Stalks
 0.6-2.8 cm, quite slender. **Twigs pale**
grey & squarish when young. Old
 leaves red. **FLOWER** ± 1 cm, white or
 cream, in branched clusters **usually**
behind leaves, 4.5-10 cm, **individual**
flowers without stalks, main stalks
 rounded or slightly angled. Buds
 1-3 mm, calyx cup 2.5-6 mm, funnel
 shaped with **1-2 mm stalk & 4**
obscure teeth. 4 petals, **2 mm, joined**
into a cap & falling as soon as
flower opens, scattered glands.
 Outer stamens 4-6 mm, style 2-6.5 mm,
 stout. **FRUIT** 0.8-2 cm, ovoid or oblong,
 pink turning dark red-purple or black,
 juicy, edible.

NOTE common throughout NT in
 semi-open forests, often planted.

427 *Syzygium fruticosum*

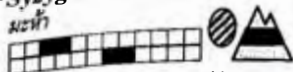
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Tree to 12 m, very similar to *S. cumini*
LEAF 7-12 x 3-6 cm, 12-16 pairs of
 side veins, 2-6 mm apart. Stalks
slightly winged, **twigs brown**,
 rather squarish. **FLOWER** main
 stalks short, axes distinctly 4-
 angled. Calyx cup 2-3 mm, with very
 short stalk (<0.5 mm), outer
 stamens & style 2-4.5 mm. **FRUIT**
 0.8-1.3 cm, globose or ovoid.

NOTE widespread but less common
 than *S. cumini*.

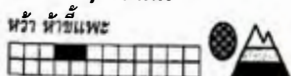


428 *Syzygium albiflorum*

Tree to 20 m. **BARK** red-brown or pale grey, slightly flaky or quite deeply cracked. **LEAF** 9-14 x 3.5-6 cm, narrowly ovate or lanceolate with pointed or blunt tip & slightly tapering base. 7-13 pairs of side veins, usually with marginal vein, midvein sunken above. Stalks 1-1.8 cm, slender. **FLOWER** white or cream, in forked clusters at end of twigs & upper leaf axils, 3-6 cm, usually with several branches from base. Flowers in threes, central one without stalk, side ones with slender stalks. Buds 4-7 mm. Calyx cup 6-8.5 mm, funnel-shaped with distinct stalk, 2.5-4.5 mm & 4 large, rounded lobes. 4 free petals, rounded, densely gland-dotted. Outer stamens 7-13 mm, style 8.5-15 mm. **FRUIT** (0.5)1.2-3.5 cm, pale green to dark purple-black, globose.

NOTE fairly common especially in hill evergreen forests.

SIMILAR 429 *S. zimmermannii* narrower leaves with tapering base, slightly winged stalks & inconspicuous sunken dots on veins, no marginal vein. Flower clusters 4-8 cm.

430 *S. claviflorum*

Tree to 20 m. **BARK** grey or cream-brown, slightly cracked. **LEAF** 6-17 x 2-7 cm, narrowly elliptic or lanceolate, tapering at both ends, 13-26 pairs of faint side veins, with double marginal vein, midvein sunken. Stalks 0.2-0.7 cm, twigs squarish. **FLOWER** white, clusters at end of twigs & in leaf axils, to 3 cm, with very short common stalk, individual flowers without stalks. Calyx cup 9-20 mm, club-shaped or narrowly funnel shaped with long stalk, 7-15 mm, 4 teeth. Outer stamens 5-10 mm, style 8-16 mm. **FRUIT** 1-1.7 cm, yellow-green ripening dark red-purple, ellipsoid or "barrel-shaped". **NOTE** uncommon, less disturbed forests.



431 *Syzygium cinereum*

LANNALAI



Tree to 20 m. **BARK** pale grey or brown, flaking, sometimes quite deeply cracked. **LEAF** 7-16(24) x 3-8 cm, shape very variable, pointed or blunt at both ends. 6-12(18) pairs of side veins, 1 or 2 marginal veins, midvein sunken above. Stalks 0.5-1.6 cm, twigs pale cream, flaky. **FLOWER** small, white or cream, in slender clusters behind leaves, to 8 cm with several branches from base, individual flowers without stalks. Buds 0.1-0.2 cm, calyx cup 2-3 mm, funnel-shaped without stalk, 4 tiny teeth. 4 petals joined into a hood in bud, falling as soon as flower opens, gland-dotted. Outer stamens 1.5-2.5 mm, style <1.5 mm. **FRUIT** (0.6)1.3-1.5 cm, dark red to purple-black, globose.



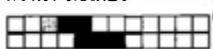
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432 *Cleistocalyx nervosum*var. *operculatus*

หว้าป่า มะเกี๋ยง



Evergreen or partly deciduous tree to 25m. **LEAF** 18-28x5-10 cm, elliptic, obovate or lanceolate, pointed or tapering at both ends, completely smooth. Mid vein sunken above, 10-12 pairs of side veins, **no marginal vein**. Old leaves red. **FLOWER** $\pm$ 1.5-2 cm, white, in branched clusters **behind leaves**, to 14 cm, axes $\pm$ angled, individual flowers without stalks. Calyx cup 2.8-4 mm, funnel-shaped without distinct stalk (<1mm). Calyx 2.5-5.5 mm, **covering buds like a hood & falling off as one piece when flower opens**. 4 petals, 1.8-4.2 cm, rounded, attached to calyx. Outer stamens 4.5-7 mm, style 5-8.5 cm. **FRUIT** $\pm$ 1 cm, globose. **NOTE** uncommon, shady areas.

SIMILAR var. *paniala* flowers usually in clusters of 3, calyx cup >4 mm with distinct stalk 2-2.5 mm, petals >4 mm. Fruits >1.5 cm, oval-oblong. Introduced, commonly cultivated for its fruits.



431



431



432 var. paniala



432 var. paniala



432 var. paniala

433 *Decaspermum parviflorum*

ssp. *parviflorum* หัวแหวน

Shrub or small tree to 10 m. **LEAF** 1-10 x 0.5-4 cm, opposite, ovate or elliptic with tapering tip. 10-20 pairs of faint side veins, joined at margin, usually silky-hairy on main vein below. Stalks 0.3-0.5 cm. **FLOWER** white or pink, clusters at leaf axils. Calyx 1-2.5 mm, 5 blunt lobes 0.5-1 mm, persistent in fruit. 5 free spreading petals 2.5-5 mm, hairy. Many stamens, style ± 3 mm, with **globose stigma**. **FRUIT** small, dark purple-black, often silky. **NOTE** scattered in less-disturbed forests.

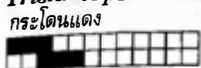


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434 *Tristaniopsis burmanica*

กระโดนแดง



Small evergreen tree to 13 m with gnarled trunk & twisted branches. **BARK** pale grey-brown, **peeling in thin vertical strips, dry-looking**, inner bark cream. **LEAF** 5-8.5 x 2-3.5 cm, **alternate**, clustered near end of twigs, narrowly obovate with blunt or pointed tip & tapering base, sometimes slightly notched. Young shoots silky hairy, mature leaves completely smooth, thick & waxy, dark green & shiny above, paler with tiny opaque dots below. ± 20 pairs of side veins, 1 marginal vein. Stalks < 1 cm. **FLOWER** pale yellow, in short dense clusters (cymes) at leaf axils, individual stalks slender, 2-4 mm, $\pm$ slightly hairy, main stalks short, with tiny linear bracts. Calyx 2-4 mm, bell-shaped with 5 short blunt teeth, sparsely white hairy on both sides. Petals 1-1.5 mm, rounded, overlapping in bud. Stamens in groups of 5-7 in **very short bundles opposite the petals**, free almost to base, filaments slightly hairy. Ovary silky, half-superior. **FRUIT** 0.5-0.7 cm, dry capsule, opening at top into 3 sections, oblong with persistent calyx at base, finely hairy. Seeds ± 4 mm, flattened & angled. **NOTE** very common in open, well-drained areas, favouring exposed ridges, often associated with pines & *Vaccinium*. 2 varieties in Thailand - var. *rufescens* young leaves densely hairy below with short curly red-brown hairs; mainly in N. & E. Thailand. var. *burmanica* young leaves smooth below or with scattered straight pale hairs below; mainly in S. Thailand.



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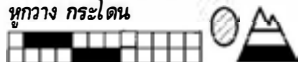
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LECYTHIDACEAE Brazil nut

285 spp. worldwide, mostly in S. America, 2 genera & 3 spp. in NT.

435 *Careya arborea*

ทุกราบ กระโดน



Deciduous tree to 20 m with spreading crown in good sites, remaining stunted & gnarled in poor sites. **BARK** grey-brown, cracked & flaking in thin strips. **LEAF** 15-30 x 8-14 cm, broadly obovate, tips rounded with short point, base tapering into short stalk, margin usually with **fine, rounded teeth**. Mature leaves dull green, smooth. **FLOWER** 5-6 cm, pink or red, bisexual, in short thick-stemmed clusters at end of leafless twigs, 2-8 cm, individual flowers without stalks. Calyx ± 2 cm, bell-shaped with 4(5) fleshy, rounded lobes. 4(5) free petals, ± 3 cm, pale green or yellowish, very fragile & soon falling. **Many white or red-purple stamens, twice as long as petals**, in 3 whorls - outer ones longest, without anthers, middle ones with anthers, inner ones much shorter & converging, without anthers - all united at base into a thick fleshy ring & falling together. 1 long slender style with inconspicuous stigma. Ovary inferior, with thin cup-shaped disc at top. **FRUIT** 5-6 cm, bright green ripening brownish, globose or ovoid with persistent style & calyx teeth at top, thick-skinned with fleshy pulp & many seeds, ± 1.2 cm. **NOTE** common throughout NT in semi-open forests & disturbed areas. The flowers open at night & fall early the following morning.



436 *Barringtonia acutangula*

จิกนา



Leaves 7-20 cm, narrowly obovate with tapering tip, finely toothed. Flowers 1-2.5 cm, in slender, dangling clusters of 60-90 flowers, 20-58 cm, individual stalks 0.3-1.2 cm, all stamens with anthers. Fruits slightly 4-angled. **SIMILAR** ⁴³⁷*B. angusta* leaves 30-60 cm, not toothed. Flowers 3.5-5 cm, clusters 60-250 cm, thick main stalks, individual stalks < 0.1 cm, base of flower with 4 hairy ridges. Fruits with 4 wavy ridges, 2-5 mm wide.

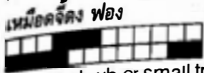


MELASTOMATACEAE

Predominantly tropical family, mostly herbs & shrubs. 4950 species worldwide, only 1 genus & 2 species in NT.

438 *Mecycylon plebejum*var. *siamense*

เม็กซิออน พอส



Evergreen shrub or small tree to 9 m, often with crooked trunk. **BARK** dark brown, thin, finely to deeply cracked, inner bark cream. **LEAF** 5-10 x 2-4 cm, simple, **opposite-planar**, narrowly elliptic or ovate with long tapering tip & pointed base, no teeth. Mature leaves leathery, dark green & shiny above, completely smooth. Side veins very faint, looped at margin. Stalks 0.3-0.5 cm, no stipules, twigs dark brown, **circular in cross-section with 4 narrow ridges**. **FLOWER** <1 cm, **bright blue-purple**, regular, bisexual, grouped into tight clusters in leaf axils or behind leaves, individual stalks ± 2 mm, slender, with joint & bracts at base. Calyx funnel-shaped with 4 broad teeth. ± 2 mm, 4 free petals with recurved tips, falling early. 8 equal stamens with purple filaments & yellow anthers with a **curved spur at the base**. Single slender style with inconspicuous stigma, ± 3 mm. Ovary inferior, covered by an 8-grooved disc. **FRUIT** 0.7-0.9 cm, yellowish, turning dark blue-purple, globose with remains of style on top, smooth & shiny, thinly fleshy with 1 large seed.

NOTE common understory tree in drier, semi-open forests.

439 *M. scutellatum*

เม็กซิออน



Shrub or small evergreen tree to 9 m, similar to *M. plebejum* but leaves 2-4 x 1-2 cm, elliptic or oblong with blunt or slightly notched tip. Stalks 0.2-0.4 cm, slender. Twigs squarish in cross-section with **4 ridges**. Fruits ripening blackish.



LYTHRACEAE

600 species, mostly tropical herbs, 1 genus in NT with 8 native & many introduced species.

Lagerstroemia

53 species, S. Asia & Australia. Deciduous trees, often with fluted trunk when fully grown, no latex or sap. Inner bark with thin layer which quickly turns blue-purple on exposure to the air. Leaves simple, opposite-planar, not toothed, often with pointed buds. Flowers mostly large & showy, white, pink or purple, usually in branched clusters at end of twigs. Calyx bell-shaped with 5-8 triangular teeth, 5-6 delicate spreading petals with slender stalks, many free stamens, single slender style. Fruit a dry capsule with persistent calyx at base, splitting into 3-6 sections & releasing large numbers of winged seeds.

NOTE The color of the petals is often variable within a species, which leads to misidentification. The calyx is a more reliable character & is usually similar in both flower & fruit. Most of our native species are called "Tabek", but this name is also used for *Terminalia mucronata*³⁹² which has similar bark & habit but tiny flowers without petals.

HABITAT a common element of moister deciduous forests, usually associated with Teak, *Terminalias* & bamboos, often dominating the upper canopy after more valuable species have been logged out.

USES frequently cultivated for their spectacular flowers.

⁴⁴¹*Lagerstroemia loudonii*

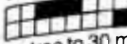
Deciduous tree to 20m with silvery bark. **LEAF** 7-14x4-6cm, oblong with short, slightly thickened tip & blunt or rounded base, sparsely grey-hairy esp. below. 8-12 pairs of side veins, stalks 0.3-0.5cm. **FLOWER** pink or purple, usually flowering when ± leafless, clusters up to 20 cm, calyx with faint ridges, 1 hairy **outside & inside on upper half**, petals 1.3-2 cm, often **fringed**. **FRUIT** 1.5-2.2 cm, obovoid with slightly ridged calyx. **NOTE** commonly planted, flowering in March.

1. flowers <1.2 cm, petals white, <0.6 cm
2. leaves 5-10 cm; pale simple hairs below, very fine net venation calyx with 5-6 ridges; bark dark grey-brown, fissured *L. villosa* 442
2. leaves 10-17.5 cm; yellow-brown star-shaped hairs, coarser venation calyx not ridged; bark pale cream-brown, smooth & flaking *L. calyculata* 443
1. flowers >2.5 cm, petals white, pink or purple
3. calyx without obvious grooves or ridges outside
4. ovary smooth
 - shrub or small tree to 10 m; bark pale brown, smooth, peeling in thin flakes; lvs 3-7.5 x 2-3.5 cm, oval with blunt tip, smooth & glossy above, stalks <0.3cm; fws 3.5-5 cm, white/pink/purple, in dense clusters to 15cm, stalks smooth; petals crisped & curly with long slender stalks; fts 1-1.2 cm, globose. *L. indica* 440
 4. ovary hairy
 5. leaves blunt-tipped, hairy below; fts ± 2cm, obovoid. Cultivated tree *L. loudonii* 441
 5. leaves with tapering tips; fruits 1-1.5 cm, ovoid Wild tree
 6. leaves ± smooth; fruits 1.5 cm; tree to 10m *L. balansae* 447
 - fw; clusters with yellowish hairs, floral leaves narrowly pointed
 6. leaves hairy below; fruits 1-1.2 cm; *L. cochinchinensis* 446
 - tree to 40m; fw clusters with rusty-brown hairs, floral leaves oval
3. calyx with obvious ridges or grooves outside
7. calyx with 6 ridges & horn-like projections between the teeth *L. venusta* 448
7. calyx with 10-12 grooves or ridges, no horn-like projections
8. flowers 2.5-4 cm, white, pink or mauve; young leaves hairy
9. calyx lobes brown-hairs insides, petals color variable. Cultivated
10. petal usually fringed; deciduous tree, flowering Mar-Apr *L. loudonii* 441
10. petal usually not fringed; evergreen tree, flowering all year *L. floribunda* 445
9. calyx obes smooth inside; petals usually white. Wild tree *L. tomentosa* 444
8. flowers mauve or purple, 5-10 cm, young leaves smooth
11. flowers 5.7.5 cm, in elongated clusters up to 40cm long calyx with broad rounded ridges & much narrower grooves flower buds ± 1 cm; fruits 1.5-2.5 cm, globose *L. speciosa* 450
11. flowers up to 10 cm, in short clusters usually <15 cm long calyx with narrow ridges & narrow grooves, ± same width; flower buds 1.5-2 cm; fruits 2.5-4 cm, ovoid *L. macrocarpa* 446



442 *Lagerstroemia villosa*

เขตรักษาพันธุ์สัตว์ป่าห้วยขาแข้ง



Large tree to 30 m with long, straight trunk & narrow crown. **BARK** dark brown or grey-black, roughly fissured. **LEAF** 5-10 cm ovate to broadly lanceolate with tapering tip & rounded base, **softly greyish hairy below** especially when young. 5-7 pairs of arching side veins with thin network of smaller veins. Stalks 0.4-0.5 cm. **FLOWER** <1 cm, **white**, slightly scented, in dense rounded clusters with softly hairy stalks. Calyx with 5-6 triangular teeth & **5-6 narrow, wing-like ridges**, densely greyish hairy. 5-6 tiny pointed petals, **much shorter than calyx**. 5-6 larger stamens, twice as long as inner stamens, all with white filaments & dark anthers. Ovary smooth. **FRUIT** 1.2-1.5 cm, oblong or narrowly ovoid with short point, <1/3 covered by persistent calyx.

NOTE fairly common in moist deciduous forests throughout NT.

SIMILAR *L. calyculata*⁴⁴³ is the only other species with such small flowers, but the calyx is not ridged & the bark is much paler. *L. tomentosa*⁴⁴⁴ has similar bark but larger flowers >2 cm across.

443 *Lagerstroemia calyculata*

ตะแบกแดง

BARK pale creamy-grey, smooth & flaking in thin, rounded plates. **LEAF** 12-18 x 3-5 cm, lanceolate with tapering tip & blunt base. Young leaves & twigs densely covered with **yellowish star-shaped hairs** which easily rub off. Many pairs of side veins with a prominent network of smaller veins. **FLOWER** <1.2 cm, white, in pyramidal clusters, 15-20 cm. Calyx deeply cup-shaped with 5-6 short teeth **densely yellow-hairy outside, without grooves or ridges**, each tooth bearing a small tuft of white hairs at the tip. **FRUIT** 0.6-0.8 cm, dark brown & glossy, 1/2-1/3 covered by calyx.

NOTE often reported, especially south of Lamphun. Easily mistaken for *L. cochinchinensis*⁴⁴⁶ or *L. floribunda*⁴⁴⁵ without flowers.



444 *Lagerstroemia tomentosa*

เสลา เส้าขาว



Large tree to 35 m with narrow crown & slender branches. **BARK dark grey-brown, cracked & flaking in thin vertical strips**, inner bark with many thin brown & white layers. **LEAF** 10-18 x 4-6.5 cm, lanceolate with tapering tip & blunt base. Young leaves with **yellowish star-shaped hairs**, mature leaves sparsely hairy or almost smooth. Old leaves yellow-bronze. 9-10 pairs of side veins with **close ladder-like tertiary veins, prominent below**. Staks 0.6-1 cm. **FLOWER** 2.7-3.5 cm, white or pale pink, stalks not ridged but with yellowish hairs. Calyx with 5-6 large teeth & **10-12 ridges**, yellowish-hairy outside, **smooth inside even at tips**. Petals rounded or pointed with long slender stalks, minutely hairy along the edges. 6-7 large pink stamens with dark anthers & many smaller ones with yellow anthers. Ovary hairy. **FRUIT** 1-1.4 cm, globose or ovoid, dark brown, smooth, $\frac{1}{3}$ covered by calyx. **NOTE** common in moist deciduous & semi-evergreen forests. **SIMILAR** *L. loudoni*⁴⁴¹ has pink or purple flowers with fringed petals and calyx hairy at tips inside.

445 *Lagerstroemia floribunda*var. *floribunda* ตะแบกหนา

Tree to 25 m but usually much smaller, trunk fluted. **BARK pale cream, smooth, flaking in thin plates**. **LEAF** 8-20 x 5-8 cm, with blunt or slightly pointed tip & rounded base, **tertiary veins rather faint & widely-spaced**. Young leaves pinkish-brown, densely covered with **star-shaped hairs**, mature leaves dark green & nearly smooth. **Twigs sharply ridged**. **FLOWER** 2.5-3.5 cm, pale pink or purple, fading to white, in large clusters with long side branches to 40 cm, axes & buds densely covered with fine **golden-brown hairs**. Calyx with 10-12 blunt ridges & 5-6 large teeth, **usually with 5-6 smaller teeth in-between, brown hairy outside & near tips inside**. **FRUIT** 1.2-2 cm, dark brown, oblong, $\frac{1}{2}$ covered by hairy calyx. **NOTE** widely cultivated, possibly native, open areas.



446 *Lagerstroemia*
cochinchinensis var. *ovalifolia*

Very large tree to 43 m with slender branches & long, tapering trunk, **strongly fluted** towards base. **BARK** pale creamy-brown, smooth & flaking in thin, rounded plates. **LEAF** 6-9 x 2-4.5 cm, narrowly ovate with pointed tip & rounded base. Young leaves densely covered with orange-brown star-shaped hairs, persisting in mature leaves at least on veins below. 8-12 pairs of curved side veins with fine ladder-like tertiary veins, **sunken above**. Stalks 0.3-0.7 cm. **FLOWER** 3.5-5 cm, bright magenta-pink, clusters 9-16 cm, stalks densely brownish-hairy, with **small, oval leaves in the lower axes**. Buds pear-shaped with flat top & short point ≤ 1 mm. **Calyx not (or very slightly) ridged**, 5-6 triangular teeth with curved tips ending in a distinct 1-2 mm point, **densely brownish hairy outside & near tips inside**. Petals circular or oval with long, narrow stalks. 5-6 larger & many smaller stamens, style 2.5-3 cm, ovary densely silky-hairy. **FRUIT** 0.9-1.1 cm, ovoid, hairy, $\frac{1}{2}$ covered by calyx. **NOTE** common throughout NT in moister deciduous forests, often forming the upper canopy.

SIMILAR 447 *L. balansae* is a much smaller tree to 10 m, leaves 10-15 x 4-6 cm, smooth or sparsely hairy, tertiary veins raised above. Flowers similar but with pointed leaves in lower axils, calyx & stalks with yellowish hair. Fruits 1.3-1.5 cm. Scattered in open areas.

448 *Lagerstroemia venusta*

เสลาเปือกบาง



Tree to 17 m. **BARK** pale, peeling in long, thin flakes. **LEAF** 10-15 x 3.5-5 cm, narrowly ovate or elliptic, 6-8 pairs of curved side veins with many shorter intermediate ones, tertiary veins clearly raised above. Twigs slender, not ridged. **FLOWER** ± 2.5 cm, pink-purple, clusters to 40 cm, densely covered with white powder. **Calyx with long points between the teeth**, narrowed into short sharp ridges. 5-6 larger stamens, ovary smooth. **FRUIT** 1.8-2 cm, ovoid, $\frac{1}{4}$ covered by calyx. **NOTE** habitat as 446 less common.



449 *Lagerstroemia macrocarpa*
var. *macrocarpa*

อินทนิลบก



Small tree to 12 m. **BARK** pale grey or brown, slightly flaking, inner bark pale red with translucent stripes, fibrous. **LEAF** 12-18(25) cm, **oval or elliptic**, slightly pointed or blunt at both ends, **completely smooth**, (7)10-11 pairs of curved side veins, joined near top of leaf, raised above. Stalks 1-1.5 cm. **FLOWER** 6-10 cm, **very large & showy**, bright purple fading pinkish in **short dense clusters usually <15 cm long**. Buds 1.5-2 cm. Calyx dark red, with **10-12 narrow grooves separated by narrow ridges**, ±same width, 5-6 large teeth which are not thickened along the edges. Many slender stamens, all the same size. Ovary smooth. **FRUIT 2.5-4 cm, ovoid**, pale brown & glossy with woody calyx, no short points between the teeth. **NOTE** scattered in dry dipterocarp forests & open areas.



449



449

450 *Lagerstroemia speciosa*
var. *speciosa* อินทนิลน้ำ

Tree to 20 m but flowering while still a shrub. Crown dense & rounded with short, twisted trunk. **BARK** creamy-brown or buff-grey, smooth & peeling in thin flakes, inner bark pale brown, fibrous. **LEAF** 8-18(24) x 5-8 cm, broadly ovate or oblong with blunt or pointed tip & blunt or rounded base, mature leaves **completely smooth**. 10-15 pairs of side veins, looped at margin, quite prominent below. Stalks 0.4-0.9 cm. Old leaves orange-red. **FLOWER** 5-7.5 cm, bright pink to purple, in **elongated clusters which stick out from the crown, 30-40 cm long**. Buds ±1 cm. Calyx brown-hairy outside with **10-14 broad, rounded ridges separated by much narrower grooves**. 5-6 large teeth, thickened at the edges, usually with much smaller teeth in-between. Stamens all same length, ovary smooth. **FRUIT 1.5-2.5 cm, (sub) globose**, smooth, ¼ covered by thick, woody calyx often with short points between the teeth. **NOTE** commonly planted, probably not native in NT.



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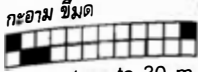
450

CRYPTERONIACEAE

Tiny tropical family of 11 species worldwide, 1 species in NT.

451 *Crypteronia paniculata*

กะอาม ชิมด



Evergreen tree to 30 m with long, straight trunk & slender, steeply ascending branches forming a rather open crown. **BARK** thick, dark grey-brown, closely ridged & fissured, usually flaking into thin strips, inner bark pale brown, fibrous, without latex or sap. **LEAF** 8-17 x 4-7 cm, simple, opposite-planar, narrowly ovate to oblong-elliptic with blunt or slightly pointed tip & blunt or rounded base, no teeth. **Young leaves bluish-purple** at first, turning pinkish-brown, mature leaves mid-green, completely smooth or finely hairy below. 5-8 pairs of side veins, sunken above, not joined at margin. Stalks 0.5-1 cm with minute stipules which fall early leaving linear scars between the leaf pairs. Twigs dark red-brown, **squarish with 4 shallow ridges & slightly swollen at nodes**. **FLOWER** <0.5 cm, cream or pale yellow-green, male & female on different trees, branched spike-like clusters towards end of twigs, 15-25 cm, individual stalks very short. Calyx 2.5-4 mm, cup-shaped with 5 triangular lobes, finely red-brown hairy outside, densely white-hairy inside esp. males. **No petals**. Males with 5 stamens attached to edge of calyx between lobes, short infertile style. Females with short infertile stamens & longer style with 2-lobed stigma **FRUIT** 0.2-0.5 cm, dark purple, globose or ovoid, often faintly grooved, with persistent calyx & style, often finely hairy, dry, splitting into 2 sections, **many tiny seeds with papery wing**.

NOTE uncommon, typically in less-disturbed forests but occasionally found along roadsides.

SIMILAR easily confused for a *Terminalia* ³⁸⁹ when not fruiting.



SONNERATIACEAE

Tiny family with only 8 species worldwide, confined to tropical Africa & Asia, 1 species in NT.

452 *Duabanga grandiflora*

ลำพำ ดมเด่น



Huge evergreen tree to 40 m & 200 cm diameter. Young trees have whorls of horizontal side branches, but in older trees the main side branches become massive & steeply ascending with drooping tips. **BARK** pale grey, pimply, not cracked, irregularly flaking in older trees. Younger trees with hoop-shaped ridges & large, shield-shaped leaf scars. **LEAF** 10-27 x 4-10 cm, simple, opposite-planar in long, flattened sprays, narrowly ovate to oblong-lanceolate with blunt or slightly pointed tip & rounded or slightly heart-shaped base, no teeth. Dark green above, grey-green (glaucous) below, completely smooth when young. 12-28 pairs of parallel side veins, arched & joined at margin. Stalks 0.2-0.7 cm, stout, with tiny stipules. **Twigs squarish with 4 narrow ridges which twist back & forth between leaf pairs.** **FLOWER** 5-7.5 cm, white, in heavy branched clusters (corymbs) of up to 20-30 flowers at ends of twigs. Calyx 1.2-3 cm, pale green, broadly bell-shaped with 4-7 fleshy triangular lobes, not ribbed. 6-7 petals, obovate with round tip & very narrow base, wrinkled & very fragile, falling in the early morning. Many slender stamens, much longer than petals, single long slender style with lobed stigma. **FRUIT** 2.7-4.5 cm, broadly ovate with **large star-shaped calyx at base**, bright green eventually turning dark brown & woody, splitting into 5 sections & releasing enormous numbers of minute thread-like seeds.

NOTE a common feature of moist areas throughout NT, frequently the largest trees in the forest, reaching 60m in W. Thailand.

SIMILAR easily recognised by the opposite leaves which are brought into the same plane by the twigs twisting, rather than the leaf stalks.

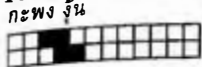


DATISCEACEAE

Minute family with only 4 species worldwide, 1 species in Thailand, which in sometimes placed in a separate family of its own, *Tetrameleaceae*.

453 *Tetrameles nudiflora*

นพพจ ๕%



One of the forest giants of NT, reaching a height of 50 m with an spreading open crown & very long, straight trunk, becoming **strongly buttressed when fully grown**. Completely leafless from Dec-Mar.

BARK thin, **pale silver-grey, smooth & shiny** with large circular warts when younger, becoming puckered when old. Inner bark thick & soft, pale yellow-brown, no latex or sap. **LEAF** 12-20 x 10-15 cm, simple, alternate, clustered near end of twigs, **broadly ovate or almost circular** with shortly pointed tip & **rounded or heart-shaped base**, often slightly lobed, **usually irregularly & bluntly toothed**. Young leaves silky hairy, mature leaves pale green, thin, minutely hairy below. 5 main veins from base, distinctly raised above. Stalks 6-10 cm, slender with clear joint at base, no stipules. Twigs stout with large leaf scars. **FLOWER** tiny, greenish, male & females on different trees, in long drooping spikes crowded near end of leafless twigs, 10-20 cm & unbranched in males, 8-20 cm & branched in females. **No petals**. Males ± 2 mm with 4 stamens opposite the sepals, surrounding a depressed disc. Females ± 5 mm, bell-shaped with 4-5 short styles at the top opposite calyx teeth. **FRUIT** 0.5 cm, pale brown, ovoid or globose, finely ridged, **outer layer very thin & papery with 4 openings & remains of calyx at top**, many minute seeds.

NOTE a characteristic feature of lowland moist forests, favouring flat alluvial areas close to streams. Sometimes growing on rocks or even ruined buildings, as at Angkor Wat.

SIMILAR not likely to be confused with any other species, although the habit can be reminiscent of a *Ficus*.



ARALIACEAE

Mostly tropical family of about 800 species, concentrated in SE Asia, 6 genera & ±20 species in NT.

BOTANY evergreen shrubs or small trees, occasionally growing on rocks or on other trees (epiphytic), with or without thorns, no latex. Leaves alternate, very variable (see key), often different between young & fully grown plants. Flowers mostly small (<1.2 cm), bisexual or male only, usually in large, complex clusters with the individual flowers grouped into stalked clusters (umbels), typically at end of twigs. Calyx minute, 5 free petals (rarely up to 11 & fused in bud), 5 free stamens, styles free or fused into a column. Ovary inferior with thin disc. Fruits small, globose or flattened with persistent styles at top, mostly thinly fleshy with several seeds.

ECOLOGY a distinctive feature of the understory in evergreen forests, sometimes in open areas.

454 *Schefflera* มีพระนารายณ์

5 species in NT, evergreen shrubs or much-branched trees to 12 m, frequently growing on other trees.

BARK usually pale grey, without thorns. **LEAF** digitate, 6-11 leaflets, up to 20x8 cm, usually without teeth & completely smooth when mature (except *S.petelotii* which has ±scattered teeth near top & dense woolly hairs below).

FLOWER small, white or green, sometimes purplish, **individual stalks not jointed**, typically with 5 free petals, 5 stamens & 5 free styles (except *S.pueckleri* & *S.subintegra* which have fused petals, up to 140 anthers & styles fused into a single column). **FRUIT** up to 1 cm, black-purple or red-orange, thinly fleshy with a large stone.

NOTE fairly common in evergreen forests from 300-2000 m.

SIMILAR 455 *Macropanax* เทียนฟาน have flowers & fruits with jointed stalks & the leaves are often toothed. Several distinct species in NT.

1. stems thorny

2. palmate or digitate leaves

3. flowers & fruits with 2 (rarely 3) locules

3. flowers & fruits with 5 or more locules

Brassaiopsis 462
Trevesia 460

2. pinnate leaves (2-4x divided)

5. leaflets smooth or slightly hairy on veins only *Aralia foliolosa* 457

5. leaflets with bristly hairs on veins & surface *Aralia montana* 456

1. stems not thorny

6. digitate leaves

7. flowers & fruits with jointed stalks

Macropanax 455

7. flowers & fruits without jointed stalks

8. leaflets toothed, dense woolly hairs below

Schefflera petelotii 454

8. leaflets not toothed, completely smooth *Schefflera* spp. 454

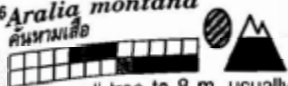
6. once-pinnate leaves

Aralia sect. *Pentapana* 458

6. 2-4x pinnate leaves, flowering without leaves

Heteropanax fragrans 459



456 *Aralia montana*

Shrub or small tree to 8 m, usually with a single main stem like a palm when young, **armed with sharp thorns**. **LEAF** 1.2-3 m, **very large**, **2-4x pinnate**, leaflets 4-13x3-5 cm, narrowly ovate with tapering tip & rounded or slightly pointed base (side leaflets asymmetric), finely & often rather sharply toothed. Young leaves finely hairy, **mature leaves with bristly hairs on veins & on lower surface**. Side leaflets with very short stalks, end one to 2.5 cm. Main stalks often thorny, strongly swollen at nodes, clasping stem at base. **FLOWER** minute, white, in complex branched clusters at end of twigs, to 100 cm. Main stalks often thorny in lower half, axes silky hairy with triangular bracts, 5-20 mm. **Individual flower stalks 4-10 mm, jointed near top**. 5 free petals, ± 2 mm, **overlapping in bud**, 5 free stamens, ± 3 mm, 5 styles with spreading tips. **FRUIT** ± 0.5 cm, black, globose with 5 curved styles at top, smooth, strongly 5-ribbed when dry, thinly-fleshy with 5 angular seeds. **NOTE** common in open areas

SIMILAR 457 *A. foliolosa* leaves either completely smooth or with scattered hairs confined to the veins, never on the surface. *Oroxylum indicum* has similar habit & leaf type, but the leaves are opposite & smooth.

458 *Pentapanax* closely related genus, recently combined with *Aralia*, but easily distinguished by the **once-pinnate leaves & stems without thorns**. 4 species in NT.

459 *Heteropanax fragrans*

พระเจ้าร้อยท่า อ้อยช้าง

Habit & leaf type similar to *Aralia montana* but **without thorns**. Leaflets oval or oblong with short, abrupt tip. Young leaves with star-shaped hairs, mature leaves smooth, untoothed. Flowering when leafless, stalks not jointed, 5 petals, not overlapping in bud, 2 spreading styles. Fruits to 0.8 cm, 2-lobed, flattened, with reddish star-shaped hairs. **NOTE** scattered in open areas below 900 m.



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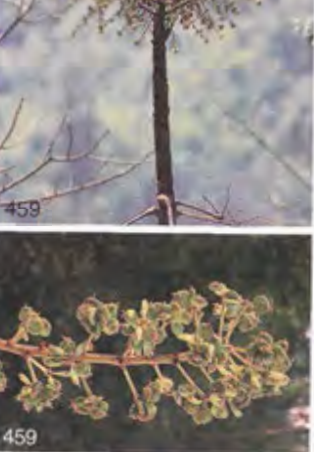
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460 *Trevesia palmata*

ตางหลวง



Small sparsely branched tree to 8 m with **thorny stem**, somewhat palm-like in shape. **LEAF** 30-60 cm, palmate or digitate, very variable in shape, mostly circular with 5-9 lobes/leaflets & heart-shaped base, **usually with characteristic "webbing" between the base of the lobes/leaflets**, irregularly toothed. Young leaves with red-brown hairs, mature leaves completely smooth & shiny above, veins sharply **prominent** below. Stalks 20-90 cm, thorny, base swollen & sheathing stem, with divided stipule-like appendage (ligule). **FLOWER** small, greenish, in branched clusters at end of twigs & upper leaf axils, to 60 cm, with 3 umbels on each side branch, 25-50 flowered, **individual stalks slender, to 3 cm, not jointed**. Calyx toothed, minute, pointed, **8-10(12) petals**, partly fused, 8-12 free stamens, styles fused into a short, blunt column. Ovary 8-12-celled. **FRUIT** to 1.7 cm, globose or obconical with thick, short style-column at top, thinly fleshy, with flattened seeds (pyrenes) **NOTE** common understory tree of fire-free evergreen forests.

SIMILAR ⁴⁶¹*T. lateospina* has stems with dense bristle-like hairs, simple leaves with up to 13 lobes, never digitate, deeply incised & toothed. Flower clusters much shorter, individual stalks short.

462 *Brassaiopsis* ตัง

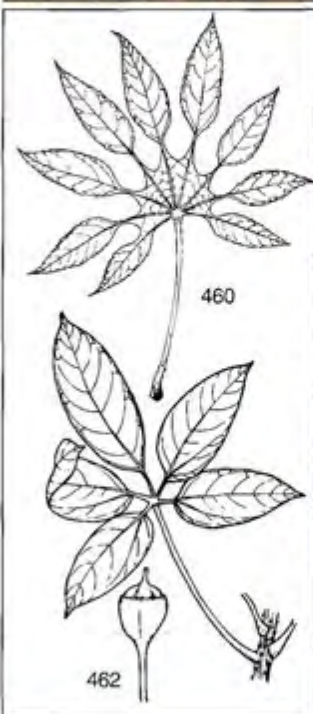
5 species in NT. Sparsely branched trees to 10 m with **thorny stems**, easily mistaken for *Trevesia*. **LEAF** 20-80 cm, palmate or digitate with 3-7 lobes/leaflets, very variable in shape but **never with webbing between the lobes/leaflets**, smooth to densely hairy. Stalks to 120 cm. **FLOWER** stalks **not jointed**, 5 petals, 5 slender stamens, styles united into a column with spreading stigmas. Ovary 2-3(5) celled, broad disc. **NOTE** scattered in less disturbed evergreen forests.



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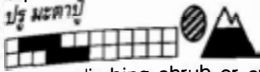


462

ALANGIACEAE

Tiny family with only 1 genus & 21 species worldwide, confined to tropical Africa & Asia, 4 species in NT.

463 *Alangium salvifolium*
ssp. *hexapetalum*



Deciduous climbing shrub or erect tree to 15 m. **LEAF** 7-15x3-7 cm, simple, alternate, usually planar, oval or obovate to oblong with abrupt tip & blunt base, **symmetrical or nearly so**. Mature leaves thinly leathery, glossy green above, **completely smooth or with scattered hairs on veins below**. 3 basal veins, 3-6 pairs of side veins, fine network of smaller veins. Stalks 0.5-1.5 cm. **FLOWER** 1.2-3.3 cm, cream or pale yellow, bisexual, in shortly branched clusters (cymes) of 3-17 flowers at leaf axils or behind leaves, 1.4-2.3 cm. Individual stalks 0.2-0.8 cm, shortly & densely hairy, main stalks very short, 0.2-0.4 cm. Buds long & slender, swollen at base. Calyx tube 1-2 mm, densely hairy, with 5(7) spreading lobes as long as tube. 5(7) narrowly strap-shaped petals, pressed close together but not overlapping in bud, curling backwards as flower opens, finely hairy on both sides. **10-18 stamens**, 12-18 mm, with long hairs at top & along edge, anthers longer than filaments, connectives smooth. Single style 11-18 mm, smooth with disc-like stigma, slightly 5-7 angular, ovary with raised disc. **FRUIT** 0.9-1.8 cm, red turning jet black, spherical or oval with persistent calyx at top, smooth or sparsely hairy, sometimes very slightly 12 ribbed, stone with 1 seed.

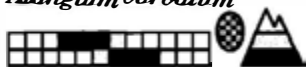
NOTE scattered in open areas, commonly planted for its fragrant flowers.

SIMILAR 3 closely related species which have **broadly ovate leaves** with tapering tips & rounded or heart-shaped base, flowers with **as many stamens as petals**. Usually restricted to moist areas. >>



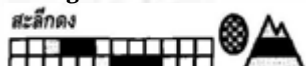
ALANGIACEAE

464 *Alangium barbatum*



Small tree to 10 m with slender, drooping twigs. Leaves to 16x9 cm, narrowly ovate or oblong with tapering tip & **flat or rounded base, ±slightly asymmetric**, golden-hairy especially on midvein above & stalks. Flower in short branched clusters to 4 cm, up to 15 flowers, individual stalks 7 mm, calyx 2 mm, petals & style 10 mm, stamens 7 mm, silvery hairs at base.

465 *Alangium kurzii*

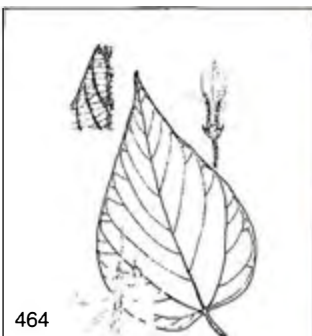


Tree to 28 m, never scrambling, with slender drooping twigs. **LEAF** 4-20x4-15 cm, broadly ovate with tapering tip & **heart-shaped base, obviously asymmetric**, not lobed or toothed. 5-7 main veins from base, 4-7 pairs of side veins. **Mature leaves** densely covered with **soft golden hairs** below & on veins only above. Stalks 1.3-4 cm, densely hairy. **FLOWER** 1.9-3 cm, very fragrant, main stalks to 4 cm. 7-9 petals, 1.7-2.8 cm, stamens 15-25 mm, not thickened at base, dense silvery hairs, connectives also hairy. Style smooth, 14-23 mm. **FRUIT** 1.2-1.5 cm, ellipsoid with blunt tip, smooth to thinly hairy, sometimes slightly grooved, crowned by distinct disc. ripening dark purple to black.

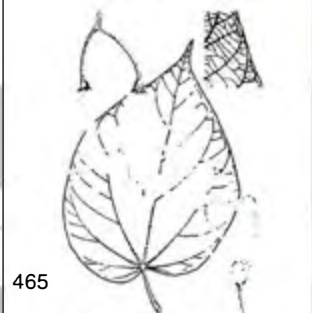
466 *Alangium chinense*



Small tree to 12 m with straight trunk & sympodial branching. **LEAF** 5-28x3-25 cm, broadly ovate or triangular with tapering tip & **heart-shaped base, obviously asymmetric**, sometimes with scattered coarse teeth or faintly lobed. 5-9 main veins from base, 6 pairs of side veins, **smooth or slightly hairy on both sides**, especially on veins. Stalks 1.6-6 cm. **FLOWER** clusters 2.2-8.5 cm with distinct main stalk, 1.5-2.5 cm, individual stalks 0.5-2.2 cm with scattered short hairs. 6-8 petals, 12-20 mm, stamens ±22 mm, connectives smooth, style 7-15 mm, with strips of hairs. **FRUIT** 0.9-1.3 cm, ellipsoid, dark violet when ripe.



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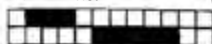
466

CORNACEAE

120 spp. worldwide, mostly N. temperate, 3 genera & 4 species in NT.

467 *Nyssa javanica*

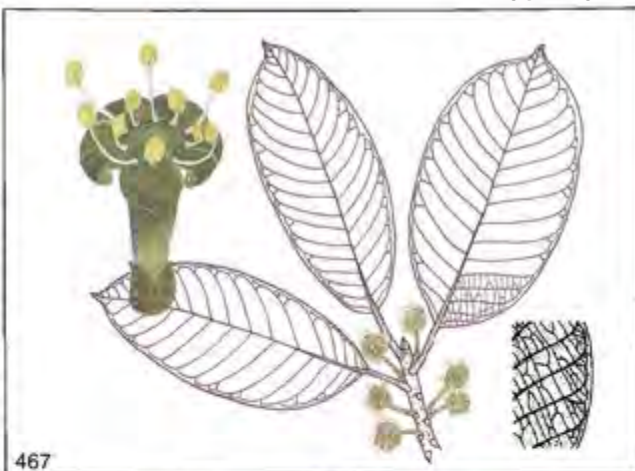
นางคางหมื่น



Briefly deciduous or semi-evergreen tree to 40 m with dense, oval crown & drooping branches. **BARK** dark grey or brown, smooth or slightly flaky, inner bark dull yellow-brown. **LEAF** 5-20x3-9 cm, simple, alternate, usually clustered near end of twigs, oval or obovate to narrowly elliptic with blunt or tapering tip & pointed base, no teeth. Young leaves pale green & densely silvery silky-hairy, completely covering the tree for a few days each year. Mature leaves dull dark green & smooth except on veins above, grey-green (glaucous) & sparsely hairy below. Stalks 1-3.5 cm, slightly flattened, no stipules. Buds narrowly conical. **FLOWER** tiny, yellow-green, male & bisexual on different trees. Males in dense heads of 20-49 flowers, 1.2-1.5 cm, in axils of young leaves or just behind them, main stalks 0.5-3 cm, individual stalks short but distinct. Females in much smaller heads with only 3-8 stalkless flowers. Calyx bell-shaped with 4-5 unequal teeth & 2 bracts at base, densely hairy outside. 5(4) free petals, overlapping at base & curved backwards at tips, smooth or sparsely hairy. 8-10 stamens in 2 indistinct whorls surrounding a large circular disc. Single forked style, 1.5-2 mm, ovary inferior. **FRUIT** 1.5-2.5 cm, pale green ripening yellow-brown to dark red, ellipsoid or ovoid with persistent calyx & disc at top, sometimes several fruits merged together at base. Outer wall leathery, fleshy inside with a single large flattened stone which is grooved on one side & knobbly on the other.

NOTE locally common in less disturbed evergreen forests. Formerly treated as a distinct family-Nyssaceae

SIMILAR⁴⁶⁸ *Mastixia euonymoides* leaves **opposite**, flowers **bisexual**, in many-flowered branched clusters at end of twigs, petals not overlapping. Fruits $\pm 2.5 \times 1.2$ cm, dark green to black, with bony stone which is deeply grooved down one side, dividing seed into 2 lobes. Rare, undisturbed forest



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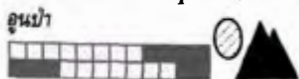


467

CAPRIFOLIACEAE

420 species worldwide, several species of shrubs in NT but only 3 which usually reach 3 m or more.

469 *Viburnum inopinatum*



Deciduous shrub or small tree to 6 m
LEAF 9-20(26)x3.5-8 cm, **simple**, **opposite**, clustered near end of twigs, narrowly elliptic with $\pm$ tapering tip & blunt or slightly pointed base, $\pm$ slightly asymmetric, untoothed or with scattered shallow teeth near top. 5-7 pairs of steeply curved side veins, joined at margin, sunken above. Mature leaves, sometimes tinged dark red, smooth except on midvein above, **more or less densely hairy below with both simple & star-shaped hairs intermingled**. Stalks 1-3 cm, grooved, densely hairy, **no stipules**.
FLOWER small, white, bisexual, in regularly forked clusters (compound umbels) at end of twigs, 9-13 cm, axes densely hairy. Calyx $\pm$ 1.5 mm, with 5 minute teeth, very hairy. Corolla tube $\pm$ 1.5 mm, with 5 lobes **slightly longer than tube**. 5 stamens, 6-7 mm, fused to base of corolla, anthers pale yellow or brown. Style very short with 3 stigmas, **ovary hairy**, inferior.
FRUIT 0.4-0.5 cm, red, oval & flattened, crowned by persistent calyx, thinly fleshy, single hard stone with **3 grooves on one side & 2 on the other**. **NOTE** fairly common in open areas. Crushed parts with strong smell.

SIMILAR 2 species with corolla tube much longer than lobes:

470 *V. cylindricum* ~~small~~ small tree to 10 m with thick leathery leaves, untoothed, completely smooth or with scattered hairs in vein axils. Flowers with red anthers & smooth ovary. Fruit violet or black, succulent, stone with 1 groove on one side & 1 on the other.

471 *V. foetidum* shrub to 3 m with smaller & thinner leaves, 2-7x1-3 cm, coarsely toothed, densely hairy especially on veins & stalks. Flower clusters 2-4 cm, with large leaf-like bracts at base, anthers white, tan or violet, ovary with several glands. Fruit 0.6 cm, stone as *V. inopinatum*.



472 *Sambucus javanica*

สะพ้านกิ่ง



Evergreen shrub to 3m. **LEAF** 10-50 cm, **odd-pinnate**, 2-8 pairs of cm, opposite leaflets, 8-20x1.2-5 cm, oblong-lanceolate with tapering tip, sharply toothed, completely smooth. **FLOWER** ± 0.5 cm, white, fragrant, crowded in large spreading clusters at end of twigs. Calyx 0.5 mm, corolla 2 mm, with 5 blunt spreading lobes & **yellow cup-shaped glands** (nectaries). 5 stamens, short style with 3 or 5 stigmas. **FRUIT** ± 0.5 cm, red then black, globular, fleshy with 3-5 small seeds.

NOTE common in open moist areas. Crushed parts with strong smell.

SIMILAR 473 *S. simpsonii* shrub 2-4m, ± 3 pairs of leaflets, 5-15x2-4cm. Flowers in dense clusters 20-45 cm, calyx 1mm, corolla 4-5mm, no nectaries. Introduced from N.America

**RUBIACEAE Coffee family**

Large & very diverse family with 10,200 species worldwide, concentrated in the tropics where they form a major component of the understory in rainforests. In Malaysia, Rubiaceae is the largest woody family, with over 500 tree species ($\pm 12\%$ of total tree flora). In the drier climate of NT, it is not so abundant but is still the third largest family, with at least 30 genera & 55 species.

BOTANY mostly evergreen shrubs or small trees, sometimes thorny, no latex or sap. Leaves **simple, opposite** often in 2 rows (decussate), sometimes in whorls of three, **no teeth**. Easily recognised by the **interpertiole** **stipules**, sometimes fused together into a sheath, often falling early but always leaving a characteristic scar connecting the two leaves of a pair. Flowers regular, mostly bisexual, typically with 4-5 inconspicuous sepals & 4-5 petals fused into a **tubular or funnel-shaped corolla with 4-5 stamens attached around the mouth of the tube**. Ovary inferior with long, slender style, often forked near top. Fruits very diverse, berries, drupes or capsules, usually with persistent calyx at top.

ECOLOGY important component of both dry & moist forests, particularly lowland ones, usually understorey.

USES the only species of major economic importance is coffee, *Coffea* spp., from C.Africa, otherwise the family provides very little of commercial importance, although many species are cultivated for their ornamental, often fragrant flowers.

1. flowers & fruits in heads
2. fws & fts in tightly packed spherical heads on long stalks
3. heads grouped into branched clusters
4. terminal leaf bud flat & rounded; leaf tip rounded *Mitragyna* 483
4. terminal bud broadly conical; if tip pointed *Metadina trichoma* 487
3. heads solitary or fascicled, not in branched clusters
5. heads ≤ 2.5 cm diam., in axils of young leaves; seed with wing; terminal leaf bud flattened & blunt, not sticky *Haldina cordiflora* 480
5. heads 2.5-4cm diam., at end of twigs; seeds without wing; terminal leaf bud flattened & blunt, not sticky *Nauclea orientalis* 482
5. heads ≥ 4 cm diam., at end of twigs; seeds without wing; terminal leaf bud narrowly conical, sticky *Anthocephalus chinensis* 481
2. flowers in loose heads, calyx tubes fused at base; *Morinda* 489
1. flowers & fruits free, not in heads
6. plants thorny
7. anthers enclosed within corolla *Ceriscoides* 497
7. anthers projecting beyond corolla >>

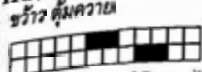
continued on page 218

8. flower clusters at end of main twigs *Fagerlindia*⁴⁹⁸
 8. flower clusters at end of leafy side shoots *Catunaregam*⁴⁹⁶
 8. flower clusters in leaf axils
 9. clusters on short stumps, stipules fused in sheath ⁴⁷⁴*Meyna*
 9. clusters not on stumps, stipules free *Canthium parvifolium*⁴⁹³
6. plants not thorny
 10. flowers <1 cm *Wendlandia*⁴⁹⁹
 10. flowers 1-3 cm
 11. twigs with soft, spongy bark. fruits with air spaces inside ⁴⁷⁵*Mycetia*
 fws in short-stalked axillary clusters, often with stalked glands, corolla quite large with cylindrical tube, $\pm$ hairy inside, not twisted in bud, stamens attached below middle of tube & not projecting, stigma forked; fruits white, many seeds
 11. twigs not spongy, fruits without air-spaces
 12. flower & fruit clusters in leaf axils
 13. style much longer than corolla, stigma simple; stipules fused *Pavetta indica*⁵⁰¹
 13. style not much longer than corolla; stipules not fused
 14. style stout, lobed; lvs with domatia, fw stalks 2-6mm
 15. fws in branched clusters (cymes), main stalks 3-5mm, individual stalks 2-3mm; fts 1.2-2.2cm *Canthium glabrum*⁴⁹¹
 15. fws in spherical clusters (umbels), main stalk 6-10mm, individual stalks 4-6mm; fts 0.6-0.8cm *Canthium umbellatum*⁴⁹²
 14. style slender, forked, lvs without domatia, fws without stalks
 16. corolla twisted in bud, style 2-forked ⁴⁷⁶*Hyphianthera*
 fws in fascicles with many pointed, ridged bracts at base, corolla hairy inside, anthers hairy at base, not projecting, style $\pm$ longer than corolla berries with 4 large, flat, overlapping seeds
 16. corolla not twisted in bud, style 3-9 forked ⁴⁷⁷*Lasianthus*
 lvs planar, with unpleasant smell when crushed, fws on short woody stumps
 slumps, corolla $\pm$ hairy inside, stamens $\pm$ projecting, style slightly longer than corolla, drupes with 2-9 seeds, stones usually ribbed, yellow or blackish
12. flower/fruit clusters at end of main twigs or leafy side shoots
 17. flowers with a large, white, leaf-like sepal *Schizomussaenda*⁴⁸⁸
 17. flowers without enlarged sepal
 18. corolla twisted in bud, stipules fused into sheath, not forked
 19. corolla 5-lobed; berry with many seeds *Tarennoidea*⁵⁰³
 19. corolla 4-lobed; drupe with 1-2 seeds
 20. style slightly longer than corolla, style 2-forked
 fw clusters with modified lvs at base *Ixora kerrii*⁵⁰²
 20. style much longer than corolla, style simple
 fw clusters without modified lvs *Pavetta indica*⁵⁰¹
 18. corolla not twisted in bud, stipules usually free, $\pm$ forked
 21. style much longer than corolla, ⁴⁷⁸*Hymenodictyon*
 fw clusters spike-like, often with large leafy bracts, corolla smooth inside, stigma simple, disc tubular; fts splitting, seeds winged all round
 21. style shorter or slightly longer than corolla ⁴⁷⁹*Psychotria*
 fw clusters not spike-like, corolla usually hairy at mouth, stigma forked, disc cushion-shaped; fts not splitting, seeds not winged
10. flowers >3 cm
 22. white flowers with purple dots on inside, leaf buds not sticky *Rothmannia sootepensis*⁵⁰⁹
 22. flowers without purple dots, leaf buds with sticky resin
 23. lvs, fws & fts with distinct stalks *Gardenia sootepensis*⁵⁰⁵
 23. lvs, fws & fts with very short stalks *Gardenia obtusifolia*⁵⁰⁶



480 *Haldina cordifolia*

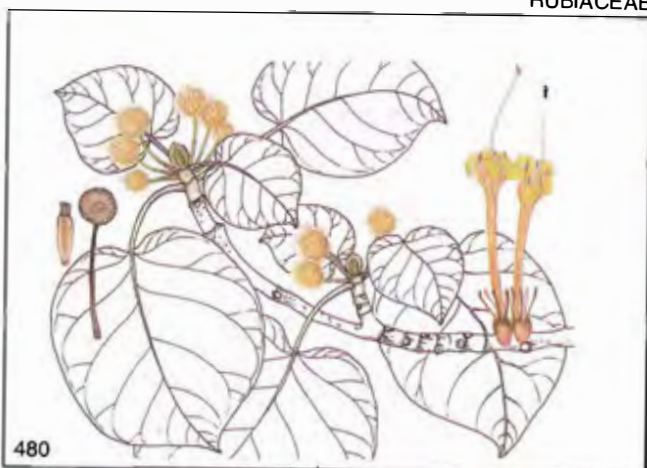
หาลดีน คุ้มควา



Deciduous tree to 25 m with straight, slightly fluted trunk & open, rounded crown. **BARK** pale brown to dark grey, smooth or scaly & finely fissured, inner bark pink to dark brown. **LEAF** 8-20x6-16 cm, rarely to 30x20 cm, opposite in 2 rows (decussate), **circular or broadly ovate** with short tip & heart-shaped base. Young leaves pale green with pink stalks, mature leaves thin with scattered rough hairs above & denser soft hairs below. 5-7 basal veins, 5-8 pairs of side veins. Stalks 3-8 cm, slender. Young twigs squarish with flat, **rounded buds** which are protected by a pair of pale green, ridged stipules, 1.2-1.8 cm. **FLOWER** <1 cm, pale yellow or pinkish, slightly fragrant, in dense spherical heads, 1.5-2.5 cm diam., several together in very young leaf axils, stalks 3-7 cm. Calyx ± 0.25 cm, with short tube & 5 oblong lobes, hairy outside. Corolla ± 0.5 cm, with slender tube & 5 blunt lobes, finely hairy outside. 5 stamens with very short filaments attached to upper part of corolla tube, style much longer than corolla, ± 1 cm. **FRUIT** 0.3-0.4 cm, in globose heads, dry, with hard partitions between the seeds, each fruit splitting from top into 2(4?) sections with a persistent central axis & calyx. Seeds tiny, pointed at one end, narrowly winged.

NOTE scattered in semi-open forests, often associated with Teak. The young leaves & flower heads burst forth simultaneously from the same bud.

SIMILAR *Anthocephalus chinensis*⁴⁸¹ has larger heads, 3.5-5 cm, at end of twigs & narrowly conical, sticky leaf buds. *Metadina trichoma*⁴⁸⁷ & *Mitragyna* spp.⁴⁸³ have flower & fruit heads grouped into large, branched clusters.



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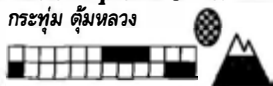
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481 *Anthocephalus chinensis*

กระพุ่ม ตุ่มหลวง



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Briefly deciduous tree to 30m. Young trees have a long straight trunk with horizontal side branches clustered near the top. Mature trees develop a large, oval crown with drooping branches. **BARK** pale grey-brown, smooth when young, becoming coarsely flaky when older, inner bark pale yellow. **LEAF** 10-30x5-14 cm, opposite-planar, oblong or ovate with blunt or slightly pointed tips & rounded or slightly heart-shaped base, often $\pm$ asymmetric. Young leaves pale green & softly hairy, mature leaves dark green & glossy above, smooth or slightly hairy below. 8-14 pairs of $\pm$ straight & parallel side veins, curved & open at margin, tertiary veins ladder-like. Stalks 2-4 cm, stipules falling early but leaving distinct ring-like scars. **Buds narrowly conical & pointed, with sticky resin.** **FLOWER** white turning pale orange, in dense spherical heads, 4-6 cm diam, **solitary or in pairs** at end of twigs. Stalks 2.5-6 cm, jointed with a pair of reduced leaves in the middle. Calyx tubes closely pressed together but not fused, with 5 short blunt lobes, smooth outside. Corolla tube long & slender with 5 narrow lobes, smooth both sides. 5 stamens with very short filaments, style much longer than corolla with narrow, simple stigma. **FRUIT** heads 3.5-5 cm, green then brown, rather fleshy, individual fruits conical, closely pressed together, splitting into 4 sections with many minute, wingless seeds.

NOTE fairly common, usually in open areas along streams.

SIMILAR 482 *Nauclea orientalis* กระพุ่มน้ำ tree to 15m with slender, drooping twigs & flat, rounded leaf buds. Flower heads 2.5-4 cm, calyx tubes completely fused with surrounding flowers. Fruit heads 2.5-4 cm, individual fruits fused into an irregular fleshy mass. Uncommon, habitat as *Anthocephalus*.



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483 *Mitragyna rotundifolia*

กระพุ่มเงิน แก่นเห็ดลึง



Deciduous tree to 30m with open crown & sympodial branching. **BARK** cream or pale grey, quite smooth with large lenticels. **LEAF** 14-25x10-20 cm, up to 60x25 cm in young trees, opposite in 2 rows (decussate), oval or broadly ovate with blunt or slightly pointed tip & rounded or heart-shaped base. Young leaves pale green, silvery-hairy, mature leaves smooth above, finely hairy with domatia in vein axils below. 6-10 pairs of side veins. Stalks 2-6 cm, buds to 4 cm, **broadly obovate, strongly flattened**, covered by a pair of pale green ridged stipules. **FLOWER** in dense spherical heads, **1.5-2(2.5) cm diam.** (not including stamens), **grouped into regularly branched clusters** at end of twigs, heads in threes, central one with very short stalk. Individual flowers ± 0.6 cm, with a pair of slightly ridged bracts at base, 2.5-3 mm, **hairy along margins**. Calyx < 1 mm, with **short blunt lobes**, smooth. Corolla narrowly funnel-shaped, lobes $\pm$ as long as tube, densely hairy near mouth inside. 5 stamens without filaments, slightly protruding beyond corolla tube, style much longer than corolla, stigma mitre-shaped. Disc convex, quite large. **FRUIT** heads **1-1.6 cm diam.**, individual fruits slightly ridged, conical or ellipsoid, splitting into 2 sections, **seeds winged all round.**

NOTE common in open areas throughout NT.

SIMILAR 484 *M. hirsuta* กระพุ่มโลก leaves 8-18x4-12 cm (larger in young trees), with ovate buds. Flower heads 2-2.5 cm, with linear calyx lobes divided nearly to base, > 1.5 mm. Fruit heads 1.5-2 cm.

485 *M. diversifolia* mature leaves 6-14x3-9 cm, flower bracts not hairy along margins, calyx > 2 mm.

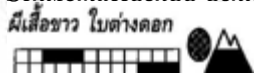
486 *M. parviflora* var. *microphylla* from upper Burma is often mistakenly recorded for NT but has corolla lobes $< \frac{1}{2}$ as long as tube, smooth or nearly so.



487 *Metadina trichotoma*

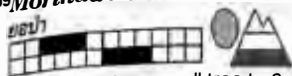
Evergreen tree to 25m with brown, slightly flaking bark. **LEAF** 8-24x3-8 cm, narrowly elliptic, tapering at both ends, opposite in 2 rows (decussate), dark green & glossy above, usually with domatia in vein axils below. Stalks 1-3 cm, stipules 2-4 mm, **terminal leaf buds broadly conical, not flattened or sticky**. **FLOWER** heads 1.5-2 cm diam, pale yellow, **grouped in branched clusters at end of twigs**, 12-30 cm. Calyx tubes separate, not fused with surrounding flowers, corolla smooth inside, stigma globose or club-shaped, disc indistinct. **FRUIT** heads ± 1 cm diam, individual fruits ± 0.2 cm, pyramidal, separate from each other, splitting into (4)2 sections, seeds strongly flattened, pointed at one end, not winged.

NOTE scattered in fire-free forests.

488 *Schizomussaenda dehiscens*

Scrambling shrub or climber, sometimes a small tree to 7m. **BARK** brown, shallowly fissured. **LEAF** 8-22x2.5-7cm, opposite in 2 rows (decussate), narrowly elliptic or obovate to lanceolate with tapering tip & pointed base, slightly hairy on veins especially below. Stalks 0.7-1.2cm, stipules 2mm, pointed, **deeply forked**, young twigs squarish. **FLOWER** in branched clusters (corymbs) at end of twigs, to 5cm, individual stalks short with small bracts at top. 4 small pale green sepals 1-1.5mm, narrowly pointed, **1 much larger white sepal**, 2-5cm, leaf-like with rounded blade & long narrow stalk. Corolla tube ± 2 cm, bright orange, with 5 short triangular lobes, hairy inside. Stamens attached to upper half of corolla tube, not projecting, style forked, disc large. **FRUIT** ± 1 cm (dry), dark green with pale dots (lenticels), irregularly globose, fleshy with many angular seeds. **NOTE** scattered along forest edges & in gaps.



489 *Morinda tomentosa*

Deciduous shrub or small tree to 8m with straggly crown & short, twisted trunk. **BARK** brown, fissured. **LEAF** 10-21x5-9 cm, opposite (except at flowers), spiral, oval or ovate with abrupt tip & pointed base. Mature leaves thin, **softly hairy on both sides**, dull dark green above, paler with **dark dots** (acarodomatia) scattered over surface below. 8-10 pairs of irregularly spaced side veins & a clear network of finer veins. Stalks 0.6-2 cm, stipules 3-5 mm, triangular, **usually forked & fused into a sheath**, falling early. **FLOWER** $\pm$ 2 cm, pure white, in loose heads **opposite a solitary leaf**, or several heads together at end of twigs. Common stalks 1.2-2.5 cm with a cluster of large deciduous bracts at top, individual flowers without stalks. Calyx tubes flat at top, **fused with neighbouring flowers at base**, hairy inside. Corolla funnel-shaped with 5 (6) spreading, blunt lobes, $\pm$ half as long as tube, **softly hairy on both sides**. 5-6 short stamens attached at mouth of corolla tube & not projecting beyond it, filaments 5 mm. Style longer than corolla tube, stigma 2-lobed, ovary with distinct disc. **FRUITS fused into an irregular, knobby mass**, 1.5-3 cm, green, turning whitish, fleshy & juicy, each individual fruit with 1 hard seed (pyrene). Stalks slender, to 4 cm.

NOTE common in semi-open forests.

SIMILAR ⁴⁹⁰ *M. citrifolia* ~~vs~~ leaves 15-30x4-14 cm, pointed at both ends, completely smooth, shiny above, 5-6 pairs of side veins, tertiary veins flat below, stipules obovate & blunt. Flowers 1.5-1.8 cm, corolla smooth outside, hairy at mouth only inside. Fruits 2.5-4 cm, ripening pale yellow. Native to S. Thailand, often cultivated in NT.



491 *Canthium glabrum*

คำเต็ม



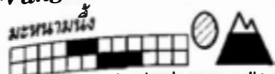
Small evergreen tree to 15m with a straight, tapering trunk & **horizontal side branches in pairs**, sticking out at all angles like the spokes of an umbrella. **BARK** pale grey-brown, smooth or slightly fissured, **not thorny**. **LEAF** 7-18x3-9 cm, opposite-planar, often drooping, narrowly ovate or elliptic-oblong with pointed or slightly tapering tip & blunt or rounded base, slightly asymmetric. Mature leaves completely smooth, shiny & dark green above, usually with **tiny sunken pits** (domatia) in vein axils below. 4-9 pairs of quite straight, steeply-angled side veins. Stalks 0.5-2 cm, stipules 4-7 mm, triangular with recurved tips, distinctly ridged. **FLOWER** $\pm$ 0.5 cm, pale green or whitish, in branched clusters (cymes) at vein axils, 2-3 cm, main stalks 3-5 mm, individual stalks slender, 2-3 cm. Calyx $\pm$ 1 mm with 5 minute teeth, corolla globose (urceolate) with 5 lobes as long as tube, not overlapping in bud, curved backwards in mature flowers, hairy at mouth inside. 4-5 stamens attached to mouth of corolla tube, filaments very short, style 2.5 mm with **large, stout stigma**, slightly protruding from corolla, ovary with ring-like disc. **FRUIT** 1.2-2.2 cm, dark green ripening black, ellipsoid or obovoid with slightly sunken tip, usually slightly 2-lobed, thinly fleshy with 2 hard triangular seeds (pyrenes).

NOTE dense forests, uncommon.

SIMILAR 492 *C. umbellatum* ทั่วถิ่น leaves with tapering tip & pointed base, stipules 8-10 mm. Flowers in spherical clusters (umbels), main stalk 0.6-1 cm, individual stalks 4-8 mm. Fruits 0.6-0.8 cm, stalks to 1.3 cm, seeds not ridged. 493 *C.*

parvifolium หนามมะเค็ด deciduous shrub or small tree to 7m with sharp spines. Leaves to 5.5x3 cm, finely golden hairy when young, sparsely rough-hairy when mature. Flowers in groups of 2-8 without common stalk, individual stalks 0.1-0.4 cm. Fruits yellow-green, juicy. Common in open areas.



494 *Vangueria pubescens*

Deciduous straggly shrub or small tree to 8m with **long, straight spines in pairs**. **LEAF** 5-10x3-6 cm, ovate or oval, slightly pointed at both ends, thin, scattered rough hairs above, **denser soft hairs below**. Stalks 0.4-1 cm, stipules narrow & pointed, to 1 cm. **FLOWER** small, green, in short clusters (cymes) at axils of young leaves or on stumpy side branches, 2.5-4 cm, individual stalks 0.4-0.6 cm, finely hairy. Corolla globular with 5 triangular lobes alternating with short stamens, finely hairy both sides. Style slightly longer than corolla, with **globose stigma**. **FRUIT** 1.5-2 cm, yellow-green, globose, $\pm$ slightly lobed or angled, with circular calyx scar & 5 short points at top, fleshy with 4-5 hard, red-brown seeds (pyrenes) in a star-shaped pattern.

NOTE widespread, fairly common.

SIMILAR ⁴⁹⁵*V. spinosa* leaves completely smooth with tufts of hairs in vein axils below, flowers smooth with disc-like stigma, fruits up to 4 cm, edible. 3 other genera of spiny shrubs, formerly included in *Randia*.

⁴⁹⁶*Catanuregam* leaf axils with 2 buds, upper one developing into a long, straight spine. Flower clusters without stalks, corolla bell-shaped with 5-10 lobes, overlapping to left, stamens on upper half of corolla, projecting beyond corolla. Fruits $\pm$ 3 cm, ellipsoid or ovoid, seeds ellipsoid or kidney-shaped.

⁴⁹⁷*Ceriscoides* leaf axils with only 1 bud developing into short side shoots, at first with leaf & flowers, later becoming a spine. Flowers with tubular corolla, stamens on upper half of throat, enclosed within corolla. (see under *Gardenia*⁵⁰⁵ for some species)

⁴⁹⁸*Fagerlindia* leaf axils with 2 buds, as *Catanuregam*. Flower clusters truly terminal, corolla salverform, smooth, stamens projecting beyond corolla. Fruits < 2 cm, subglobose, smooth, spongy, 2 Pyrenes each with 1 seed.



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499 *Wendlandia tinctoria*

แซ้งกว๊าง



Evergreen shrub or small tree to 8m. **BARK** brown, fissured & flaking in long strips, inner bark cream. **LEAF** 4.5-10(14)x2-4.5(6) cm, opposite or rarely in whorls of 3, spiral, oblong-lanceolate, tapering at both ends. Young shoots finely hairy, **mature leaves smooth & glossy dark green above, smooth or softly hairy below**. Stalks 0.6-1.2 cm, with narrowly triangular stipules, 3-5 mm. **FLOWER** 0.3-0.4 cm, white or cream, in branched clusters at end of twigs & upper leaf axils, densely-flowered, 4-20 cm. Main **stalks** smooth or softly hairy, individual flowers without stalks, often with several small persistent bracts at base. Calyx ± 1 mm, with 4 minute teeth, much shorter than tube, **smooth or softly hairy**. Corolla tube 2-3 mm, with 4-5 blunt or rounded lobes, ± 1 mm. 5 stamens attached to mouth of corolla & slightly projecting, no filaments, style $\pm$ as long as corolla, stigma forked, ovary with fleshy, ring-like disc. **FRUIT** 0.1-0.2 cm, globose with persistent calyx at top, **smooth or slightly hairy**, splitting into 2 parts with many tiny flattened seeds.

NOTE very common in the under storey of hill evergreen forests, often with pine. 3 subspecies in NT:

ssp. *tinctoria* leaves usually slightly hairy below. Flower stalks, calyx & corolla sparsely hairy.

ssp. *floribunda* leaves smooth. Flower stalks & calyx smooth; corolla hairy at top.

ssp. *orientalis* leaves, flower stalks, calyx, corolla & ovary completely smooth.

SIMILAR ⁵⁰⁰*W. scabra* leaves usually elliptic, roughly hairy above, densely & softly hairy below. Flowers in dense, pyramidal clusters with roughly hairy stalks & calyx, each flower with 1-2 linear bracts at base, fruits densely hairy. Locally common.



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501 *Pavetta indica*

เขิน



Shrub or small tree to 5m with straggly, spreading crown. **BARK** pinkish brown, smooth to slightly flaking. **LEAF** 8-22x2-7 cm, opposite in 2 indistinct rows, narrowly elliptic, obovate or lanceolate, usually pointed or tapering at both ends. Mature leaves thin, smooth or sparsely hairy, with **small dark swellings on lower surface**. 5-7 pairs of side veins. Stalks 0.6-3.5 cm, with thin, triangular stipules **fused into a short sheath**, twigs slightly squarish. **FLOWER** 1.5-2.5 cm, white, slightly fragrant, sometimes tinged violet or green at tips, in loose, branched clusters (cymose corymbs) at end of twigs & upper leaf axils, 3-15 cm wide, individual stalks 0.2-0.6 cm. Calyx 0.1-0.25 cm, with 4 tiny teeth. Corolla trumpet-shaped with a narrow tube, 0.8-1.8 cm, and 4 spreading, blunt lobes, 0.5-1 cm, twisted together in bud, usually hairy inside & smooth outside. 4 stamens with short filaments & **twisted anthers**, attached to mouth of corolla & curved outwards when aging. **Style very long & slender, at least 2x as long as corolla**, with simple inconspicuous stigma. **FRUIT** 0.5-0.7 cm, glossy green turning black, globose or slightly flattened & 2-lobed with persistent circular calyx at top, thinly fleshy with 2 brown seeds, curved on one side but flat on the other.

NOTE fairly common in semi-open forests. The dark swellings on the leaves contain symbiotic bacteria which fix atmospheric nitrogen.

SIMILAR ⁵⁰²*Ixora kerrii* เขิน shrub to 3m with narrowly ovate or oblong leaves with tapering tip & slightly pointed or rounded base, leathery, smooth, no dark swellings, 11-14 pairs of side veins, stalks 0.2-0.5 cm. Flower clusters to 20 cm, with modified leaves at base. Corolla tube pink, 1-1.3 cm, lobes white, $\pm$ 0.25 cm, anthers not twisted, style slightly longer than corolla, stigma forked. Fruits 1-1.2 cm, red turning black.



503 *Tarennoidea wallichii*

Evergreen tree to 18m with short, gnarled trunk & dense ovoid crown, obviously sympodial growth pattern.

BARK thin, brown or grey-brown, smooth or finely cracked, inner bark pale orange & yellow, fibrous. **LEAF** 10-24x4-8 cm, opposite, narrowly elliptic or obovate with slightly pointed or blunt tip & slightly tapering base. 9-11 pairs of arched side veins, finer veins faint. Young leaves pale green, mature leaves leathery, completely smooth, glossy dark green above. Stalks 0.8-2.5 cm, very slightly winged near top, stipules 10x5 mm, triangular with thin transparent margin. Buds shiny dark brown, narrowly conical. **FLOWER** ± 0.5 cm, pale green turning yellow, in dense branched clusters at end of twigs & upper leaf axils, to 7 cm, without main stalks, individual stalks < 1 mm. Calyx ± 3 mm, cup-shaped with 5 triangular teeth. Corolla tube cylindrical, smooth outside, with ring of hairs at mouth inside, 5 blunt lobes, ± 2.5 mm, curved strongly backwards. 5 stamens with short filaments, projecting slightly beyond corolla tube, anthers & stigma brown, style long & slender, ± 4 mm.

FRUIT 0.8-1.8 cm, dark green with yellow circle at top, globose, smooth, thinly fleshy, 1 stone with 3-4 seeds.

NOTE common in less disturbed hill-evergreen forests.

504 *Tarenna vanprukii*

var. *vanprukii* พุดผกา



Evergreen shrub or small tree to 6m. **LEAF** 13-18x4-6cm, narrowly elliptic or ovate, pointed both ends, smooth except on veins. 8-9 pairs of side veins, raised above. Stalks 1.3-2 cm, stipules fused, pointed, slightly hairy. **FLOWER** in corymbs at end of twigs, to 12 cm wide, individual stalks short. Sepals ≤ 1 mm, slightly hairy. Petals ± 8 mm, tube 1.5 mm, very hairy at throat, lobes hairy along margin. Anthers ± 6 mm, style ± 10 mm, smooth. **FRUIT** ± 0.8 cm, globose.

NOTE widespread, open areas.



505 *Gardenia sootepensis*

คำนำหน้า



Deciduous tree to 15m with open, straggly crown & stout, twisted trunk. **BARK** pale cream or grey, quite smooth, peeling in thin plates, no thorns. **LEAF** 9-28x4-15 cm, oblong or obovate with blunt tip & rounded base. Young leaves pale orange, silvery-hairy, mature leaves glossy dark green above, finely hairy below. 16-20 pairs of straight, parallel side veins, curved & joined at margin. Stalks to 1 cm, stipules ± 1 cm, **fused into a sheath** around the twigs, soon falling but leaving an obvious ring-like scar. Leaf buds broadly conical covered with **sticky yellow resin**. **FLOWER** large, pale green or white turning rich yellow-orange, solitary at end of twigs or on stout stumps in leaf axils, stalks 1-1.5 cm. Calyx 1.2 -2 cm, tubular with short pointed teeth, **deeply split on one side**, ribbed, dark green, sticky & finely hairy outside. Corolla tube 5-7 cm, narrowly cylindrical with 5 widely spreading, blunt-tipped lobes, 3-4 cm, closely twisted together in bud. 5 stamens alternating with corolla lobes & attached slightly below them, anthers sessile, style slightly longer than corolla tube, hairy at base, stigma club-shaped. **FRUIT** 3-5 cm, bright green, oval with distinct nipple at top & 5 shallow ridges, fleshy with many small seeds. Stalks thick, to 1 cm.

NOTE fairly common in semi-open & dry dipterocarp forests.

SIMILAR 506 *Gardenia obtusifolia* หน่อไม้ฝรั่ง has leaves, flowers & fruits with very short stalks. Leaves 6-14x3-6 cm, blunt-tipped, scattered rough hairs both sides. Calyx <1 cm, with 5 pointed teeth. Corolla tube 4-5 cm, lobes 2-2.5 cm. Fruits 2-3 cm. Uncommon.

507 *Ceriscoides (Gardenia) sessilifolia* หน่อไม้ฝรั่ง straggly shrub with long sharp spines in pairs, leaves 5-10 cm, narrowly obovate or lanceolate, pointed at both ends, stalks 0.6-0.8 cm, stipules not fused together. Flowers green, unisexual & bisexual on same tree, fertile flowers without >>



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stalks. Calyx tube 0.6-0.8 cm, flask-shaped with large leaf-like lobes, densely hairy outside. Corolla lobes as long as tube, velvety outside. Fruits ± 3.5 cm, brown, ovoid with short hard tip & circular calyx scar at top, slightly rough but not hairy.

508 *Ceriscoides (Gardenia) turgida*
กระเมียน habit, leaves & fruits as *G. sessifolia* but with cream flowers, all bisexual, 2-3 clustered together on short, thick side branches. Calyx ± 4 mm, bell-shaped with 5 minute teeth, corolla tube 8-10 mm, lobes up to 15mm, smooth outside.

509 *Rothmannia sootepensis*

กระเมียน



Small evergreen tree to 8m with sympodial branching. **BARK** red-brown or dark grey-brown, finely cracked & flaking. **LEAF** 8-14x2-5 cm, opposite, often planar, narrowly elliptic, pointed or tapering at both ends, base slightly asymmetric. Mature leaves completely smooth, dull dark green above, pale green with sunken glands (1 mm) in vein axils below. 6-8 pairs of arched side veins, finer veins faint. Stalk < 0.4 cm, stipules ± 0.4 cm, triangular, falling early. Twigs flattened when young, leaf buds broadly triangular. **FLOWER** 5-7.5 cm, **white with red-purple dots near mouth inside**, in clusters of 1-5 flowers on a short common stalk at end of leaves, individual flowers without stalks. Calyx 6-10 mm, 5 narrow pointed lobes, densely hairy outside. Corolla narrowly funnel shaped with (4)5 blunt lobes, much shorter than tube, closely twisted together in bud, 5 stamens attached to upper part of corolla tube & not projecting beyond lobes anthers ± 1.4 cm, no filaments. Style ± 5 cm, smooth, at least as long as corolla tube, stigma 2-lobed. **FRUIT** 2.5-6 cm, dark yellow-brown, ellipsoid or subglobose, slightly sunken at the top with a short point in the middle, divided into 2 chambers each with several flattened seeds surrounded by a slimy orange pulp.

NOTE scattered, semi-open areas.



COMPOSITAE (ASTERACEAE)

The largest family of flowering plants in the world with 22,750 species of which the vast majority are herbs. Only 2 genera & 4 tree species in NT. **BOTANY** leaves simple, alternate, spirally arranged, no stipules. Flowers tiny, grouped in dense heads with whorls of overlapping scale-like bracts at the base (involucre), the whole head appearing at first sight to be a single, fluffy flower. Each individual flower consists of a dense mass of silky hairs (pappus - modified sepals) surrounding a tubular corolla with 5 recurved lobes, 5 stamens fused into a tube & a forked style with 2 stigmas. Fruits (achenes) tiny, dry, crowned by a circle of hairs & dispersed by wind.



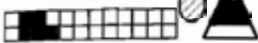
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510 *Gochnatia decora*

หัวมีอดัน ยางแก้หูลวง



Straggly deciduous tree to 6 m with spreading, twisted branches. **BARK** dark brown, thick, deeply cracked. **LEAF** 11-17x4-7 cm, narrowly elliptic-oblong or lanceolate with tapering tip & pointed base, often slightly asymmetric, **no teeth**. Young shoots densely covered with a mat of silky whitish hairs, mature leaves thin, dull green, smooth or nearly so. Stalks 1.2-4 cm, slender. **FLOWER** heads ± 2.5 cm, white, in dense clusters at end of leafless twigs. Each head with 4-8 individual flowers surrounded at base by many layers of pointed orange-brown scales, inner ones largest. Individual flower stalks ± 7 mm, densely silky-hairy, pappus 1.2-1.5 cm. **Anthers arrow-shaped at base with 2 slender hair-like tails**. Style swollen at fork. **FRUIT** heads to 7 cm diam, individual seeds 0.6-1.2 cm, 5-ribbed, with scattered bristles & dense silky hairs.

NOTE fairly common in semi-open forests, often with pine. Flowering when completely deciduous.



510



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⁵¹¹*Vernonia volkameriifolia*

ชามะลิเครือไทย



Evergreen shrub or small straggly tree to 5 m. **BARK** dark brown, thin, smooth. **LEAF** 15-50x5-20 cm (smaller near flowers), obovate with pointed or blunt tip & narrow base, **usually with scattered coarse teeth**, rarely untoothed. Mature leaves dull dark green & smooth above, paler with **scattered long hairs** below. Stalks 0.5-3 cm. **FLOWER** heads 1.2-1.8 cm, pale purple, in **branched pyramidal clusters** at end of twigs & upper leaf axils, to 90 cm. Each head with **5 whorls** of blunt bracts at base, ± 5 mm high. Anthers with arrow-shaped base but **no tails**. Style not swollen at fork. **FRUIT** seed 0.3-0.5 cm, irregularly 10-ribbed with 2 whorls of stiff white hairs (pappus), ± 1 cm. **NOTE** common in moist, open places up to 2000 m. 2 varieties in NT- var. *siamica* has larger leaves, 25-50 cm, with curved teeth & denser flower clusters, each head with 7-9 fws. var. *volkameriifolia* has smaller leaves, usually <30 cm & only 4-5 flowers per head.

SIMILAR ⁵¹²*V. parishii* ชามะลิเครือ shrub to 3 m, leaves 15-30x5-8 cm, oblong or oblanceolate, usually untoothed or with obscure teeth, sparsely hairy on main veins only above, $\pm$ densely hairy below. Flower heads 0.8-1.2 cm, red-purple, clusters to 30 cm, axes densely hairy, 6-8 flowers per head, bracts in 5 whorls, 5 mm high. Fairly common, 250-1400 m.

⁵¹³*V. arborea* ตะกวน tree to 15 m, leaves 9-20x3-8 cm, elliptic, untoothed, smooth or slightly hairy below. Flower heads ± 1 cm, white, fragrant, clusters to 40 cm, 5-6 flowers per head, bracts in 4 whorls, 3 mm high. Rare, <800 m.

Gochnatia decora ⁵¹⁰ deciduous tree with flower heads in dense, unbranched clusters.



ERICACEAE heather family

3400 species throughout the world, widespread in temperate regions but usually restricted to mountains in the tropics. 4 genera & 10 species in NT

514 *Vaccinium sprengelii*

หัวแหวน ส้มแปะ



Evergreen shrub or small tree to 6 m with short, twisted trunk. **BARK** dark brown, deeply & densely cracked, inner bark cream. **LEAF** 4.8x2.3 cm, narrowly elliptic with tapering or pointed tip & blunt or pointed base, usually with scattered sharp teeth especially near top. Young shoots finely hairy, mature leaves thinly leathery, completely smooth. 5-7 pairs of widely spaced side veins, joined at margin, finer veins almost invisible above but forming a raised network below. Stalks 0.1-0.3 cm. **FLOWER** $\pm$ 1 cm, white or pink, hanging upside down like tiny lanterns in a row along one side of a central unbranched stalk, 4-6 cm long. Individual stalks 2-3 mm with 2 deciduous pink bracts at base. Calyx 5-toothed, finely hairy or almost smooth, corolla 5-7 mm, globular (urceolate) with 5 short, recurved lobes. 10 stamens, enclosed within corolla, filaments hairy & swollen at base, **anthers with 2 tube-like projections**, $\pm$ as long as filaments. Ovary inferior, surrounded by thick disc. **FRUIT** 0.7-0.8 cm, pink or red, globose with persistent calyx at top, thin-skinned, fleshy, many tiny seeds. **NOTE** very common in semi-open forests, especially along exposed ridges with pine. A very fire-tolerant species, becoming increasingly abundant in degraded areas.

SIMILAR 515 *V. apricum* flowers $\pm$ 6 mm diam, anthers without tube-like projections. Uncommon.



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516 *Cratibiodendron stellatum*

ตาวัวเคย



Small partly deciduous tree to 6 m with gnarled trunk & branches. **BARK** dark brown, deeply cracked, inner bark pale orange. **LEAF** 5-11x3-5 cm, oblong or narrowly elliptic, slightly pointed or blunt at both ends, tips usually slightly notched with a tiny point in the centre (continuation of the midvein), **no teeth**. Young shoots pink-orange, mature leaves thickly leathery, completely smooth, lower surface with scattered minute black glands. 12-20 pairs of straight side veins, forked near margin, with many intermediates & a clear network of finer veins, all raised above. Stalks 0.7-1 cm. **FLOWER** 0.3-0.5 cm, white, slightly fragrant, in branched clusters at end of twigs, to 20 cm, axes slightly hairy. Calyx ± 1 mm, 5-lobed, slightly hairy, corolla bell-shaped with 5 thick triangular lobes, slightly hairy. 10 stamens, shorter than corolla, style ± 2 mm, ovary superior, hairy. **FRUIT** 1.3-1.6 cm, woody, globose or ovoid with persistent calyx at base, clearly 5-angled & splitting into 5 sections, each with 4-7 winged seeds.

NOTE common along exposed ridges, often with pines.

517 *Lyonia ovalifolia*

เมี่ยงแดง



Deciduous tree to 10 m. **LEAF** 7-18x3-11 cm, oval or broadly ovate with **pointed (rarely blunt) tip** & rounded or slightly heart-shaped base, **no teeth**, smooth or slightly hairy on veins below. **FLOWER** 0.8-1.3 cm, white, in unbranched clusters at end of twigs & at axils of reduced leaves, 6-15 cm. Corolla narrowly ovoid or nearly cylindrical with 5 tiny lobes, hairy. 10 stamens $\frac{1}{2}$ as long as petals, anthers with 2 tube-like projections. **FRUIT** 0.4-0.5 cm, dry & smooth, globose or star-shaped with small persistent calyx at base, splitting into 5 sections with minute wingless seeds.

NOTE locally common in pine forests, 1250-1600 m.



Rhododendron

Very large genus with over 800 species concentrated in the Himalayas & China, 6 species in NT. Evergreen shrubs or small trees with thick, leathery leaves, untoothed, often with brown dots (scales) below, no stipules. Flowers large & spectacular, in head-like clusters at or near end of twigs, the base of each cluster surrounded by several bracts. 5-7 petals fused into a broadly funnel or bell-shaped corolla with rounded lobes. 5-14 free stamens, often longer than corolla, 1 slender style. Fruits dry & woody, splitting septicidally into 5-7 sections with many seeds. A distinctive feature of mountain tops, rarely found below 1200 m.

519 **Rhododendron ludwigianum**

กุหลาบขาว คำขาว



Shrub to 3 m. **BARK** red-brown, slightly cracked. **LEAF** 6-11x2-4.5 cm, narrowly elliptic or obovate, pointed both ends. Mature leaves dark green & smooth above, **covered with tiny orange-brown dots (scales) below**. **FLOWER** 4-6.5 cm, white or pink, often with a yellow, orange or green blotch inside, pink or dark purple in bud. Clusters of 2-3 flowers at end of twigs, never more than one cluster per twig. Buds enclosed by large pink bracts with hairy margins. Calyx inconspicuous, corolla broadly funnel-shaped with 5 rounded lobes, tube 3.5 cm. **10 stamens**, $\pm$ as long as corolla tube, hairy near base. **Style with scales & short hairs in lower half only, smooth towards top**, ovary densely scaly.

NOTE exposed ridges at 1600-2180 m, endemic to Doi Chiang Dao & neighboring mountains.

SIMILAR 2 other species also typically have white flowers. *R. veitchianum*⁵²⁰ style with scales but no hairs. *R. moulmainense*⁵²¹ leaves, style & ovary without hairs or scales; flowers not truly terminal.

1. flowers axillary or pseudoterminal (near end of twigs but with leaf bud in front), often > 1 flower cluster per branch *R. moulmainense* 521
1. flowers truly terminal, one cluster per branch
2. leaves & twigs not scaly
3. flowers from terminal bud but young leaves from axillary buds, corolla usually dark red. Doi Intanon & Om Koi *R. arborea* var. *delavayi* 522
3. both flowers & leaves from same terminal bud
4. corolla white/pale pink, 5 stamens. Doi Langka ⁵¹⁸*R. microphyton*
4. corolla red/purple, 7-10 stamens. Loei province *R. simsii* 524
2. leaves & twigs scaly
5. style scaly in upper half only *R. ludwigianum* 519
5. style scaly throughout
6. twigs & leaves with $\pm$ persistent bristles. Loei province *R. lyi* 525
6. usually not bristly, rarely with scattered, deciduous bristles
7. leaves brownish below with very dense scales (visible X1) flowers mostly dark red *R. surasianum* 523
7. leaves greenish below with scattered scales (not visible X1) flowers mostly white or pinkish *R. veitchianum* 520



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520 *Rhododendron veitchianum*

กุ่ม



Shrub to 3 m, **often growing on other trees** (epiphytic). **LEAF** 5-10x2-4 cm, narrowly obovate or oblanceolate, dark green & smooth above, pale greenish with **scattered small scales below**, (not visible X1). **FLOWER** 6-7 cm, white, pink or pale yellow, in clusters of 3-8 flowers at end of twigs, never more than one cluster per twig, individual stalks 1-1.2 cm. Calyx 6-8 mm, with short unequal teeth, hairy along margins. Corolla broadly funnel-shaped with wavy lobes, scaly both sides. **10-14 stamens**, unequal, as long as corolla, hairy at base, **style scaly throughout but without hairs**, longer than stamens, deeply lobed stigma. **FRUIT** $\pm 3 \times 1.3$ cm, cylindrical, wrinkled & scaly.

NOTE locally common in hill evergreen forests, 1350-2400 m.

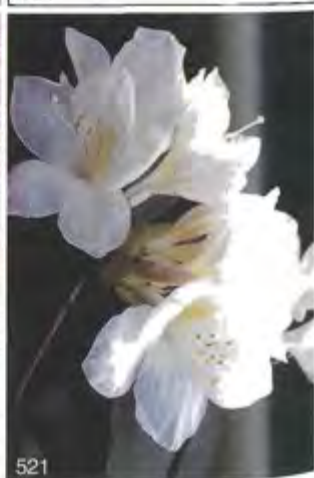
521 *R. moulmainense*

คำขาว



Shrub or small tree to 6(10) m, not epiphytic. **BARK** red-brown, quite rough. **LEAF** 5-12.5 cm, oblong to lanceolate with slightly pointed tip. Mature leaves **completely smooth or with scattered hairs only along the edge, not scaly**. Stalks ± 0.6 cm. **FLOWER** 3.5-5 cm, white, in simple clusters (umbels) at upper leaf axils or grouped near end of twigs & appearing terminal but always with a leaf bud in front, **often with several clusters of 3-5 flowers grouped together**, with very small bracts at base. Individual stalks up to 2.5 cm, smooth. Calyx small with 5 minute teeth, corolla tube ± 1.2 cm broadly funnel-shaped with 3-4 blunt lobes longer than tube. **10 stamens**, slightly hairy at base, shorter than corolla. **Ovary & style completely smooth, no scales**. **FRUIT** $\pm 3.5 \times 0.5$ cm, smooth.

NOTE locally common in less-disturbed hill forests, 900-2030 m.



522 *Rhododendron arborea*var. *delavayi*

กุหลาบพันปี ค่านดง



Small evergreen tree to 10 m with stout, gnarled trunk & twisted branches. **BARK** dark red-brown, flaking. **LEAF** 8-15x2-3 cm, oblong or narrowly obovate, slightly pointed or blunt at both ends, no teeth. Mature leaves leathery, dark green & shiny above, paler with **silvery hairs** but **no scales** below. Stalks to 1.2 cm. Leaf buds covered with overlapping scales & scattered hairs, **always in leaf axils & never with flowers in the same bud**. **FLOWER** 3-5 cm, **dark red**, very showy, in compact spherical clusters at end of twigs, one cluster per twig, with large deciduous hairy bracts at base. Calyx very short & inconspicuous, 5-toothed, corolla broadly funnel-shaped with blunt lobes. 10 slender stamens, shorter than corolla. Ovary brown-hairy. **FRUIT** 1.5-3 cm, oblong or slightly curved like tiny bananas, indistinctly ridged, woody, slightly hairy when young, splitting into 5 sections containing many dark brown seeds with a tuft of hairs at both ends.

NOTE restricted to the upper slopes of Doi Intanon & Doi Mon Chong. *R. arborea* is found throughout the Himalayas but var. *delavayi* is only known from Yunnan, N. Vietnam & N. Thailand. A sight not to be missed at the peak of its flowering in late February.

SIMILAR 523 *R. surasianum* is the only other species in NT with dark red flowers but the mature leaves are brownish with very dense scales below (visible X1). Not seen by authors. 2 well known species from Loei province also have dark red flowers.

524 *R. simsii* กุหลาบแดง leaves as *R. arborea* but both flowers & young leaves develop from the same terminal bud.

525 *R. lyi* mature leaves brownish with fairly dense scales below, young twigs & calyx with dense, more or less persistent bristles.



MYRSINACEAE

Predominantly old world family with 1225 species worldwide, 5 genera & 26 species of trees & woody shrubs in NT. **BOTANY** Evergreen shrubs & small trees. Leaves simple, usually alternate, spirally arranged, often gland-dotted, no stipules. Flowers regular, bisexual or unisexual, 4-5(6) sepals usually fused at base, persistent in fruits, 4-5(6) petals fused at base, stamens fused to corolla tube opposite the lobes, Ovary usually superior (half-inferior in *Maesa*). Fruits globose, fleshy, with or without a stone, usually 1-seeded (except *Maesa*).

ECOLOGY mostly understory plants of evergreen forests.

531 *Ardisia polycephala*

พืคลิงกาสา



Shrub or small tree to 8 m. **BARK** dark brown, smooth, thin. **LEAF** 12-20x4-8.5 cm, narrowly oblong to slightly oblanceolate, with blunt or slightly pointed tip & narrowly pointed base, margin without teeth or glands. 12-20 pairs of side veins with many shorter intermediate ones, arching quite far from margin. Mature leaves thick & leathery, **completely smooth with no hairs or scales**, dark green above, paler with **scattered tiny black dots below**. Stalks 1-2 cm, twigs stout, slightly squarish with large leaf scars.

FLOWER pink, bisexual, in dense unbranched clusters at leaf axils or behind leaves. Individual stalks 1-1.5 cm, main stalks 3-10 cm, buds conical, 0.8-1 cm. Calyx ± 5 mm, divided almost to base with overlapping lobes, curved backwards at tips, gland-dotted & minutely hairy outside. Corolla with short tube & pointed or blunt lobes, twisted & overlapping to right in bud, gland-dotted outside. Stamens with short filaments & narrowly pointed anthers, ± 5 mm, black dotted on one side, style slender with tiny stigma. **FRUIT** 0.7-0.9 cm, red or black with dense black dots, thinly fleshy with a single 1-seeded stone.

NOTE scattered in both deciduous & evergreen forests up to 900 m.

1. leaf margin with rounded teeth & glands
 2. leaves hairy below, veins end at glands
 2. leaves $\pm$ with scattered scales but never hairy, veins looped
 3. leaves clustered near end of twigs, fws/fts with scattered dark dots
lvs with faint tertiary veins, leaf stalks 0.4-1 cm
 3. leaves not clustered, fws/fts very densely dotted
lvs usually with obvious tertiary veins, stalks 1-1.5 cm, twigs with black lines
 1. leaf margin usually untoothed, never with glands
 4. plants not scaly, calyx lobes recurved, overlapping
 5. fws in umbels, 2-6 per cluster, main stalks < 1 mm thick
 5. fws in corymbs, > 5 per cluster, main stalks 1.5-2.5 mm thick
 4. plants usually scaly, calyx lobes spreading, not overlapping
 6. flowers in terminal panicles
 6. flowers in axillary or pseudoterminal* corymbs/umbels
 7. lvs widest above middle, blunt tips, fw stalks smooth
 7. lvs widest in middle, tapering tips, fw stalks mostly scaly
 8. flowers in unbranched clusters
 8. flowers in branched clusters
- *appearing terminal, but always with a reduced leaf bud at end of cluster

526 *A. corymbifera*

527 *A. crenata*

A. vivens 534

528 *A. attenuata*

A. polycephala 531

A. colorata 532

529 *A. kerrii*

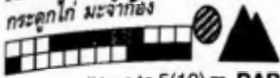
530 *A. quinquegona*

A. nervosa 533



532 *Ardisia colorata*

กระดุกไก่ มะจำก้อง



Shrub or small tree to 5(10) m. **BARK** brown, quite smooth, very thin. **LEAF** 13-28x3-8 cm, oblong-lanceolate with pointed or slightly tapering tip & blunt or slightly pointed base, **no teeth or glands on margin**. Mature leaves without hairs but with scattered tiny rusty-brown scales & dark gland dots below. 15-20 pairs of side veins with many shorter intermediate ones. Stalks 0.6-1.5 cm, young twigs pale cream, densely scaly. **FLOWER** 0.25-0.3 cm, pale pink, in **branched pyramidal clusters** (panicles) at **end of twigs**, 10-18 cm. Individual stalks 0.2-0.4 cm, $\pm$ scaly. Calyx $\pm$ 0.1 cm, split 2/3 into **spreading lobes**, **not overlapping**, black-dotted. Corolla deeply split with blunt lobes, no gland dots. Anthers $\pm$ 1.5 mm. Style $\pm$ 4 mm, slender & projecting before petals open. **FRUIT** 0.4-0.5 cm, globose. **NOTE** locally common in moist, shady areas <1000 m.



532



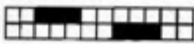
532



532

533 *Ardisia nervosa*

จีมานดก



Small tree to 8 m. **BARK** dark brown, smooth or shallowly cracked. **LEAF** 7-13x2.5-4.5 cm, narrowly elliptic, tapering at both ends, margin without teeth or glands, $\pm$ wavy. Mature leaves leathery, **densely covered with minute rusty scales & translucent dots below**. $\pm$ 30 pairs of closely parallel side veins, looped at margin, tertiary veins raised on both sides. Stalks 0.5-0.8 cm, twigs grey, often squarish. **FLOWER** 0.3-0.4 cm, white, in **branched clusters** (corymbose panicles), 1.5-4x2-7 cm, **appearing terminal but always with a reduced leaf bud at the top**. Calyx $\pm$ 0.1 cm, deeply split into **spreading lobes**, **not overlapping**. Corolla lobes pointed, with scattered brown glands. Anthers $\pm$ 2 mm, shortly pointed, style 3.5-4 mm, projecting before bud opens. **FRUIT** $\pm$ 0.5 cm, globose, yellow-green ripening pale pink, slightly flattened. **NOTE** shady or semi-open areas, often on limestone.



533



533

534 *Ardisia virens*

ฉะลิม



Shrub to 4 m. **LEAF** 9-20x3-8.5 cm, well-spaced, elliptic-oblong or lanceolate, pointed at both ends, with **rounded glandular teeth**. Mature leaves smooth or slightly scaly below, usually with many black dots. 15-20 pairs of side veins, looped at margin, tertiary veins distinct on both sides. Stalks 0.5-1.5 cm, twigs with black lines. **FLOWER** 0.6-0.8 cm, white in branched or unbranched clusters (compound corymbs or umbels) at end of twigs. Main stalks very short, individual stalks 1-2 cm. Calyx & corolla with dense black dots. **FRUIT** 0.7-1 cm, globose, red with black glands. **NOTE** shady areas to 2500m

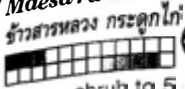
535 *Rapanea yunnanensis*

รั้งกะเที๋



Evergreen shrub or small tree to 7 m, rarely to 17 m. **LEAF** 8-18x3-6 cm, usually clustered, elliptic or lanceolate, narrowed to a blunt tip at top, pointed at base, untoothed or with scattered fine teeth. Mature leaves leathery, completely smooth with **many tiny dark dots** (sunken pit-like glands) below. Side veins rather faint, closely parallel, joined in a submarginal vein. Stalks 0.6-1.2 cm, terminal bud with large finely hairy scales. **FLOWER** 0.25-0.3 cm, pale green or violet, male & female on different trees, in dense simple clusters (fascicles/umbels) on **very short, scaly branches**. Individual stalks 0.5-2 mm, quite thick. Calyx lobes ± 1.5 mm, ovate with blunt or, pointed tips, fused at base with scattered hairs along margin & gland dots near top. Corolla tube ± 0.5 mm, with pointed lobes, $\pm 2 \times 1$ mm, densely hairy on margin & inside, sparsely gland-dotted outside. Anthers ± 1 mm with very short filaments. Stigma ± 3 mm, curved & sausage-shaped, with very short style. **FRUIT** ± 0.5 cm, globose with persistent calyx at base, thinly fleshy with single 1-seeded stone. **NOTE** shady areas to 2200 m.



537 *Maesa ramentacea*

Evergreen shrub to 5 m, rarely a small, straggly tree to 10 m. **BARK** pale brown with dense lenticels, inner bark pink & cream. **LEAF** 8-17x2-6 cm, narrowly ovate or lanceolate with tapering tip & blunt or rounded base, **not toothed or with very scattered tiny teeth**. Mature leaves **completely smooth**, dark green above, paler with **dark gland stripes** below. 5-9 pairs of arched side veins, tertiary veins faint. Stalks 0.6-1.3 cm, twigs smooth. **FLOWER** ± 0.2 cm, white, in **much-branched clusters** (panicles) at leaf axils or just behind end of twigs, **shorter than leaves**, 4-12 cm. Individual stalks 0.1-0.2 cm, smooth or minutely hairy. Calyx ± 0.1 cm, $\frac{1}{2}$ divided into spreading rounded lobes. Corolla bell-shaped with rounded lobes as long as tube. Anthers as long as filaments, style slightly longer than calyx with 2-lobed stigma, ovary half-inferior. **FRUIT** 0.2-0.6 cm, pale green to pale creamy brown, globose, thinly fleshy with many tiny seeds.

NOTE common in moister forests & disturbed areas.

SIMILAR ⁵³⁸ *M. paniculata*

ขยายพันธุ์ leaves toothed, stalks 1-1.8 cm, flowers in pyramidal panicles to 30 cm wide at end of twigs, longer than leaves, corolla tube as long as lobes, smooth. ⁵³⁹ *M. permollis*

กำลังข้างเผือก leaves 12-25x8-18 cm, broadly elliptic or obovate, abruptly tipped, with long hairs on tiny raised bumps, stalks 2-3.5 cm, densely brown-hairy. Flower ± 0.3 cm, in racemes or sparsely-branched panicles at leaf axils, shorter than leaves. Corolla tube much longer than lobes. Fruits densely hairy.

⁵⁴⁰ *M. glomerata* leaves with thin, broad glandular stripes, hairy below when young, stalks 1-2 cm, twigs & stalks densely & persistently hairy. Flower ± 0.2 cm, in crowded panicles at leaf axils, corolla tube much longer than lobes, densely hairy.

1. corolla tube much longer than lobes
2. lower surface of leaves with hairs on raised knobs *M. permollis* ⁵³⁹
2. hairs not on raised knobs *M. glomerata* ⁵⁴⁰
1. corolla tube $\pm$ same length as lobes
3. flowers in many-branched clusters (panicles)
4. leaves toothed, flowers at end of twigs, longer than leaves *M. paniculata* ⁵³⁸
4. leaves entire, flower clusters in leaf axils, shorter than leaves *M. ramentacea* ⁵³⁷
3. flowers in unbranched or sparsely branched clusters
5. leaves oval, stalks 1-4 cm *Mindica* ⁵⁴²
5. leaves narrowly elliptic or oblong, stalks 0.5-1 cm
6. leaves hairy below & on midvein above ⁵³⁶ *M. perlaris*
- shrub to 3m; lvs 7-11 cm, elliptic/lanceolate, pointed both ends, coarsely toothed except near base, twigs hairy; flower clusters 1-5 cm, stalks hairy. Doi Intanon.
6. leaves sparsely hairy below but not above *M. montana* ⁵⁴¹



(photo of fruit on p 242)

MYRSINACEAE

⁵⁴¹**Maesa montana**

หัตถ์คนแคระ



Evergreen shrub 2-3 m, similar to *M. ramentacea* but leaves narrowly elliptic or oblong with **thickened teeth**, smooth or sparsely hairy below, $\pm$ with glandular stripes, 8-12 pairs of side veins, stalks 0.5-1 cm, twigs & flower stalks usually sparsely hairy. **Flowers in unbranched or sparsely branched clusters at leaf axils**, 2-8 cm. Corolla tube as long as lobes, slightly hairy. **SIMILAR** ⁵⁴²*M. indica* leaves broadly elliptic or oval with regular, thickened teeth & glandular stripes, stalks 1-4 cm. Twigs, flower stalks & corolla tube smooth.



SAPOTACEAE

Tropical family, 975 species worldwide, 5 genera & about 10 spp. in NT.

BOTANY evergreen trees usually with white latex. Leaves simple, alternate (except *Sarcosperma*), spirally arranged, usually thick & leathery, smooth or with forked hairs, untoothed, stipules none or tiny & falling early. Flowers inconspicuous, mostly white or greenish, regular, bisexual, often nocturnal, facing downwards in small clusters at leaf axils or behind leaves. 4-8 sepals in 1 or 2 rows, almost free, 4-8 petals fused into a short tube at base. Stamens usually in 2 rows, inner row often sterile, 1-2x as many as petals, filaments often short. Single slender style with tiny stigma, ovary superior. Fruits a fleshy berry with persistent calyx at base, not splitting, with slit-like cavities & 1-5(8) large, hard seeds.

ECOLOGY uncommon, mostly restricted to the understory of less disturbed lowland evergreen forests.

USES good timber but local species are too uncommon to be of widespread use. *Mimusops elengi* from India is widely planted for its delicate flowers & countless medicinal uses.



1. leaves opposite or nearly so

Sarcosperma arboreum ⁵⁴⁸

1. leaves alternate

2. fws with 4 sepals in 2 rows

3. leaves well-spaced, mostly planar; 3^o veins parallel to 2^o veins ^{543a}*Payena*
lvs oblong or elliptic, side veins looped, stalks usually grooved; corolla 8-lobed, ≥ 16 stamens, all fertile; 1 seed with narrow scar as long as seed.

3. leaves spirally clustered near end of twigs, 3^o veins in network

^{543b}*Madhuca*

2. fws with 5-6 sepals leaves spirally clustered near end of twigs

4. flowers with 6 sepals in 2 rows

⁵⁴⁵*Palaquium*

lvs mostly obovate, $\pm$ stipules. Corolla with 6 (5?) lobes, 12 fertile stamens in 2 rows. 1-3 seeds with broad scar $\pm$ as long as seed & 1/3 as wide.

4. flowers with 5 overlapping sepals in 1 row

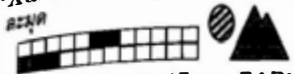
5. corolla with $\pm$ upright lobes, stamens not projecting beyond corolla
lvs elliptic-oblong, no stipules. corolla 5-lobed, 5 fertile & 5 sterile stamens attached to middle of corolla tube, sterile ones shorter, flattened, not fringed. 5 seeds

⁵⁴⁴*Pouteria*

5. corolla with spreading lobes, stamens projecting beyond corolla

Xantolis ⁵⁴⁶



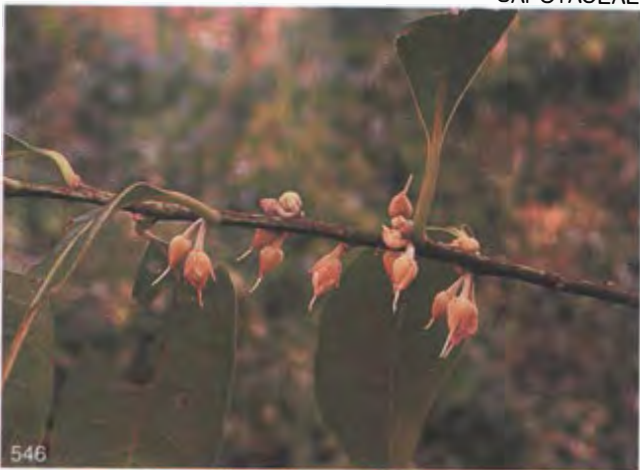
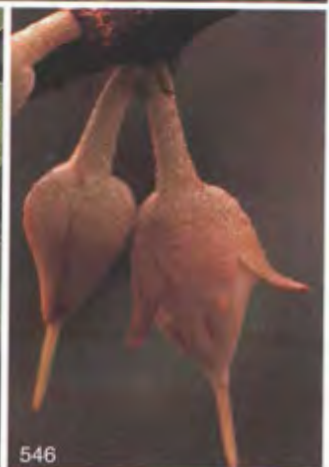
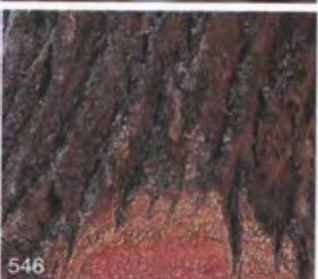
546 *Xantolis dongnaiense*

Evergreen tree to 17 m. **BARK** brown, deeply cracked, sometimes spiny. **LEAF** (4) 10-15x(2) 3-6 cm, **spiny**, alternate, spirally arranged, broadly elliptic to oblong with blunt or slightly pointed tip & tapering base. Young shoots & terminal buds **yellowish to brownish hairy**, mature leaves leathery smooth or nearly so. 8-16 pairs of side veins, arched & joined at margin, **tertiary** veins in a network, sometimes subparallel to side veins. Stalks 0.5-1.3(2) cm. yellow or brown hairy when young, becoming smooth or nearly so. Twing often with lenticels. **FLOWER** $\pm$ 1 cm, fragrant, in simple clusters (fascicles) at leaf axils, stalks 4-8 mm. densely covered with fine **rusty-brown hairs**. **5 overlapping sepals in a single row**, 4-6 mm, triangular or ovate, hairy outside as stalks, silky insides. Corolla 4-8 mm, white or cream with 5 oblong lobes. 5 fertile stamens attached to top of corolla tube opposite lobes, filaments $\pm$ 1 mm, anthers $\pm$ 3 mm, with pointed tip & heart-shaped base. 5 sterile stamens alternating with fertile ones, **deeply fringed**. Style 6-15 mm, ovary densely hairy. **FRUIT** 2-3x1-1.8 cm, yellow or reddish ovoid or ellipsoid with blunt or slightly pointed tip, $\pm$ with persistent style at top, thinly fleshy with hard outer layer. 1-2(5) large glossy dark brown seeds with **large oblong scar** $\frac{1}{2}$ as long as seed & 3-4 mm wide.

NOTE scattered in both deciduous & evergreen forests.

SIMILAR 547a *X. burmanica* young leaves with silvery-silky hairs. mature leaves smooth (inc. stalk). Flowers slightly larger, stalks & sepals with greyish hairs, corolla 6-10mm, style $\pm$ as long as corolla. Evergreen or deciduous forest up to 1000m.

547b *X. cambodiana* shrub or small tree, leaves 2-8 cm, usually blunt-tipped, densely hairy below when young, later $\pm$ smooth. Stalks 2-5 mm, hairy. Flower with white or rusty hairs, corolla 4-6 mm. style $\pm$ as long as corolla. Sterile stamens not fringed, $\pm$ toothed. Fruits with dense yellow hairs when young. Open deciduous forests <500m.



548 *Sarcosperma arboreum*

มะขาม เหมือดหอม



Evergreen tree to 14 m. **BARK** red brown or creamy-brown, smooth or shallowly fissured, corky, inner bark pale cream. **LEAF** 16-26x5-8 cm, rarely to 35x13 cm, **opposite**, oblong or lanceolate with tapering or abrupt tip & pointed base, untoothed. Mature leaves leathery, dark green above, completely smooth with **colorless crater-like glands in vein axils**, ± 1 mm. 6-14 pairs of prominent arching side veins, open at margin, tertiary veins ladder-like, $\pm$ at right angles to midvein, raised both sides. Stalks 1.2-2.5 cm, flat at both ends, with inconspicuous stipules which soon fall, leaving triangular scars ± 1 mm.

FLOWER pale yellow or greenish, mildly fragrant, in slender branched or unbranched clusters at leaf axils, 5-20 cm, stalks finely hairy. Calyx 2.5-3.5 mm with **5 rounded lobes in a single row**, subequal, strongly overlapping, densely hairy outside. Corolla tube ± 2 mm with 5 rounded lobes, 2-2.5 mm, overlapping in bud. 5 fertile stamens **alternating with tiny sterile ones**, attached to corolla tube with short filaments & oblong anthers. Ovary smooth. **FRUIT** ± 2.5 cm, dark purple with pale grey sheen which easily rubs off, ellipsoid with blunt tip & persistent recurved calyx at base, firmly fleshy, 1-2 dark brown seeds.

NOTE fairly common & widespread in less-disturbed evergreen forests. Previously considered a distinct family, *Sarcospermataceae*, with only 12 species worldwide.

SIMILAR 549 *S. kachinense* var. *kachinense* leaves distinctly hairy below when young, later $\pm$ smooth, mostly without gland pits, stalks < 1 cm, usually with "ears" at the top. Reported for neighbouring regions. All other species of *Sapotaceae* have alternate leaves.



EBENACEAE TABLE 11

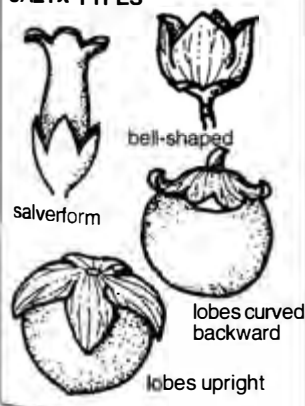
Mainly tropical family with 485 species worldwide, 1 genus with 24 species in NT.

BOTANY evergreen or deciduous trees without latex or colored sap, rarely thorny. Leaves simple, alternate, spiral or planar, not toothed, no stipules. Flowers regular, axillary, male & female on different trees. Males in short clusters (cymes), females solitary or in pairs, usually slightly larger than males. Calyx with 4(3-7) spreading or recurved lobes, often wavy & distinctly veined. Corolla with 3-7 twisted lobes, usually fused into short tube at base. Males with 3?-many free or fused stamens, often also with a sterile pistil. Females with 1-4(8) free or fused styles, usually also with sterile stamens. Fruit usually fleshy, sometimes dry & irregularly splitting, with persistent enlarged calyx at base. 2-16 seeds.

ECOLOGY scattered but never dominant in a wide variety of habitats, including dry open areas & moist evergreen forests as well as lower hill forests.

USES *Diospyros ebenum* from India provides the famous black ebony wood, several local species also provide quality timber. The fruits are mostly inedible & often **poisonous**, but are used for fish traps, dyes etc.

CALYX TYPES



1. twigs with thorns *D. montana* ⁵⁶¹
1. no thorns
2. calyx 3-lobed (also in fruits); corolla 3-lobed ⁵⁵⁰*D. ferrea*
2. calyx & corolla 4- or 5-lobed
- 3. FLOWER KEY**
4. corolla tubular or salverform
5. calyx divided $\frac{1}{2}$ - $\frac{3}{4}$
6. calyx with blackish hairs both sides *D. coactanea* ⁵⁶⁴
6. calyx smooth inside, $\pm$ hairy outside *D. undulata* ⁵⁶²
7. calyx lobes curved backwards ⁵⁵¹*D. variegata*
7. calyx lobes spreading
5. calyx divided to base
8. calyx hairy both sides ⁵⁵²*D. pilosanthera*
8. calyx smooth inside, $\pm$ hairy outside
9. σ fws without stalks; ρ solitary, stalks 2-3 mm *D. dasyphylla* ⁵⁶⁵
9. σ fw stalks 3-5 mm; ρ clustered, stalks 3-5 mm ⁵⁵³*D. dictyoneura*
9. σ fw stalks 5-10 mm; ρ solitary, stalks 10-15 mm *D. martabanica* ⁵⁶³
4. corolla globose, ovoid or bell-shaped
10. corolla divided to at least halfway
11. lvs <12 cm; calyx divided $\frac{1}{2}$, hairy outside *D. mollis* ⁵⁵⁹
11. lvs 10-25 cm; calyx divided to base, smooth ⁵⁵⁴*D. frutescens*
10. corolla divided to $\frac{1}{3}$ or less
12. calyx smooth inside
13. leaves 10-28 cm, smooth when mature *D. ehretioides* ⁵⁵⁸
13. leaves <10 cm, persistently hairy *D. dumetorum* ⁵⁶⁰
12. calyx hairy inside
14. calyx divided $\frac{1}{2}$; mature lvs smooth ⁵⁵⁵*D. malabarica*
14. calyx divided $\frac{3}{4}$; mature lvs smooth or hairy ⁵⁵⁶*D. rhodocalyx*
14. calyx divided to base; mature lvs hairy below *D. glandulosa* ⁵⁵⁷
- 3. FRUIT KEY**
15. fruit stalks 0.8-2 cm
16. calyx divided to base
17. calyx lobes upright, hairy both sides, obvious veins ⁵⁵³*D. dictyoneura*
17. calyx lobes bent backward, smooth inside, no veins *D. martabanica* ⁵⁶³
16. calyx divided $\frac{1}{2}$ - $\frac{3}{4}$
18. fts 1.5-2.5 cm; calyx lobes oblong, smooth inside *D. ehretioides* ⁵⁵⁸
18. fts 2.5-4 cm; calyx lobes triangular, hairy both sides ⁵⁵⁵*D. malabarica*
15. fruit stalks <0.6 cm
19. calyx lobes upright or spreading (at least at tips)
20. calyx divided $\frac{1}{2}$, smooth both sides ⁵⁵⁴*D. frutescens*
20. calyx divided at least $\frac{3}{4}$, hairy both sides
21. fruits globose; fruiting calyx veined
22. fruits <2.5 cm, dry & brittle ⁵⁵⁶*D. rhodocalyx*
22. fruits >2.5 cm, fleshy *D. glandulosa* ⁵⁵⁷
21. fruits ovoid, dry; fruiting calyx not veined ⁵⁵²*D. pilosanthera*
19. calyx lobes curved backwards (including tips)
23. calyx divided $\frac{1}{2}$ - $\frac{1}{2}$
24. calyx divided to $\frac{1}{3}$, faintly veined *D. undulata* ⁵⁶²
24. calyx divided to $\frac{1}{2}$, distinctly veined ⁵⁵¹*D. variegata*
23. calyx divided to base
25. calyx hairy inside *D. dumetorum* ⁵⁶⁰
25. calyx smooth inside
26. fruits 4-7 cm, fleshy *D. dasyphylla* ⁵⁶⁵
26. fruits <2.5 cm, dry & brittle *D. mollis* ⁵⁵⁹

EBENACEAE

557 *Diospyros glandulosa*

กล้วยถั่ว



Evergreen or partly deciduous tree to 15 m. **BARK** dark grey-brown or red-brown, shallowly to quite deeply cracked. **LEAF** 8-18x3-6.5 cm, narrowly elliptic-oblong with broadly tapering tip & slightly pointed or blunt base. Young leaves densely coated with golden-brown hairs, mature leaves smooth or with scattered dark brown hairs on midvein above, $\pm$ densely pale brown hairy below. 4-7 pairs of curved side veins, sunken above, tertiary veins ladder-like. **Stalks** 1-1.5 cm, densely hairy. **MALE FLOWER** stalks $\pm$ 2 mm, hairy. Calyx 4-6 mm, bell-shaped, divided nearly to base with 4(5) lobes, long-hairy on both sides. Corolla 6-8 mm, globose, divided $\frac{1}{4}$ - $\frac{1}{2}$, smooth on both sides except along midline. 14-30 stamens. **FEMALE FLOWER** larger than males, 12 smooth sterile stamens, 1 hairy style with 4 stigmas, ovary hairy. **FRUIT** 2.5-4 cm, yellow-orange, succulent, globose or oval, slightly sunken at both ends, densely coated with silky hairs which easily rub off. Stalks 0.3-0.5 cm. Calyx lobes 1.6-1.8 cm., spreading & wavy, conspicuously veined. 3-7 dark brown seeds in a star-shaped pattern. **NOTE** common in hill forests.

558 *Diospyros ehretioides*

ดิบเตาดิน มะพลับดง

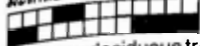


Deciduous tree to 15 m. **LEAF** 10-28x7-23 cm, oval, elliptic or ovate with blunt or rounded tip & rounded or heart-shaped base. Young leaves finely hairy, mature leaves leathery, **smooth or nearly so**. 6-12 pairs of forked side veins, sunken above, tertiary veins faint. Stalks 1-2 cm. **MALE FLOWER** stalks $\pm$ 3 mm, finely hairy. Calyx 2-3 mm, corolla 3-5 mm, both divided $\frac{1}{3}$, sparsely hairy outside, smooth inside. 20-30 smooth stamens. **FEMALE** stalks $\pm$ 1 cm, calyx divided $\pm$ to base, style & ovary woolly. **FRUIT** 1.5-2.5 cm, yellow to red-brown, ovoid with blunt tip, dry, hairy when young, later smooth. Calyx divided $>\frac{1}{2}$ into oblong lobes, bent backwards but not wavy, faintly veined, hairy outside, smooth inside. Stalks to 1.2 cm. **NOTE** fairly common, semi-open areas.



559 *Diospyros mollis*

มะเกลือ



Evergreen or deciduous tree to 30 m.

BARK grey to blackish. **LEAF** 4-11x1.5-4 cm, narrowly elliptic or lanceolate with pointed tip & blunt or rounded base, sometimes heart-shaped or oblique. Young leaves silvery hairy, mature leaves thick & rather brittle, smooth or finely hairy esp. on midvein below, drying blackish. 10-15 pairs of side veins, open at margin, obvious on both sides. Stalks 0.5-1 cm, hairy. **MALE FLOWER** stalks $\pm$ 1 mm, hairy. Calyx 1-3 mm, divided $\frac{1}{2}$ into 4 recurved lobes, hairy outside, smooth inside. Corolla 6-8 mm, globose, divided $\frac{1}{2}$, smooth on both sides. Stamens 14-24, smooth. **FEMALE** larger, stalks 1-3 mm, 8-10 sterile stamens, 4 hairy styles, ovary hairy. **FRUIT** 1.4-2.2 cm, oval or globose, dark olive green ripening black, smooth & shiny with brittle skin, **not fleshy**. Calyx lobes $\pm$ 5 mm, bent backward but not wavy, faintly veined. Stalks 2-5 mm.

NOTE common in semi-open evergreen & deciduous forests.

SIMILAR 2 other *Diospyros* also with small leaves but 3-7 pairs of steep side veins & fruiting calyx divided to base in narrow pointed lobes.

⁵⁶⁰*D. dumetorum* มะเกลือน้อย leaves 155 cm, $\pm$ densely hairy below, drying grey-green. Male flowers with corolla 3-4 mm, divided $\frac{1}{3}$, hairy along midline outside, 14-18 stamens with silky filaments. Females with 1 silky style & 7-9 sterile stamens. Fruits 1.1-1.2 cm, ovoid with short nipple at top, slightly grooved silky when young. Calyx lobes, $\pm$ 5 mm. Uncommon, limestone ridges 1000-1200 m.

⁵⁶¹*D. montana* มะเกลือป่า twigs often thorny, leaves 1.5-12 cm, $\pm$ slightly hairy, drying yellowish. Male flowers with corolla 8-10 mm, divided $\frac{1}{2}$ - $\frac{2}{3}$, smooth both sides. 14-20 stamens with smooth filaments. Females with 4 smooth styles & 4-12 sterile stamens. Fruit 1-3 cm, globose with nipple at top, hairy when young. Calyx lobes straight or bent, wavy. Common, open disturbed areas.



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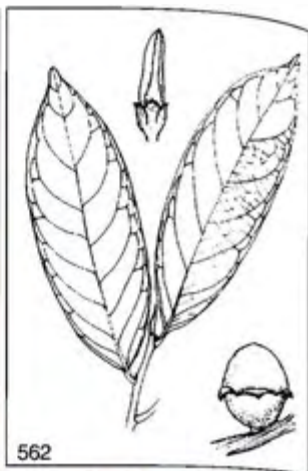
EBENACEAE

562 *Diospyros undulata*var. *cratericalyx*

พลับเชาะ ดกช้าง



Evergreen tree to 20 m. **LEAF** 12-25x3-9 cm, usually elliptic-oblong or lanceolate with abrupt or slightly tapering tip & rounded or slightly pointed base. Young shoots with short, scattered pale brown hairs, mature leaves rather thick, **smooth on both sides**. 9-15 pairs of arched side veins. Stalks 0.6-1 cm, smooth. **MALE FLOWER** in dense clusters, often behind leaves, stalks 5-7 mm. Calyx 3-5 mm, bell-shaped, divided $\frac{1}{2}$ into 4(5) lobes, hairy both sides. Corolla 0.8-1.3 cm, tubular, divided $\frac{1}{2}$, silky outside, smooth inside. 12-16 silky stamens. **FEMALE** no stalks, calyx divided $\frac{1}{3}$, woolly-hairy on both sides, later smooth outside. Corolla as males but larger. 4-8 smooth sterile stamens, 1 smooth style with hairy ovary. **FRUIT** 1.5-2.6 cm, no stalks, oval or subglobose, rounded at both ends, dry, woolly-hairy when young, later smooth. Calyx lobes curved backwards, $\pm$ wavy, no veins, hairy inside. **NOTE** fairly common, semi-open areas.

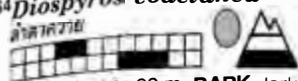
563 *Diospyros martabanica*

ไผ่เต่า



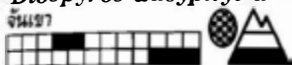
Evergreen tree to 13 m. **LEAF** 7-18x2-6 cm, oblong with pointed tip & blunt or rounded base. Young shoots with long golden hairs, mature leaves smooth above, silky-hairy below. 12-21 pairs of arched side veins, sunken above, with conspicuous ladder-like tertiary veins. Stalks 0.2-0.5 cm, roughly hairy. **MALE FLOWER** stalks 0.5-1 cm, hairy. Calyx 7-8 mm, funnel-shaped, divided to base into narrow pointed lobes, silky outside smooth inside. Corolla $\pm$ 2 cm, tubular with spreading lobes, divided $\frac{1}{2}$ to $\frac{3}{4}$, silky outside, smooth inside. 12-16 smooth stamens, unequal. **FEMALE** stalks 1-1.5 cm, 1 densely hairy style. **FRUIT** 1.5-2.5 cm, oval or globose with sunken base & rounded tip, silky-hairy, not fleshy. Stalks 0.7-2.3 cm. Calyx lobes narrow & pointed, free nearly to base, bent backwards but not wavy, faintly veined, silky outside, smooth inside. **NOTE** shady areas in evergreen forests.



564 *Diospyros coactanea*

Deciduous tree to 20 m. **BARK** dark grey, deeply fissured, inner bark pinkish-orange. **LEAF** to 20x7 cm, pinkish-orange. Mature leaves hairy below. ± 20 pairs of $\pm$ parallel side veins. Stalks ± 1 cm. **MALE FLOWER** stalks 2-3 cm, smooth. Calyx bell-shaped, divided $\frac{1}{2}$ into 4(5) lobes, blackish hairs on both sides. Corolla tubular, divided $\frac{1}{5}$, hairy outside, smooth inside. 10-14 stamens, smooth. **FRUIT** 2-3 cm, greenish-yellow, globose or oval, woody, skin > 2 mm thick, smooth or slightly hairy near base.

NOTE uncommon, semi-open areas.

565 *Diospyros dasyphylla*

Evergreen tree to 20 m with open, spreading crown. **BARK** medium brown, shallowly fissured. **LEAF** 7-20x3.5-8 cm, oval or oblong with blunt or pointed tip & rounded or heart-shaped base, often asymmetric. Young shoots densely hairy, mature leaves $\pm$ smooth above, hairy below. 10-14 pairs of arched side veins, sunken above. Stalks 0.3-0.5 cm, densely hairy. **MALE FLOWER** no stalks. Calyx 2-3 mm, broadly bell-shaped, **divided $\pm$ to base** into 4 spreading lobes, hairy outside, smooth inside. Corolla 6-7 mm, tubular, divided $\frac{1}{2}$, hairy outside, smooth inside. 12-16 stamens with hairy filaments. **FEMALE** stalks 2-3 mm, hairy. **FRUIT** 4-7 cm, **large & succulent**, ripening bright orange, globose or oval, rounded or slightly sunken at both ends, smooth. Calyx lobes free, spreading or curved backward but not wavy, finely hairy outside, smooth inside, no veins. Stalks ± 0.5 cm.

NOTE uncommon, shady areas in evergreen gallery forests.



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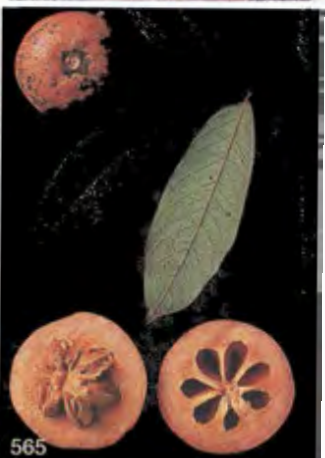
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SYMPLOCACEAE

Tropical family with 250 species worldwide, 1 genus & 9 species in NT.

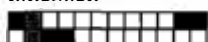
BOTANY evergreen trees without latex or colored sap. Leaves simple, alternate, spirally arranged, often toothed, no stipules. Flowers white or yellowish, regular, bisexual, in spike-like clusters. Calyx with 5 lobes fused at base, corolla with short tube & 5 overlapping lobes. Many stamens attached to base of corolla between lobes, single style, ovary inferior. Fruit a drupe with persistent calyx at top.

ECOLOGY scattered in hill evergreen forests, rarely <1000 m.

1. flowers 2.5-5 cm, petals fused >1/2; fruits >2 cm *S.henschelli* 573
1. flowers <2 cm, petals fused only at base, fruits <2 cm
2. midvein raised above, calyx usually smooth *566S. lucida*
2. midvein sunken above
3. calyx hairy outside
4. persistent bracts hiding ovary; individual fw stalks <0.5 mm
ovary smooth *S.cochinchinensis* ssp. *cochinchinensis* 574
4. deciduous bracts, not hiding ovary; individual fw stalks >0.5 mm
5. ovary smooth; leaves 11-24 cm, smooth *567S.longifolia*
5. ovary ± hairy; leaves 3-10 cm, smooth or hairy *568S.sumunita*
5. ovary hairy; leaves 7.5-20 cm, hairy below *S.macrophylla* 572
3. calyx smooth outside
6. individual fw stalks <0.5 mm *S.cochinchinensis* ssp. *laurina* 574
6. individual fw stalks >0.5 mm
7. terminal buds large, outer bracts smooth, inner bracts hairy *569S. dryophylla*
7. terminal buds & bracts smooth (both inner & outer) *570S. hookeri*
7. terminal buds & bracts hairy (both inner & outer)
8. ±100 stamens, disc hairy *S. racemosa* 571
8. 25-40 stamens, disc smooth *568S. sumunita*

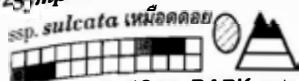
571 *Symplocos racemosa*

เหมือดพอม



Shrub or small tree to 8 m. **LEAF** 6-15x1.5-5 cm, obovate, blunt or pointed at both ends, obscurely toothed. Young shoots & buds finely brown-hairy, mature leaves **smooth or nearly so**. 5-9 pairs of arched side veins, ± joined into submarginal vein, coarse network of smaller veins. Stalks 0.7-1.5 cm, twigs usually smooth. **FLOWER** in slender ± branched clusters at leaf axils, 5-10(17) cm, **individual stalks 1-3(6) mm**, axes hairy with deciduous bracts 34 mm. Calyx 1-3 mm, **smooth or rarely minutely hairy**, corolla 5-6 mm, ±100 stamens, disc sparsely hairy, style smooth or hairy near base, ovary smooth. **FRUIT** 0.8-1.1 cm, ellipsoid, fleshy, 2-3 celled with smooth stone containing 1 straight seed. **NOTE** common in drier forests <1000 m.



572 *Symplocos macrophylla*

Shrub or tree to 18 m. **BARK** pale brown or red-brown, thin, smooth or slightly fissured. **LEAF** 8-20x3-6.5 cm, narrowly elliptic-ovate or lanceolate with tapering ($\pm$ curved) tip & pointed or blunt base, margin with fine, rather sharp teeth & glands. **Young shoots & twigs densely covered with long dark hairs**, mature leaves dark green above, usually brown-hairy at least on veins below. 6-17 pairs of steeply curved side veins, looped at margin. Stalks 0.6-1.3 cm, stout. **FLOWER** in simple or unbranched clusters (fascicles / racemes), to 3 cm. Individual stalks to 2 mm, axes densely hairy, buds conical, enclosed by overlapping deciduous bracts 1.5-5 mm. Calyx 1-2 mm, deeply divided, silky-hairy. Corolla 2.5-6 mm. 30-50 stamens. Disc densely hairy with 5 faint ridges, style smooth or with scattered hairs at base. **FRUIT** 0.6-0.9 cm, ellipsoid or cylindrical with persistent calyx at top, thinly fleshy with single stone containing 1-2 straight dark brown seeds. **NOTE** widespread & fairly common along edge of hill forests.

573 *Symplocos henschelii*ssp. *magnifica*

Evergreen tree to 30 m. **BARK** grey to brown. **LEAF** 7-17x3-7.5 cm, elliptic, narrowed at both ends. Terminal leaf buds hairy, mature leaves smooth above, smooth or sparsely hairy on veins below. 5-11 pairs of arched side veins, midvein sunken above. Stalks 0.5-1.7 cm. **FLOWER** in narrow unbranched clusters to 10 cm, individual stalks 3-6 mm, finely hairy. Calyx 0.6-1 cm, cup-shaped with short teeth, $\pm$ finely hairy. **Corolla** 2-3 cm, fused $\frac{1}{2}$ - $\frac{3}{4}$ into narrow tube with spreading or recurved lobes, slightly hairy near top. 20-110 stamens, fused into a tube slightly shorter than corolla & fused to it except near top. Style slightly longer than stamens, >>



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SYMPLOCACEAE

stigma knob-like. **FRUIT** 3-5x2-3 cm, green, narrowly obovoid to spindle-shaped with flattened top, often asymmetric or curved, fleshy, with smooth stone. **NOTE** rare, endemic to Doi Intanon & adjacent mountains, undisturbed forests 1400-1800m.

574 *Symplocos cochinchinensis*
ssp. *cochinchinensis*

เหือดหลวง



Shrub or small tree, rarely to 20 m.

BARK dark grey or brown, smooth with faintly U-shaped ridges. **LEAF**

(9)12-25x3-9 cm, mostly narrowly elliptic & pointed at both ends, **margin with short teeth & glands**. Young shoots densely covered with orange-brown hairs, mature leaves usually hairy at least on veins below, rarely ±smooth. 8-16 pairs of ±parallel side veins, very prominent below, usually open at margin, with a fine network of ladder-like smaller veins, mid vein sunken above. Stalks 0.5-2 cm, younger twigs & terminal buds densely brown-hairy. **FLOWER**

slightly fragrant, in branched spike-like clusters at leaf axils or several together just behind end of twigs, 3-15 cm. Axes densely brown hairy, **individual stalks very short, <0.5 mm, with persistent bracts which completely hide the ovary, >2 mm**. Calyx lobes ±2 mm, **hairy outside**. Corolla 3-5 mm. 30-80 stamens, as long as corolla. Style 3-5 mm, smooth, ovary smooth. **FRUIT** 0.5-1 cm, bluish when fully ripe, globose or flask-shaped with a narrow neck & enlarged beak-like calyx at top, shallowly grooved, thinly fleshy with 1 curved seed.

NOTE fairly common, understory of hill evergreen forests to 2500 m.

SIMILAR ssp. *laurina* mature leaves smooth, faintly toothed, 6-9(13) pairs of side veins, not parallel, often joined into a sub-marginal vein with a coarse network of smaller veins. Calyx smooth, not enlarging in fruit, bracts enclosing only base of ovary.



STYRACACEAE

Small but widespread family, 160 species worldwide, 1 genus & 2 species in NT.

575 *Styrax benzoides*



Small slender evergreen tree to 15 (20) m. **BARK** red-brown, smooth or finely fissured, inner bark with resin. **LEAF** 7-15x3.5-5.5 cm, simple, alternate, spirally arranged, narrowly elliptic to lanceolate with tapering tip & ±pointed base, sometimes slightly asymmetric, not toothed. 6-11 pairs of steep side veins, tertiary veins ladder-like. Young leaves densely hairy, mature leaves dark green & smooth above, **whitish with a mat of soft star-shaped hairs below**, rarely almost smooth. Stalks 0.6-1.5 cm, no stipules. **FLOWER** 0.9-1.5 cm, white, regular, bisexual, in branched or unbranched clusters at end of twigs & leaf axils, up to 20 cm. Individual stalks 2-4 mm, densely hairy. Calyx ±4 mm, bell-shaped with flat rim or 5 shallow teeth, hairy both sides. Corolla tube 2-2.5 mm, with 5 narrow, pointed lobes. 10 ±equal stamens, fused together at base & attached to corolla tube, filaments hairy, anthers bright orange. Single style 7-12 mm, with 3 lobed stigma & hairy ovary. **FRUIT** 1-1.8 cm, pale grey-green, globose, densely covered with short star-shaped hairs, **splitting into 3 unequal parts** with persistent calyx at base, skin hard but thin <2 mm, 1(2) hard dark brown seeds in each part. **NOTE** common in understory & along edges of hill evergreen forest. Easily recognised by the distinctive **star-shaped galls** which are easily mistaken for fruits (see photo).

SIMILAR ⁵⁷⁶*S. rugosus* leaves 4-10x2-6 cm, ovate, deeply & often irregularly toothed, densely hairy below, stalks <0.5 cm. Flowers 1.4-1.8 cm, solitary or paired in leaf axils, calyx deeply split & irregularly toothed. Fruits ±1 cm. Uncommon, open hill forests.

S. benzoin leaf base blunt or rounded, fruits 1.5-2 cm, not splitting, thick-skinned (3-5 mm). Neighbouring countries, evergreen forests <500 m.



OLEACEAE olive family

615 species worldwide, mostly in Asia, 5 genera & 11 species in NT.

BOTANY mostly small evergreen trees without latex or colored sap. Leaves odd-pinnate or simple, **opposite**, no stipules. Flowers small, mostly white or pale yellow, regular, bisexual or unisexual, calyx with 4 short teeth, 4 petals fused into a tube & sometimes joined in pairs, 2 (rarely 4) stamens attached to corolla tube between petals, ovary superior, style often attached on the side, no disc. Fruits winged or drupe-like.

ECOLOGY mostly understorey trees of less-disturbed hill evergreen forests.

578 *Fraxinus floribunda*

578



Briefly deciduous tree to 25 m. **BARK** dark brown, deeply fissured. **LEAF** 22-36 cm, **odd-pinnate** with 2-4 pairs of opposite leaflets, 8-15x3-5.5 cm, narrowly ovate or oblong with tapering tip, **finely toothed**. Young leaves hairy below, mature leaves thin & completely smooth. Side leaflet stalks 0.6-2 cm, end one to 3.5 cm, main stalk 6-20 cm. **Leaf buds black**. **FLOWER** white, fragrant, in large branched clusters at end of twigs, appearing with young leaves, male & female on different trees. Calyx 1-1.5 mm, cup-shaped with 4 small teeth. 4 oblong petals, 3-4 mm, fused at base, slightly narrowed at both ends. Stamens much shorter than petals. Style short with forked stigma. **FRUIT** 2-3.5 cm, densely clustered on slender stalks, **winged at one end**, widest near top with blunt or notched tip & tapering base, seed hidden by persistent calyx. **NOTE** uncommon in less-disturbed hill evergreen forests. **SIMILAR**

579 *Schrebera swietenoides* leaflets not toothed, twigs & leaf stalks thickened at nodes. Flowers 0.8-1 cm, yellow-green turning brownish, fragrant at night. Corolla with narrowly cylindrical tube & 4-7 spreading lobes as long as tube, 5-8 mm. Fruit 3.5-7.5 cm, obovoid or pear-shaped, woody, splitting into 2 sections each with 2-4 winged seeds. Scattered in deciduous forests up to 1200 m.

1. leaves odd-pinnate
2. leaflets toothed
2. leaflets not toothed

1. leaves simple

3. mature leaves finely hairy below

4. leaves toothed

4. leaves not toothed

3. mature leaves completely smooth

5. corolla tube much longer than lobes, leaves $\pm$ toothed

6. calyx 10 mm, with long hairs

6. calyx 7 mm, smooth or with short hairs

5. corolla tube shorter than lobes, leaves always untoothed

7. flowers terminal & in upper axils, stamens longer than corolla

7. flowers all axillary, stamens shorter than corolla

8. leaf stalks 2-3 cm, side veins not sunk above

8. leaf stalks 0.7-1 cm, side veins sunk above

- petals much narrower near top

- petals much narrower near top

Fraxinus floribunda 578

Schrebera swietenoides 579

Olea oblanceolata 585

Olea rosea 584

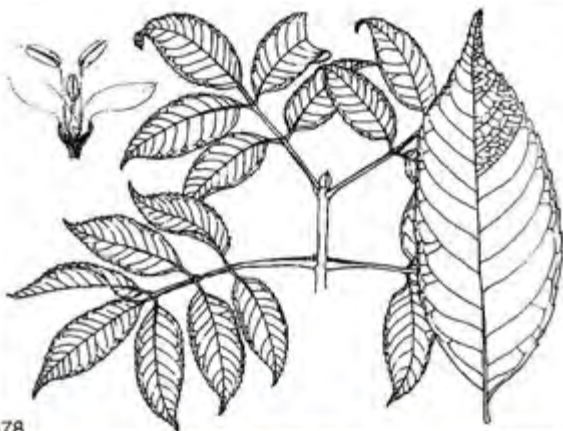
Olea salicifolia 586

Olea dioica 587

Ligustrum confusum 583

Chionanthus ramiflorus 580

Chionanthus caudiflorus 581



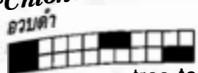
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580 *Chionanthus ramiflorus*

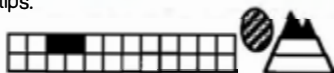
Small evergreen tree to 17m with slender, slightly drooping twigs. **BARK** pale grey to blackish, smooth or finely cracked. **LEAF** 9.25x3.5-7 cm, simple, narrowly elliptic, obovate or oblong-lanceolate, with tapering or almost blunt tip & narrowly pointed base, **not toothed**. Mature leaves thin, dark green above, **completely smooth**. 8-12 pairs of side veins, tertiary veins faint. Stalks 1.2-3 cm. **FLOWER** white or pale yellow, bisexual, in much-branched clusters at leaf axils or along twigs behind leaves, 3-15 cm. **Lower side branches at least 1/2 as long as main branch**, individual stalks 1-2 mm. Calyx 1-1.5 mm, deeply 4-lobed. Corolla ± 3 mm with 4 **oblong lobes twice as long as tube**. Stamens shorter than corolla, Anthers ± 1 mm, sessile, spherical with notched tips. Stigma obscurely 2-lobed with short style. **FRUIT** 1.2-2 cm, green ripening dark red to purple-black, ellipsoid or obovoid with blunt or slightly pointed tip & rounded base with persistent calyx, thinly fleshy with single 1-seeded stone. **NOTE** fairly common in both deciduous & evergreen forests.

SIMILAR 2 other species with side branches of flower clusters $< 1/2$ as long as main branch. 581 *C. caudifolius* leaves 9-20 cm, stalks 0.6-1.2 cm.

Flowers in spike-like clusters at upper leaf axils, petals with narrow pointed tips, anthers ovoid. Fruits 2.5 cm, ovoid or ellipsoid with slightly pointed base. Locally common, moist areas < 1000 m. 582 *C. sutepensis* petals oblong, not pointed, anthers elliptic with round tips.

583 *Ligustrum confusum*

583



Shrub or small tree to 8m. **LEAF** 4-12x2-5 cm, narrowly ovate or lanceolate, untoothed. Mature leaves completely smooth. ± 5 pairs of side veins. Stalks 0.3-1.2 cm, finely hairy, young twigs with many lenticels. **FLOWER** white or cream, bisexual, in branched clusters **at end of twigs & in upper leaf axils**, 3-14 cm, lowest branch $\pm 1/2$ as long as main branch with 2 leafy bracts, falling early. Individual stalks short, smooth, axes finely hairy. Calyx 1.5 mm, truncate, completely smooth. Corolla 4-5 mm, funnel-shaped with spreading lobes, longer than tube, oblong & blunt, tube as long as calyx, smooth. 2 slender stamens, **projecting beyond corolla**. **FRUIT** ± 0.5 cm, purple or black, globose with persistent calyx at base, thinly fleshy with single small stone. **NOTE** uncommon, less disturbed hill evergreen forests. **SIMILAR** *Chionanthus*⁵⁸⁰ flowers never at end of twigs, stamens shorter than corolla.



580



580



580



580



583



583

584 *Olea rosea*

เก็ดสี 74



Shrub or small tree to 12m. **BARK** dark brown, shallowly cracked. **LEAF** 4-16x1.5-5.5 cm, simple, oblong or lanceolate with tapering tip & pointed base, **no teeth**. Mature leaves dark green & smooth above, **finely hairy especially on veins below**. 6-10 pairs of arched side veins, sunken above, tertiary veins faint. Stalks 0.4-1.1 cm, young twigs densely hairy. **FLOWER** 0.2-0.4 cm, white or pale yellow, drying pinkish, unisexual, in branched clusters which are paired at end of twigs or solitary at upper leaf axils. **Stalks & calyx hairy**. Males in densely flowered clusters to 15 cm, calyx lobes triangular, corolla ± 2 mm with rounded lobes. Females in sparser clusters to 7 cm, calyx lobes rounded, corolla ± 3.5 mm with rounded lobes, ± 1 mm. Anthers sessile, circular, slightly notched at both ends. Style thick & short with disc-like stigma. **FRUIT** ellipsoid or globose, slightly flattened with short point (stigma) at the side, thinly fleshy with single thin 1-seeded stone.

NOTE scattered in less disturbed hill evergreen forests.

SIMILAR 585 *O. oblanceolata* leaves widest near top, sharply toothed, finely hairy below. Flower clusters $\pm 9 \times 5$ cm, stalks & calyx with scattered long hairs, corolla ± 3 mm, anthers rounded.

586 *O. salicifolia* คำไก่ leaves with blunt teeth, completely smooth. Flower clusters 3-11x1-3 cm, stalks & calyx with scattered long hairs, corolla ± 1.5 mm, anthers with short point

587 *O. dioica* leaves untoothed or with scattered teeth, completely smooth. Flower clusters ± 3 cm, stalks & calyx smooth or with scattered short hairs, corolla ± 2 mm, anthers deeply notched at both ends. Fruits 1.2-1.8 cm.



APOCYNACEAE

Mainly tropical family with 1700 species worldwide, 10 genera & 19 species in NT.

BOTANY trees or shrubs with **white latex in trunk & in leaves**. Leaves simple, mostly opposite, sometimes spiral or whorled, untoothed. Flowers with 5(4) free sepals, 5(4) petals usually fused into a narrow funnel or tube with spreading lobes, overlapping in bud. Stamens attached to inside of corolla tube, ovary usually superior with 2 separate carpels united into a single style. Fruits mostly dry & splitting lengthways (follicles), sometimes fleshy. Seeds often with tuft of hairs at one or both ends.

ECOLOGY both deciduous & evergreen forests, predominantly below 1000m.

USES *Apocynaceae* are often cultivated for their showy flowers. Some are poisonous & have medicinal value.

1. leaves whorled

2. fruits splitting, seeds with 2 tufts of hairs (fig.A)

Alstonia 594

2. fruits not splitting, with stone, seeds without hairs

588 *Rauvolfia verticillata*

shrub; leaves papery, smooth, 9-18 pairs of curved side veins, twigs often squarish; flowers white or red, in whorls at end of twigs, corolla tube 9-18mm, lobes 2-4mm, overlapping to left, smooth outside; fruits paired or solitary, 8.3-14x4.5-5.5mm

1. leaves opposite

3. plants spiny

589 *Carissa spinarum*

shrub or climber to 5m; leaves circular or elliptic, leathery, smooth or finely hairy, 25 pairs of steep side veins; flowers white, corolla tube 5-21mm, lobes 1.5-15mm, pointed, overlapping to right, stamens not projecting, no disc; fruits 0.3-6cm, fleshy, 4 seeds

3. not spiny

4. FLOWER KEY

5. corolla lobes overlapping to left in bud (fig.B)

6. stamens fused into a cone around style (fig.E), longer than corolla

Wrightia 600

6. stamens not fused into cone, enclosed within corolla tube

7. with disc

588 *Rauvolfia verticillata*

7. without disc

8. leaves with submarginal vein

590 *Hunteria zeylanica*

tree to 20m; lvs 4-17x1.2-6.5cm, lanceolate or elliptic with narrow tip, 14-30 pairs of 2° veins, smooth, stalks with ochrea; fws white, corolla tube 6-9mm, lobes 25mm, smooth outside; fts 1.5-3.5cm orange, berries in pairs, ovoid with stipe, 2-seeds

8. leaves without submarginal vein

Tabernaemontana 591

5. corolla lobes overlapping to right in bud (fig.C)

9. stamens fused into a cone around style (fig.E)

592 *Kibatalia macrophylla*

tree to 15m; lvs 17-35x5-13cm, narrow tip, veins hairy; fws white/pale green, clusters 2.8-4.2cm, main stalks very short, corolla tube 1.1cm, lobes 1.2-1.5cm, stamens > corolla anthers arrow-shaped, disc 5 lobed; fts 7.5-18.5cm, in pairs, no lenticels, many seeds

9. stamens not fused into cone, not projecting

10. without disc

Holarrhena 598

10. with 2-lobed disc

593 *Kopsia arborea*

small tree to 12m; lvs 7-22x1.5-6cm, pointed both ends, 15-18 pairs of side veins smooth, stems ridged between lf stalks; fws white, clusters 6.5-9cm. Sepals 2.5mm; corolla tube 2.8-3.5cm, lobes 1.4-1.9cm, anthers ovate; fts 2.6-3.9cm, ovoid

4. FRUIT KEY

11. fruits fleshy, not splitting

12. fruits without stone (berry)

12. fruits with stone (drupe)

Hunteria zeylanica (see above)

Kopsia arborea (see above)

11. fruits dry, splitting

13. seeds with red coating (aril)

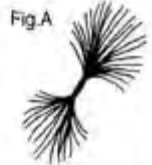
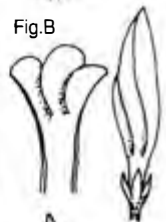
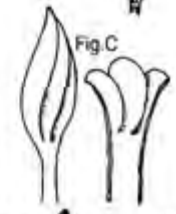
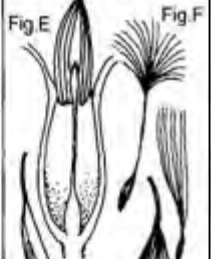
13. seeds with tuft of hairs (fig.F)

Tabernaemontana (see above)

14. hairs pointed towards top of fruit (fig.G)

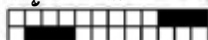
Holarrhena 598

14. hairs pointed towards base of fruit (fig.H)



594 *Alstonia scholaris*var. *scholaris*

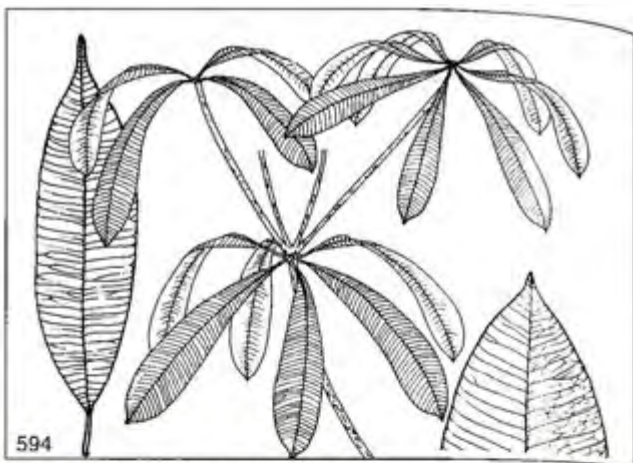
พญาสัตบรรณ ดินเบ็ด



Briefly deciduous tree to 20(40)m with **layered crown** & long, straight trunk, sometimes fluted at base. **BARK** creamy brown, smooth, inner bark with white latex. **LEAF** 5-32x1.5-8 cm, in **regular whorls of 4-8**, appearing **digitate**, narrowly obovate with rounded to shortly pointed tip & narrowed base. Mature leaves **completely smooth**, pale below. **20-40 pairs of straight, parallel side veins**, **tertiary veins prominent above**. Stalks 0.7-1.8 cm, usually with distinct stipule scars between leaf pairs. **FLOWER** white or yellowish-green, in branched clusters (compound umbels) grouped at end of twigs, 3-13 cm, axes finely hairy, individual stalks ± 1 mm. Sepals 1-2 mm, corolla tube 5-10 mm, lobes 1.7-4.5 mm, **overlapping to left in bud**, hairy in upper half on both sides. Stamens attached to upper half of corolla tube, not projecting, with pointed anthers 1-2 mm. Style 3-5 cm, ovary hairy, disc very small or absent. **FRUIT** 21-56x0.2-0.3 cm, in **pairs**, smooth, splitting into ? sections with many hairy seeds, oblong, **blunt or rounded at both ends**, 4-7.5 mm. **NOTE** fairly common in both deciduous & evergreen forests & along forest edges, often cultivated.

SIMILAR 3 other species with leaves in whorls of 3-4, tapering at both ends.

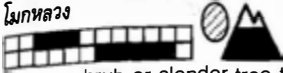
595 *A. rostrata* tree to 30m. Leaves 5-14x1.6-5.5 cm, 35-55 pairs of side veins, stalks 1.1-2.3 cm. Flower stalks 1-2 mm, smooth, corolla tube 4-6 mm, lobes 2.2-2.5 mm, finely hairy both sides. Fruits 12-20x0.7-0.9 cm, solitary. Scattered in evergreen forests up to 1300m. 596 *A. rupestris* shrub to 4m, leaves 2.5-13x0.5-2 cm, narrowly elliptic or lanceolate, 50-80 pairs of side veins with glands in axils, no stalks. Flower stalks 2.5-4 mm, smooth, corolla tube ± 7 mm, lobes 3 mm, smooth outside, ovary smooth with large, 2-lobed disc. Fruits 6-7.5x0.5 cm. Rare, Doi Chiang Dao, 1700-1800m. >>



597 *A. macrophylla* หังฟ้า tree to 30m. Leaves 5.5-30x3-10 cm, oblong-ovate, usually finely hairy below, 14-20 pairs of side veins. Flower stalks 20 pairs of side veins. Flower stalks 2-5 mm, hairy, corolla tube 4-5.5 mm, lobes 3.5-6.5 mm, overlapping to right. Seeds pointed at one end. Native to S. Thailand, cultivated in NT.

598 *Holarrhena pubescens*

ไม้หลวง



Deciduous shrub or slender tree to 15m. **BARK** pale grey or brown, peeling in irregular, rounded pieces, inner bark pale. **LEAF** 10-27x4-12 cm, opposite-planar, elliptic or oblong with **tapering or pointed tip & blunt base**. Mature leaves quite thin, smooth or sparsely hairy on both sides. 10-16 pairs of side veins, no glands. Stalks 0.2-0.6 cm. **FLOWER** 2.5-3.5 cm, white or pale yellow, sometimes tinged pink, fragrant, in drooping clusters which are branched almost from base, 4-11 cm, usually appearing axillary but actually at end of young side shoots. Individual stalks 0.6-1.7 cm, slender, finely hairy. Sepals 2-4 mm, narrow & pointed, hairy outside, with scattered glands inside. Corolla tube 0.8-1.4 (1.8) cm, lobes 1-2 cm, rounded tips, **overlapping to right**. Stamens attached to corolla tube near base, filaments short, hairy at base, anthers narrowly pointed. Style 1.8-2.5 mm, no disc. **FRUIT** 18-43x0.3-0.8 cm, narrowly cylindrical, **hanging in curved pairs**, dry, splitting along one side. Seeds, 13-17 mm, **smooth** but with a **long tuft of hairs 2x as long as seed, pointing towards top of fruit**.

NOTE common in semi-open forests. Many flowers develop into ellipsoid galls, $\pm 5 \times 2$ cm (see photo).

SIMILAR 599 *H. curtisii* หังฟ้า shrub to 3m. Leaves 3-12.5 cm, rather thick & leathery with blunt or rounded tips, often notched, $\pm$ densely hairy below, stalks 0.1-0.3 cm. Flowers at end of twigs, corolla tube 0.9-2.2 cm, lobes slightly longer. Fruits 7-30 cm, upright at least when young, seeds finely hairy. Open areas below 500 m.



600 *Wrightia arborea*

ไม้ก้าน



Deciduous shrub or tree to 20m.
LEAF 7.5-14x 2.5-6.5 cm, opposite-planar, elliptic or oblong with tapering tip & blunt or slightly pointed base. Mature leaves **shortly hairy especially below**, usually with glands in vein axils, stalks 0.2-0.7 cm, hairy. **FLOWER** 1.5-2.3 cm, white, sometimes tinged yellow or green, in branched clusters (cymes) at end of twigs, 3.5-7 cm, individual stalks hairy, 0.5-1.1 cm, main stalks short. Sepals 0.1-0.3 cm, hairy with 5 large glands inside. Corolla tube 0.3-0.7 cm, lobes 0.8-1.5 cm, **overlapping to left**, hairy both sides, with **10 orange 2-3 lobed scales** (corona) much shorter than stamens. Stamens 5-7 mm with short filaments & large **arrow-shaped anthers fused into a cone around style**. Style 6-8 mm, ovary smooth, no disc. **FRUIT** 9-34x0.6-1.8 cm, brown with **cream dots** (lenticels), narrowly cylindrical with shallow grooves at both ends, **usually smooth**, splitting into 2 sections. Seeds ± 1.5 cm, with a **long tuft of hairs at one end, pointing towards base of fruits**.

NOTE common, deciduous forests

SIMILAR 601 *W. religiosa* ไม้ก้าน shrub to 5m, leaves to 8x3 cm, flowers white, sometimes with red-purple tinge, hanging on slender stalks, 0.8-3 cm, sepals with narrow glands. Corolla tube 0.2-0.4 cm, lobes 0.5-1 cm, no scales. Fruits 9-17x0.4 cm, smooth, no lenticels. Cultivated.

602 *W. coccinea* ไม้ก้าน tree to 7m, flowers orange-red, sepals without glands, corolla tube ± 0.2 cm, lobes ± 1 cm, 5 scales opposite petals. Tak province.

603 *W. pubescens* ไม้ tree to 15m. Flowers white or pink, corolla tube 0.3-0.7 cm, lobes 0.8-2.7 cm, 10 large linear scales as long as stamens, the ones opposite sepals slightly shorter & forked. Fruits without lenticels, minutely hairy. Nakhorn Sawan province.

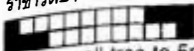


BUDDLEJACEAE

120 species, only 1 species in NT, formerly included in *Loganiaceae*

604 *Buddleja asiatica*

ราชวटीป่า ไคร้บก



Shrub or small tree to 5m. **LEAF** 5-20(30)x2-7 cm, simple, usually opposite but alternate near flowers, narrowly elliptic or lanceolate, tapering at both ends, finely toothed or almost untoothed. Mature leaves thin, dark green, smooth or slightly hairy above, **pale grey due to a dense coating of short, star-shaped hairs below.** Stalks 0.25-1.5 cm, with tiny stipules which fall early. **FLOWER** 0.4-0.6 cm, white or rarely pale violet, in branched or unbranched spike-like clusters at end of twigs & upper leaf axils, to 25 cm. Calyx 1-4 mm, bell-shaped with 4 triangular lobes, hairy outside. Corolla with long, narrow tube & 4-5 spreading lobes, 1-2 mm, hairy outside & in upper half inside. 4 stamens with very short filaments attached to mouth of corolla. **FRUIT** 0.4-0.5 cm, oblong splitting into 2 reflexed sections with many winged seeds, ± 1 mm. **NOTE** very common in waste-ground & along forest edges.



604



604



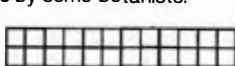
604

LOGANIACEAE

± 400 species worldwide, 2 species in NT, recently (1994) transferred to *Gentianaceae* & *Strychnaceae* by some botanists.

605 *Fagraea ceilanica*

โคงการเขา ผ้ามืด



Evergreen climber, shrub or small tree to 12m, **usually growing on other trees** with aerial roots like a fig (epiphytic). **BARK** greyish, thin, smooth or finely cracked, inner bark white. **LEAF** 5-23x1.8-11.5 cm, simple, opposite, narrowly elliptic or obovate with abruptly pointed tip & tapering base, untoothed. Mature leaves thick & fleshy, completely smooth with **very faint side veins**. Stalks 1-3.5 cm, with thick persistent **stipules fused into a ring** 1-2 mm high. **FLOWER** 4-8 cm, white or pale yellow, fragrant, in short branched clusters (cymes) **at end of twigs**, to 8 cm. Individual stalks 0.8-4.5 cm. Calyx 0.8-2.7 cm, divided $> \frac{1}{2}$ into 5 blunt lobes. Corolla tube funnel shaped with 5 spreading or recurved lobes as long as tube, sometimes fringed. 5 stamens with slender filaments, 2.2-3.5 cm, attached to throat of corolla & not projecting beyond lobes. **FRUIT** 2.5-4.5 cm, dark green ripening dark purple-black, smooth & glossy, often sticky, oval with pointed tip & persistent calyx. Pulp soft & juicy with many seeds, ± 3 mm.

NOTE scattered throughout NT. **SIMILAR** 606 *F. fragrans* ไม้เลื้อย tree to 30m with dark brown, deeply fissured bark. Leaves 7-13cm. Flowers 1.5-2.5 cm, clusters in leaf axils, to 15cm, stamens projecting well beyond corolla. Fruits 0.5-1 cm, globose, orange-red, seeds 1-2 mm, roughly angled. Uncommon.



605

607 *Strychnos nux-blanda*

มะติง

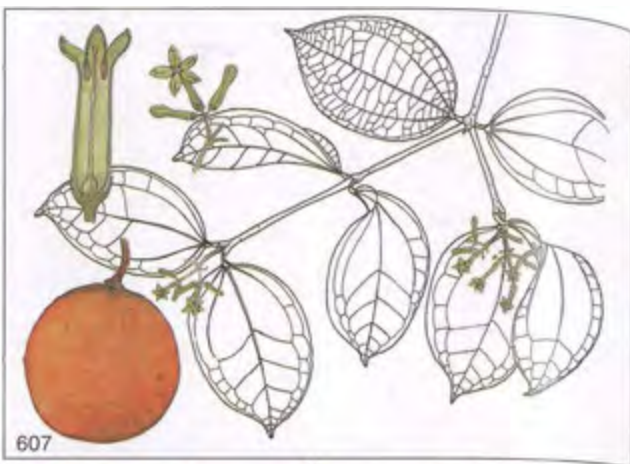


Deciduous shrub or small tree to 15m with straggly, spreading crown. **BARK** pale grey, smooth or with horizontal wrinkles, sometimes spiny. **LEAF** 7-20x6-18 cm, simple, opposite, broadly ovate, oval or almost circular with blunt or abruptly pointed tip & blunt, rounded or slightly heart-shaped base, untoothed. Mature leaves yellow-green, smooth or minutely hairy on veins. **5-7 main veins from base**, 3-5 pairs of arched side veins. Stalks 0.4-1.5 cm, no stipules. **FLOWER** 1-1.4 cm, creamy-white or pale green, bisexual, in forked clusters (corymbs) at end of twigs or on short side branches from upper leaf axils, 3-6 cm. Individual flowers with short stalks, ± 1.5 mm, grouped in threes on a common stalk, 0.8-3 cm, smooth or sparsely hairy with a **linear bract** at base, 1.5-6 mm. Calyx **1.5-2 mm**, divided $\pm$ to base into 5 pointed lobes, **smooth or sparsely hairy outside**. Corolla with long narrow tube & 5 spreading lobes, ± 3 mm, smooth or finely hairy outside. 5 stamens attached to throat of corolla, no filaments. 1 slender style projecting beyond corolla. **FRUIT** 5-8 cm, globose, bright orange with very thick, smooth skin & fleshy pulp. 4-15 ellipsoid seeds, 5-15mm thick.

NOTE common in semi-open forests throughout NT.

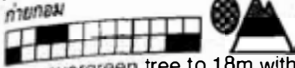
SIMILAR 608 *S.nux-vomica* แสดงใจ tree to 25m with a more slender crown. Leaves 5-18x4-12 cm, 3-5 main veins, completely smooth both sides. Flower stalks densely hairy with minute bracts. Calyx 0.5-1.5 mm, hairy outside. Fruits 2.5-4.5 cm, with only 1-4 disc-like seeds, <7mm thick. Status uncertain in NT, common in C. & E.Thailand. Possibly conspecific with *S.nux-blanda*.

WARNING! The fruit pulp of both species is edible but the seeds of *S.nux-vomica* contain **strychnine**, one of the world's most powerful nerve toxins. Although the seeds of *S.nux-blanda* are not toxic, the 2 species are easily confused so it is unadvisable to eat either!



BORAGINACEAE

Predominantly herbaceous family with 2300 species worldwide, 2 genera & 4 species in NT.

609 *Ehretia acuminata*

Slender evergreen tree to 18m with straight trunk, becoming slightly fluted at base with age. **BARK** grey, finely fissured. **LEAF** 8-20x4-7.5 cm, simple, alternate, narrowly elliptic or ovate with tapering tip & pointed or blunt base, **finely & quite sharply toothed**. Young leaves with scattered short hairs, mature leaves completely smooth, thin but tough. 6-9 pairs of steeply curved side veins. Stalks 1.6-

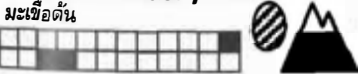
3.6 cm, slender, no stipules. **FLOWER** white, strongly fragrant, bisexual, in dense branched pyramidal clusters (cymose panicles) at end of twigs & upper leaf axils, to 16 cm, individual stalks <2 mm. Calyx ± 2 mm, deeply divided into 5 triangular lobes. Corolla ± 6 mm with **short tube & 5 spreading rounded lobes**. 5 stamens attached to mouth of corolla between lobes & projecting beyond them. 1 long slender style with **forked tip**. **FRUIT** 2-4 cm, orange-red ripening black, globose or oval with persistent calyx at base, fleshy with 2 small stones (pyrenes) each with 1-2 seeds.

NOTE uncommon along edges of evergreen forests & in gaps.

SIMILAR ⁶¹⁰ *E. laevis* ก້อย small tree to 10m. Leaves 3-17x2-9 cm, oval or obovate, $\pm$ blunt at both ends, no teeth. Corolla lobes pointed, longer than tube. Fruits slightly 4-lobed with 4 stones, each with 1 seed.

SOLANACEAE potato family

Predominantly herbaceous family with 2950 species worldwide, concentrated in tropical America, no native trees in NT but 1 widely naturalized species.

611 *Solanum verbascifolium*

Shrub or small tree to 5m, **not thorny**. **LEAF** 8-28x3-16 cm, simple, alternate, spirally arranged, narrowly elliptic or ovate with tapering tip & blunt or rounded base, untoothed. Young shoots **densely covered with white or pale yellow star-shaped hairs**, persistent on stalks & lower surface of mature leaves, scattered above. Stalks 1.2-4 cm, densely hairy, no stipules. **FLOWER** ± 1.5 cm, white, bisexual, in forked clusters (cymes) at end of twigs or upper leaf axils, to 24 cm. Individual stalks 0.7-1 cm, densely hairy. Calyx ± 5 mm, with 5 triangular teeth, densely hairy. Corolla with very short tube & 5(6) spreading lobes, ± 4 mm, densely hairy outside, crumpled in bud. 5(6) stamens with short filaments & large yellow anthers **grouped in a cone around the style**. **FRUIT** 0.8-1 cm, yellow-green, globose berry with densely hairy calyx at base, pulpy with 2(4) sections & many flattened seeds.

NOTE throughout NT in wasteground & fallow fields.



SCROPHULARIACEAE

Predominantly herbaceous family with 5100 species worldwide concentrated in temperate areas, only 1 tree species in NT.

612 *Wightia speciosissima*

23177711



Evergreen shrub or small tree, rarely to 20m, with short stout trunk & straggling branches, **usually growing on other trees or on rocks**. **BARK** pale grey or cream, smooth, no latex. **LEAF** 10-35x7-13 cm, simple, **opposite**, oval or broadly ovate with blunt or slightly pointed tip & rounded base, not toothed. Mature leaves thick & waxy, completely smooth or with scattered star-shaped hairs below. 3-7 pairs of steeply curved side veins, tertiary veins often faint. Stalks 0.7-3.5 cm, stout, no stipules. **FLOWER** 2.5-3.5 cm, **bright magenta pink**, bisexual, in narrow branched clusters (thyrses) at leaf axils, to 20 cm, individual stalks 6-8 mm, densely covered with brown star-shaped hairs. Calyx 6-7 mm, bell-shaped with 3-5 lobes. **Corolla narrowly funnel-shaped with 2 unequal lips**, upper lip straight with 2 rounded lobes ± 8 mm, lower lip curved backwards with 3 rounded lobes, $\pm 6-7$ mm, densely hairy outside. 4 stamens, 2-3 mm, attached near mouth of corolla tube between the lobes, one pair much longer than the other & projecting beyond corolla lobes, filaments hairy near base, anthers smooth. 1 slender style as long as stamens, with inconspicuous stigma & smooth ovary. **FRUIT** 2.5-4x1 cm, oblong or bullet-shaped, smooth, splitting into 2 sections (septate) with many winged seeds, $\pm 7 \times 1.5$ mm.

NOTE uncommon at higher elevations up to 2000m, typically in exposed, rocky areas, but also growing as a large epiphyte in the upper canopy of evergreen forests.

SIMILAR *Ficus*⁷⁶⁴ also often grow on other trees but usually have alternate leaves & white latex in the trunk. (see also *Fagraea*⁶⁰⁵)



BIGNONIACEAE

Predominantly tropical family with 750 species worldwide, 9 genera & 14 species in NT. **BOTANY** leaves **once-pinnate, bipinnate or 3-4x pinnate, usually opposite in 2 rows** (decussate), rarely in whorls of 3, often with **scattered circular glands on lower surface**, no stipules. Flowers bisexual, often large & spectacular, with 4-5 fused sepals, 4-5 fused petals & 4(5) stamens attached to corolla tube, often with 2 of the stamens much longer than the other 2. Fruits a pod-like capsule, dry & splitting into 2-4 sections with many, winged seeds (except *Pauldopia*).

ECOLOGY mostly small trees of forest edges & gaps, more abundant in lowland forests but also scattered in hill forests up to 1700 m.

USES Bignoniaceae contains some of the world's most spectacular ornamental trees, such as the African Tulip tree (*Spathodea campanulata*) from tropical Africa & *Jacaranda obtusifolia* from tropical S.America, both of which are widely planted in NT. The only local species commonly grown as an ornamental is *Millingtonia hortensis*, although several other species are often cultivated for their edible flowers.

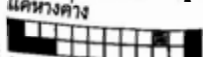
1. leaves once-pinnate
 2. leaves in whorls of 3
 3. 3-4 pairs of leaflets, rounded/blunt tips, star-shaped hairs below
Heterophragma sulfureum 628
 3. 4-10 pairs of leaflets, tapering tips, smooth both sides
Santisukia kerrii 613
 2. leaves opposite in 2 rows
 4. lowest pair of leaflets much smaller than others, stipule-like
 5. calyx deeply split on one side, pods not ridged
Markhamia stipulata 615
 5. calyx 5-toothed, not split on one side, pods with 10 ridges
Fernandoa adenophylla 616
 4. lowest pair of leaflets not much smaller than others
 6. calyx deeply split at least half way on one side
 7. leaflets hairy; corolla white, narrowly tubular; pods not ridged
Dolichandrone serrulata 618
 7. leaflets smooth; corolla yellow, funnel-shaped; pods with 3 prominent ridges on each section
Fernandoa collignonii 617
 6. calyx not deeply split
 8. corolla narrowly funnel-shaped, lobes similar, not obscuring mouth
 9. evergreen tree; calyx tubular irregularly lobed, 3-5 mm
Rademachera eberhardtii 620
 9. deciduous trees; calyx cylindric or bell-shaped, >5 mm, shortly lobed
 10. leaflets with narrowly tapering tips; corolla lobes fringed
Stereospermum fimbriatum 622
 10. leaflets with blunt tips; corolla lobes not fringed
Stereospermum cylindricum 623
 8. corolla broadly funnel-shaped, lobes not similar, obscuring mouth
 11. leaflets with tapering tips; flowers in widely branched clusters
pods with 4 ridges
Stereospermum colais 624
 11. leaflets with blunt tips; flowers in short clusters, 5-14 cm
pods with 4 faint angles
Stereospermum neuranthum 625
 1. leaves 2-4x pinnate
 12. flowers terminal; fruits flattened
 13. leaves 3-4x pinnate, up to 150cm, not toothed;
flowers red-purple or brownish; fts 40-120cm
Oroxylum indicum 626
 13. leaves 2-3x pinnate, up to 50cm, usually toothed near top;
flowers white; fruits <40cm
Millingtonia hortensis 627
 12. flowers axillary or behind leaves; fruits cylindrical
 14. small tree to 7m; leaf stalks narrowly winged, leaflets not stalked;
fw clusters 8-17 cm, corolla funnel-shaped; seeds not winged
Pauldopia ghorta 614
 14. tree to 20m; leaf stalks not winged, leaflets stalked; fw clusters
<4cm, corolla barrel-shaped; seeds winged
Rademachera ignea 621



BIGNONIACEAE

615 *Markhamia stipulata*

แคทพาง



Deciduous or rarely evergreen tree to 15 (rarely 25) m with open, straggly crown. **BARK** creamy brown, thin, slightly fissured, inner bark with alternate pale orange & dark orange layers. **LEAF** 25-55 cm, **once-pinnate** with 2-5 pairs of leaflets, usually plus a long-stalked end one. Leaflets elliptic or narrowly ovate with tapering tips & **fine, rather sharp teeth**. Lower surface of mature leaflets with indistinct pale brown hairs which easily rub off & scattered sunken glands near base. Side leaflet stalks 3-5 cm.

Lowest pair of leaflets circular & much smaller than the others, 1.5-3 cm, close to base of main stalk & stipule-like. **FLOWER** 7-10 cm, cream or brownish-yellow, in narrow unbranched clusters at end of twigs, 14-33 cm. Calyx 3.5-5.5 cm, **deeply split on one side only, curved sharply backwards at the tip, without lobes or teeth**. Corolla broadly funnel-shaped with many large (2-3 mm) wart-like glands outside. **FRUIT** 45-70 cm, straight or slightly curved towards tip, **not ridged**, splitting lengthways into 2 sections. Seeds 3.5 cm, rectangular with thin semi-transparent wings on both sides.

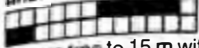
NOTE open areas in both deciduous & evergreen forests up to 1600 m. 3 varieties in NT - var. *stipulata* calyx & fruits densely covered with velvety hairs, lowland forests. var. *kerrii* calyx & fruits densely covered with long, woolly hairs, hill forests. var. *pierrii* corolla tinged red, calyx & fruits smooth or slightly hairy, fruits dense glands.

SIMILAR *Fernandoa adenophylla*⁶¹⁶ also has stipule-like basal leaflets & large yellow flowers but side leaflets with very short stalks & usually untoothed, calyx with 5 ± equal teeth & not deeply split on one side, fruits spirally twisted with 8-10 ribs.



616 *Fernandop adenophylla*

ฝ้ายแดง



Deciduous tree to 15 m with irregular crown & thick, often drooping branches. **BARK** pale brown, smooth or slightly flaking, inner bark soft, cream or pale yellow with orange streaks. **LEAF** 25-60 cm, **once-pinnate**, 2 to 4 pairs of leaflets, with or without an end one, 8-24x6-17 cm, upper ones much larger than lower ones, broadly obovate or elliptic with blunt or slightly pointed tips, untoothed or with scattered shallow teeth. Lower surface with rusty brown star-shaped hairs which easily rub off & scattered sunken glands. Side leaflet stalks very short, <0.5 cm. **Lowest pair of leaflets circular & much smaller than others**, stipule-like, 1-3 cm. **FLOWER** 6-9 cm, cream or brownish-yellow, nocturnal, in narrow clusters (thyrses) at end of twigs, 16-23 cm, axes stout & densely brown hairy. Calyx 2.5-4.5 cm, bell-shaped with **5 ± equal triangular lobes**, densely brown hairy. Corolla broadly funnel-shaped. **FRUIT** 35-70x1.5-2.5 cm, **spirally twisted pods with 8-10 ribs**, covered with short dark brown hairs, splitting lengthways into 2 sections. Seeds 2-3 cm, flat with 2 thin wings.

NOTE fairly common in open forests & secondary growth.

SIMILAR ⁶¹⁷*F. collignonii* leaflets 4-6 cm wide, long-tipped, smooth, lowest pair not reduced & stipule-like. Flower clusters 12-15 cm, calyx with 2-3 short teeth on one side & split ± halfway on the other side, smooth. Fruits 32-44 x 3.5-4.5 cm, straight or slightly curved with 6 ribs, smooth, seeds 4-4.5 cm. Rare, Nan province.

Markhamia stipulata ⁶¹⁵ also has large yellow flowers & leaves with stipule-like basal leaflets but side leaflets with long stalks & fine teeth, calyx deeply split on one side, fruits not twisted or ridged.



618 *Dolichandrone serrulata*

แคชว้า



Deciduous tree to 25m with narrow, cylindrical crown & slender branches. **BARK** pale brown, smooth or slightly flaking. **LEAF** to 43 cm, once-pinnate, 3-5 pairs of leaflets, 5-14x3-6 cm, elliptic with tapering tip & strongly asymmetric base, **usually with scattered teeth**. Young leaves slightly sticky, mature leaves smooth or with tufts of hairs in vein axils below & a few large glands on the midvein. Leaflet stalks 0.5-1.3 cm. **FLOWER** 12-21 cm, pure white, opening at night, in short unbranched clusters of 3-7 flowers at end of twigs, 2-3 cm. Individual flower stalks 1.8-3.8 cm, buds narrowly conical & slightly curved, 3-5 cm. Calyx 3-5 cm, pale green with many glands, **deeply split on one side only**, spathe-like. Corolla narrowly tubular in the bottom half, funnel shaped in the top half (**both parts $\pm$ same length**), with spreading, wavy lobes. Stamens not projecting beyond corolla. **FRUIT** up to 85x1.8 cm, pointed, spirally twisted, seeds 2.2-2.8x0.5-0.8 cm, rectangular, thin with transparent wing.

NOTE scattered in open forests from Chiang Mai southwards, most often seen in wet rice fields where it is left because of its edible flowers.

SIMILAR 619 *D. columnaris* from S. Thailand has narrower flowers with the lower tubular part of the corolla at least 3x as long as the upper funnel-shaped part.

620 *Radermachera eberhardtii*

แคฉ่าย



Small evergreen tree to 12 m. **LEAF** 10-30 cm, **once-pinnate**, 2-3 pairs of leaflets plus an end one. Leaflets 10-30 cm, smooth with purple-black glands near base. **FLOWER** 3-4 cm, **bright yellow** in slender branched clusters at end of twigs, 12-50 cm. Calyx 0.3-0.5 cm, tubular with 5 irregular lobes.



Corolla narrowly funnel-shaped ± straight with 3-4 lobes. **FRUIT** 18-25 cm, slightly twisted persistent calyx at base, hanging in bunches. **NOTE** uncommon understory tree of moist evergreen forests.

621 *Radermachera ignea*



Evergreen or semi-deciduous tree to 20 m with narrow, rather open crown & slender, drooping branches. **BARK** creamy brown, soft & corky, finely cracked. **LEAF** 18-50 cm, **twice or 3X pinnate**, leaflets 4-12x2-4.5 cm, oval or elliptic with tapering tips & pointed base, not toothed. Mature leaflets smooth & slightly shiny above, paler with scattered dark green glands below. Main stalk & side stalks slightly swollen at base & at nodes, often tinged red. **FLOWER** 4.5-7.5 cm, **bright orange**, opening in the morning, clusters of 2-5 flowers **on old branches or on main trunk**, stalks 1-1.7 cm, finely hairy. Calyx 1.5-2 cm, tubular with 5 short teeth, split halfway on one side only. **Corolla** barrel-shaped, widest in the middle with 5 very short lobes. **FRUIT** 30-45 cm, very slender & slightly twisted, splitting lengthways into 2 thin-walled sections with several rows of seeds attached to a corky central strand. Seeds 1-1.5 cm, flat with a narrow wing at both ends.

NOTE scattered in both evergreen & deciduous forests.



622 *Stereospermum fimbriatum*

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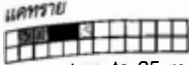
Briefly deciduous tree to 35 m with narrow crown, steeply ascending main branches & long slender trunk, fluted at base. **BARK** pale grey or creamy-brown, slightly flaking. **LEAF** 25-60 cm, odd-pinnate with 2-4 pairs of opposite leaflets, 6-15-2.5x6 cm, narrowly ovate or lanceolate with **long tapering tips** & rounded or asymmetric base, not toothed. Young leaves purple, mature leaves pale yellow-green with pale brown hairs. Leaflet stalks 5-8 mm.

FLOWER 5-8 cm, white or pale pink, in loose branched clusters at end of twigs & leaf axils, 8-30 cm, usually appearing before young leaves. Stalks with **sticky yellowish hairs**. Calyx 0.8-1.7 cm, tubular with 5 very short lobes, densely hairy outside. Corolla broadly funnel-shaped with 5 spreading, **deeply fringed** lobes. Stamens smooth at base. **FRUIT** 30-60x0.8-1.1 cm, twisted in loose, open spirals. squarish in cross-section with faint ridges. Seeds 2-3 cm, narrowly winged at both ends, arranged in **deep notches** along a central strand.

NOTE scattered in moist deciduous & lowland evergreen forests. Flowers opening at night - in the early morning the old corollas spin down one by one, carpeting the ground beneath the tree.

SIMILAR 623 *S. cylindricum* แคสี leaflets with blunt or slightly pointed tips, flowers in narrow clusters with leaf-like bracts, calyx ridged, corolla lobes not fringed, fruits 30-45x0.5-0.7 cm. Dry, open forests from Tak & Sukhothai southwards.



624 *Stereospermum colais*

Deciduous tree to 25 m with bushy crown & short trunk. **BARK** creamy brown, slightly flaking. **LEAF** 25-45 cm, odd-pinnate, 2-4(6) pairs of leaflets, 6-13x3-6 cm, elliptic with **tapering tips**, not toothed. Mature leaflets smooth or with scattered tiny white hairs below, usually with a few large flat dark glands near base. Leaflet stalks slender, 0.5-1.7 cm. **FLOWER** 1.8-2.5 cm, in open branched clusters at end of young shoots, 15-40 cm, stalks usually without hairs. Calyx 0.5-0.7 cm, purplish-brown, bell-shaped with 3-5 short pointed lobes. Corolla pale yellow, broadly funnel-shaped with 2 crinkled lobes which press inwards **concealing the mouth**, lower lobe grooved with creamy-purple hairs near the mouth, like a beard. Stamens hairy at base. **FRUIT** 9-55x0.8-1.2 cm, straight or slightly curved with 4 **obvious ridges**, splitting lengthways into 4 sections. Seeds $\pm 2 \times 0.5$ cm, narrowly winged at both ends, arranged in deep notches along a corky central strand.

NOTE fairly common in semi-open areas in moist deciduous & hill evergreen forests. Flower slightly fragrant, opening in the morning.



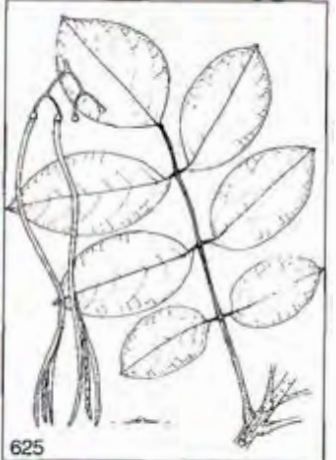
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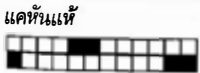
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624



625

625 *Stereospermum neuronanthum*

Similar to *S. colais* but leaflets 11-18x5-11 cm, oval or broadly obovate with blunt tips, finely hairy below, stalks 0.1-0.8 cm. **FLOWER** 2.5-3.5 cm, greenish white with dark purple veins, clusters 5-14 cm, stalks slightly hairy, calyx 0.9-1.5 cm, corolla lobes pressed inwards but only partially concealing the mouth, smooth inside. **FRUIT** 35-50x0.6-0.9 cm, faintly ridged, hairless.

NOTE scattered in semi-open deciduous & pine-dipterocarp forests up to 1200 m.



625

626 *Oroxylum indicum*

เพกา มะลิคไม้



Evergreen or semi-deciduous tree to 10 (20) m. Young trees have a single main stem with the leaves clustered at the top like a palm tree. After flowering the stem splits, developing into an irregular, sparsely branched crown. **BARK** pale creamy brown or pale grey, smooth or finely cracked with large leaf scars on younger trees.

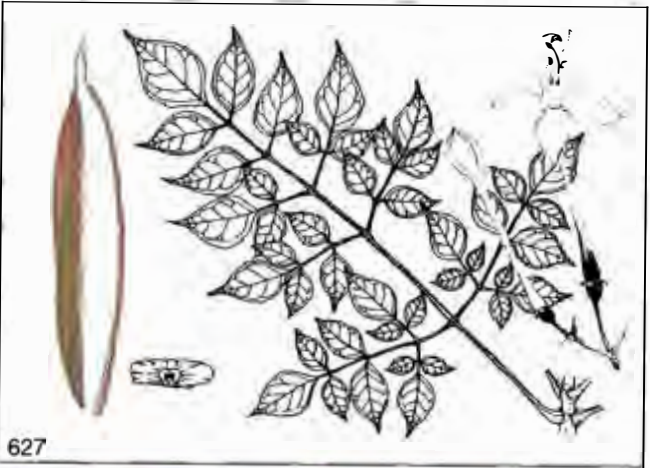
LEAF up to 150 cm, **3 or 4X pinnate** with upper side stalks once divided, middle ones twice divided & lower ones 3X divided, giving the whole leaf a triangular appearance. Leaflets 5-10 cm, oval or broadly ovate, long-tipped, not toothed, smooth or with scattered very short white hairs below. Leaflets stalks 5-8 mm, side stalks & main stalk arched, swollen at base & at nodes. **FLOWER** 8-12 cm, **reddish-brown or purple outside**, greyish-white or cream inside, clustered near top of an upright, fleshy stem at end of twigs, 60-180 cm, usually with both flowers & fruits together on the same stem. Calyx 2-4 cm, irregularly lobed or unlobed. Corolla trumpet-shaped, **thick & wrinkled** with scattered glands outside & dense hairs inside. 5 stamens, hairy at base. **FRUIT** 30 to 120 cm, dark brown, **flattened**, slightly curved at base with a fine ridge on each side, **woody**, splitting into 2 sections lengthways. Seeds 4-8 cm, flat with a broad, semi-transparent wing.

NOTE open areas & secondary growth, often cultivated for its edible young fruits. The flowers open at night & have a rather unpleasant musty smell. In the morning, the petals may be found on the ground, often with deep scratches on them caused by bats which have come to feed on the flowers during the night.



627 *Millingtonia hortensis*

ปิ่นกาขาว



627

Deciduous tree to 15 m. **BARK** grey, deeply & irregularly cracked, thick & corky, inner bark pale brownish-cream. **LEAF** 20-60 (100) cm, usually **bipinnate but sometimes once or 3x pinnate**, 3-5 pairs of opposite leaflets plus an end one, lower 2 or 3 pairs usually further subdivided into 1 or 2 pairs. Leaflets 2-4(7) cm, narrowly ovate or triangular with tapering tips, usually **toothed** at least near top, thin, dark green above, paler with scattered sunken dark green glands near base below, smooth or with scattered white hairs along veins & tufts in vein axils below. Leaflet stalks 0.2-1 cm, main stalk slightly swollen at base & at nodes, grooved in upper section. **FLOWER** 9-11 cm, **pure white & slightly waxy**, in spreading, branched clusters (thyrses) at end of twigs, (10)20-40 cm. Calyx 2-4 mm with 5 short, blunt lobes. **Corolla narrowly tubular** with 5 short, pointed lobes. Upper 2 lobes joined in the middle, other 3 spreading. **FRUIT** 30-40 cm, straight, **flattened**, splitting lengthways into 2 thin-walled sections. Seeds 1.5-3.5 cm, thin with broad transparent wing.

NOTE scattered in open deciduous forests, favouring rocky areas, frequently planted. Flowers delicately fragrant, opening in the early evening with only a few flowers in one cluster opening on the same evening.



627



627



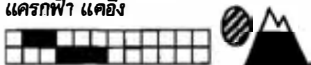
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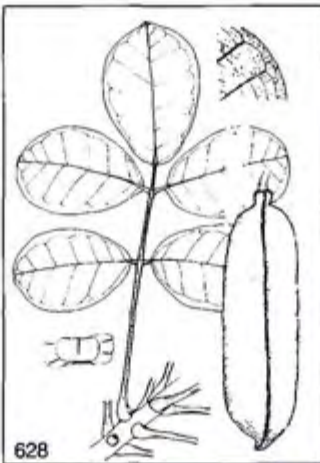
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628 *Heterophragma sulfureum*

แคระฟ้า แดง



Deciduous tree to 22 m with open, narrow crown & crooked trunk. **BARK** grey, thick, deeply cracked. **LEAF** 25-70 cm, usually in **whorls of 3**, rarely opposite, **once-pinnate** with 3 to 4 pairs of leaflets, upper ones largest, 9-21 x 5-14 cm, oval or elliptic with **blunt or rounded tip** & rounded, asymmetric base, not toothed. Mature leaves smooth or with scattered greyish star-shaped hairs above, denser below. Sunk glands, ± 2 mm, near base of leaf. **FLOWER** 5-7 cm, white or pale yellow, opening in the daytime, slightly fragrant, in **thyrses** at end of twigs, 10-24 cm, hairy axes. Calyx with 5 $\pm$ equal, rounded lobes. Corolla narrowly funnel-shaped with wavy lobes, slightly hairy outside. Stamens not projecting. **FRUIT** 30-55 x 5.8 cm, oblong, straight, pointed at both ends, not ridged but thickened along the joints, with short pale brown hairs. Seeds 4 x 2 cm, with a broad transparent wing. **NOTE** scattered in open dry dipterocarp forests from Doi Suthep southwards.



LABIATAE

mint family

Large cosmopolitan family with 6700 species worldwide, the vast majority of which are herbs. 6 genera & at least 16 tree species in NT. All the local tree genera were until recently (1992) placed in *Verbenaceae*.

BOTANY mostly deciduous shrubs & trees, no latex or colored sap. Leaves simple or digitate, usually opposite in 2 rows (decussate), no stipules, twigs often squarish. Flowers bisexual, usually asymmetric, calyx typically with 5 unequal teeth, corolla usually funnel-shaped with 4-5 lobes often fused into **2 unequal lips**. 4-5 stamens attached to corolla, nearly equal or one pair much longer than other. 1 slender style with forked stigma. Fruits various, fleshy & not splitting. **ECOLOGY** a common element of lowland deciduous forests & secondary growth. **USES** *Labiatae* includes *Tectona grandis* (teak), which is the most important timber tree in Thailand, but none of the other species are of particular value.



1. leaves trifoliate or digitate

Vitex 637

1. leaves simple

2. flowers large & showy, corolla >1.5 cm

3. stamens much longer than corolla

3. stamens shorter than corolla

629 *Clerodendrum*
Gmelina arborea 630

2. flowers small & inconspicuous, corolla <1 cm

4. flowers in large pyramidal clusters (panicles) at end of twigs

Tectona grandis 631

5. leaves large with short stout stalks

Premna pyramidata 636

5. leaves smaller, stalks slender

4. flowers in flat-topped clusters (corymbs), usually in leaf axils

6. corolla purple, style much longer than corolla *Callicarpa arborea* 634

6. corolla white or green, style shorter than corolla

7. corolla with 4 similar lobes, lvs sharply toothed

Callicarpa rubella 633

7. corolla with 2 dissimilar lips, lvs untoothed or shallowly toothed

Premna latifolia 634

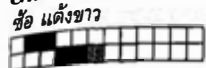
8. leaf stalks 0.6-2 cm

Premna villosa 635

8. leaf stalks >2.5 cm

630 *Gmelina arborea*

ชื่อ แตงขาว



Deciduous tree to 25 m with a narrow crown & slender, drooping branches.

BARK pale creamy-brown or greyish, smooth with pale corky lenticels, becoming cracked & flaking with age, inner bark cream. **LEAF** 10-19x7-15

cm, simple, clustered near end of twigs, oval or broadly ovate to nearly triangular with shortly tapering tip & blunt, flattened or slightly heart-shaped base, untoothed. Young shoots densely covered with yellowish star-shaped hairs, mature leaves smooth or with scattered hairs especially below, often glaucous. 3(5) basal veins, 4-7 pairs of side veins. Stalks 4-11 cm, slender, with a pair of rounded glands at the top.

FLOWER 2.5-3.5 cm, yellow-brown, in narrow branched clusters (thyrses) at end of leafless twigs & in axils of fallen leaves, stalks densely hairy with small linear bracts at base. Calyx 0.3-0.4 cm, cup-shaped with 4-5 short teeth, densely brown-hairy outside. Corolla funnel-shaped with a wide mouth & 5 very unequal lobes, the upper 2 fused together & curved slightly backwards, the lower 3 fused together & curved forward with the middle lobe much larger than the side ones, usually densely hairy outside. 4 stamens, one pair longer than the other, attached to corolla tube & projecting slightly beyond the mouth. Style short with 2 small, unequal stigmas, ovary smooth. **FRUIT** 2-3.2

cm, greenish-yellow, smooth & slightly glossy, globose or obovoid with persistent calyx at base, fleshy with a hard 1-2 seeded stone.

NOTE common in semi-open deciduous forests throughout NT, often with Teak.

SIMILAR *Trewia nudiflora*⁷⁴⁷ leaves alternate, without glands, flowers pale yellow-green, inconspicuous.



631 *Tectona grandis*

Deciduous tree to 30m & up to 180 cm diam., trunk becoming fluted & slightly buttressed at base in mature trees. **BARK** pale brown, thin, flaking in narrow vertical strips, inner bark white. **LEAF** 15-60x12-35 cm, broadly obovate or oval with shortly pointed or blunt tip & tapering base, no teeth. Young shoots densely covered with yellowish star-shaped hairs, mature leaves rough above, softly hairy below. Stalk 1-5 cm, stout, **narrowly winged**. **Twigs squarish**. **FLOWER** 0.7-0.9 cm, white, sometimes with red-purple dots, in widely-branched **pyramidal clusters at end of twigs**, to 50 cm. Calyx ± 0.3 cm, bell-shaped with 6(5) reflexed lobes, densely brown-hairy outside. Corolla funnel-shaped at base with 6(5) spreading lobes, later curved backwards, hairy outside & at throat inside. 6(5) $\pm$ equal stamens, attached near base of corolla & projecting far beyond it. Style as long as stamens, ovary densely hairy. **FRUIT** ± 2 cm, consisting of a thin, papery envelope (inflated calyx) surrounding a hard, silky-hairy stone, ± 1 cm, with 4 cavities each containing 1 seed.

NOTE Teak once formed a major component of moister deciduous forests throughout NT but has been almost completely logged out in the natural state, usually being replaced by bamboo forests. However, it regenerates quickly even on degraded sites, so the days of the famous teak forests may not yet be over.

SIMILAR *Premna* 634 are called "false teak" but the leaves are smaller & always have distinct stalks.



632 *Callicarpa arborea*var. *arborea*

ช้างเผือก ฝัาขาว

Deciduous or semi-evergreen shrub or small tree to 15 m. **BARK** pale creamy-grey, smooth or finely fissured. **LEAF** 13-30x5-15 cm, simple, decussate, narrowly obovate or elliptic-oblong, **pointed at both ends, untoothed or with scattered shallow teeth**. Young shoots densely covered with creamy star-shaped hairs, mature leaves dark green with scattered hairs on midvein above, **whitish with a dense mat of star-shaped hairs**. 8-11 pairs of obvious side veins. **Stalks 2.5-5.5 cm**, densely hairy. **FLOWER** small, pale purple or lilac, regular, in **flat-topped forked clusters (corymbs) at upper leaf axils**, 7.5-14 cm wide, main stalks 2.5-6.5 cm, densely hairy. Calyx ± 1 mm, bell-shaped with 4 short teeth, densely hairy. Corolla tube ± 2 mm, finely hairy outside in bud, later smooth, glandular inside. 4 equal lobes, spreading & pointed, **not fused into 2 lips**. 4 stamens, attached to middle of corolla tube & projecting beyond it. 1 long slender style, **much longer than corolla or stamens**, with obscurely lobed stigma. **FRUIT** 0.3-0.4 cm, lilac to dark red-purple, globose with persistent calyx at base, smooth, thinly fleshy with 4 small stones (pyrenes), each with one seed.

NOTE very common in waste ground & along forest edges.

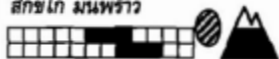
SIMILAR 633 *C. rubella* น้ําลายผีเสื้อ

evergreen shrub to 2 m. Leaves to 20x6 cm, ovate with tapering tip & blunt or heart-shaped base, coarsely toothed, stalks 0.4-0.6 cm. Flowers white or greenish, clusters to 6 cm with short main stalks 0.8-2 cm. Style shorter than corolla. Fairly common in semi-open forests above 1100 m, often with pine. *Premna* spp.⁶³⁴ have corolla lobes fused into 2 lips.



634 *Premna latifolia* var. *latifolia*

ลิกซี้โก๋ มั่นพริ้ว



Deciduous scrambling shrub or straggly tree to 13 m. **BARK** creamy brown, slightly flaking, inner bark pale cream. **LEAF** (5)12-16x5-8 cm, simple, usually clustered near end of twigs, ovate or elliptic with pointed tip & blunt or slightly heart-shaped base, untoothed or with scattered irregular teeth in upper half. Young shoots densely velvety hairy, mature leaves thin, **smelling of cabbages when crushed**, with scattered short rough hairs above & denser soft hairs below. 7-8 pairs of side veins, tertiary veins ladder-like. **Stalks** 0.6-2(3) cm, densely hairy, twigs with stunted leaves at base of new years' growth. **FLOWER** 0.5-0.8 cm, cream or yellow-green, in branched **flat-topped clusters** (corymbs), 6-13 cm, at end of twigs & on short axillary shoots, appearing with young leaves. Individual flowers without stalks, axes velvety-hairy. Calyx ± 2 mm, cup- or bell-shaped with (4)5 short, equal teeth, densely hairy especially outside. Corolla ± 4 mm, funnel-shaped, with (4)5 very unequal lobes fused into 2 lips, upper one deeply 2-cleft, lower one 3-cleft, smooth or sparsely hairy outside, many long hairs at throat inside. 4-5 stamens attached to mouth of corolla & projecting beyond it. Ovary glandular & hairy at top with forked style. **FRUIT** 0.4-0.6 cm, green ripening blackish, slightly juicy with 4 wrinkled stones (pyrenes), each with 1 ovate seed.

NOTE scattered in semi-open areas. var. *cuneata* is a woody climber, leaves with pointed base.

SIMILAR 635 *P. villosa* leaves with long soft, simple hairs below, stalks 3-8 cm. Flowers white, calyx without teeth. Deciduous & evergreen forests to 1200 m. 636 *P. pyramidata* เป็ด leaves 15-30x7-15 cm, young shoots with dense creamy star-shaped hairs, stalks 2.5-10 cm. Flowers in branched pyramidal clusters (thyrses) at end of twigs, to 25 cm. Calyx ± 2 mm, 4-5 equal teeth & dense orange-brown hairs, corolla with long hairs at throat but otherwise smooth. Fruits obovoid or pear-shaped, stone obscurely wrinkled. Moist areas to 800 m, typically on limestone.



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Vitex

Leaves **trifoliate or digitate** with 3-7 leaflets. Calyx cup- or bell-shaped with 5 short teeth, corolla funnel shaped with short tube & **5 unequal lobes, lowest one usually much larger than others & lip-like**. 4 stamens attached to corolla tube & projecting beyond it, one pair larger than the other, style slender with short 2-lobed stigma. Fruit thinly fleshy with persistent calyx & single hard stone containing 4 seeds (pyrenes).

638 *Vitex limoniifolia*

ตีนนก



Deciduous tree to 17 m. **BARK** pale grey-brown, thin, slightly cracked & flaking. **LEAF** trifoliate (rarely unifoliate), leaflets 7-25x2.5-8.5 cm, broadly obovate to lanceolate, tapering or pointed at both ends, untoothed or with scattered shallow teeth. Young shoots velvety-hairy, mature leaflets thin but firm, smooth or minutely hairy above, **shortly & softly brown hairy below**, usually with shiny, resinous glands. All leaflets **without distinct stalks**, main stalks 5-10 cm, **broadly (>1 cm) winged, even on mature trees**. **FLOWER** 0.4-0.6 cm, white & violet, in branched spike-like clusters (thyrses) at **end of twigs** & upper leaf axils, to 30 cm. Individual flowers with short stalks, velvety-hairy, in dense bunches partly hidden by **conspicuous leafy bracts**, ±7 mm. Calyx 2-3 mm, velvety-hairy. **FRUIT** purple/black, globose with tuft of red-brown hairs at top & hairy calyx at base.

NOTE common, semi-open forest.

SIMILAR ⁶³⁹*V. pinnata* 3-5 leaflets, smooth or nearly so, main stalks narrowly winged or not at all. Flowers 0.8-1.2 cm, white or pinkish, in open-branched clusters to 15 cm. Calyx ±6 mm, semi-spherical, mealy-hairy. Central Thailand.

V. peduncularis ⁶⁴⁰ leaf stalks winged in young trees only, leaflets smooth, flowers axillary.

1. flower clusters at end of twigs
2. flower clusters with leafy bracts; leaflets hairy without stalks
V. limoniifolia ⁶³⁸
3. 3 leaflets, leaf stalks broadly winged
flowers in spike-like clusters; throughout Thailand
3. 3-5 leaflets, main stalks narrowly winged or not at all
flowers in open branched clusters; C. & S. Thailand *V. pinnata* ⁶³⁹
2. flower clusters without leafy bracts
4. leaflets without stalks; cultivated shrub
(1) 3 leaflets, +7x3 cm, aromatic when crushed, minutely grey-hairy below;
flowers in slender spike-like clusters, calyx with dense short greyish hairs ⁶³⁷*V. trifolia* var. *trifolia*
4. leaflets with distinct stalks; wild trees
5. leaflets smooth *V. quinata* ⁶⁴⁴
5. leaflets softly hairy *V. canescens* ⁶⁴³
1. flower clusters in leaf axils
6. leaflets softly hairy; fw clusters shorter than leaf stalks *V. vestita* ⁶⁴²
6. leaflets smooth or nearly so; fw clusters longer than leaf stalks
7. leaflets, calyx & corolla with shiny yellow dots
leaf stalks ± narrowly winged *V. peduncularis* ⁶⁴⁰
7. no yellow dots; leaf stalks never winged *V. glabrata* ⁶⁴¹



640 *Vitex peduncularis*

กาสามปีก



Deciduous or semi-evergreen tree to 25 m but usually much smaller. **BARK** pale grey, smooth or shallowly cracked & flaking, inner bark pale creamy orange. **LEAF** trifoliate, leaflets 8-17 cm, lanceolate, tapering or pointed at both ends. Young shoots sparsely hairy (mealy), mature leaves thin, **smooth or sparsely hairy with tiny yellow dots** (resin glands) below. Side leaflet stalks 0.5-1.5 cm, main stalks 5-9 cm, **often winged in young trees** but usually not winged in mature trees. **FLOWER** 0.7-1 cm, white with yellow or purple markings, in narrow branched clusters (thyrses) at leaf axils or just behind leaves, 10-25 cm. Individual stalks 2-6 mm, slender, with **minute bracts**. Calyx & corolla finely hairy with **shiny yellow dots** outside, calyx ± 2 mm, corolla tube ± 4 mm, lower lip longer than tube. **FRUIT** 0.5-0.8 cm, yellow-green ripening dark red-purple to black, smooth, fleshy with a single hard stone containing 4 seeds.

NOTE very common in semi-open forests & secondary growth.

SIMILAR 2 other species also with flower clusters in leaf axils but leaf stalks never winged.

641 *V. glabrata* ไม้เนื้อแข็ง larger tree to 20 m. 3-5 leaflets, 5-13 cm, all parts smooth or nearly so, no yellow gland dots. Fruits to 1.2(2) cm, succulent. Uncommon in deciduous/bamboo forests & disturbed areas < 800 m.

642 *V. vestita* ไม้พุ่มขนาดเล็ก shrub or small tree. 3 leaflets, 5-10 cm, finely hairy below, glands as *V. peduncularis*, side leaflet stalks < 8 mm. Flower clusters < 6 cm, stalks hairy. Fruit ± 0.5 cm. Uncommon in evergreen forests up to 1500 m.



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643 *Vitex canescens*

Deciduous tree to 12 m. **BARK** creamy-brown, shallowly cracked & flaking, inner bark pale yellow often with orange spots. **LEAF** trifoliate or digitate with 3-5 leaflets, 5-16x2-7 cm, narrowly ovate or lanceolate with tapering tip & pointed base, untoothed or with shallow rounded teeth. Young shoots densely covered with soft yellow-grey hairs, mature leaves thin, **finely hairy at least below**. Side leaflet stalks 0.5-1.2 cm, end one much longer, main stalks 3-8 cm, finely hairy. **FLOWER** white or pale yellow, sometimes with pinkish tinge, in branched clusters (thyrses) **at end of twigs & axils of fallen leaves**, to 15 cm. Individual stalks slender, 2-4 mm, densely hairy, **without leafy bracts**. Calyx $\pm$ 2 mm, hairy outside. Corolla $\pm$ 4 mm, hairy outside. **FRUIT** 0.6-1.5 cm, ripening yellow then black, oval to slightly pear-shaped, with flat calyx at base. **NOTE** common in semi-open deciduous/bamboo forests & disturbed areas.

644 *Vitex quinata*

พาลีแย่นดอย



Evergreen tree to 25 m. **BARK** grey, shallowly fissured, rather soft. **LEAF** trifoliate or digitate with 5 pairs of leaflets, 5-22x2.5-8 cm, usually oblong or narrowly obovate with tapering tip & pointed or blunt base. Young shoots sparsely hairy, **mature leaves smooth**. 8-10 pairs of side veins. Side leaflet stalks 0.4-1.5 cm, end one 1.5-4 cm, main stalks 3-13 cm. Twigs sparsely hairy. **FLOWER** cream or yellow $\pm$ with purple markings, in branched clusters at end of twigs & axils of upper leaves, (5) to 35 cm. Individual stalks slender, finely hairy, with minute bracts. Calyx 2-4 mm, broad teeth, corolla tube 4-7 mm. **FRUIT** 0.5-1 cm, bronze-green, obovoid or pear-shaped with short point. **NOTE** scattered in less-disturbed forests.



MYRSTICACEAE

400 species mainly confined to tropical rainforests of SE Asia, 3 genera & up to 13 species in NT.

BOTANY evergreen trees with **red sap**. Leaves simple, alternate, usually planar, often thick & leathery, untoothed, no stipules. Flowers small & inconspicuous, male & female on different trees. Calyx with 3 (rarely 2) leathery lobes, not overlapping in buds, **no corolla**. Males with stamens densely clustered into a cup-shaped, triangular or disc-like mass (androecium). Fruits yellow or orange-red, usually thick skinned, splitting into 2 sections, single large seed with thin, orange or red coating (aril).

ECOLOGY scattered in less-disturbed evergreen forests, mostly <1000m.

USES local species have good timber but few other uses. Nutmeg is *Myristica fragrans*, from N.Guinea.

645 *Knema erratica*

พันธุ์ เลือดควาย



Tree to 20m with dense, narrow crown. **BARK** grey-brown, **flaky**, inner bark with copious red sap. **LEAF** 16-30x3-7 cm, narrowly oblong or oblong-lanceolate with pointed tip & **slightly pointed or rounded base**. Young shoots with pale brown star-shaped hairs, mature leaves leathery, dark green & smooth above, grey-green & smooth or sparsely hairy esp. on veins below. 20-30 pairs of side veins, raised above. Stalks 1-1.5 cm. **Twigs with conspicuous grooves near tips**. **FLOWER** males ± 0.5 cm, globose or triangular, in clusters of 1-4 flowers in leaf axils, stalks ± 0.7 cm 10-13 anthers in a triangular mass on a short stalk. Females with **2-4 lobed stigma**.

FRUIT $\pm 2.5 \times 2$ cm, solitary or in pairs, ellipsoid, hairy when young. **NOTE** scattered in less disturbed hill evergreen forests.

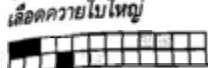
SIMILAR ⁶⁴⁶*K. linifolia* bark not flaky, leaves 15-40x7-13 cm, usually heart-shaped at base. Flowers 0.7-1 cm, obovate or pear-shaped, stalks 1.2-1.5 cm, 14-18 anthers. Fruits 2.5-3.5 cm, usually persistently hairy.

⁶⁴⁷*K. conferta* leaves usually heart-shaped at base & persistently hairy below. Male flowers in dense clusters on short woody stumps, 13-18 anthers, fruits 3.5-4 cm. Probably confined to Malaysia & Indonesia although often erroneously reported for Thailand. ⁶⁴⁸*K. globularia* leaves 8-17x1.5-5 cm, 13-18 pairs of side veins, midvein lying in a groove on upper surface. Male flowers in dense clusters on short woody stumps, stalks thickened near top, anthers dark red or purple. Fruits 1.5-2 cm, small collar at top of stalk.



649 *Knema furfuracea*

เลือดควายใบใหญ่



Evergreen tree to 20m with **narrow, pyramidal crown, branches horizontal with drooping tips.**

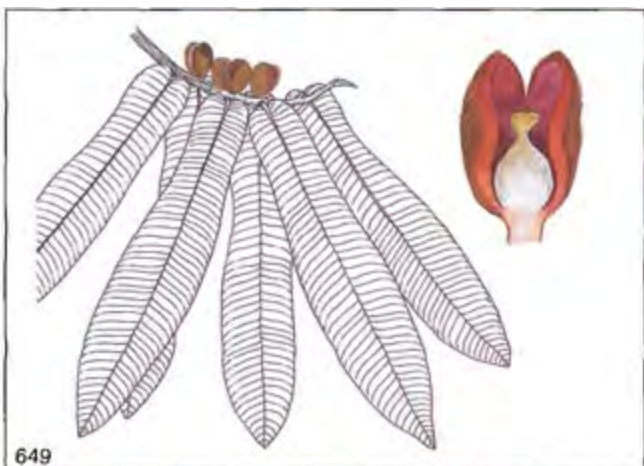
BARK grey-brown, quite thin, flaking in long strips, inner bark with **copious pink sap.** **LEAF** 10-50x3-14cm, oblong-lanceolate with pointed tip & gradually narrowed towards the heart-shaped base. Young shoots densely brown-hairy, mature leaves leathery, dull dark green above, grey-green below, **smooth or nearly so.** 24-35 pairs of side veins, **raised above** with

dense network of smaller veins. Stalks & twigs stout. **FLOWER** yellow-brown, in **short clusters with woody main stalks, mostly behind leaves.** Males 6-7 mm, individual stalks 7-10 mm, with minute bract near middle of stalk. Calyx densely covered with pale brown star-shaped hairs outside, smooth inside with 3 blunt, triangular lobes. 10-13 sessile anthers densely clustered on a disc-like platform with a stout stalk. Females $\pm$ 10mm with very short stalks < 2mm. Calyx hairy as males outside but bright red & finely hairy inside. Ovary with dark brown, star-shaped hairs, **stigma disc-shaped with sunken centre & jagged margin.** **FRUIT** 3.5-4.5

cm, oblong, rounded at both ends, densely covered with yellow-brown hairs, skin very thick, $\pm$ 1cm, stalks 0.4-0.5cm. Seeds with thin crimson coating(aril), fringed near top.

NOTE a distinctive feature of less-disturbed lowland forests.

SIMILAR ⁶⁵⁰*K. laurina* leaves 9-28x3-8 cm, persistent scattered hairs at least on veins below. 12-24 pairs of side veins, sunken above. Twigs not or only slightly striate at tips. Male flower stalks $\pm$ 5mm, with small bract near top. Females with 2-lobed stigma. Fruits 2.5-3 cm. C. & S. Thailand.



MYRSTICACEAE

⁶⁵²*Horsfieldia glabra*

มะพร้าวหูก



Evergreen tree to 23 m. **BARK** medium brown, vertically furrowed but not flaking, outer bark hard & brittle.

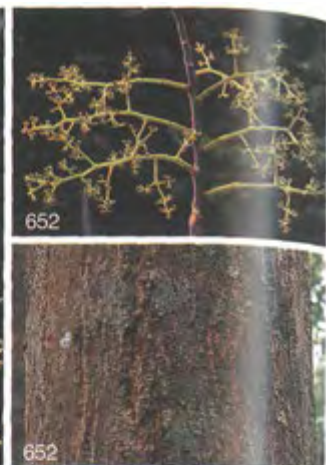
LEAF 13-20 x 3.5-8 cm, rarely to 28 x 10 cm, narrowly elliptic or obovate with blunt or pointed tip & slightly tapering base. Mature leaves leathery, completely smooth, dark green & glossy above, paler green but not greyish below. 9-16 pairs of curved side veins, mostly sunken above, **smaller veins faint**. Stalks 1-2.5 cm, twigs striate with many lenticels.

FLOWER males 2-2.5 mm, yellow, in much-branched clusters at leaf axis or behind leaves, 6-19 cm, lower branches 1.5-5 cm, individual stalks 1-3 mm, smooth (also axes). Calyx globose or oval, often slightly triangular at base, divided $\frac{1}{2}$ into 2 or 3 pointed lobes, 2-3 mm. 6-12 stamens, **attached by their backs to globular or cup-shaped column**, ± 2 mm diam. Females 2.5-3 cm in smaller clusters, to 5 cm, lower branches 1-2 cm. Ovary ± 2 mm, **smooth**. **FRUIT** 2-3.5 cm, yellow, smooth, firmly fleshy with single oblong seed, 1.6-2.5 cm, **completely covered by thin orange coating (aril)**, not fringed at top.

NOTE scattered or locally common in less-disturbed forests.

SIMILAR ⁶⁵³*H. kingii* leaves 12-35 x 5-17 35 x 17 cm, 14-18 pairs of side veins, flat above, smaller veins often distinct. Male flowers 3-4 mm, stalks usually finely hairy, calyx deeply divided $\pm 3/4$, females ± 5 mm, ovary densely hairy. Fruits 4-4.5 cm, seeds ovoid.

⁶⁵⁴*H. valida* leaves 18-35 x 7-13 cm, 18-25 pairs of side veins, raised above, smaller veins usually faint, stalks 0.5-1 cm. Male flowers ± 2 mm, calyx divided $\pm$ to base, females ± 3 mm, ovary smooth. Fruits 8-10 cm.



LAURACEAE Table 13

2850 species mostly in SE Asia & tropical America, 13 genera & at least 25 species in NT.

BOTANY mostly evergreen trees with smooth, thin outer bark & aromatic inner bark, often with resinous sap. Leaves simple, alternate or opposite, generally spirally arranged, always untoothed, often leathery & finely gland-dotted, no stipules, old leaves typically yellow. Flowers mostly small, greenish-white or yellowish, bisexual or male & female on different trees, crowded in branched clusters or globular heads at leaf axils. Calyx (perianth) with 3 or 5 lobes in 2 whorls, no corolla. Stamens typically in 2 to 4 whorls of 3, third whorl often with glands at base, inner whorl frequently sterile & inconspicuous. Anthers opening by 2 or 4 little upturned flaps. Single style, usually short, ovary usually superior. Fruit thinly fleshy with single large seed, often with swollen stalk & usually with persistent calyx at base.

ECOLOGY understory & canopy trees of less-disturbed evergreen forests, becoming increasing abundant >1000m.

USES many essential & aromatic oils/flavorings, the most well-known being cinnamon & camphor. None of our local species provide edible fruits or commercially valuable timber.

NOTE *Lauraceae* is one of the most difficult families to identify - it is often impossible to be sure of the species even with a microscope!

656 ***Actinodaphne***

ดอชิงลา



LEAF whorled, young leaves produced in distinct flushes. Terminal buds large, pointed, protected by many layers of overlapping leafy bracts, leaving distinct scars on twigs. **FLOWER** male & female on different trees. Males with 9 fertile stamens in 3 whorls, inner whorl with 2 glands each. Females with 9 infertile stamens & 1 slender style with peltate stigma. **FRUIT** reddish, seated on persistent enlarged calyx tube. **NOTE** a difficult & variable group, probably several distinct spp. in NT.

- | | |
|--|--|
| 1. leaves whorled, buds with large overlapping bracts | <i>Actinodaphne</i> 656 |
| 1. leaves spirally-arranged | |
| 2. flowers in dense globular heads with conspicuous bracts at base | |
| 3. leaves with 3 main veins | |
| 4. 6 fertile stamens | <i>Neolitsea zeylanica</i> 665 |
| 4. 9-12 fertile stamens | <i>Lindera</i> 666 |
| 3. leaves with 1 main vein | <i>Litsea</i> 657 |
| 2. flowers in branched clusters without bracts | |
| 5. fruit with persistent calyx | |
| 6. fruit nearly completely enclosed by calyx cup | <i>Cryptocarya</i> 679 |
| 6. fruit partly covered by calyx cup | <i>Cinnamomum</i> 668 |
| 6. fruit with persistent calyx lobes but no cup | |
| 7. calyx lobes clasping base of fruit | <i>Persea</i> 676 & <i>Phoebe</i> 673 |
| 7. calyx lobes curved backwards | 655 <i>Machilus</i> |
| 5. fruit without persistent calyx | |
| 8. flower calyx lobes spreading | <i>Alseodaphne</i> 678 |
| 8. flower calyx lobes closely pressed together | <i>Nothaphoebe</i> 677 |
| 8. flower calyx lobes? | <i>Beilschmiedia</i> 681 & <i>Potameia</i> 680 |



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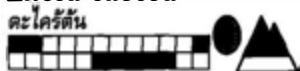
656

Litsea

Leaves usually alternate, rarely subopposite, buds usually without scales. **Flowers in globose heads** (compound umbels) at leaf axils or slightly behind leaves, covered by overlapping $\pm$ persistent bracts in bud.

Male & female on different trees.

Calyx with very short bell-shaped tube & usually 6 $\pm$ equal lobes. 9-12 fertile stamens in 3-4 whorls, inner whorl with 2 glands each, anthers 2-celled. Stigma obscurely lobed or peltate. Fruits with $\pm$ enlarged stalks & persistent **untoothed** calyx.

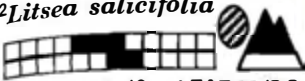
661 Litsea cubeba

Deciduous or semi-evergreen tree to 10 m, often flowering while still a slender shrub. **BARK** green when young, later dark grey with lighter patches, smooth. **LEAF** 5-14x1.5-5 cm, alternate, usually clustered near end of twigs, narrowly ovate or **lanceolate** with tapering tip & pointed base. Young shoots silky-hairy, mature leaves thin, **completely smooth**, dark green above, greyish (glaucous) below. 7-10 pairs of slender side veins, raised on both sides. Stalks 0.5-2 cm, narrowly winged. Twigs smooth, leaf buds without bracts. **FLOWER** bright yellow, in dense heads of 4-6 flowers with 4 papery, concave bracts at base. Main stalk short but slender, <1 cm, individual stalks 1-2 mm. 6 oval calyx lobes, smooth outside, finely hairy inside. Stamens $\pm$ 2 mm, anthers oblong with slender filaments, hairy at base only. Style short & curved, stigma discoid, ovary smooth. **FRUIT** 0.5-0.7 cm, yellow-green ripening black, globose, succulent, calyx tube not enlarged, $\pm$ 0.2 cm diam, stalks $\pm$ 0.4 cm, swollen at top.

NOTE common in open places & wasteground, sometimes cultivated. **Crushed leaves, flowers, fruits & bark** smell of **citronella**. Usually flowering when deciduous.

1. leaves more or less hairy below
2. midvein flat or raised above, calyx irregularly 2-3 lobed
2. midvein sunken above, 4-7 (usually 6) regular lobes
3. flower heads & fruits grouped into racemes ⁶⁵⁷ *L. wightiana*
3. flower heads & fruits solitary or fascicled
4. leaves leathery; calyx enlarged in fruit
5. leaves not glaucous below; small tree to 10m
5. leaves glaucous below; large tree to 40m ⁶⁵⁸ *L. semecarpifolia*
4. leaves not leathery; calyx not enlarged in fruit ⁶⁵⁹ *L. firma*
1. leaves smooth or nearly so below ⁶⁶⁴ *L. monopetala*
6. 3 main veins ⁶⁶⁵ *Neolitsea*
6. 1 main vein
7. calyx not enlarged in fruit; small $\pm$ deciduous tree ⁶⁶¹ *L. cubeba*
7. calyx enlarged in fruit; larger evergreen trees
8. leaves 15-25 cm, 6-8 pairs of side veins ⁶⁶⁰ *L. albicans*
8. leaves 7-10(25) cm, 10-15 pairs of side veins ⁶⁶² *L. salicifolia*



662 *Litsea salicifolia*

Evergreen tree to 10 m. **LEAF** 7.5-16x2-5 cm, alternate or subopposite, shape very variable, elliptic to lanceolate with tapering tip & pointed base. Young shoots finely hairy, mature leaves leathery, **smooth or nearly so**, glossy above, usually glaucous below. (6)10-15 pairs of side veins, flat or slightly raised above, prominent below. Stalks 0.6-2.5 cm, twigs minutely hairy. **FLOWER** in dense heads at leaf axils, solitary or several together (fascicled), males 4-6 flowered, head stalks <1 cm. 6 short calyx lobes, filaments hairy. **FRUIT** 0.8-1.5 cm, red to dark purple or black, succulent, narrowly ellipsoid or oblong. **Calyx tube much enlarged, club or funnel-shaped, narrower than fruit.**

NOTE widespread & fairly common.

663 *Litsea glutinosa*

var. *glutinosa*

พืชน้ำ ดอกส้ม



Small deciduous or semi-evergreen tree to 10 (15) m. **BARK** pale creamy-brown or greyish, ± finely fissured, inner bark yellow with aromatic resin. **LEAF** 8-23x4-11 cm, alternate, clustered near end of twigs, oval, obovate or elliptic-oblong with blunt tip & slightly pointed base. Young leaves densely covered with soft, yellowish hairs, mature leaves leathery, dark green & glossy with scattered hairs on main veins above, finely hairy below. 8-13 pairs of side veins, slightly raised above, tertiary veins ladder-like, faint above. Stalks 1-2.5 cm, finely hairy. **FLOWER** heads 8-10 flowered, several together in unbranched clusters at leaf axils, to 7 cm. 4 hairy bracts, ±5 mm, main stalks 1-3(6) cm, individual stalks 0.5-0.6 cm, finely hairy. **Calyx irregularly split into 1 or 2 lobes**, occasionally unlobed, hairy along margins. 9-20 stamens, anthers rounded, filaments hairy. Ovary small, smooth. **FRUIT** 0.7-1 cm, black, globose with flat or slightly sunken top. Calyx stout, fleshy, obconical, densely hairy. **NOTE** common & widespread, semi-open forests.



662 ♂



662 ♀



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664 *Litsea monopetala*

กะทิง หมื่นใบ



Small evergreen or briefly deciduous tree to 9 (17) m. **BARK** pale brown or darkish grey, smooth becoming rough & slightly furrowed/flaking with age, rather thick, inner bark with aromatic resin. **LEAF** 8-20x5-8/12 cm, alternate, mostly oval or obovate, sometimes ovate or oblong, with blunt or rounded tip & pointed or slightly heart-shaped base. Mature leaves smooth, dark green & glossy above, indistinctly yellow-brown hairy below. **All veins sunken above**, 6-12 pairs of side veins, smaller veins ladder-like, faint above. Stalks 0.6 - 2.5 cm, quite slender, finely hairy. **FLOWER** white or greenish-yellow, 5-6 dense heads clustered together at leaf axils or behind leaves, each head 24 cm diam. with 4-8 flowers & 4-6 rounded bracts, ± 4 mm, papery & quite densely hairy. Main stalks slender, 0.4-1.5 cm, individual stalks 2-4 mm, hairy. **Calyx with 5-7 irregular blunt lobes**, free or fused at base, reflexed, hairy especially on edges. Males with 9-12 slender stamens, longer than calyx lobes, ± 5 mm, inner whorl with 2 **stalked glands** each, 0.25-0.75 mm, inner stamens slightly shorter, anthers oblong, filaments long-hairy, females with 9-12 sterile stamens shorter than calyx lobes. **FRUIT** 0.6-1.2 cm, blue-black, smooth & glossy, oval or ovoid with slightly pointed tip & with **flat saucer-shaped calyx** 4-10 mm diam. Stalk stout, slightly thickened.

NOTE fairly common in both evergreen & deciduous forests throughout NT.

665 *Neolitsea cassia* เตียน

LEAF 8-26x3-8 cm, oblong-lanceolate, narrowed at both ends, leathery, completely smooth, with **3 main veins**, outer pair $> \frac{1}{4}$ length of leaf, 2-4 pairs of very steep side veins. **FLOWER** in heads as *Litsea* but **without stalks**, 4-5 calyx lobes & only **6 fertile stamens**. **FRUIT** 0.8-1.2 cm, ovoid or globose. **NOTE** rare, less disturbed forests > 1200 m.



666 *Lindera caudata*

Evergreen small tree or shrub. **LEAF** up to 15x4 cm, lanceolate with long-tapering tip & pointed base, finely hairy below, 3 main veins $\pm$ as long as leaf, stalks hairy, 0.7-1.1 cm. **Young leaves pale pinkish-purple.** **FLOWER** small, male & female on different trees, in head-like clusters (umbels) **without main stalks**, at leaf axils & just behind leaves, individual stalks $\pm$ 1 mm, hairy. 6 calyx lobes, fused into short tube at base, finely hairy. 9 short stamens, the inner 3 with 2 sessile glands, filaments hairy, anthers with 2 flaps, ovary smooth, at base of a hairy receptacle, large stigma, slightly 3-angled. **NOTE** uncommon, less-disturbed forests.

668 *Cinnamomum porrectum*

เทพทวาร จวงหอม



Large briefly deciduous tree to 30 m with open crown & long straight trunk. **BARK** dark grey or brown, **deeply & irregularly fissured**, inner bark red-brown, strongly aromatic. **LEAF** 5-15x2.5-6 cm, spirally arranged, elliptic or narrowly ovate with tapering or slightly pointed tip & blunt base. Mature leaves grey-green (glaucous) below, **old leaves red.** **1 main vein**, 3-7 pairs of arched side veins, raised on both sides with a fine raised network of smaller veins. Stalk 1.2-2.5 cm, twigs slender. **FLOWER** tiny, pale yellow, sweetly fragrant, in slender branched clusters at upper leaf axils & just behind end of twigs (pseudoterminal), 8-10 cm, individual stalks $\pm$ 0.5 cm, smooth. Structure as *Cinners*. **FRUIT** $\pm$ 0.8 cm, dark purple, globose, smooth. Calyx $\pm$ 0.4 cm, cup-shaped, without **teeth**. Stalks distinctly swollen near top. **NOTE** rare in less-disturbed lowland evergreen forest.



SIMILAR ⁶⁶⁹*C. camphora* leaves 5-8(11)x3-5(7) cm, ovate with tapering tip, distinctly glaucous with glands in vein axils below. 3-4 pairs of side veins, lowest pair basal & reaching $\frac{1}{2}$ - $\frac{3}{4}$ length of leaf but much thinner than midvein. Stalks 2.5-3 cm, old leaves red. Flower clusters $\pm$ 7 cm, individual stalks 1-1.5 mm, smooth. Originally from China, occasionally cultivated in NT, traditionally a source of Camphor.

670 *Cinnamomum iners*

ခင်းပင်



Evergreen tree to 20 m with dense oval or cylindrical crown. **BARK** pale brown or greyish, smooth, thin, inner bark pinkish with a **strong smell of cinnamon**. **LEAF** 8-30x3-9 cm, (sub)opposite, oblong or lanceolate, $\pm 3\times$ as long as wide & widest in middle, blunt or slightly pointed at both ends. Young twigs pink, **silky-hairy**, mature leaves leathery, completely smooth, dark green above, grey-green (glaucous) below. **3 main veins running $\pm$ entire length of leaf**, outer pair joined to central one ± 5 mm above base of leaf, **transverse veins faint**, ladder-like. Stalks 0.8-1.7 cm, twigs slender & shiny, old leaves yellow. **FLOWER** ± 0.5 cm, white, in slender branched clusters at end of twigs & upper leaf axils, **as long as leaves**, 10-25 cm. Main stalks long & slender, individual stalks 0.4-0.5 cm, **finely silky-hairy**. Calyx with 6 lobes in 2 rows, 2-3 mm, finely silky-hairy outside & at base only inside. 9 fertile & 3 sterile stamens, inner fertile whorl with glands. Style as long as ovary with disc-like stigma, ovary smooth. **FRUIT** 1-1.5 cm, dark green ripening purple-black, oval, with persistent but not enlarged cup-shaped calyx at base, ± 5 mm, **lobes partly deciduous, breaking in half**. Inside with juicy purple flesh & a single large smooth seed.

NOTE common in understory of evergreen forests.

SIMILAR 671 *C. caudatum* leaves 5-14x3-9 cm, alternate, $< 2\times$ as long as wide, ovate with tapering tip & blunt or rounded base, $\pm$ oblique. Flower clusters shorter than leaves, < 10 cm, individual stalks 6-8 mm. Fruits with persistent calyx lobes, not breaking in $\frac{1}{2}$. 672 *C. verum* ရှိခင်းပင် leaves 5-15x3-8 cm, $\pm 2\times$ as long as broad, distinctly glaucous below. Outer 2 veins reaching $\pm \frac{3}{4}$ length of leaf, smaller veins clear. Calyx lobes densely hairy outside, silky inside. Fruits 1-1.6 cm, calyx 0.7-1 cm, with 12 ridges, lobes breaking off near base. This is the "true" cinnamon of commerce, rare in the wild.



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Phoebe

Leaves alternate, often clustered near end of twigs, frequently with sympodial branching. Flowers bisexual, in branched clusters at upper leaf axils & close to end of twigs (pseudo-terminal), without whorl of bracts at base. Calyx with short tube & 6 lobes, outer 3 slightly shorter. 9 fertile stamens, inner whorl with 2 glands on filaments. 3 sterile stamens heart-shaped with distinct stalks. Style slender with blunt stigma, ovary superior. Fruits ovoid or ellipsoid with **hard, cup-shaped calyx at base**, stalks not thickened. Base enclosed by hard, closely pressed calyx lobes.

673 *Phoebe lanceolata*

แหลมบก ดงห่อม



Evergreen tree to 15 m, flowering while still a shrub. **BARK** brown, cracked. **LEAF** 10-25x2-8 cm, **narrowly elliptic to lanceolate** or almost linear, tapering at both ends. Bud scales densely hairy, mature leaves thinly leathery, **completely smooth**, dark green above, grey-green (glaucous) below especially when younger. 6-10(15) pairs of arched side veins, slightly raised above, smaller veins ladder-like, faint above. Stalks 1.5-2.5(4) cm, **FLOWER** small, white or cream, in slender long-stalked clusters crowded near top of twigs, to 20 cm. Individual stalks 2-4 mm, slender, smooth. Calyx lobes 23 mm, **smooth**. **FRUIT** 0.8-1.2 cm, glossy black, oblong or narrowly ovoid, flattened or slightly sunken at both ends, with persistent calyx at base, ± 5 mm. Stalks to 1 cm, slightly thick & warty.

NOTE common in both dense & semi-open evergreen forests, also sometimes in deciduous forests.

SIMILAR see page 292.



674 *Phoebe paniculata* มะดูกดง

Evergreen tree to 13m. **BARK** pale with short fissures & large lenticels. **LEAF** 10-30x5-9 cm, lanceolate, elliptic or narrowly obovate, tapering both ends. Young shoots brown-hairy, mature leaves sparsely hairy below & often also on midvein above. 6-12 pairs of side veins, prominent below. Stalks 0.8-2(4) cm. **FLOWER** small, white, in branched clusters on long slender common stalks at end of twigs & upper leaf axils, axes hairy. Individual stalks at least as long as calyx, hairy. Calyx lobes pointed, $\pm$ 3mm, **hairy outside**, inner ones slightly shorter & rounded. **FRUIT** 0.8-1.2 cm, oval, black & glossy, partly enclosed by hard persistent calyx. **NOTE** scattered in less disturbed hill forests.



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675 *Phoebe cathia*

LEAF $\pm$ 16x5 cm, elliptic or obovate, stalks $\pm$ 1.2 cm. **FRUIT** $\pm$ 1.5 cm, ellipsoid with slightly sunken tip. Calyx $\pm$ 4 mm, lobes overlapping, hard & closely pressed to base of fruit. Stalks thickened, bright red. **NOTE** scattered in moist hill evergreen forests.



675



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676 *Persea gamblei* อินทนิล

Evergreen tree. twigs hairy at first. **LEAF** 14-20x3.5-6.5 cm, alternate, (ob)lanceolate, tapering at both ends. Young shoots red-brown hairy, mature leaves smooth & nearly glossy above, **finely red-brown hairy below**. 6-10 pairs of curved side veins, prominent below. Stalks $\pm$ 1 cm, hairy when younger. **FLOWER** in branched clusters with flowers only near end of branches, shorter than leaves. Stalks red-brown hairy. Calyx $\leq$ 4mm, 6 $\pm$ equal lobes in 2 rows, **silky-hairy both sides**. 9 fertile stamens, shorter than calyx, filaments hairy, 3 inner ones with 2 glands, 3 sterile stamens with arrow-shaped heads. Ovary smooth, stigma small, disc-like. **FRUIT** $\pm$ 0.7 cm, globose. **NOTE** scattered in less disturbed hill forests.



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677 *Nothaphoebe umbelliflora*

ทังใบชา



Evergreen tree to 30 m. **BARK** grey-brown, smooth or slightly scaly with many lenticels. **LEAF** 13-20x5-7 cm, alternate or subopposite, clustered near end of twigs, narrowly elliptic or obovate with blunt or abruptly pointed tip & tapering base. Young shoots finely hairy, mature leaves leathery, completely smooth. 5-12 pairs of side veins, curved & joined at margin, midvein raised above. Stalks 1-2 cm, grooved, twigs slightly angled. Buds small, ovoid. **FLOWER** in branched clusters at upper leaf axils & close to end of twigs (pseudo-terminal), 8-19 cm, flowers in groups of 3-5. Individual stalks 3-5 mm, finely brown-hairy. Calyx tube short with 6 hairy lobes in 2 whorls, **outer whorl smaller than inner whorl, closely pressed together even in mature flowers**. 9 fertile stamens with rounded anthers & short, hairy filaments, inner 3 with glands. 3 minute sterile stamens. Style slender with small, peltate stigma, ovary smooth. **FRUIT** to 3 cm, shiny green ripening dark red then black, oblong or obovoid with persistent but not enlarged calyx at base. **Stalks pink or red**, very conspicuous, swollen at top.

NOTE locally common in less-disturbed evergreen forests.



678 *Alseodaphne nigrescens*

ขมิ้นดิน

LEAF to 19x9 cm, elliptic, spirally-arranged, often clustered at intervals. Young shoots with short dense orange-brown hairs, ± persistent at least below, stalks short, twigs whitish. **FLOWER** bisexual, in branched clusters at leaf axils. Calyx with 6 **spreading** lobes, outer 3 slightly smaller. 9 fertile stamens with distinct filaments, inner whorl with glands, 3 very small sterile stamens. Style slender, as long as ovary with small, disc-like stigma. Ovary partly enclosed in a rather shallow tube. **FRUIT** to 3.7-1.6 cm, black & glossy, bullet-shaped, thinly fleshy & juicy or woody with enlarged fleshy stalk but no calyx. **NOTE** uncommon, less-disturbed evergreen forests.



679 *Cryptocarya pallens*

หมากขี้ฉ้าย



Evergreen tree to 15 (30) m with narrow crown & long, straight trunk.

BARK pale orange-brown, **peeling in very thin, papery flakes**, inner bark cream, strongly perfumed. **LEAF** 7-19x3-8 cm, alternate, narrowly ovate or elliptic with shortly tapering or blunt tip & pointed or blunt base, $\pm$ slightly asymmetric. **Young shoots finely brown-hairy**, mature leaves smooth & glossy above, grey-green (glaucous) & smooth or indistinctly hairy smooth below. 1 main vein, sunken above, 5-9 pairs of steeply curved side veins, flat above. Stalks 0.6-1(2) cm, finely hairy. **FLOWER** 0.2-0.3 cm, pale yellow or greenish, in branched clusters at axils of upper leaves & $\pm$ as long as them, individual stalks < 2 mm, with pale hairs. Calyx with 6 subequal lobes as long as tube, ± 2 mm, hairy outside. 9 fertile stamens, inner 3 with 2 glands. 3 conspicuous sterile stamens with distinct stalks. Stigma small, ovary smooth, hidden in calyx tube. **FRUIT** 1.4-2.5 cm, dark green ripening purple-black, ovoid-oblong with pointed tip, **almost completely enclosed by hard, persistent calyx**, thinly fleshy with 2 ovoid seeds.

NOTE scattered in hill-evergreen forests, moderately fire-tolerant.

680 *Potameia*

FLOWER in branched clusters, bisexual, 4 equal sepals in 2 opposite whorls. 4 fertile stamens, 2 smaller infertile stamens, anthers 2-celled. stigma inconspicuous. ovary superior. **FRUIT** stalk not thickened, with disc-like remains of tube $\pm$ with subsessile calyx.

681 *Beilschmiedia*

Large evergreen trees. **LEAF** 8-26x3-10 cm, alternate or subopposite, side veins typically widely spaced & conspicuous, raised above. **FLOWER** small, bisexual, in branched clusters at leaf axils & just behind end of twigs (pseudoterminal), without whorl of bracts at base. Calyx tube short with $\pm$ equal lobes. 6 or 9 fertile stamens with **hairy filaments**, inner whorl with glands at base. 3 **spear-shaped sterile stamens with distinct stalks**. Stigma very inconspicuous. **FRUIT** to 6 cm, oval-oblong, smooth, usually rather woody, **without calyx at base**, stalks not or hardly swollen. **NOTE** scattered in hill forests, probably several distinct species in NT.

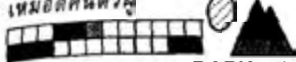


PROTEACEAE

1300 species mainly in Australia & S. Africa. 2 genera & 3 species in NT.

682 *Helicia nilagirica*

HELICIA 682



Evergreen tree to 15 m. **BARK** pale cream to dark brown, shallowly cracked or almost smooth. **LEAF** 8-20x4-9 cm, simple, alternate, spirally arranged, obovate or elliptic with shortly pointed or blunt tip & narrowed base, **untoothed or with scattered coarse teeth**. Young shoots densely red-brown hairy, mature leaves leathery, **smooth or nearly so**, dark green above, pale grey-green below. 6-12 pairs of curved side veins. Stalks 0.5-2.5 cm, no stipules. **FLOWER** 1-1.8 cm, pale yellow or greenish-white, **bisexual**, regular, in narrow unbranched clusters at leaf axils or behind leaves, 5-20(34) cm. Individual stalks 2-4 mm, **fused in pairs**, **smooth**. Calyx (perianth) with 4 oblong lobes fused into short tube at base, curling backwards with age, not overlapping, **smooth**. No corolla. 4 stamens attached to base of lobes with short filaments & oblong anthers. Style to 1.5 cm, very slender, club-shaped at top. Ovary smooth with 4 disc glands. **FRUIT** 2-3.8 cm, purple-brown, smooth, globose or obovoid with short tip & **narrow base (stipe)**, 1 large seed. Stalks to 0.5 cm, stout & woody. **NOTE** very common in semi-open hill forests, often with pine. **SIMILAR** 2 other species with narrower, oblanceolate leaves:

683 *Helicia formosana* var. *oblanceolata* leaves 15-39x3-9.5 cm, sharply toothed, often hairy esp. on main veins below, stalks mostly <0.8 cm. Flower 1.6-2.7 cm, stalks & calyx usually hairy. Fruit 1.2-2.8 cm, slightly hairy, mostly without stipe.

684 *Heliciopsis terminalis* leaves of young trees deeply lobed, up to 50 cm, mature trees with leaves usually <20x7 cm, not lobed or toothed, stalks 1.5-4 cm. Flowers 1-1.4 cm, ♂ & ♀ on different trees, stalks & calyx finely hairy. Fruits 3-4.2 cm, 1-2 seeds, wrinkled in upper half, no stipe.



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THYMELAEACEAE

750 species mainly in Australia & S.Africa, 2 genera & 3 species in NT.

685 *Aquilaria crassna* eaglewood

ฤๅษณา ไผ่พยอม



Evergreen tree to 30 m with narrow crown & slender, drooping branches.

BARK brownish-grey, shallowly fissured & flaking in thin strips, inner bark pale yellow with patches of **fragrant, dark-colored resin** in old trees. **LEAF** 6-11x3-5 cm, simple,

alternate, spirally-arranged, lanceolate or narrowly elliptic with tapering tip & blunt or pointed base, untoothed but often wavy. Young shoots densely silvery silky-hairy, mature leaves leathery, dark green above, smooth or with scattered silky hairs on main veins below. **3 main veins** from base,

12-19 pairs of faint side veins with **many parallel intermediate ones**, reaching margin, tertiary veins ladder-like. Stalks 0.2-0.7 cm, no stipules. **FLOWER** 0.6-0.8 cm, white or pale green, regular, bisexual, in simple clusters (fascicles) at or opposite upper leaf axils. Individual stalks 0.6-1 cm, slender, silky-hairy, main stalks 0.3-1 cm. Calyx (perianth) bell-shaped with 5 lobes, 3-4 mm, no corolla but with **10 hairy petal-like scales** attached to mouth of calyx tube opposite lobes, ± 1 mm. 10 stamens in 2 rows, fused to mouth of calyx, $\pm$ as long as lobes. Style < 1 mm, stigma 2-4 lobed, ovary superior, brown-hairy, no disc. **FRUIT** 2-4 cm, bright green, silky-hairy when young, obovoid or oval with a **narrow longitudinal ridge & persistent enlarged calyx at base**, thinly leathery, becoming strongly wrinkled & eventually splitting into 2 sections, 1(2) glossy seeds with a **long, tail-like appendage**.

NOTE rare in the wild, confined to well-protected areas. Highly valued for its fragrant resin which is only found in dying trees & seems to be caused by a disease.



EUPHORBIACEAE

Very large & diverse family, 8100 species found everywhere in the world except the Arctic & Antarctic but most abundant in the tropics. One of the 2 biggest families of trees in NT (together with *Leguminosae*), with at least 30 genera & 70 species.

BOTANY Evergreen or deciduous trees, occasionally with white latex or watery sap. Leaves simple (except *Bischofia*), mostly alternate, less commonly opposite, sometimes palmate or lobed, often with long, slender stalks swollen at top & sometimes with glands, nearly always with stipules but they are often small & fall early. Flowers generally small & inconspicuous, mostly green, yellow or white, male & female always in different flowers but either on the same or on different trees. 3-5 sepals, petals often absent, (3-5 & free if present), 1 to many stamens, free or fused into central column. 2-3 styles usually fused at base & forked at tips, ovary superior. Fruits always with few seeds (1-6), often 3(6) lobed, dry & splitting or thinly fleshy & not splitting, seeds sometimes surrounded by fleshy pulp.

ECOLOGY *Euphorbiaceae* is one of the commonest families in moister lowland forests & in secondary growth areas. In lower hill forests & dry deciduous forests they are less common but still significant, whilst in upper hill forests they are rarely found except in gaps & other open areas. Most of the species are shrubs or small trees, very few of them reach 20 m. Despite the small size of the flowers, *Euphorbiaceae* are almost all are insect pollinated.

USES *Hevea brasiliensis* (rubber tree) & *Manihot esculenta* (cassava), both from S.America, are the most important members of the family. None of the local species are of commercial significance although some provide edible fruits (*Phyllanthus emblica* & *Baccaurea ramiflora*).

NOTE *Euphorbiaceae* is a very diverse family which is difficult for the beginner to recognise as there are almost no delineating characters which all species have in common. Bearing in mind that it is one of the commonest families, you should always suspect that a tree with simple leaves & inconspicuous unisexual flowers might be a *Euphorbiaceae*! Several botanists have questioned whether *Euphorbiaceae* is a natural family at all (ie: derived from a common ancestor) and it is quite likely that in future it will be split into several distinct families. *Euphorbiaceae* is currently being revised for the Flora of Thailand.

- | | |
|---|----------------------------------|
| 1. plant like a cactus | 686 <i>Euphorbia</i> |
| 1. plant not like a cactus | |
| 2. leaves trifoliate | <i>Bischofia javanica</i> 701 |
| 2. leaves simple | |
| 3. leaf base peltate | |
| 4. leaf base strongly peltate (>5 mm from edge) | |
| 5. young shoots, flowers & fruits with dense star-shaped hairs | <i>Mallotus barbatus</i> 731 |
| 5. all parts smooth or with scattered hairs | |
| 6. leaves 7-9 lobed | 687 <i>Ricinus communis</i> |
| 6. leaves 2-5 lobed or not lobed | <i>Macaranga</i> 726 |
| 4. leaf base weakly peltate (<5 mm from edge) | |
| 7. leaves not toothed, with red margins & stalks; fruits smooth | <i>Bala kate baccata</i> 742 |
| 7. leaves often toothed, margins & stalks usually green; fruits bristly | <i>Mallotus peltatus</i> 734 |
| 3. leaf base not peltate | |
| 8. leaves with scales or star-shaped hairs | |
| 9. leaves with scales | |
| 10. leaves linear, >5x as long as wide | <i>Homonoia riparia</i> 725 |
| 10. leaves not linear, <3x as long as wide | <i>Croton</i> 710 |
| 9. leaves with star-shaped hairs | |
| 11. leaves opposite | |
| 12. leaves ovate, <2x as long as wide, usually densely hairy below | <i>Trewia nudiflora</i> 747 |
| 12. leaves oblong, >2x as long as wide, scattered hairs | <i>Mallotus</i> 729 |
| 11. leaves alternate | |
| 13. leaves with a pair of glands at base | |
| 14. leaves ovate, flowers in spreading clusters with showy white petals | 688 <i>Aleurites moluccana</i> |
| 14. leaves obovate or oblong, flowers in narrow clusters, no petals | <i>Croton</i> 710 |
| 13. leaves without glands at base | 689 <i>Sumbaviopsis albicans</i> |
- lvs 15-23x7-13 cm, slightly toothed, ± minutely peltate, stalks ±6 cm, swollen both ends; fws in bisexual racemes at end of twigs, 5 calyx lobes; males with 0, 5 or 10 petals, broad & overlapping, many free erect stamens, no sterile pistil; females without petals, 3 styles fused at base, forked at tip; fls to 3.3x1.5 cm, depressed-globose & slightly 3-lobed, splitting, golden-brown, scurfy.

EUPHORBIACEAE

8. leaves smooth or with simple hairs

14. leaf stalks long & slender, 3-12 cm, often swollen at both ends, leaves smooth or nearly so, spirally arranged, often toothed

15. leaves ovate or elliptic with red or black glands near base

16. leaves toothed

17. bark deeply cracked, with white latex

Sapium insigne ⁷⁴⁴

17. bark not deeply cracked, with clear or reddish sap

Macaranga kurzii ⁷²⁸

16. leaves not toothed

Balakata baccata ⁷⁴² & *Sapium discolor* ⁷⁴³

15. leaves narrowly obovate or elliptic-oblong, glands greenish or absent

18. flowers & fruits at end of twigs (sometimes also in upper leaf axils)

Trigonostemon ⁷⁴⁵

18. flower & fruits behind leaves or in lower leaf axils

19. leaves with glandular rounded teeth

Ostodes paniculata ⁷³⁶

flowers with petals; fruits brownish, with short nipple-like style, no fleshy pulp

19. leaves untoothed or with shallow rounded teeth

Baccaurea ramiflora ⁷⁰⁰

flowers without petals, males with 4-8 stamens, females with short stalks & styles; fruits with fleshy pulp

19. leaves usually with small but quite sharp teeth, rarely untoothed

Cleidon spiciflorum ⁷⁰⁹

flowers without petals, males with 35-80 stamens, females with long stalks & styles; fruits green, without fleshy pulp

14. leaves stalk short & stout 0.2-1.5 (2.5) cm, leaves smooth or hairy, often planar, not toothed

20. leaves tiny, <2.5x0.4 cm, strongly planar & appearing pinnate

Phyllanthus emblica ⁷³⁷

20. leaves larger, >3x0.5 cm

21. stipules fused in ring, flowers & fruits opposite leaves

Suregada multiflora ⁷⁴¹

21. stipules not fused, flowers & fruits in leaf axils or at end of twigs

22. flowers & fruits in elongated, unbranched clusters (racemes)

23. fruits red or black, not splitting, male & female flowers on different trees

Antidesma ⁶⁹¹

23. fruits yellowish, splitting male & female flowers on same tree

Phyllanthus columnaris ⁷³⁸

22. flowers & fruits in fascicles or head-like clusters (fascicles/condensed racemes)

24. flowering specimens

25. flowers with petals (often minute!)

26. leaf veins distinct; style with 2 branches

Bridelia ⁷⁰²

26. leaf veins indistinct; style with 3 branches

⁶⁹⁰ *Cleistanthus*

lvs untoothed, base symmetrical, often glaucous below; small stipules often paired; flowers like *Bridelia*; fruits dry & woody / leathery, 3-lobed, splitting, 2 seeds per lobe no aril

25. flowers without petals

27. stamens fused in column, stigmas in cone

Glochidion ⁷¹⁹

27. stamens free or fused at base only

28. flowers without disc, leaves ± with glands at top of stalks, ± toothed

Aporosa ⁶⁹⁷

28. flowers with disc, leaves without glands, not toothed

Phyllanthus roseus ⁷³⁹

24. fruiting specimens

29. fruits splitting when ripe

30. seeds with red or orange coating (ariloid)

31. fruits distinctly 3-6-lobed, splitting from base upward

Glochidion ⁷¹⁹

31. fruits not distinctly lobed, splitting from top downward

Aporosa villosa ⁶⁹⁷

30. seeds without red or orange coating

Cleistanthus (see above)

29. fruits not splitting when ripe

32. leaf base symmetric, smooth or hairy with obvious veining

33. fruits in contracted racemes

Aporosa octandra ⁶⁹⁸ & *A. wallichii* ⁶⁹⁹

33. fruits in head-like clusters

Bridelia ⁷⁰²

32. leaf base asymmetric, always smooth, veining less obvious

Phyllanthus roseus ⁷³⁹

Antidesma

Shrubs & small trees. Leaves alternate, not lobed or toothed, stalks short with deciduous stipules, no glands. **FLOWER** minute, in slender spike-like clusters, often several grouped together, male & female on different trees. Calyx cup-shaped with 3-5 overlapping sepals, no corolla. **Males with a prominent disc of free or fused glands** & 3-5 stamens, longer than sepals. Females with ring-like disc & 3(4-5) short forked styles. **FRUIT** globose or oval with persistent calyx at top, ripening red or black, not splitting, fleshy with a slightly flattened stone & 1(2) seeds.

691 Antidesma bunius

မုသိမ်း



Small tree to 8 (17) m with dense crown & stout, gnarled trunk. **BARK** dark grey-brown, slightly fissured & flaky, inner bark reddish. **LEAF** 8-22x3-8 cm, narrowly elliptic-oblong or obovate with blunt or abruptly tapering tip & pointed base. Leaf buds with brown hairs, mature leaves dark green & glossy above, **smooth both sides**, 7-9 pairs of arched side veins, joined near margin, dense network of smaller veins. Stalks 0.5-1.2 cm, stipules 3-9 mm. Young twigs green with creamy-brown lenticels. **FLOWER** in branched or unbranched drooping spikes at end of twigs & upper leaf axils, 5-15 cm, axes smooth. Male flowers without stalks, 4 sepals, ± 1 mm, smooth. 3-4 stamens, yellow-green ripening red with **purple-black anthers**. Disc with 4 distinct glands, slightly hairy at base. Sterile ovary stout, obovoid, much larger than disc. Female flowers with short stalks, sepals ± 0.5 mm, hairy along edges, 4(5) stigmas, disc & ovary smooth. **FRUIT** 0.6-1.2 cm, globose, spikes 5-10 cm, individual stalks 0.3-0.5 cm. **NOTE** common in evergreen forests 700-1500 m, sometimes cultivated.

1. twigs & mature leaves completely smooth

2. leaves 8-20 cm, thick, male flowers without individual stalks
disc of 4 distinct glands*A. bunius* ⁶⁹¹2. leaves to 12 cm, thinner, male flowers with individual stalks ± 1 mm
disc dome-like*A. acidum* ⁶⁹⁴

1. twigs & mature leaves hairy at least on veins

3. leaves 3-12 cm, 6-7veins; disc not dome-shaped

4. leaves with blunt or rounded tip; calyx 4-5lobed, 4-5stamens

disc of free, hairy glands; stigma lateral

Aghaeseimbilla ⁶⁹²

4. leaves with pointed tips; calyx 3-lobed, 3 stamens

disc glands fused into smooth cup, stigma terminal

A. sootepense ⁶⁹³

3. leaves 10-20 cm, 8-16 veins; disc dome-shaped

5. leaves & twigs sparsely hairy, calyx 4-lobed, 4 stamens

stigma terminal; fruits smooth

Amontanum ⁶⁹⁵5. leaves & twigs $\pm$ densely yellow-hairy, calyx 5-6lobed, 5-6 stamens

stigma lateral; fruits slightly hairy

A. velutinosum ⁶⁹⁶

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692 *Antidesma ghaesembilla*

เผือกป่า



LEAF 4-10x2-5 cm, oval or ovate with blunt or slightly notched at both ends. Young leaves pink & quite densely hairy, mature leaves dark green, **smooth or sparsely hairy** below & on veins only above. 6-7 pairs of arched side veins, fine network of smaller veins. Stalks 0.2-1.2 cm, red-hairy esp. when young. **FLOWER** males ± 1.5 mm, green-yellow, faintly scented, loosely clustered in short upright bunches of 2-8 spikes at end of twigs & upper leaf axils, 3-10 cm. Main stalks hairy, individual flowers without stalks. 4-5 rounded calyx-lobes, ± 0.8 mm, hairy both sides. Disc of 4-5 free glands, finely hairy. 4-5 stamens, sterile ovary hairy. Females 2-3 mm, individual stalks 0.5 mm, **hairy**, **sepals** ± 1 mm, **hairy both sides**. 3-4 terminal stigmas. **Disc cup-shaped with long hairs**. **FRUIT** 0.3-0.5 cm, **hairy**, globose or slightly flattened with small nipple at top.

NOTE fairly common in semi-open areas & along edges of evergreen forests.

693 *Antidesma sootepense*

มะเผือกสาย



Shrub or small tree to 6 m. **LEAF** 3-12x1-3.5 cm, oblong or lanceolate with **tapering tip & pointed base**. Mature leaves finely hairy or almost smooth below. 6-7 pairs of arched side veins. Stalks 0.2-0.4 cm, usually hairy. Twigs red-brown hairy when young, later smooth. **FLOWER** males in slender branched clusters at end of twigs, to 10 cm, main stalks slightly hairy. 4 sepals, hairy outside, ± 0.5 mm. 4 stamens surrounded by smooth disc with fused glands, sterile ovary obconical, very slightly hairy. Female spikes unbranched, to 7 cm, individual stalks robust, < 1 mm, sepals hairy both sides, ± 0.8 mm. Stigmas terminal, disc cup-like, **nearly smooth**, ovary smooth. **FRUIT** smooth.

NOTE common in both deciduous & evergreen forests.



694 *Antidesma acidum*

เผ่าสร้อย



LEAF 5-12x2-5 cm, obovate with abruptly tapering tip & pointed base. Mature leaves smooth or sparsely hairy on veins. 5-8 pairs of arched side veins. **FLOWER** males with stalks 1-3 mm. **3 sepals**, 1 mm, sparsely hairy outside. 3 stamens 2 mm, attached to dome-like disc, hairy around edges. Females with 3 terminal stigmas, ovary 2 mm. **FRUIT** ±0.5 cm, usually slightly hairy, clusters to 7 cm. **NOTE** common in drier deciduous & pine forests.

695 *Antidesma montanum*

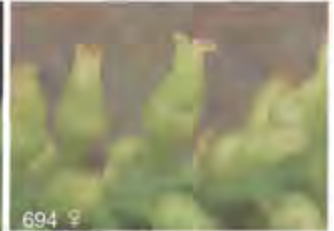
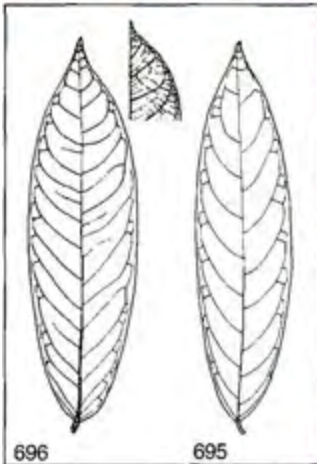
มะเขือขาม



Tree to 8-10 m. **LEAF** 10-22x3-8 cm, obovate-elliptic or oblong with pointed or tapering tip & blunt or pointed base. Mature leaves thin, **smooth or sparsely hairy** esp. on veins. 8-10 pairs of side veins, looped at margin, fine network of smaller veins. Stalks 0.3-0.7 cm. **FLOWER** in slender ± branched clusters at end of twigs & upper leaf axils, 3-12 cm. Bracts narrow & pointed, 1 mm, stalks 1 mm. **3 rounded sepals**, 1 mm, **nearly smooth on both sides**. Males with 3-4 stamens attached to smooth, dome-shaped disc, sterile ovary smooth. Females with 3-4 **terminal stigmas**, ovary smooth. **FRUIT** 0.4-0.7 cm, globose, deeply dimpled.

696 *A. velutinosa* เผ่าเหล็ก

LEAF 10-25x3-8 cm, oblong or lanceolate with tapering tip & pointed base. Young shoots densely hairy, mature leaves thin, with **silvery or yellowish velvety hairs on both sides**, especially on veins. 9-16 pairs of looped side veins, sunken above. Stalks 0.3-0.7 cm. **FLOWER** at end of twigs & upper leaf axils, 8-10 cm. **45 pointed sepals**, 1-1.5 mm, **very hairy both sides**. Males with 5-6 stamens attached to smooth, dome-shaped disc, sterile ovary obovoid, hairy at top. Females with 4 reflexed **lateral stigmas** & smooth, cup-shaped disc. Ovary smooth or sparsely hairy. **FRUIT** 0.5-0.6 cm, globose or slightly oblique, coarsely dimpled, finely hairy. Spikes 7.5-15 cm, individual stalks to 0.5 cm.



697 *Aporosa villosa*

เหมือดโตนด เหมือดหลวง



Small deciduous tree to 8-10 m. **BARK** grey-brown or red-brown, deeply cracked, thick, inner bark pale yellow or orange with thin brown rings. **LEAF** 9-18x5-8 cm, sometimes up to 28x15 cm, alternate, spiral or planar, elliptic-oblong or narrowly obovate with blunt or abruptly pointed tip & rounded or slightly pointed base, untoothed or with scattered shallow rounded teeth. Mature leaves thick, **densely covered by short soft brown hairs below** & on veins only above. 7-10 pairs of arched side veins, joined at margin. Stalks 0.8-2.5 cm, thick, swollen with 2 small hairy glands at top, densely hairy. **FLOWER** male & female on different trees. Males in spikes, 1.5-5 cm, several together at leaf axils or behind leaves, stalks hairy, 3-9 flowers per bract. Calyx cup-shaped, 3-4(5) sepals, usually **hairy both sides**, no corolla. 2-3(5) free stamens, no disc. Females in clusters of 2-5 flowers on stout stumps, to 1 cm, individual flowers without stalks. Styles doubly forked with 4 stigmas, **ovary brown-hairy**. **FRUIT** $\pm 1 \times 0.7$ cm, ovoid with curved tip & persistent styles, **densely yellow-brown hairy, splitting, irregularly**, 1 seed with **fleshy orange coating (aril)**. **NOTE** common understory tree of both deciduous & pine forests.

SIMILAR 698 *A. octandra* นวลเสี้ยน evergreen tree. young shoots slightly hairy, mature leaves completely smooth. Male flower clusters ± 3 cm, sepals hairy along margins. Females with densely brown-hairy ovary. Fruit ± 0.7 cm, globose, not splitting, slightly hairy when young, finally smooth. 1-2 flattened seeds without colored aril. Less common, moister areas.

699 *A. wallichii* deciduous tree. Leaves completely smooth. Male flower clusters 2-5 cm, all parts smooth except base of bracts. 3-5 narrowly obovate sepals, ± 1.5 mm. Females with smooth ovary. Fruit ellipsoid, smooth, splitting irregularly. 1-2 seeds with bright orange coating (aril). Uncommon, moist areas.



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704 *Bridelia retusa*

เต็งหนาม



Small deciduous tree to 10(20) m with irregular, shabby crown & horizontal or drooping sprays of leaves. **BARK** pale grey or grey-brown & smooth when young, becoming dark brown & fissured with age, **often slightly spiny when young**. **LEAF** 6-26x3-12 cm, becoming much smaller towards end of twigs, alternate-planar, oblong or elliptic, slightly pointed or blunt at both ends, sometimes slightly notched, without teeth. Young shoots finely grey-hairy, mature leaves leathery, smooth except on midvein above, finely hairy or almost smooth below. **16-24 pairs** of +straight & parallel side veins, forked but **reaching margin & joined to a thin vein which runs along the very edge of the leaf**. Stalks 0.6-1.2 cm, no glands. Stipules ± 2 mm, pointed, falling early. Old leaves pinkish-brown. **FLOWER** ± 0.5 cm diam, green or yellowish-green, sometimes with orange or red tinge, in dense heads of (3)8-15 flowers at axils of leaves or grouped into spike-like clusters at end of leafless twigs, male & females in different flowers but on same tree. Individual flowers with **short stout stalks**, < 2 mm. 5 thick triangular sepals 1.5-2 mm, not overlapping, smooth or hairy especially near base. 5 fragile, whitish petals with jagged tips, 1-1.5 mm. Males have **stamens & sterile pistils fused into a stout column**, 1-1.5 mm, with 5 **spreading arms** tipped with red-purple anthers. Females have 2 styles with forked stigmas, fused at base only, ± 1 mm. Ovary < 1.5 mm, partly enclosed in flask-shaped disc. **FRUIT** 0.5-0.9 cm, pale green ripening blackish, globose or ovoid, sometimes 2-lobed, not splitting, thinly fleshy with **two** thin-walled stones. **NOTE** common in deciduous & dry evergreen forest & open areas 600-1000 m, rarely to 1400 m. **SIMILAR** 4 other closely related species (see p. 306 & 307).

1. leaves with side veins not reaching edge of leaf.

B. glauca 707

flower stalks 2-6 mm. Fruits with 1 stone

1. leaves with side veins running right to the edge of the leaf.

flower stalks < 2 mm. Fruits with 2 stones

2. mature leaves completely smooth

3. 13-17 pairs of side veins

B. ovata 708

3. 5-10(12) pairs of side veins

B. curtisii (see below)

2. mature leaves hairy at least below

4. (16)19-28 pairs of side veins

B. retusa 704

4. 5-15 pairs of side veins

5. fws 6-12 mm, in spike-like clusters in front of lvs

B. stipularis 705

sepals 4-5 mm, hairy; fts 0.7-1.2 cm, stipules quite persistent.

5. fws 2-6 mm, in leaf axils, sepals < 3 mm, smooth; fts 4-8 mm

6. (9)11-15 pairs of side veins; fws dark red.

703 *B. affinis*

shrub to 6 m, lvs 5-22x2.5-8.5 cm, blunt or pointed both ends, rough hairy below

fws 0.4-0.6 cm, up to 10 per cluster, sepals 1.5-3 mm; fts 0.6-0.8 cm, blackish

6. 5-12(15) pairs of side veins; flowers green or yellowish.

7. leaves with pointed tips, densely hairy below *B. tomentosa* 706

7. leaves with blunt tips, sparsely hairy

702 *B. curtisii*

tree to 7 m; lvs 3-8x1-3.6 cm, leathery, fws 0.3-0.5 cm, sepals 1.5-3 mm



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705 *Bridelia stipularis*

มะกานเครือ



LEAF densely covered with soft brown hairs when young, later sparsely hairy above but **quite densely velvety-hairy below**. **9-13(15) pairs** of side veins. Stipule 3-10 mm, quite persistent. **FLOWER** 0.7-1.2 cm, 3-6 flowers per cluster, stalks <1 mm, sepals 4-5 mm, hairy outside, petals 2-3 mm. **FRUIT** 0.7-1.4(2) cm, dull dark red to black. **NOTE** primary & secondary forests to 1100 m, often in moist areas.

706 *Bridelia tomentosa*

ขนหนอน กระบือ



LEAF 2.5-14x1-6 cm, oblong or narrowly obovate, usually with **pointed or tapering tip** & blunt base. Young shoots sparsely brown-hairy, mature leaves thin, **finely brown-hairy at least on veins below**. **7-12 pairs** of side veins. Stalks 0.2-0.6 cm, stipules 2-4 mm, falling early. **FLOWER** 0.3-0.5 cm diam., in clusters of 10(20) flowers, styles completely free. **FRUIT** 0.5-0.7 cm, green then blackish, globose or slightly flattened & 2-lobed, sunken at top. **NOTE** common in open areas up to 1000 m.

707 *Bridelia glauca* สีวละที

Tree to 30 m. **LEAF** 5-30x2-14 cm, elliptic-oblong or narrowly obovate with **pointed or tapering tip**. Mature leaves smooth above, $\pm$ sparsely hairy below. **11-18 pairs** of side veins, **joined & not reaching margin**, tertiary veins in network pattern, raised above. **FLOWER** 0.3-0.5 cm diam., in clusters of up to 50 flowers with **distinct individual stalks**, 2-6 mm, densely hairy. Sepals $\pm$ 2 mm, anthers pale yellow. **FRUIT** 0.5-1 cm, red-purple or blackish with a **single stone**. **NOTE** scattered to locally common in both primary & secondary forests up to 1500 m, moist areas.

708 *Bridelia ovata*

สีวาลา

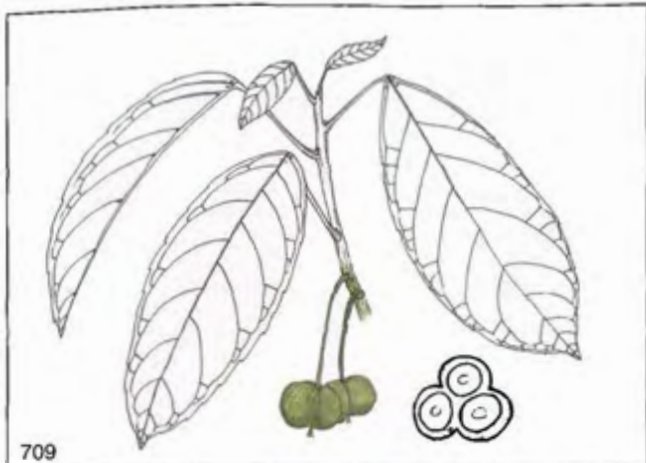
Leaves 4-20x2-8 cm, oval or ovate, margin often wavy, **all parts smooth**. 13-17 pairs of side veins. **FLOWER** in clusters of 1-5(20), males 0.3-0.5 cm diam. with short stalks, 1.5-3 mm, females 0.4-0.6 cm diam. without stalks. **FRUIT** 0.5-1 cm, pale greenish-purple to black, globose & slightly flattened, 2-lobed, sunken at top. **NOTE** locally common, moist to fairly dry areas up to 800 m.

709 *Cleidion spiciflorum*

คันทมิ



Small evergreen tree to 12 (20) m with dense, oval crown. **BARK** grey-brown, thin, smooth. **LEAF** 10-25x3.5-8 cm, alternate or sub-opposite, elliptic-oblong to narrowly obovate, tapering or slightly pointed at both ends, with **scattered shallow but quite sharp teeth**. Mature leaves thin, **completely smooth**, sometimes with domatia in vein axils. 5-7 pairs of side veins, top ones arched, lower ones petering out at teeth, tertiary veins raised above. Stalks **long & slender**, 3-10 cm, swollen at both ends, $\pm$ with glands at top. **FLOWER** male & female usually on different trees, no petals, no disc. Males in dangling spike-like clusters at leaf axils, to 25 cm, with slender individual stalks, to 0.7 cm. sepals, globose, not overlapping. **35-80 free stamens**, often in distinct whorls, on raised conical receptacle. Females solitary or paired at leaf axils with **very long stalks**, thicker near top. 2-3 **very long eccentric styles**, to 23 mm in fruit, joined at base, each with 2-3 stigmatic arms. Ovary sparsely hairy. **FRUIT** 1.5-2.8 cm, stalk 4-8 cm, green, usually **strongly 2-lobed**, rarely 1- or 3-lobed, with persistent styles to 3 cm. Outer layer leathery, whitish inside with thin chocolate brown inner layer, splitting into 2(3) sections. Seeds spherical, smooth. **NOTE** common in the understory of fire-free forests, often near streams. **SIMILAR** *Ostodes* 736 leaves with glands at tips of teeth, fws with white petals. *Baccaurea* 700 leaves clustered, usually untoothed, female fws & fts on main trunk & branches.



EUPHORBIACEAE

Croton

Very large genus, ±800 species, centered in tropical America. Leaves alternate, spiral or clustered, often silvery below with **scales or star-shaped hairs** at least when young and a **pair of glands** at base of leaf or top of stalk. Flowers small, in narrow unbranched upright clusters at end of twigs & upper leaf axils, usually with females near base & males above. Individual flowers stalked, 5 sepals, 5 petals (rarely absent), males with many stamens, females with 3 forked stigmas. Fruits dry, splitting, mostly 3-lobed.

⁷¹⁵*Croton roxburghii*

(*C. oblongifolius*)

เผลาไฟญ



Deciduous shrub or small tree to 12 m, branching in whorls. **BARK** grey-brown, thin, smooth or slightly cracking, inner bark reddish. **LEAF** 10-30x4-10 cm, often clustered near end of twigs & appearing whorled, oblong or oblanceolate, pointed or blunt at both ends, **closely but irregularly toothed**. Young leaves pinkish-brown with **yellowish scales**, mature leaves dull green & smooth above, **smooth or nearly so below**. 13-19 pairs of side veins. Stalks 1-7 cm, swollen at top with a pair of rounded glands. **FLOWER** ±0.7 cm, greenish-white, slightly fragrant, in narrow clusters to 36 cm, all male or with females below males. Main stalks densely scaly at first, later smooth. Individual stalks slender, 2.5 mm, densely scaly. Males with ovate sepals ±3 mm, hairy at first, petals ±3 mm, densely **white-hairy** outside & along margin. 10-12 stamens with yellow anthers. Females with sepals, densely scaly-hairy all over, petals ±2 mm (sometimes absent), 3 free stigmas 3-4 mm, forked near top. **FRUIT** 0.6-0.8 cm, globose, grooved or slightly 3(2) lobed, sparsely scaly, leathery. **Stalks** 3-5 mm.

NOTE common throughout NT in open areas & secondary growth, also semi-open forests to 650 m.

SIMILAR ⁷¹⁵*Croton sp. (robustus)* เผลาไฟญ leaves 8-18x3.5-6 cm, un-toothed or with very shallow teeth. >>

1. young & mature leaves silvery & densely hairy or scaly below
2. leaves distinctly 3-nerved at base ⁷¹⁸*C. kongensis*
3. lvs mostly whorled, silvery & brown-dotted below, leaf stalks <2 cm flower clusters <3 cm long ⁷¹⁷*C. cascarioides*
3. lvs alternate, silvery but not brown-dotted below, leaf stalks >2 cm flower clusters >3 cm long ⁷¹⁰*C. sp. (argyratus)*
1. mature leaves smooth or only partly hairy
4. lvs with 3 distinct basal veins, glands on margin, fts 13-20 mm ⁷¹¹*C. tigium*
4. lvs ± 3-veined, glands on leaf stalk or close to it, fts usually <13 mm ⁷¹²*C. hutchinsonianus*
5. leaves slowly losing hairs
5. leaves quickly losing hairs
6. lvs mostly whorled; glands stalked, longer than wide ⁷¹³*C. herri*
6. lvs alternate or whorled; glands always wider than long
7. lvs ± not toothed, hairs with 10-20 branches, not fused *C. sp. (robustus)* ⁷¹⁶
7. leaves toothed, hairs scale-like, with 30-45 fused branches
8. teeth close together (several mm), fw clusters becoming smooth, ♀ sepals 2.5-3 mm, completely hairy outside; fts 6-7 mm ⁷¹⁵*C. roxburghii*
8. teeth widely spaced; fw clusters persistently hairy, ♀ sepals 5-7 mm, smooth in upper part; fts 11 mm ⁷¹⁴*C. poilanei*



Young leaves with dense yellow-brown star-shaped hairs, mature leaves smooth or with scattered hairs near base & along midvein below. **Stalks** 1.3-3 cm with flat glands at top. **FLOWER** slightly smaller, often several clusters together, 8-24 cm, axes densely hairy, petals with dense white star-shaped hairs outside but not along margin. Male stalks ± 3 mm, female stalks 8-10 mm. **FRUIT** 0.8-0.9 cm, densely hairy later smooth, stalks ± 1 cm. **NOTE** fairly common in semi-open hill evergreen & along forest edges, 600-1400 m. Previously referred to as *C. robustus*, but possibly an undescribed species endemic to Thailand

717 *Croton cascarilloides* shrub to 5 m, leaves 5-17x3-7 cm, whorled, pointed or tapering at both ends, untoothed or slightly toothed, with dense silvery scales & scattered black dots below, 1 main vein from base, stalks 1-3 cm. Flowers silvery-white to yellowish, clusters to 7 cm. Fruits 0.6-0.7 cm, green $\pm$ with brown scales. Uncommon, usually on limestone rocks.

718 *Croton kongensis* similar to *C. cascarilloides* but with 3 distinct basal veins & dense shiny orange-brown scales below, no black dots. Flower clusters to 16 cm. Uncommon.

Glochidion

TABLE 14

Shrubs or small evergreen or briefly deciduous trees. **LEAF** alternate-planar, often in drooping sprays up to 1 m long, untoothed. Stalks short, stipules usually persistent, twigs often zigzagging. **FLOWER** small, pale green or greenish-yellow, in dense simple clusters (fascicles) at leaf axils & behind leaves, males & females in different flowers on same tree. (4)6 sepals in 2 rows, often unequal, no petals, no disc. Males with slender stalk & trumpet-shaped calyx, 3(8) stamens, filaments fused into a column. Females usually without stalks. **styles fused into a column or knob**, usually lobed or toothed at tip. **FRUIT** 3-6 lobed with persistent sepals & style, thin-walled, splitting from base upward. Seeds attached to central column, with thinly fleshy red or orange coating (sarcotesta).



1. style column cylindrical, narrower than top of ovary 719 *G. dasystylum**
lvs 4-12x2-5 cm, rough hairy below & on stalks; sepals pointed & hairy, style column 3-4x as long as ovary, hairy; fts 0.6-0.7 cm, deeply 6-8-lobed, sparsely white-hairy. Evergreen forests 800-1350m
1. style column not cylindrical, as wide as ovary at base
2. style column globose, widest in middle *G. sphaerogynum* 724
2. style column conical, widest near base
3. twigs, leaves & flowers completely smooth 720 *G. assamicum*
lvs 9-15 cm, lanceolate with tapering tips, twigs angled. Style column $\geq$ ovary; fts 0.5-0.8 cm, faintly lobed, smooth or sparsely hairy. Moist areas 550-850m.
3. twigs, leaves & sepals hairy *G. rubrum* 722
2. style column obovoid or obconical, widest towards top
4. style column hairy, <2x higher than ovary *G. eriocarpum* 723
4. style column smooth, 3-4x higher than ovary 721 *G. acuminatum***
lvs 5-12 cm, pointed both ends, hairy below. Female flower stalks 1.5-2 mm, sepals very unequal, 1.5-2 mm, outer 3 hairy & ridged, inner 3 smooth. fruits 0.6-0.8 cm, dark purple, deeply 4-6 lobed. Open areas, 1400-1600m.

* = var. *kerria* ** = var. *siamense*

722 *Glochidion rupestris*

กระดุมผี



Deciduous shrub or small tree. **LEAF** 3-14x1.5-5 cm, narrowly ovate to lanceolate, slightly tapering tip & blunt or slightly pointed base. Mature leaves **smooth** 5-6 pairs of side veins, tertiary veins quite clear. Stalks 2-4 mm, stipules triangular, 1 mm. **FLOWER** male stalks 3-4 mm & hairy at first, later 10-14 mm, slender & smooth. Sepals ± 2 mm, narrowly ovate, smooth or slightly hairy both sides. Females without stalks, sepals as males, outer 3 hairy outside, inner 3 small & smooth. Style column 1-4 mm, conical, smooth, **2-5x as long as ovary**, with 3 upright arms, 0.25-1 mm, **ovary hairy**. **FRUIT** 0.8-1.5 cm, pinkish, depressed-globose, 3-5 lobed, concave or flat both ends with tiny knob-like style at top, minutely hairy at first, later $\pm$ smooth. **Seeds** ± 3 mm, **pale brown**, shiny, 3-angled.

NOTE widespread & common, open areas & secondary growth, deciduous / bamboo forests, 300-900 m.



723 *Glochidion eriocarpum*

ไทรยัด



Deciduous shrub or small tree to 10 m. **LEAF** 3.5-11x3-5 cm, oval-elliptic or narrowly ovate with tapering or broadly pointed tip & blunt or pointed base, $\pm$ asymmetric. Twigs & young shoots densely brown-hairy, mature leaves thin, usually **softly hairy especially on veins**. 4-7 pairs of side veins, obvious on both sides, tertiary veins ladder-like, faint. Stalks 3-4 mm, hairy, stipules triangular, ± 3 mm. **FLOWER** both sexes often in same cluster. Males with slender stalks 2-6 mm, finely hairy. Sepals narrowly ovate, outer 3 hairy both sides, inner 3 hairy only outside on mid-ridge. Females with **distinct stalks** > 1 mm, sepals slightly fused at base, slightly broader than males. Style column obovoid, widest near top, **< 2x as long as ovary**, 4-8 toothed, hairy at base. Ovary globose with 4 grooved lobes, concave at top. >>





22



23

with long pale yellow hairs. **FRUIT** 0.8-1.5 cm, depressed globose, concave at top, 4-8 lobed, hairy. Seeds red, remaining attached to column a long time.

724 *Glochidion sphaerogymum*

มันปลา

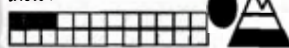


LEAF 9-19(35) x 3-6 cm, narrowly ovate or lanceolate, narrowed at both ends, leathery, **completely smooth**. 6-8 pairs of slender side veins. Stalks 48 mm, stipules short, triangular. **FLOWER** male stalks long & rather stiff; sepals elliptic. Females densely clustered with **very short stalks** <0.5 mm, sepals circular. **Style column sub-globose**, not toothed. **FRUIT** 0.8-1.2 cm with short stout stalk, deeply 6-12 lobed & strongly flattened, smooth, concave with **large persistent globose style** at top.

NOTE widespread & common, open areas in both deciduous & evergreen forests. 550-1300 m. Fruits often galled

725 *Homonoia riparia*

ไคร้



Evergreen shrub to 4 m. **LEAF** 10-25 x 1.5-3 cm, alternate, **linear**, pointed or quite blunt at both ends, untoothed or finely toothed. Young shoots hairy, mature leaves with scattered hairs & **minute round scales** below. Stalk 0.6-1.2 cm. **FLOWER** tiny, male & female usually on different trees. Males in slender spikes at upper leaf axils & above them, to 14 cm. Calyx globose, splitting into 3 valvate lobes, no petals, no disc. Stamens numerous, fused at base in pairs. Female clusters to 4 cm, slightly behind leaves, with 5-8 overlapping narrow unequal lobes. Styles red, spreading, ovary hairy. **FRUIT** ± 0.4 cm, clusters to 8 cm, splitting into 3 sections.

NOTE always close to streams, often in large colonies.



723



724



724



725 ♂



725

726 *Macaranga denticulata*

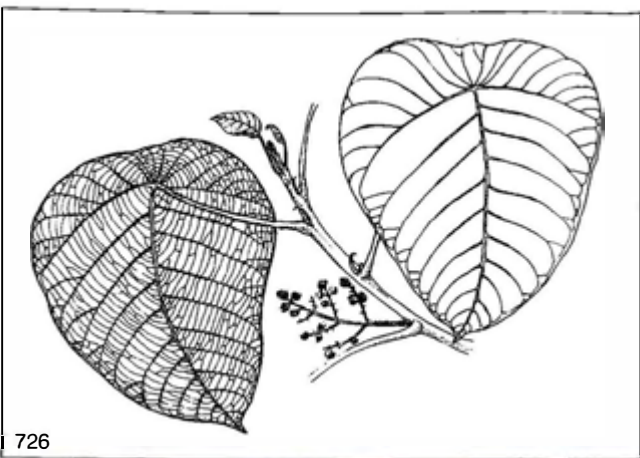
ตองแตม ปอขี้แฮด



Small evergreen tree to 18 m with very open crown & straight, tapering trunk.

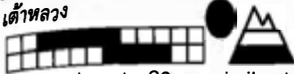
BARK pale grey, smooth with u-shaped ridges & shield-shaped leaf scars when younger. Inner bark fibrous with watery pinkish sap. **LEAF** 14-34x10-28 cm, alternate, spiral, broadly ovate to almost circular with slightly tapering tip & **peltate base**, **usually unlobed, margin shallowly toothed** or almost untoothed. Young leaves densely covered with minute brown hairs, mature leaves thin, smooth, blue-green above, greyish-white (glaucous) **below**. Several main veins radiating from stalk, smaller veins forming a "spiderweb" pattern. Stalks 5-18 cm, swollen at both ends. Stipules 7-10 mm, narrow & pointed, falling early. Young twigs hollow. **FLOWER** minute, greenish, male & female on different trees. Males in much-branched pyramidal clusters just behind leaves or at lower leaf axils, 7-12 cm, minutely brown-hairy with dense groups of stalkless flowers in axils of small 3-lobed bracts. Calyx with 3-4 lobes, ± 1 mm, not overlapping, rusty-scurfy outside, no petals, 9-18 free stamens, no disc. Female clusters at axils of upper leaves, 5-10 cm, individual flowers solitary. Similar to males but with **23 very short red styles**, ovary with yellowish glands. **FRUIT** 0.5-0.8 cm, mostly behind leaves, green with sticky yellow powder, ripening blackish, globose with 2 shallow lobes, leathery, splitting into 2 parts with a persistent central column. Seeds ± 2.5 mm, black with thin orange coating.

NOTE common pioneer species in moister open areas & secondary growth, also natural gaps in evergreen forest.



727 *Macaranga siamensis*

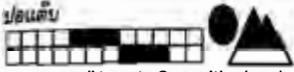
เตาหลวง



Evergreen tree to 20 m, similar to *M.denticulata* but with **much larger leaves**, 30-75 cm, almost circular, usually with **3-5 shallow lobe**, **rarely unlobed**. Young shoots & underside of mature leaves **finely velvety-hairy**. Stalks 15-50 cm, stipules 2.5-5 cm, papery, hairy along mid-ridge. Males in slender clusters 20-37 cm, female clusters 12-20 cm. Unmistakable, largest simple leaves of any native tree except Palms. Habitat as *M.denticulata*, less common.

728 *Macaranga kurzii*

ปอแก้ว



Shrub or small tree to 8 m with slender branches. **BARK** pale grey, smooth with many lenticels, inner bark with red sap. **LEAF** 7-15x4-8 cm, ovate or triangular-rhomboid with long-tapering tip & slightly pointed or heart-shaped base, usually not or only very slightly peltate, sometimes slightly lobed, usually finely toothed. Young shoots reddish & silvery-hairy, mature leaves thinly hairy or nearly smooth. 3 basal veins with **raised red glands in axils**. Stalks 3-8 cm, slender, smooth or with scattered hairs near top. **FLOWER** minute, at end of twigs & upper leaf axils, stalks with yellowish hairs & reduced leaves in axils. Male clusters 4-11 cm, 6-7 flowers together in axils of deeply divided bracts, ± 1 cm. Calyx 3-lobed, 14-20 stamens. Female clusters head-like, to 4 cm, each bract with 4 flowers. Calyx spathe-like, ± 3 mm. 2 long slender styles, ± 10 mm, shortly fused at base, ovary with thorny glands. **FRUIT** ± 1 cm, 2-lobed with soft bristles.

NOTE uncommon in moist, semi-open areas or gaps.

SIMILAR *Balakata baccata*⁷⁴² leaves without teeth, twigs with white latex.



Mallotus

Mostly evergreen shrubs or small trees. **BARK** thin, smooth, usually pale grey, inner bark often pink, $\pm$ with red sap. **LEAF** opposite or alternate, spiral, $\pm$ toothed, **often with star-shaped hairs**, stipules small & falling early. **FLOWER** minute, in spike-like clusters at end of twigs & upper leaf axils, male & female usually on separate trees. Calyx 3-4(5) lobed, not overlapping, often bursting irregularly, no petals. Males in groups, with >15 free stamens. Females mostly solitary, with 3 short styles & linear or **feathery** stigmas. **FRUIT** often covered with **soft bristles**, 3-lobed or angled, splitting into 3 parts with persistent central column. Seeds black & glossy, $\pm$ with small aril.

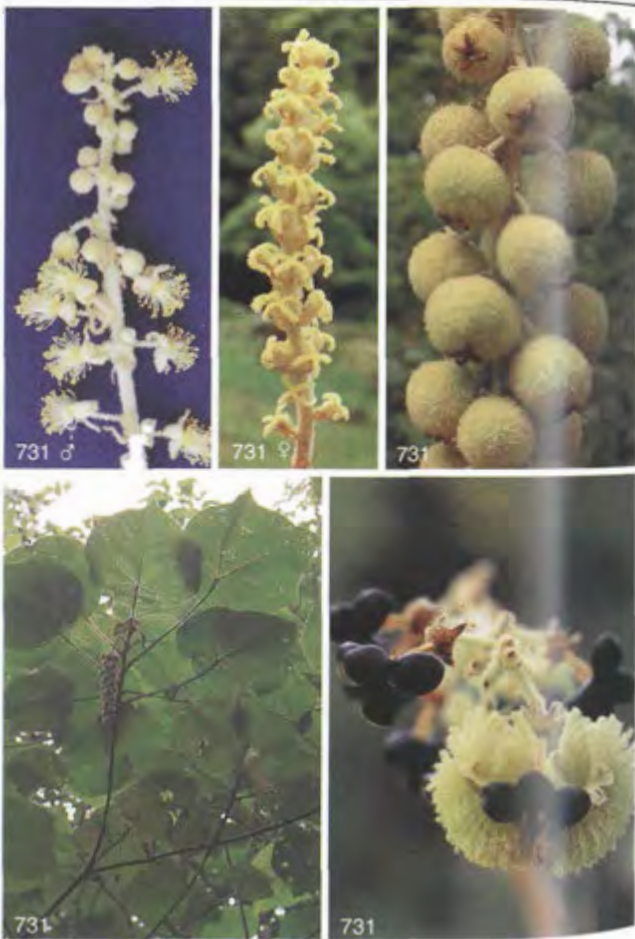
731 *Mallotus barbatus*
var. *barbatus*



Evergreen shrub or small tree to 8 m with widely spreading crown. **LEAF** 10-34x8-26 cm, alternate or sub-opposite, **broadly ovate or circular**, often slightly lobed with several short-pointed tips & rounded or heart-shaped base, **strongly peltate**, usually with scattered shallow teeth. Young shoots densely coated with **yellowish wooly star-shaped hairs which persist in mature leaves at least on veins below**. 7-9 main veins. Stalks 5-22 cm, with linear stipules ± 7 mm. **FLOWER** spikes often crowded together in branched clusters. Male clusters 15-30 cm, 4-6 lanceolate recurved sepals, ± 3.5 mm, densely hairy outside, glandular inside, 50-85 stamens. Female clusters to 10 cm, calyx at first 2-lobed later deeply 4-lobed, ± 3 mm, matted hairs outside, smooth inside. Ovary red with 4(3-5) yellow styles, 3.5-4.5 mm. **FRUIT** 1.5-2 cm, densely pale brown-woolly, depressed-globose, in strings to 30 cm, splitting irregularly into 4-6 parts each with a glossy black seed, 4-6 mm.

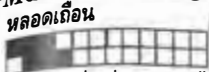
NOTE locally common in open areas & secondary growth.

1. leaf base peltate (>3 mm from edge)
- 2 lvs broadly ovate or circular, strongly peltate (>13 mm from edge) *M.bartatus* 731
2. lvs obovate-oblong, slightly peltate (± 5 mm from edge) *M.peltatus* 734
1. leaf base not peltate
- 3 leaves triangular, as wide as long, white below *M.paniculatus* 733
3. leaves much longer than wide, pale green or grey below
4. leaves all opposite
5. lvs elliptic-oblong or lanceolate with wavy teeth *M.khasianus* 729
lvs 12-25 cm, slightly pointed base, stalks 1.8-3.5 cm, all parts smooth, male clusters 10-15 cm, stellate-hairy; fruits ± 1.8 cm, slender prickles
5. leaves obovate with coarse teeth *M.cuneatus* 730
lvs with tapering base, smooth or very finely scurfy, stalks >1.5 cm
4. at least some leaves alternate
6. lvs mostly alternate; young shoots densely red-brown scurfy; ovary & fruits not spiny *M.philippensis* 735
6. lvs both alternate & opposite; young shoots smooth or with scattered **pale** hairs; **ovary** & fts softly spiny *M.oblongifolius* 732



732 *Mallotus oblongifolius*

พลูดเหือน



Evergreen shrub or small tree to 12 m. **LEAF** 8-23x3-8 cm, **opposite and alternate**, narrowly elliptic or oblong with tapering tip & narrowed to a blunt or heart-shaped base, often asymmetric, shallowly toothed or almost untoothed. Mature leaves thin, **smooth or sparsely hairy on main veins below**. 3-5 basal veins with blotch-like glands, 8-14 pairs of side veins. Stalks 2-6 cm, twigs smooth. **FLOWER** males in narrow unbranched clusters to 18 cm, 3-4 sepals, ± 30 stamens. Females in very slender clusters to 20 cm. Calyx flask-shaped, 2-lobed or split on one side, styles 5-7 mm with feathery stigmas, ovals red-brown. **FRUIT** 1-1.3 cm, with short red-brown knobs or bristles. **NOTE** uncommon, shady areas.



EUPHORBIACEAE

733 *Mallotus paniculatus*

สอยดาว



Small evergreen or briefly deciduous tree to 10 m with open, often flat-topped crown & slender, spreading branches. **LEAF** 8-18x5-16 cm, alternate, **broadly ovate or triangularrhomboid** with tapering tip & slightly pointed to almost flat base, $\pm$ slightly peltate, sometimes shallowly 3-lobed, untoothed or with scattered shallow teeth. Young shoots densely coated with short red-brown hairs, mature leaves dark green & almost smooth above, **white** & densely short-hairy below with orange-brown veins. 3-5 basal veins, $< 1/2$ length of leaf, 5-8 pairs of $\pm$ straight & parallel side veins. Stalks 3-12(18) cm with a pair of raised glands at top. **FLOWER** ± 0.5 cm, whitish, σ & ♀ on same or different trees, **spreading branched clusters** drooping from end of twigs, up to 30 cm. Males with stalks 1.5-2.5 mm, 3-4 sepals, ± 2.5 mm, 50-60 stamens. Females with stalks 0.5-1 mm, calyx bell-shaped, 5-lobed, ± 2.5 mm, broadly linear stigmas, 2-3 mm. **FRUIT** ± 0.8 cm, **hanging in long strings**, **globose with soft bristles & pale brown hairs**. **NOTE** fairly common, forest edges & understory of denser forests.



EUPHORBIACEAE

734 *Mallotus peltatus*

สลัด



Bushy shrub or small evergreen tree to 8 m. **LEAF** 10-22x10 cm, obovate-oblong with pointed or tapering tip & rounded or slightly heart-shaped base, usually **narrowly peltate** (± 5 mm), often shallowly toothed. Young shoots velvety-hairy, mature leaves dark green, smooth or with tufts of hairs in vein axils. Stalks 2.5-11 cm, sparsely hairy. **FLOWER** male clusters 5-21 cm, individual stalks jointed, 1-1.5 mm. 3-4 sepals, ± 2 mm, recurved with hairy tips. 17-35 stamens. Female clusters 8-20 cm, individual stalks 2.5-4 mm, **calyx** 4-5.5 mm, flask-shaped, split on one side, $\pm$ toothed, styles 5-10 mm. **FRUIT** 0.9-1.2 cm, 3-4 lobed, covered with **short soft curved bristles**, persistent style 0.8-1 cm. **NOTE** common, forest edges.



734



734 ♀



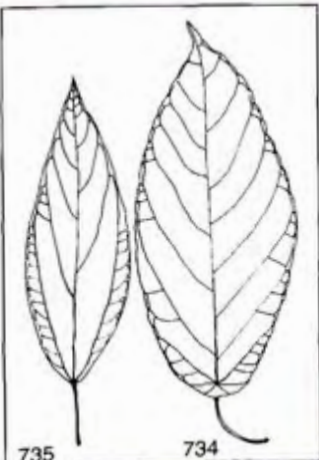
734

735 *Mallotus philippensis*
var. *philippensis*

ค้ำค้ำ



Evergreen tree to 12 m with dense crown & short, often fluted trunk. **LEAF** 7-20x3-7 cm, alternate, elliptic-oblong or narrowly ovate with pointed or tapering tip & blunt or slightly pointed base, **never peltate**, untoothed or with scattered small teeth. Young shoots densely coated with minute red-brown hairs, mature leaves dark green & smooth above, paler grey-green & usually with scattered soft hairs at least on veins below. 2 small glands at base of leaf, often also with minute reddish glands on lower surface. **3 prominent basal veins** $> \frac{1}{2}$ as long as leaf, ± 5 pairs of steep side veins. Stalk 2-8 cm, slender, rusty-scurfy. **FLOWER** male clusters 2-16 cm, individual stalks 2-3 mm, 3-4 sepals, 2.5-3 mm, star-shaped hairs outside, glands inside, 18-30 stamens. Female clusters 5-12 cm, stalks 0.5-1 mm, (3)5 irregular sepals, 1-2 mm, 3 short styles with feathery stigmas, 2-4 mm, ovary with red star-shaped hairs. **FRUIT** 0.7-0.9 cm, covered with short hairs & tiny **red** (powdery) glands. **NOTE** common in secondary growth.



735

734



735



735 ♀



735 ♀



735 ♂

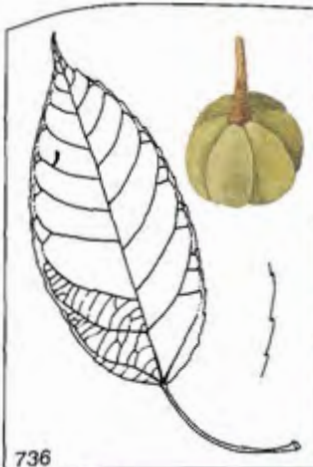
736 *Ostodes paniculata*

NEPAL



Small evergreen tree to 10 m with irregular, spreading crown & twisted trunk. **BARK** pale grey, smooth, inner bark often with red or yellowish sap. **LEAF** 15-24x7-9 cm, alternate, spiral, narrowly ovate or oblong with abruptly tapering tip & blunt or rounded base, **finely toothed with a pair of fused glands at tip of each tooth** & at base of leaf. Young shoots finely hairy, mature leaves smooth or very sparsely hairy below. **3 main veins from base**, $\pm 1/3$ as long as leaf, 7-9 pairs of side veins, joined at margin. Stalks 4-17 cm, swollen with 2 glands at top. Stipules falling very early. **FLOWER** ± 1.2 cm, **white**, sometimes tinged pink, in narrow branched clusters at leaf axils or slightly behind leaves, 12-22 cm, male & female on different trees. Male buds globose, 4-5 mm, individual stalks 5-6 mm. 5 overlapping sepals, $\pm$ fused at base. **5-6 unequal petals**, ± 7 mm, ovate-oblong with blunt tip & narrow base. ± 20 stamens on convex hairy swelling (receptacle). Female buds ovoid, 6-7 mm, individual stalks ± 5 mm, jointed in lower half, petals 9-10 mm, 3 forked styles with linear stigmas, ± 5 mm, ovary globose with white hairs. **FRUIT** 2.5-3 cm, green ripening brown, often on older branches behind leaves, usually 3-lobed with persistent nipple-like style, finely hairy when young. Outer layer leathery with woody inner layer, eventually splitting into 3 parts. Seeds 1-1.2 cm, globose with 2 ridges, dark brown or black & mottled, smooth. **NOTE** locally common in shady, moist areas.

SIMILAR *Cleidon*⁷⁰⁹ & *Baccaurea*⁷⁰⁰ have leaves without glands on teeth & flowers without petals.



736



736



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737 *Phyllanthus emblica*

มะขามป้อม



Small deciduous tree to 8(20) m with open irregular crown & crooked trunk. **BARK** grey-brown with creamy orange patches, thin, smooth, peeling in broad flakes, inner bark pink. **LEAF** 0.9-2x0.2-0.4 cm, alternate, **simple but strongly planar & appearing pinnate**, oblong or linear with blunt or slightly pointed tip & rounded base, usually asymmetric, untoothed. Young leaves finely hairy, often tinged reddish, mature leaves completely smooth. Stalks <1 mm, with tiny red-brown stipules. Twigs slender, to 20 cm, often falling together with leaves.

FLOWER tiny, pale green or creamy-yellow, $\pm$ tinged pink, in dense simple clusters (fascicles) at leaf axils or behind them, sometimes on short side shoots with young leaves at top, usually with a few female & many males in each cluster. Male stalks $\pm$ 2.5 mm, 5-6 free sepals in 2 overlapping rows, 1.5-2.5 mm, no petals. 3(5) stamens fused into short column, shorter than sepals. **Female stalks** <0.5 mm, sepals slightly larger than males & fused at base, 3 fused styles with spreading, forked stigmas, ovary half-buried in fringed disc. **FRUIT** 1.3-2 cm, **no stalks**, green & semi-translucent with pale veining, ripening yellowish, globose, juicy & edible but rather acidic, with a hard 3-sectioned stone, each section with (1)2 seeds.

NOTE very common in drier semi-open forests, fire-resistant.

SIMILAR 3 other species with much larger leaves, female flowers & fruits with slender stalks >5 mm long

738 *P. columnaris* ไม้สารภี leaves 2.5-3x0.7-2 cm, narrowly obovate or oblong, pointed at both ends, finely hairy at least on veins below. Flowers in upright unbranched clusters at end of twigs, 15-23 cm. Male stalks 1.5 mm, sepals 1 mm, stamen column 2-3 mm. Female stalks 1-2 mm, hairy, sepals, 4 mm, style 4 mm. Fruits 6 mm, splitting, pale green finally blackish, 3-lobed with persistent style, stalks $\pm$ 7 mm. Common, habitat as above.



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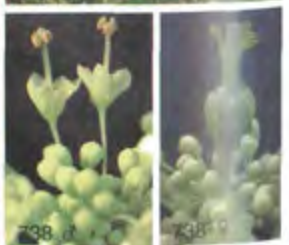
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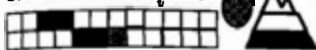
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739 *P. roseus* ผักยอคดอง shrub to 5 m, leaves 6.3-16x2-5 cm, tapering both ends, stalks very short, twigs zigzagging. Flower clusters in leaf axils, male stalks ± 1 cm, 5 papery sepals, ± 3 mm, with long hair-like tips. Female stalks to 4 cm, very slender, 6 sepals, styles 2-lobed, ± 0.5 mm, smooth. Fruits to 2.5 cm, pinkish, slightly hairy, splitting into papery sections with shiny pale brown seeds, 7-8 mm. Scattered in open moist areas to 1300m.⁷⁴⁰ *P. acidus* มะยม flowers in slender clusters on old leafless branches, to 15 cm, calyx 4-lobed, 4 free stamens. Cultivated, native of Brazil.

741 *Suregada multiflora*

ต้นทองพยับบาท มะดุกเลื่อม



Small evergreen tree to 13 m with dense crown & straight trunk. **BARK** dark brown, smooth, thin. **LEAF** 7-20x3-8 cm, alternate, spiral, elliptic-oblong or narrowly ovate, tapering or slightly pointed at both ends, not toothed. Mature leaves leathery, dark green & glossy above, **completely smooth**, with scattered tiny translucent dots. 5-9 pairs of side veins, upper ones arched & joined at margin, raised above. Stalks 0.2-0.8 cm, narrowly winged. Stipules ± 2 mm, **fused in pairs**, soon falling but leaving a distinct ring-like scar. **FLOWER** 0.8-1 cm, yellow, fragrant, in simple clusters (cymes) of 5-10 flowers **opposite the leaves**, male & female on different trees. Male stalks ± 5 mm, 5 overlapping sepals, ± 2.5 mm, finely hairy both sides, no petals. **35-60 free stamens on a convex swelling** (receptacle), each with gland at base, sometimes interspersed with smaller sterile stamens. Females with 5-6 thicker sepals & 3 short, spreading deeply forked styles. **Ovary finely hairy**, surrounded by ring-like disc. **FRUIT** 12-23 cm, pale orange ripening red-orange, usually 3-lobed with shallow nipple at top, eventually splitting into 3 leathery sections each with a globose shiny black seed with thin fleshy coating (aril), whitish inside. **NOTE** common & widespread along forest edges & in semi-open forests, preferring moister areas.



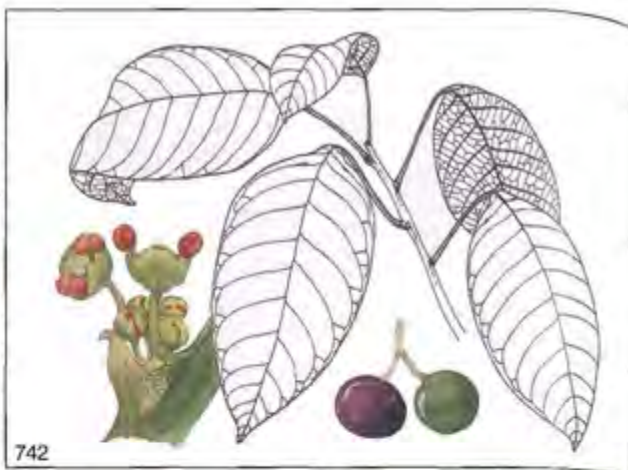


Large evergreen tree to 35 m with spreading rounded crown & thick steeply ascending branches with drooping tips. Trunk stout, up to 200 cm diameter, slightly buttressed when older. **BARK** pale grey & quite smooth with large lenticels when young, becoming dark grey-brown & deeply fissured with age, inner bark pale yellow, no latex in trunk but often with white latex in twigs. **LEAF** 8-18x3-8 cm, alternate, spiral, elliptic or ovate with pointed or tapering tip & blunt or rounded base, slightly peltate in younger trees, untoothed, completely smooth. Young leaves red-purple, mature leaves dark green above, grey-green (glaucous) below, usually reddish along margins & on stalks, with 2 dark knob-like glands at base of leaf. 11-13 pairs of $\pm$ parallel side veins, tertiary veins ladder-like. Stalks 3-7.5 cm, slender, slightly swollen at both ends. Stipules small & falling early. **Old leaves clear yellow but with red stalks.** **FLOWER** minute, in branched spike-like clusters at end of twigs & upper leaf axils, 4-22 cm, all males or with males & females in same cluster. Males in groups of 6 in axil of an obovate bract, ± 1 mm, flanked by 2 large oblong glands. **2-3 sepals fused into a toothed cup**, ± 1 mm, no petals, 2 stamens, no disc. Females solitary, ± 5 mm, calyx as males but larger, **2 styles**, slightly fused at base, 1-1.5 mm. **FRUIT** 0.8-1.3 cm, dark green with greyish dusting & whitish sap when young, ripening dark purple-black. Individual stalks slender, 0.6-0.9 cm, pearshaped or subglobose, $\pm$ slightly 2-lobed, with 2 small recurved styles at top & persistent calyx at base. Outer layer thin, not splitting, with leathery inner layer & 2 black seeds which remain attached to the central column for a long time after fruits disintegrate.

NOTE common to locally abundant in evergreen & moister deciduous forests. Fruits very attractive to birds.

SIMILAR see p321

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742



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SIMILAR ⁷⁴³ *Triadica cochinchinensis* ตະเคียหม่น smaller tree to 15 m with leaves in tiers & smooth or slightly cracked bark. Leaves 41x2.5-4 cm, old leaves bright red. Flowers in unbranched clusters, 3 styles. Fruits 1-1.5 cm, globose with up to 3 seeds. Rare, hill evergreen forests.

⁷⁴⁴ *Falconeria insignis* deciduous tree to 15m with **very deeply cracked bark, inner bark with white latex**. Leaves 13-20x5-8 cm, with shallow rounded teeth, stalks not usually tinged red, twigs thick. Flowers in stout clusters to 25 cm, males with 2 distinct sepals, slightly fused at base. Fruits 0.5-0.8 cm, ovoid, in clusters up to 50 cm. Scattered in drier deciduous forests, fire-resistant.

⁷⁴⁵ *Trigonostemon thyrsoides*

ต้นสามเหลี่ยม



Evergreen shrub or small tree to 8 m. **BARK** pale orange-brown to dark brown, quite smooth, inner bark with clear or reddish sap. **LEAF** to 33x12 cm, alternate-spiral, oblong or narrowly elliptic with tapering tip. Mature leaves completely smooth, dark green & glossy above. 8-12 pairs of side veins, joined at margin. Stalks to 8 cm, slender, young stems ridged. **FLOWER** bright yellow, in narrow branched clusters at end of twigs & upper leaf axils, males & females in different clusters on same tree or in same cluster with females nearer tips. Males with 5 small overlapping sepals, 5 petals, twisted in bud. 3(5) stamens fused into column with 3(5) short branches near top. Disc of 3-5 glands, free or united in a lobed cup. Females similar, 3 styles fused at base with notched stigmas. **FRUIT** to 1.7 cm, 3-lobed, slightly soft-spiny, splitting when mature, seeds without aril.

NOTE uncommon, moist shady areas.

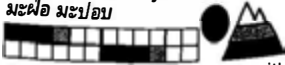
SIMILAR ⁷⁴⁶ *T. albiflorus* shrub to 5 m with white flowers.



EUPHORBIACEAE

747 *Trewia nudiflora*

มะไฟอ มะปอ



Briefly deciduous tree to 25 m with irregular crown, large spreading branches & stout trunk. **BARK** grey-brown, often with paler patches, smooth or flaking in thin pieces when older. **LEAF** 8-22x5-16 cm, (sub)

opposite in 2 rows, ovate or triangular with tapering or pointed tip & flattened or heart-shaped base, **never peltate, not toothed**. Young leaves densely coated with **star-shaped hairs**, mature leaves thin, yellow-green, with star-shaped hairs at least on veins below. 3-5 basal veins, $\pm \frac{1}{2}$ as long as leaf, 3-6 pairs of side veins with indistinct glands in axils. Stalks 4-7(10) cm, hairy, stipules narrowly triangular, 2-3 mm, falling early. **FLOWER** greenish, flowering when leafless or with young leaves, males & females on different trees. Males ± 1 cm, in drooping unbranched clusters with densely hairy axes, 7-20 cm. Individual stalks slender, ± 5 mm. (3)5 sepals, ± 4 mm, hairy especially outside, no petals, **60-90 stamens**, no disc. Females in smaller clusters of 1-4 flowers, 3-8 cm. Calyx spathe-like, splitting irregularly into 2-4 lobes, ± 5 mm, finely hairy. 2-6 styles, ± 20 mm, fused together near base, with recurved feathery stigmas. Ovary 5 mm, hairy, no disc. **FRUIT** 1.6-3.4 cm, pale green ripening brownish-yellow when ripe, globose, not splitting. Outer layer leathery & slightly rough with pale cream "potato-like" flesh surrounding a thin crusty stone, containing 2-5 hard black seeds, ± 8 mm.

NOTE common along open river banks, never far from water.

SIMILAR *Gmelina arborea*⁶³⁰ leaves with 2 large glands at base & showy yellow-orange flowers.

*Morus macroura*⁷⁵³ leaves alternate, no star-shaped hairs, white latex.



747



747 ♂



747



747 ♀



747 ♂



ULMACEAE

elm family

175 species worldwide, mostly N. temperate. Evergreen or deciduous trees without latex. Leaves simple, alternate, usually planar, often toothed, with stipules protecting leaf buds. Flowers minute, green, wind-pollinated. Calyx (perianth) 4-9 lobed, overlapping in bud, no corolla, stamens fused to calyx tube, 2 styles. Fruits dry & winged or fleshy drupes.

748 *Trema orientalis*



Small evergreen or deciduous tree to 12 m with open crown & horizontal branches with drooping tips. **BARK** pale grey-green, smooth, very thin with bright green inner layer. **LEAF** 8-19x4-9 cm, narrowly ovate, oblong or lanceolate with long-tapering tip & rounded or heart-shaped base, $\pm$ asymmetric. **Finely toothed all along margin**. Young shoots densely silvery-hairy, mature leaves with scattered rough hairs above, **grey-green with a dense mat of tiny greyish hairs & scattered longer silvery hairs below**. 3-5(7) basal veins, $\frac{1}{2}$ - $\frac{3}{4}$ length of leaf, 4-8 pairs of steep side veins, sunken above. Stalks 0.4-1.7 cm, densely hairy, often tinged pink or purple. Stipules 2-6 mm, lanceolate, **not fused in pairs**. **FLOWER** $\pm$ 0.3 cm, greenish-white, σ & ρ /bisexual flowers on same tree but in different clusters. σ in compact much-branched clusters (cymes) at leaf axils, to 2.5 cm, usually in pairs with stalk of lower cluster curved downwards. Calyx with 4-5 lanceolate lobes, 1-2 mm, not overlapping, finely hairy along margins. 4-5 stamens opposite calyx lobes. ρ similar but in more open clusters. 2 slender stigmas, free or united at base, ovary not stalked. **FRUIT** 0.3-0.7 cm, stalks to 0.3 cm, dark green or red ripening black, smooth, ovoid or lens-shaped with **persistent calyx** at base & withered stigmas at top, thinly fleshy with hard stone (pyrene). **NOTE** very common in open areas & wasteland.

1. fruits dry, winged

2. leaves toothed

Ulmus lancaefolia 752

2. leaves not toothed

Holoptelea integrifolia 751

1. fruits thinly fleshy, not winged

3. leaves densely hairy below

Trema orientalis 748

3. leaves smooth or nearly so

4. female flower clusters & fruit clusters not branched

Celtis tetrandra 749

4. female flower clusters & fruit clusters branched

Celtis timorensis 750



749 *Celtis tetrandra*

ขึ้นนอนตาย หัด



Evergreen or partly deciduous tree to 25 m with rounded crown. **BARK** pale grey or grey-green, smooth or shallowly cracked with many lenticels, inner bark pale yellow with darker spots. **LEAF** 6-18x3-8 cm, narrowly ovate to lanceolate with tapering tip & unequally blunt or heart-shaped base, **irregularly toothed in upper** $\frac{1}{2}$ - $\frac{2}{3}$. Young shoots hairy, mature leaves medium green & glossy above, **smooth** or with scattered minute hairs on veins below. **3 main veins from base**, outer pair $\pm \frac{3}{4}$ length of leaf, **3-4 pairs of arched side veins**. Stalks 0.8-1.5 cm, grooved, with deciduous stipules. **FLOWER** green or pinkish, male & bisexual flowers on same tree but different clusters, males in compact forked clusters (cymes) at axils of young leaves or along leafless twigs, solitary or 2-3 together, 1.5-3 cm. Individual stalks ± 0.2 cm, main stalks ± 1 cm, smooth, with narrow bracts. **4 (5) sepals**, 2-3 mm, fused at base, overlapping in bud, hairy along margins. 4 short stamens, erect in bud, later spreading. Females similar but in **simple unbranched clusters**, **main stalks 0.6-1.2 cm**. 2 stigmas without styles, $\pm$ fused at base, 2-3 mm. Ovary smooth, unstalked, on hairy disc. **FRUIT** 0.6-0.8 cm, green or black, smooth, globose with remains of stigmas at top, stone (pyrene) 6-angular. **NOTE** fairly common, usually in open areas close to streams.

SIMILAR ⁷⁵⁰*C. timorensis* แก้งขึ้น พระร่วง leaves obscurely toothed, (0)1-2 pairs of side veins near top of leaf, tertiary veins ladder-like, connecting 3 main veins. Young twigs & flower axes finely orange-brown hairy. Bisexual flowers & fruits in branched clusters to 6 cm, main stalks 2-3 cm, 5 sepals & 5 stamens. *Trema orientalis* ⁷⁴⁸ leaves densely hairy below.



751 *Holoptelea integrifolia*

75171



Deciduous tree to 22 m. **BARK** creamy brown or ash-grey, quite smooth with many lenticels when young, becoming roughly fissured with age. **LEAF** 8-14x4-7 cm, elliptic with short tip & blunt or slightly heart-shaped base, often asymmetric, **not toothed** (except saplings & coppice regrowth). Young shoots finely hairy, mature leaves smooth or minutely hairy below. 5-7 pairs of side veins. Stalks 0.6-1.2 cm, with deciduous pointed stipules ± 1 cm. **FLOWER** in short clusters (corymbs) in axils of fallen leaves, male & bisexual flowers intermixed in same cluster, individual stalks **finely hairy all over** with 2 deciduous bracts at middle. 4-5 lanceolate sepals, ± 2.5 mm, fused at base, hairy. Males with 8 stamens, bisexuals with 5 stamens. Ovary ± 2.5 mm, stalked. **FRUIT** 1.7-2.5 cm, obliquely oblong or circular, **surrounded by a broad papery wing, split at top with a projecting style on each side**. Stalks ± 1.5 cm, slender with joint in middle. Seeds $\pm 12 \times 8$ mm, obovoid, closer to top of fruit than base. **NOTE** scattered in semiopen deciduous/bamboo forest.

SIMILAR ⁷⁵²*Ulmus lanceaefolia* leaves oblong-lanceolate, finely toothed, leathery, glossy above. Flower stalks with joint above middle, hairy only below joint. Fruit stalks with persistent calyx. Streams <1000m.

MORACEAE fig family

1100 species almost confined to the tropics, 5 genera & 40 species in NT. **BOTANY** evergreen or deciduous trees, often "strangling", usually with white latex in the bark & often also in the leaves & fruits. Leaves simple, mostly alternate, sometimes lobed, with stipules. Flowers minute, mostly in slender drooping catkins or dense heads at leaf axils or along trunk & main branches. Male & females always in separate flowers but either on the same or on different trees. Calyx (perianth) usually 4-lobed, no corolla, 1-5 stamens opposite calyx lobes, 1-2 styles, ovary usually superior. Fruits very various, often in highly specialized compound heads.

ECOLOGY a common element of both open, regenerating areas & mature forests, mostly in moister lowland areas, becoming less common in deciduous forests & hill forests. Important food plant for many bird species, such as Hornbills. **USES** several well-known introduced fruit trees belong to *Moraceae*, including Jackfruit (*Artocarpus heterophyllus*) & Breadfruit (*A. altilis*) as well as the common fig (*Ficus carica*). Mulberry (*Morus alba*) is widely planted as a food plant for silkworms. Some native species have edible fruits but none have commercial value. *Ficus religiosa* is the most sacred of all trees for Buddhists since it was under this tree that the lord Buddha achieved enlightenment.



1. fws/fts solitary or paired

Streblus ⁷⁵⁵

1. fws/fts in compound structures
2. fws/fts inside hollow chambers

Ficus ⁷⁶⁴

2. fws/fts outside a fleshy mass
3. trees without thorns
4. lvs with 1 main vein

Artocarpus ⁷⁵⁹

4. lvs with 3-5 basal veins
5. leaves rough above; fws/fts in globose heads

Broussonetia ⁷⁵⁴

5. lvs smooth/soft hairy above fws/fts in cakin-like clusters

Morus ⁷⁵³

3. thorny shrub

Maclura ⁷⁶³

MORACEAE

753a *Morus macroura*
 ไม้พุ่ม

Large deciduous tree to 35 m.
BARK pale grey, smooth, inner bark with rather watery latex. **LEAF** 8-18x6-12 cm, alternate, $\pm$ planar, broadly ovate with tapering or pointed tip & rounded or heart-shaped base, $\pm$ asymmetric, finely toothed or untoothed, occasionally slightly lobed. Young shoots finely silky-hairy, mature leaves thin, smooth or sparsely hairy especially below. 3 main veins from base, outer pair $\frac{1}{2}$ - $\frac{3}{4}$ as long as leaf, 4-7 pairs of steep side veins, joined into a submarginal veins which continues into the tip. Stalks 2-3.5 cm with linear stipules, $\pm$ 2 cm, falling early. **FLOWER** minute, male & female on different trees. Males in slender drooping catkins at axils of young leaves, 6-14 cm. 4 rounded sepals in 2 rows, densely hairy, overlapping in bud, inner pair flat, outer pair slightly ridged (keeled), 4 stamens. Females similar but catkins slightly shorter & more crowded, sepals smooth or nearly so. 2 slender styles, $\pm$ 2.5 mm, fused at base. **FRUIT** $\pm$ 0.1 cm, white or pale yellow, very densely clustered along catkins to 15 cm, each fruit with a single seed enclosed by persistent fleshy calyx.

NOTE common both in open areas & in the upper canopy of dense forests.

SIMILAR 753b *M. australis* ไม้พุ่ม mulberry shrub or small tree to 8m. Leaves ovate, coarsely & unevenly toothed, smooth or roughly hairy. Male & female flowers both on same tree, spikes much shorter, <2.5 cm. Styles hairy, free almost to base. Fruitheads 2-5x1 cm, cylindrical, white to dark red, edible. Native of China, cultivated for fruit & as food for silkworms.

753c *M. australis* ไม้พุ่ม has styles free only at tips & dark purple fruits. Possibly a variety of *M. alba*.

Broussonetia papyrifera 754 leaves rough above, female flowers & fruits in globose heads, fruits bright orange,



754 *Broussonetia papyrifera*
paper mulberry 1887

Partly deciduous shrub or small, tree to 15 m with open, spreading crown.

BARK cream or pale brown, smooth or shallowly cracked with large lenticels, outer bark thin & fibrous, inner bark with white latex. **LEAF** 12-29x8-22 cm, alternate or sub-opposite, ± planar or clustered near end of twigs, broadly ovate or triangular with pointed tip & rounded or heart-shaped base, usually finely toothed, often deeply lobed in young trees. Young shoots densely covered with soft hairs, mature leaves thin, **rough above**, softly hairy below. 3-5 basal veins, 4-7 pairs of side veins. Stalks 3-10 cm, slender, hairy, with narrowly triangular stipules, 6-8 mm, falling early.

FLOWER minute, pale green, male & female on different trees. Males densely clustered in dangling catkins near end of twigs, 5-8 cm, individual flowers intermingled with stalked bracts. Calyx 4 lobed, not overlapping in bud, hairy outside, 4 stamens opposite the lobes & longer than them, curved inwards in bud. **Females** in **globular heads** at leaf axils, 1.5-2 cm diam., stalks 0.5-1 cm, individual flowers intermixed with many scales (aborted flowers). Calyx tubular with 2-4 minute teeth, sparsely hairy outside, 1 slender red style attached on the side of the ovary, much longer than calyx. **FRUIT** (syncarp) ±3 cm, **bright orange**, globose, with many small dark red seeds, each hanging on a long fleshy stalk & surrounded by the persistent fleshy calyx at one end. Stalks to 1.2 cm.

NOTE very common in open areas & wasteground, fast growing.

SIMILAR *Morus macroura*⁷⁵³ leaves smooth or softly hairy above, both male & female flowers in narrow catkins.



754



754 ♀ & fruit



754



754



754



754

755 *Streblus asper* var. *asper*

ไม้ผล ย่อย



Evergreen tree to 17 m with stout trunk & dense compact crown, often shrubby & forming an impenetrable undergrowth. **BARK** grey or blackish, thin, smooth or slightly cracked/ribbed, **not thorny**, inner bark cream with abundant **white latex**. **LEAF** 2.5-10x1.2-4 cm, **alternate**, mostly planar, oblong/elliptic or obovate with blunt or pointed tip & narrowed base, margin untoothed or with irregular blunt teeth. Mature leaves dark green, **rough above**. 4-6 pairs of looped side veins, basal pair $< \frac{1}{3}$ length of leaf. Stalks 0.1-0.2 cm, finely hairy with triangular stipules, 1-2 mm. **FLOWER** green, inconspicuous, separate male & female flowers on same tree, in leaf axils or behind leaves. Male flowers in small heads on very short stalks, females on slender individual stalks, solitary or several together. 4 free sepals in 2 rows, 4-7 mm, overlapping in bud. 4 stamens opposite sepals, curved inwards in bud. 2 long styles, joined at base, slightly eccentric. **FRUIT** ± 0.8 cm, bright yellow or orange, globose with 2 withered thread-like styles at top, enclosed by persistent sepals & bracts at base. Pulp sweet & juicy with 1 smooth, round, greyish-white seed (stone). Stalks to 1.8 cm, very slender.

NOTE common in open & disturbed areas, often on termite mounds.

SIMILAR 3 other species with completely smooth leaves:

756 *S. silicifolius* tree to 17m, aggressively thorny, creamy sap. Leaves to 20x10 cm, thick & rigid with **sharp, spiny teeth** along margin (like a holly tree) & 3 minute teeth at the tip. $\pm 8-12$ pairs of side veins, joined into obvious marginal vein quite far from margin, tertiary veins parallel to side veins. Stalks 0.3-1 cm. ♂ flower spikes 2.5-5 cm, pale pink, ♀ 1.2-2.5 cm, 2-5 flowered. Fruits ± 1.2 cm. Locally common on limestone outcrops.

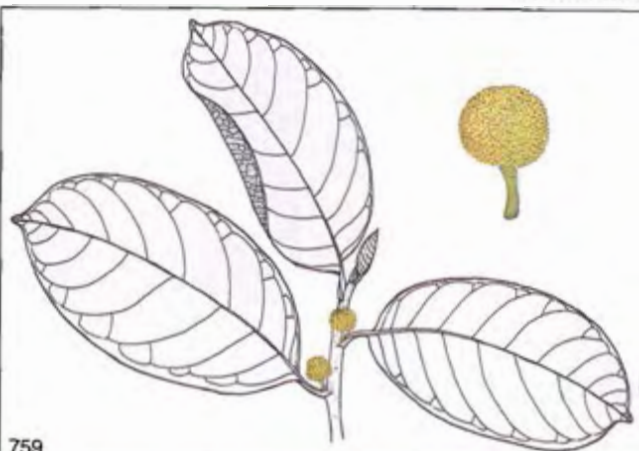
757 *S. taxoides* bushy shrub to 8m with long thorns & white latex. Leaves to 17x6.5 cm, narrowly elliptic, tapering both ends, sometimes slightly notched at tip & asymmetric at base, untoothed or with scattered teeth near top only, stalks 0.4-0.7 cm Fruit ± 0.6 cm, green, fleshy at base, with wing-like sepals 1.2-2.5 cm.

758 *S. indicus* evergreen tree to 20m, not thorny, with white latex. Leaves $\pm 11 \times 3$ cm, oblong or lanceolate, tapering both ends, not toothed, stalks ± 0.8 cm. Fruit ± 1.5 cm, enclosed by sepals, stalks to 1.5 cm. uncommon, semi-open areas in evergreen forest.

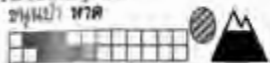


Artocarpus Jackfruit genus

50 species worldwide, 4 species in NT. Independent trees with abundant white latex in all parts. Leaves alternate, usually untoothed, with only 1 main vein from base. Flowers minute, tightly packed in oblong or globose heads around a fleshy core (receptacle), males & females in separate heads on the same tree. Males with 2-4 free or partly fused sepals & 1 stamen, females with narrow tubular calyx fused at base with neighbouring flowers & forming a continuous layer, 1 slender style. Fruits (syncarp) an irregular fleshy mass with many seeds.



759 **Artocarpus lakoocha**



Deciduous tree to 24 m. **BARK** red-brown to dark brown, becoming **rough & scaly** with age. **LEAF** 10-30x5-15 cm, alternate, $\pm$ planar, oval to broadly ovate or obovate with blunt or shortly pointed tip & rounded or slightly heart-shaped base, often asymmetric, untoothed or with minute teeth. Young shoots densely red-brown hairy, mature leaves leathery, dark green & **slightly rough above**, grey-green & **finely hairy below**. 8-20 pairs of conspicuous side veins, joined at margin, obvious network of smaller veins. Stalks 1.4-3.3 cm, finely brown-hairy with small lanceolate stipules which fall early. **Twigs rather stout, without ring scars**. **FLOWER** heads dirty yellow to pale pink or orange, solitary at leaf axils or just behind leaves. Male heads 0.8-2 cm, globular, stalks 0.8-2 cm. Female heads 1.2-2.3 cm, oval or oblong, stalks 2.5-3.5 cm. **FRUIT** 2.5-8 cm, stalks 1.2-3.8 cm, pale yellow or orange, irregularly globose or fist-shaped, knobby & velvety outside, pink inside with many oblong seeds, $\pm$ 1.2 cm.

NOTE common in semi-open areas.

SIMILAR see page 330.



large tree to 33 m, leaves as *A. lakoocha* but smooth or nearly so, glossy above, often with whitish dusting below. 8-12 pairs of $\pm$ parallel side veins, raised above. Twigs thin. Fruits smooth. Scattered in evergreen forest <1000 m.

761 *A. chaplasha* leaves up to 37x25 cm, oval or broadly obovate. Young shoots densely covered with stiff orange-brown hairs, mature leaves thin with scattered rough hairs above, denser below. Stalks 0.6-2 cm, stout & densely hairy with large lanceolate stipules, leaving ring-like scars. Flower clusters with rough, velvety stalks, 3.5-5 cm. Fruits 7-10 cm, stalks 3-10 cm, fist-shaped with tufts of bristles on raised rounded warts. Uncommon.

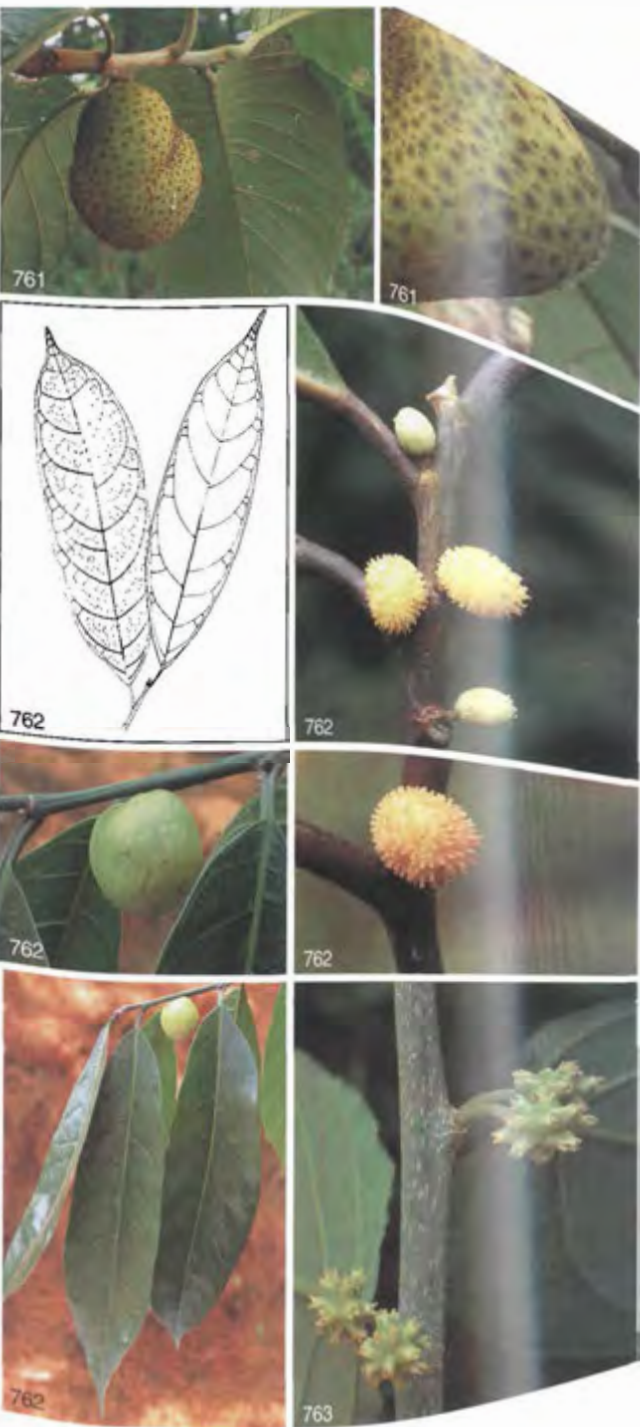
762 *A. lanceolata* evergreen tree to 20 m. Leaves 5-25x3-8 cm, narrowly obovate-oblong or lanceolate with abruptly tapering tip & narrowed or blunt base, smooth or slightly hairy especially along margin. 7-10 pairs of side veins with dense network of smaller veins, stalks 0.5-1.5 cm, twigs slender. Male flowers 0.5-1.5 cm, stalks 0.1-0.2 cm, bracts hair. Fruits 1.5-5 cm, reddish, stalks 0.3-0.5 cm, seeds $\pm$ 7x5 mm. Locally common, hill evergreen forests.

763 *Maclura fruticosa*

แมกน้อย



Scrambling shrub to 5 m with sharp $\pm$ curved thorns to 2 cm. LEAF 10-15 cm, alternate, elliptic-oblong with abrupt tip & rounded base, untoothed, completely smooth. 3-4 pairs of prominent side veins. Stalks 0.8-1 cm, slender. FLOWER densely packed in globose heads, paired in leaf axils, $\pm$ 1 cm, σ & ρ on different trees. 4 overlapping sepals alternating with small bracts. σ with 4 stamens, ρ with 1 fertile style which has a short sterile side branch near base. FRUIT heads $\pm$ 1.5-2 cm, grey-green, with several ovoid seeds packed around a fleshy centre (receptacle). Each seed $\pm$ 1 cm surrounded by enlarged sepals. NOTE fairly common, evergreen forests.



Ficus (figs) 750 species concentrated in SE Asia, 30 species in NT - the 2nd largest tree genus after *Syzygium*.

BOTANY evergreen or deciduous trees, frequently growing on other trees ("strangling"), usually with smooth pale grey bark & abundant white latex. Leaves mostly alternate, rarely opposite, spirally-arranged, sometimes lobed or toothed, typically with a prominent pair of basal veins. Leaf buds protected by conical stipules which leave a distinct ring scar on the twigs. Flowers & fruits completely enclosed in globose or pear-shaped structures (figs) with a narrow opening at the top which is protected by overlapping scales. The inside of the fig is hollow & lined with hundreds of tiny individual flowers which are of 3 kinds - ♂ with 1-5 stamens, fertile ♀ with a single slender style & infertile ♀ ("gall flowers") with a swollen base & much broader funnel-shaped style. "Strangling" figs (subgenus *Urostigma*) are usually bisexual with all 3 types of flower occurring within a single fig, whereas most of the ground figs (subgenus *Ficus*) are functionally unisexual with some trees producing only ♂ & gall flowers while other trees have only fertile ♀ flowers. Gall figs are often slightly larger & more pear-shaped with a mass of wasp grubs inside whereas fertile ♀ figs are smaller & more globose with hundreds of tiny hard seeds when ripe.

STRANGLING FIGS approximately half of our native species are so called "strangling" figs that start their life as small bushes clinging onto another tree, sending down aerial roots which gradually encircle the trunk of the host tree in an intricate interlacing network. The host tree eventually dies, probably through direct competition for light & nutrients rather than being physically "strangled" to death, leaving the fig tree as sole master of the canopy space it occupied. In some fig species, the side branches continue to send down large numbers of aerial roots which eventually become massive subsidiary trunks & enable the tree to develop a huge, spreading crown which can continue to thrive long after the original central trunk has rotted away. See p. 21 for other species with similar epiphytic growth form.

POLLINATION fig trees have developed a remarkable symbiotic relationship with *Blastophaga* wasps whereby the tree relies completely on the wasps for pollination & in return produces gall flowers whose sole purpose is to provide nourishment & protection to the young wasp grubs which are utterly dependent on the fig for their survival. In immature figs the mouth is kept tightly closed, leading to a build up of CO₂ levels due to the respiration of the wasp grubs, which will not develop in normal atmospheric conditions. However, as the fig starts to ripen the mouth opens & CO₂ levels are reduced, which in turn stimulates the wasp grubs to hatch as adults. The male wasps spend their entire lifecycle inside a single fig - as adults they live only for a few hours, their sole function being to help the females to hatch, mate with them & die. The females are more fortunate - after mating with the males, they crawl out thorough the mouth of the fig, thereby becoming covered with pollen from the ♂ flowers which are often clustered around the mouth of the fig. They then fly to other fig trees & force their way through the tightly closed mouth of an immature fig, losing their wings & legs in the process. Once inside the fig, they try to lay their eggs in the ♀ flowers by inserting their ovipositor down the style. If the flower is an infertile gall, the style is short & funnel-shaped so the wasp can successfully lay her eggs, injecting at the same time a chemical which stimulates the ovule to produce only endosperm as food for the grubs. However, if the flower is a fertile ♀, the style is too long & slender for the wasp to be able to lay her eggs. If the fig contains both fertile & infertile ♀ flowers, an individual female wasp will be able to lay some of her eggs in the infertile gall flowers while dusting the fertile ♀ flowers with pollen. However, if the fertile & infertile ♀ flowers are in separate figs, the lucky female wasps will be able to lay all their eggs without pollinating a single flower, whereas the unlucky ones pollinate the fig & thus ensure the continuation of both species although they themselves leave no offspring.



1. figs on trunk & main branches (sometimes also on twigs); independent trees, never "strangling" *Fauriculata* 768
2. leaves >15cm wide, broadly ovate or circular; figs 5-8cm
2. leaves <15cm wide, narrowly ovate or elliptic-oblong; figs usually <4cm *Fsemicordata* 787
3. leaf base very asymmetric (heart-shaped on one side, tapering on other); figs 1.2-2cm.
3. leaf base very asymmetric or nearly so; figs 2.5-5cm
4. small trees usually <10m, twigs hollow, leaves often opposite
5. leaves roughly hairy; fig stalks 0.6-2.5cm *Fhispidia* 779
5. leaves smooth or softly hairy; fig stalks 2.5-8cm *Ffistulosa* 773
5. leaves smooth; fig stalks <1cm *Fsubulata* 999
4. larger trees to 24 m, twigs solid, leaves always alternate
6. lvs 6-15(20)cm, whitish below; twigs slender; fig stalks 0.3-1.2cm *Fracemosa* 784
6. lvs 9-25cm, not whitish below; twigs stout; fig stalks 2.5-6cm *Fvariegata* 789
1. figs always on twigs, never on trunk or main branches
7. mature leaves roughly hairy, often lobed & toothed; independent trees, never "strangling"
8. leaves 5-18cm, stalks 0.3-2cm; figs 1-1.7cm, stalks 0.3-2cm, always solitary *Fheterophylla* 777
8. leaves 14-32cm, (hairy), stalks 2-11cm; figs 1.8-3cm, no stalks, usually in pairs
9. twigs, leaves & figs with long yellow or brown hairs; figs 1.8-3cm *Fhirta* 778
9. twigs, leaves & figs with short stiff white hairs; figs 1.2-1.6cm *Ffulva* 774
7. mature leaves smooth or with fine soft hairs, not lobed or toothed; trees independent or "strangling"
10. figs without distinct stalks (<0.2cm); "strangling" trees
11. leaves 5-17cm, stalks <2cm, not swollen at top
12. leaves with blunt tips
13. leaves obovate, 12-15 pairs of side veins; figs orange-red to dark purple *Fcurtipes* 772
13. leaves oval or elliptic, 6-11(15) pairs of side veins, figs pink/purple *Fmicrocarpa* 781
12. leaves with tapering tips
14. leaves with 4-8 pairs of side veins; figs 0.5-0.8cm *Fpisocarpa* 783
14. leaves with 6-11(15) pairs of side veins; figs 0.6-0.8cm, pink/purple *Fmicrocarpa* 781
14. leaves with >17 pairs of side veins; figs 0.8-1.8cm, orange *Fbenjamina* 769
11. leaves 10-24cm, stalks 2-10cm, usually swollen at top
15. leaves triangular with slender tips, <2x as long as wide
16. leaves 8-12cm with shorter tips (0.6-2.5cm), not glossy, white-dotted below *Frumphii* 786
16. leaves 12-19cm with longer tips (2-4cm), glossy above, no dots *Freligiosa* 785
15. leaves not triangular, usually >2x as long as wide
17. leaves blunt-tipped; figs 1.5-2.5cm
18. 6-10 pairs of side veins; stipules <2cm; figs with persistent bracts
19. wild tree with few aerial roots; mature leaves completely smooth *Faltissima* 766
19. cultivated tree with many aerial roots; mature leaves smooth or softly hairy 765 *Fbenghalensis*
18. many parallel side veins; bright red stipules to 15cm; fig bracts deciduous 764 *Felastica*
17. leaves with pointed tips; figs 0.5-1.2cm
20. figs densely white-hairy *Fflacor* 780
20. figs smooth or slightly hairy
21. leaves obovate or elliptic-oblong; twigs slender *Fvirens* var. *sublanceolata* 790
21. leaves ovate-elliptic; twigs stout; *Fgeniculata* 775
10. figs with distinct stalks 0.3-1.0cm; independent or strangling trees
22. leaves with faint tertiary veins; figs on woody knobs *Fsuperba* 788
22. leaves with thin but distinct tertiary veins; figs solitary or paired
23. mature leaves smooth; figs 0.6-1(1.5)cm, fig stalks 0.4-0.8(1)cm *Fglaberrima* 766 & *Fvirens* var. *virens* 790
23. mature leaves smooth or finely hairy; figs 1.8-3cm, fig stalks 1-3cm
24. independent tree; leaves blunt-tipped, stalks 3-10cm; 7-10 pairs of side veins *Fcallosa* 770
24. strangling tree; leaf tips pointed, stalks 1.8-3.5cm; 11-20 pairs of side veins *Fannulata* 767

MORACE.

NOTE: most *Ficus* spp. produce figs several times a year, so we have not shown fruiting times.

Ficus altissima



Large evergreen "strangling" tree to 30 m, usually with few or no aerial roots. LEAF 8-22x4-11 cm, alternate, ovate or oval with blunt or slightly pointed tip & blunt or rounded base, no teeth. Young shoots minutely hairy, mature leaves completely smooth, rather leathery. 3(5) basal veins, 6-10 pairs of side veins, joined into a thin marginal vein. Stalks 2.5-4 cm, with triangular stipules 1-2 cm, falling early. FIGS 1.5-2.5 cm, in pairs at leaf axils, oval or subglobose, yellow-orange ripening red-violet, smooth. No stalks, 3 thick rounded bracts at base, 3-4 mm. Fallen figs leaving broad raised scars.

NOTE: widespread & fairly common, eventually becoming one of the largest trees in the forest.

SIMILAR 756 *F. benghalensis* tree with stout, spreading branches & many aerial roots. Leaves smooth or softly hairy below. Young tree ripening dark red, 3-ribbed with 3 rounded bracts. Native of India, occasionally planted in NT.

Ficus annulata



tree to 24 m, usually with few or no aerial roots. LEAF 8-22x4-11 cm, alternate, ovate or oval with blunt or slightly pointed tip & blunt or rounded base, no teeth. Young shoots minutely hairy, mature leaves completely smooth, rather leathery. 3(5) basal veins, 6-10 pairs of side veins, joined into a thin marginal vein. Stalks 2.5-4 cm, with triangular stipules 1-2 cm, falling early. FIGS 1.5-2.5 cm, in pairs at leaf axils, oval or subglobose, yellow-orange ripening red-violet, smooth. No stalks, 3 thick rounded bracts at base, 3-4 mm. Fallen figs leaving broad raised scars.



768 *Ficus auriculata*

เดือใบใหญ่ เดือหัว



Small independent evergreen tree to 12 m with spreading, rounded crown & stout, crooked trunk. **LEAF** 15-37x11-30 cm, **broadly ovate or almost circular** with slightly pointed or blunt tip & flat or **heart-shaped base**, untoothed or with widely spaced blunt teeth. Mature leaves smooth above, sparsely hairy esp. on veins below. 3-5(7) basal veins, at least half as long as leaf, 3-6 pairs of slightly arched side veins. Stalks 5-12(20) cm, sometimes tinged red, with pointed stipules, 2-2.5 cm. Twigs smooth or sparsely hairy. **FIGS** 5-8 cm, densely clustered along short woody stumps **hanging from main trunk & branches**, yellow-brown ripening red-brown or dark purple, globose or pear-shaped with narrowed base, sometimes shallowly ridged, edible & rather sweet. Stalks 3-4(8) cm with 3 broad bracts in an irregular ring at top, 3-5 mm.

NOTE common esp. along streams.



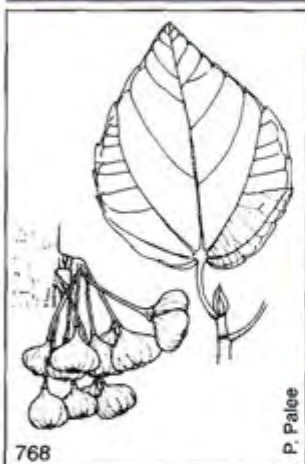
768



768



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768

P. Palee



769

769 *Ficus benjamina*

ไทรย้อย



Evergreen "strangling" tree to 20 m, rarely killing its host, with **slender, drooping branches** & few aerial roots. **LEAF** 5-12x1.6-5 cm, narrowly elliptic with **long-tapering tip** & blunt or slightly pointed base, no teeth. Mature leaves completely smooth with **many (>17) pairs of very thin, ~~parallel~~ side veins**, joined in a thin marginal vein. Stalks 0.6-1.8 cm, slender, with pointed stipules, 0.8-1.1 cm. **FIGS** solitary or paired at leaf axils, **orange or dark red**, globose or ovoid, smooth, no stalks, 3 tiny blunt or rounded bracts at base.

NOTE fairly common in the wild, frequently planted in towns. **var. benjamina** has globose fruits <1 cm, whereas **var. nudus** has obovoid fruits 1.2-1.8 cm.

SIMILAR *F. microcarpa* has many aerial roots & blunter, broader leaves with less side veins. Fruits pink or purple/black, never red-orange.



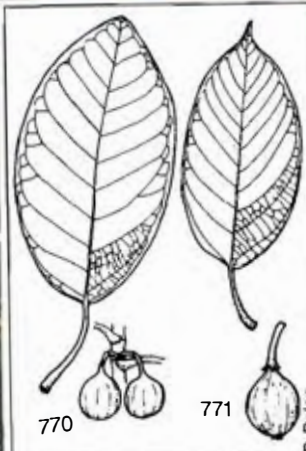
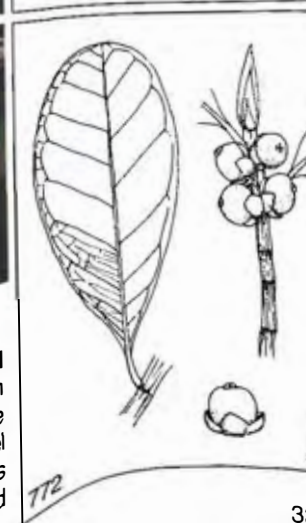
769

770 *Ficus callosa*

มะเดื่อขาว



Large independent **deciduous** or semi-evergreen tree to 30 m with rounded crown & long, straight trunk, becoming slightly buttressed with age. **LEAF** 14-32x6-19 cm, alternate, oval or elliptic with blunt or shortly pointed tip & blunt or rounded base, no teeth. Young shoots finely silky-hairy, mature leaves leathery, yellow-green & smooth above, pale green or **whitish & often sparsely rough-hairy below**. 7-10 pairs of steep side veins, joined at margin, $\pm$ forked, tertiary veins fine but distinct on both sides. Stalks 3-10 cm, with finely hairy stipules, 1-2 cm. **FIGS** 1.8-2.8 cm, solitary or paired in leaf axils or slightly behind leaves, yellow-green, subglobose or pear-shaped with very narrow base. Stalks 1-1.5 cm, slender, minutely hairy, with persistent triangular bracts $\pm$ 2 mm. **NOTE** scattered to fairly common.

771 *Ficus capillipes*

ไทร



Independent evergreen or deciduous tree to 13 m. **LEAF** 9-19x3.5-8.5 cm, (24x11 cm), narrowly obovate or elliptic with blunt or abruptly tapering top, (tip 1-1.5 cm) & blunt base. Mature leaves thin, completely smooth, pale below. 3 main veins from base, 3-9 pairs of slender side veins, joined at margin, tertiary veins faint. Stalks 1.5-5(9) cm, slender, finely hairy, with triangular stipules, 3-15 mm. Twigs very slender, cream-colored. **FIGS** 0.7-1.2 cm, solitary or in pairs at leaf axils or just behind leaves, often abundant, globose or obovate with flattened top, whitish or pale yellow to dark red, finely hairy. Stalks 1-2 cm with 3 triangular bracts in upper half or at top, 1-2 mm. **NOTE** widespread but not common.

772 *Ficus curtipes*

ไทรหิน



"Strangling" tree to 16 m. **LEAF** 10-19x4-8.5 cm, **obovate with rounded tip & narrowed base**. Mature leaves leathery, completely smooth. Midvein broad & flat, $\pm$ 3 basal veins to $\frac{1}{4}$ length of leaf, 8-12 pairs of thin side veins looped or joined in submarginal vein, flat above. Tertiary veins parallel to side veins. Stalks 1.2-2 cm, stipules to 2.5 mm. **FIGS** 0.7-1.5 cm in pairs at leaf axils or behind leaves, orange-red to dark purple, **covering $\frac{1}{2}$ of leaf**. **NOTE** widespread but not common.

772

773 *Ficus fistulosa* var. *fistulosa*

ขี้ขาว มะเคี้ยวขี้



Small independent evergreen or briefly deciduous tree to 15 m with open, irregular crown. **BARK** with rather sparse, dirty cream latex. **LEAF** 10-30x5-15 cm, mostly alternate but **sometimes sub-opposite**, usually narrowly elliptic or obovate with abruptly tapering tip & blunt base, often asymmetric, sometimes broadly ovate with short tip & rounded base, untoothed or with shallow wavy teeth. Young shoots red or pink, **mature leaves completely smooth**, dark green above, paler below, often with reddish veins & stalks. 4-10 pairs of side veins. Stalks 1.1-8 cm, stipules 1.2-1.8 cm. Twigs smooth or finely hairy, **usually hollow when younger & easily broken**. **FIGS** 1.7-2.5 cm, clustered on short woody stumps, usually along main branches, sometimes in leaf axils or on main trunk, yellow-green ripening red-brown, pear-shaped or globose with slightly sunken top & narrowed base, $\pm$ slightly ribbed. Stalks **2.5-5(8) cm**, slender, slightly scaly with 3 triangular bracts near top, 1-3 mm.

NOTE very common in open areas & wasteground.

SIMILAR *F. hispida* 779 has roughly hairy leaves.

774 *Ficus fulva*

Small independent tree to 15 m with open spreading crown. **LEAF** 12-30x9-15 cm, not lobed, oval or broadly ovate with short tip & rounded or heart-shaped base, finely toothed. Mature leaves with **scattered stiff white hairs**, denser on stalks, twigs & figs. $\pm$ 4 pairs of steep side veins. Stalks up to 16 cm, twigs often hollow. **FIGS** 1.2-1.6 cm, densely clustered just behind leaves, **unstaked or with short stalks**, pale yellow, $\pm$ globose with large nipple at top, hairy.

NOTE uncommon, moist areas.

SIMILAR *F. hirta* 778 twigs, leaves & figs with long yellow or brown hairs; figs 1.8-3 cm.

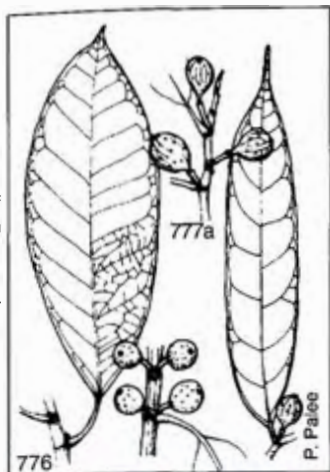


775 *Ficus geniculata*

โศ



Deciduous strangling tree to 20 m. **BARK** latex cream or yellowish. **LEAF** 8.5-17x4.5-10 cm, alternate, narrowly ovate or elliptic with straight, short or abruptly tapering tip & blunt or slightly pointed base, sometimes slightly heart-shaped, no teeth. Mature leaves firmly leathery, glossy above, smooth or minutely brown hairy below. 3 short basal veins, 7-12 pairs of $\pm$ parallel side veins, many slender & rather faint tertiary veins. Stalks 5-10 cm, stiff, swollen & jointed at top, stipules broadly ovate, twigs stout ($\pm$ 5 mm diam.) with prominent leaf scars. **FIGS** 0.6-0.8 cm, in pairs at leaf axils or behind leaves, stalks <1 mm, globose, yellowish or pinkish with white or dark red spots, smooth, with 3-4 persistent rounded bracts at base, $\pm$ 2 mm. **NOTE** scattered in deciduous/ bamboo forests, often on rocks.



776 *Ficus glaberrima* var. *glaberrima*

เดื่อไทร



Evergreen epiphytic shrub or large tree to 23 m with spreading crown. **LEAF** 12-20x4-8 cm, usually oblong with abruptly tapering tip & narrowed to blunt or slightly pointed base, no teeth. 3 basal veins, $< \frac{1}{4}$ length of leaf & running close to margin, 8-11 pairs of slightly curved side veins, joined at margin, tertiary veins thin & widely-spaced. Mature leaves thinly leathery, completely smooth. Stalks 1.3-5 cm, slender, smooth, with narrowly triangular stipules to 3 cm. Young shoots minutely hairy, twigs cream with papery flakes. **FIGS** 0.6-1(1.5) cm, usually in pairs at leaf axils, quite densely clustered, globose or slightly ovoid with nipple at top, pale green with tan warts when young, ripening orange, smooth. Stalks **0.4-0.8(1) cm**, stout, $\pm$ hairy, with large broadly triangular bracts at top, **soon falling but leaving thick, ring-like scar**. **NOTE** fairly common, often close to streams.



777a *Ficus heteropleura*

สลอดหิน



Epiphytic shrub. **LEAF** 5-14x2-6 cm, narrowly elliptic with **long-tapering tip & pointed base, not toothed**. Young shoots scurfy or slightly rough-hairy, mature leaves leathery, completely smooth. 3 basal veins, 3-5 pairs of arched side veins, joined near margin, sharply ridged above, prominent below. Stalks up to 0.6 cm. **FIGS** 0.5-0.9 cm, red-orange, **solitary in leaf axils**, globose, often slightly knobbly. Stalks slender, 0.5-1 cm. **NOTE** fairly common in moist, shady areas.



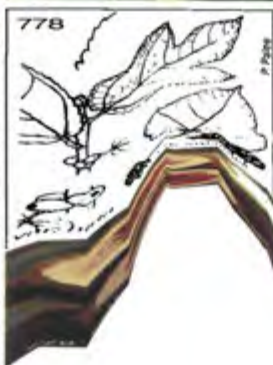
777b *Ficus heterophylla*

สลอดน้ำ มะนอดน้ำ



Scrambling shrub or small tree to 8 m, often growing on other trees but not becoming large enough to "strangle" them. **LEAF** 5-18x3-7 cm, alternate, oval or ovate to oblong-lanceolate (very variable), often $\pm$ lobed, with pointed tip & **rounded or slightly heart-shaped base**, sometimes asymmetric or slightly heart-shaped, **finely or coarsely toothed, often slightly lobed**. Young shoots densely rough-hairy, mature leaves thin with **scattered rough hairs** at least below. 3-5 basal veins, 5-6 pairs of side veins. Stalks 0.3-2 cm, triangular stipules $\pm$ 0.8 cm, twigs with slightly thickened ring at leaf scars. **FIGS** 1-1.7 cm, **in leaf axils or slightly behind them, always solitary**, green with white spots, globose or pear-shaped with sunken top & narrowed base. Stalks slender, 3-7(20) mm, with minute triangular bracts at top.

778 var. *himal.* poll figs (see p 331 for cut fruit)



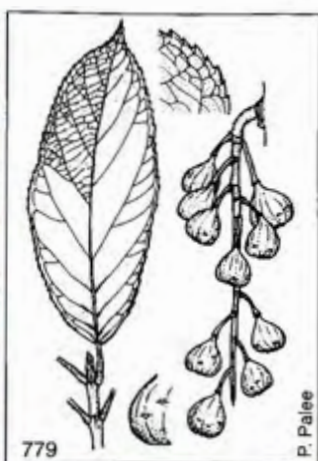
FIGS 2.5-4 cm, **clustered on long stems hanging from trunk & main branches**, sometimes in leaf axils on young trees, greenish-yellow with pale dots, pear-shaped or obconical, narrowed at base, flattened & slightly sunken at top with 7-9 inconspicuous darker **ribs** radiating from mouth, finely hairy, **often with scattered scales**. Stalks 0.6-2.5 cm with 3 small, triangular bracts.

NOTE very common, open areas.

SIMILAR *F. fistulosa*⁷⁷³ is the only other native species with opposite leaves, but is not roughly hairy.

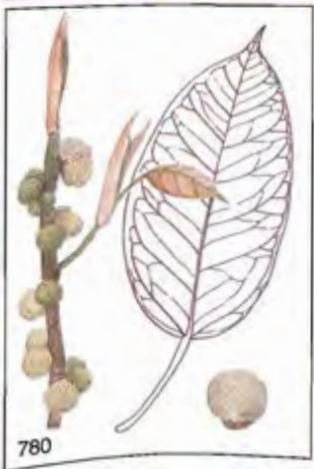
780 *Ficus lacor*

เลียบ ผักเหือด



Large deciduous tree to 20 m, independent or "strangling" but with few aerial roots. **LEAF** 8-20x4-8 cm, alternate, ovate or oblong with shortly pointed or abruptly tapering tip & blunt or slightly heart-shaped base, no teeth. Young leaves reddish, finely silky-hairy. Mature leaves yellow-green, leathery, completely smooth. 5-10 pairs of slender side veins, curved & joined near margin, basal pair $\frac{1}{4}$ - $\frac{1}{2}$ length of leaf. Dense network of smaller veins, obvious below, invisible above. Stalks 2-5 cm, slender. Stipules to 4 cm, pinkish-brown, narrowly pointed, soon falling but leaving ring-like scars. Twigs rather stout, >0.5 cm diam. **FIGS** 0.8-1.4 cm, clusters of 1-4 in axils of young leaves or slightly behind them, globose, pale green or whitish with **dense silky hairs**. No stalks, 3-4 bracts, 2x1 mm.

NOTE uncommon in the wild, planted for its edible young leaves.



781 *Ficus microcarpa*var. *microcarpa*

ไทรย้อยใบทู่



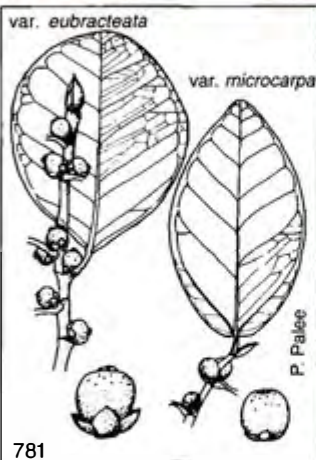
Large evergreen strangling tree to 25 m, often with several main trunks & large spreading side branches, **many aerial roots**. **LEAF** 5-13x2-5 cm, alternate, oval or elliptic, usually with **blunt or slightly tapering tip & pointed base**, no teeth. Mature leaves leathery, dark green & shiny above. **6 11(15) pairs of side veins**, joined quite far from margin into submarginal vein, basal pair to $\frac{1}{2}$ length of leaf. Stalks 0.8-1.8 cm, stipules 1-2 cm, narrowly pointed, leaving slightly raised ring-like scars. **FIGS** 0.6-0.8 cm, solitary or paired at leaf axils, pale green with raised white dots, turning **pink or purple & finally black (never orange)**, globose or obovate with slightly tapering base. **No stalks**, 3 persistent bracts at base, ± 1.5 mm. **NOTE** widespread & common esp. near streams, often planted. forma *microcarpa* is completely smooth whereas forma *pubescens* has fine hairs on twigs, stipules & figs. **SIMILAR** var. *eubracteata* has broadly oval leaves & fig bracts 4-5 mm. Rare. *F. benjamina*⁷⁶⁹ has less aerial roots, pointed leaves with many side veins & orange or red fruits.



781



781



781



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782 *Ficus nervosa* var. *nervosa*

ไทรขนหนู



Evergreen independent tree 8 to 15 (24) m. **BARK** brownish-grey, brittle, ± 1.2 cm thick, with watery or yellowish sap. **LEAF** 8-22x4-8 cm, alternate, narrowly obovate or elliptic-oblong with abruptly tapering top (tip 1-1.5 cm) & narrowed to blunt or rounded base, no teeth. **Young shoots whitish**, mature leaves thin but rigid, dark green & glossy above, paler & smooth or with scattered short hairs below. 7-13 pairs of thick, curved side veins, joined at margin, smaller veins thin but prominent on both sides. Stalks 1-3.5 cm, with narrowly pointed deciduous stipules. Twigs 2-3 mm thick, many ring-like scars. **FIGS** 0.8-1.4 cm solitary or paired at leaf axils or slightly behind them, pendulous, ovoid, pear-shaped or subglobose, base abruptly narrowed into slender neck, 6-12 mm, greenish-yellow ripening orange or red-brown, completely smooth. No stalk, bracts falling early. **NOTE** uncommon.



782

783 *Ficus pisocarpa*

ไทร



Evergreen strangling tree to 18 m.

BARK latex cream or pale yellow.

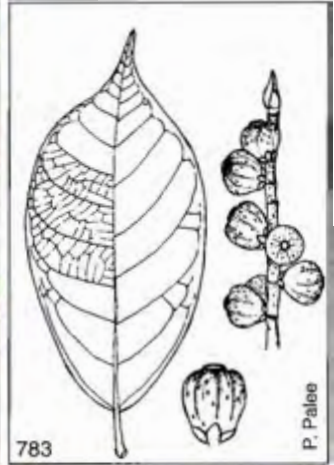
LEAF 7-17x3-9 cm, broadly ovate or elliptic with abrupt, rather sharp & often oblique tip, slightly pointed or blunt base. Mature leaves leathery, completely smooth both sides. 4-8 pairs of faint side veins, joined close to margin, basal pair $\frac{1}{4}$ - $\frac{1}{2}$ length of leaf. Stalks 1.3-3 cm, slender, slightly grooved, stipules broadly triangular, ± 1 cm. Twigs slender. **FIGS** 0.5-0.6(1) cm, solitary or paired at axils of young leaves or just behind them, globose or ovoid with flattened top & sunken mouth surrounded by a thickened ring. No stalks (<2 mm), 3 persistent bracts, ± 3 mm.

NOTE scattered to fairly common in evergreen & deciduous forests.

SIMILAR *F. microcarpa*⁷⁸¹ has blunt-tipped leaves. *F. benjamina*⁷⁶⁹ has many parallel side veins.



783



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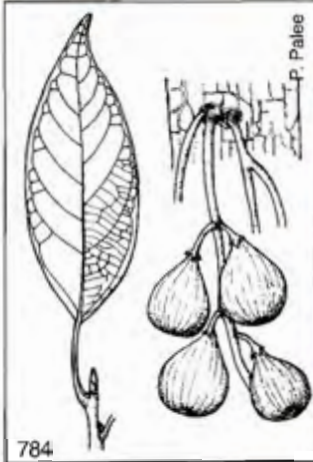
P. Paloe

784 *Ficus racemosa*var. *racemosa*

มะเดื่อเกลี้ยง

Independent deciduous tree to 24 m with rather open crown & large spreading branches, trunk becoming fluted or buttressed with age. **BARK** pinkish-grey or pale brown, becoming rough & coarsely scaly when old, inner bark pinkish with brownish-cream latex. **LEAF** 8-15(20)x4-8 cm, elliptic-oblong with pointed tip & tapering base, untoothed or with shallow rounded teeth near top. Young shoots finely hairy, mature leaves smooth, dark green above, finely white-hairy below. 5-7 pairs of side veins, basal pair $\pm \frac{1}{4}$ length of leaf, upper ones looped, sunken above, fine network of smaller veins. Stalks 3-6 cm, small deciduous stipules. Twigs slender with prominent leaf scars. **FIGS** 2.2-3.2(5) cm, densely clustered along stout woody stumps on trunk & main branches, pear-shaped, yellow-green, ripening dark red-brown, often streaked. Stalks 0.3-1.2 cm, finely hairy, with 3 narrowly triangular bracts at top.

NOTE widespread & fairly common, usually near streams.



784



784



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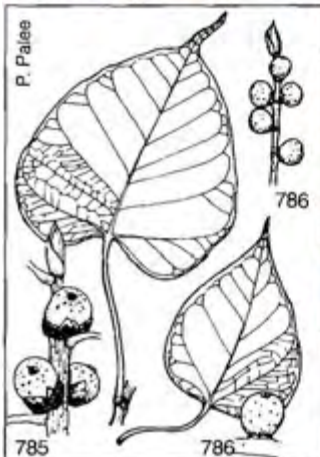
785 *Ficus religiosa*

Bodhi tree โพธิ์

Briefly deciduous "strangling" tree to 20 m with short trunk & large, spreading branches, few aerial roots.

LEAF 12-19x7-11 cm, alternate, **broadly ovate or triangular with long, narrow tip (2.5-4 cm)** & flat or heart-shaped base, untoothed but often wavy at edge. Young leaves flushed pink, mature leaves yellow-green, smooth & glossy, **not dotted below**. 3-7 basal veins, ± 8 pairs of arched side veins, joined near margin. Stalks 5-12 cm, slender, swollen & jointed at top, with large pointed stipules. **FIGS** 1.2-1.5 cm, usually in pairs at leaf axils or behind leaves, globose with sunken top, greenish-yellow ripening purple then blackish, smooth or minutely hairy. No stalk, 4-5 conspicuous bracts **covering $\frac{1}{2}$ of fruit**.

NOTE Native to India but widely planted - almost all Buddhist temples have a fine specimen. This is the tree under which Buddha received enlightenment.

786 *Ficus rumphii*

mock bodhi tree

โพธิ์นก

Similar to *F. religiosa* but leaves smaller, 8-12x6-8 cm, with shorter tips (**0.6-2.5 cm**) & blunt or rounded base, sometimes slightly heart-shaped but never strongly so. Mature leaves smooth or minutely hairy, glossy above, **minutely dotted below**. Stalks 3.5-9 cm. **FIGS** 1.3-1.5 cm, **solitary or paired in leaf axils or behind leaves**, green with white flecks, ripening dark red-purple, globose or slightly obovate, usually slightly asymmetrical. No stalks, 3 inconspicuous bracts at base, 5x5 mm.

NOTE uncommon in the wild, occasionally planted due to its close resemblance to *F. religiosa*.



787 *Ficus semicordata*var. *semicordata* เตือน

Small independent evergreen tree to 12 m. **LEAF** 15-28x5-9 cm, narrowly elliptic or oblong with pointed or tapering tip & **strongly asymmetric base, heart-shaped on one side, pointed or blunt on the other, usually finely toothed**. 3 basal veins, 7-8 pairs of side veins, curved & joined near margin, flat above. Young shoots coarsely hairy, mature leaves with **scattered short rough hairs above**, softer & denser below. Stalks 0.5-2 cm, stout, **coarsely hairy**, twigs with very narrow ring-like stipule scars, hollow when young. **FIGS** 1.2-2 cm, clustered along slender stems which start on the trunk but droop downwards & often **reach the ground, forming runners up to 2 m long just below the surface**. Young figs pink with white dots, ripening red-brown, globose or slightly pear-shaped, sunken at top with thick ring around mouth. Stalks 0.2-0.9 cm, 3 ovate bracts.

NOTE common in open areas & secondary growth. Figs edible, tasting of strawberries.

788 *Ficus superba*

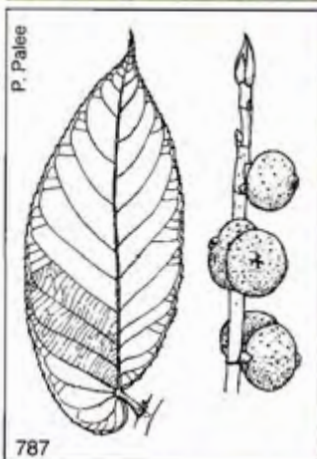
ไทร

Deciduous tree to 9 m, "strangling" but with few or no aerial roots. **LEAF** 8-20x4-12 cm, alternate, clustered, oval to elliptic-oblong with blunt or shortly pointed tip & rounded or slightly heart-shaped base, no teeth. Young leaves silky-hairy, pink quickly turning pale green, mature leaves smooth. 3(5) basal veins, 7-12 pairs of side veins, looped at margin, raised above, smaller veins faint. Stalks 4-12 cm, slender. **FIGS clustered behind leaves or on older branches**, pear-shaped, pale yellow or pink, finally purple with white spots.

NOTE var. *japonica* twigs slender, 0.2-0.6 cm diam, stipules smooth. Figs 0.7-1.1 cm, stalks 0.2-1.8 cm. var. *superba* twigs stout, 0.5-1.2 cm diam, stipules long-hairy. Figs 1.8-2.5 cm, stalks 0.7-3.5 cm.



787



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789 FICACEAE

Ficus variegata
var. *variegata*

ผักเลื้อย



Independent deciduous tree to 25 m with rounded crown & straight trunk, becoming buttressed when mature.

LEAF 9-25x4-13 cm, alternate (upper leaves sometimes sub-opposite), narrowly ovate with tapering or pointed tip & **rounded or heart-shaped base**, usually with scattered irregular **shallow teeth**. Mature leaves thin, smooth or finely hairy. 3(5) basal veins, $\frac{1}{2}$ - $\frac{1}{2}$ length of leaf, 4-8 pairs of side veins, joined at margin. Stalks 3-9(16) cm, slender, with pointed stipules, $\pm$ 1 cm, twigs stout. **FIGS** 2-3.5 cm, **densely clustered along short (to 7.5 cm) woody stumps on trunk & main branches**, often extremely prolific, pear-shaped with tapering base, ripening dark red with tiny white dots, often streaked, smooth or slightly hairy. Stalks 2.5-6 cm, **long & slender**, with small bracts at top.

NOTE widespread & fairly common, usually near streams



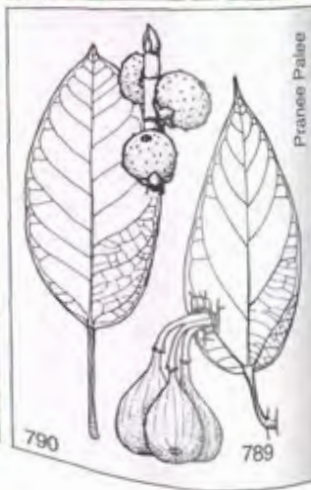
790 ***Ficus virens***

ผักเลื้อย



Large "strangling" tree with spreading crown, few or no aerial roots. **LEAF** 9-22x4-9 cm, alternate, oblong-elliptic or slightly obovate with tapering or pointed tip & slightly pointed or almost flat base, rarely heart-shaped, no teeth but slightly wavy near edge. Young leaves pale green, mature leaves thinly leathery, smooth. 3 basal veins, (5)7-11 pairs of slender but quite prominent side veins, joined at margin. Stalks 2.5-7 cm, twigs slender, buds smooth. **FIGS** 0.6-1.2 cm, **solitary or paired, usually in leaf axils or behind leaves**, (sub)globose, pale green, cream or pink finally red or purple, succulent & edible. 3 fairly large persistent bracts at base.

NOTE widespread & fairly common, often near streams, frequently growing on rocks. 2 varieties in NT: var. *sublanceolata* figs without stalks, var. *virens* figs with



Pranee Palee

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URTICACEAE nettle family

1050 mostly tropical family, 3 genera & 18 species of trees or woody shrubs in NT. **BOTANY** mostly herbs & shrubs, a few small trees to 5 m, outer bark thin & fibrous, no milky latex. Leaves simple, alternate or opposite, usually toothed, 3 main veins from base, stipules free or fused in pairs. Flowers small, unisexual, mostly in dense clusters (cymes or spikes) at leaf axils, no corolla. Males usually with 4-5 calyx lobes & 4-5 stamens opposite lobes, filaments curved strongly backwards after release pollen. Females with or without calyx. Fruits dry, 1-seeded, often enclosed by persistent calyx. **ECOLOGY** common in moister open areas & secondary growth, sometimes as understorey in semi-open forests. The flowers are pollinated by wind.

⁷⁹⁴***Boehmeria clidemioides***

Much branched shrub to 3 m. **BARK** brown, thin, smooth with large lenticels. **LEAF** 7-20x4-10 cm, **opposite or alternate**, mostly clustered near end of twigs, **2 leaves in a pair often unequal-sized**, elliptic or oblong with tapering tip & blunt or slightly pointed base, **finely or quite coarsely toothed**, roughly hairy above, softer & denser below. 3 basal veins, $> \frac{1}{2}$ as long as leaf, 2-4 pairs of side veins. Stalks 3-7 cm, slender, **stipules not fused together**. **FLOWER** in dense heads grouped into spike-like clusters **behind leaves & in lower leaf axils**, usually with tuft of new leaves at top(?), male & female flowers in same cluster, males in lower half, no stalks, tubular calyx with 2-4 teeth, stigma long & slender, projecting beyond calyx. **FRUIT** dry, enclosed in calyx with persistent stigmas.

NOTE fairly common, open areas. 2 varieties in NT: var. *clidemioides* leaves < 10 cm, var. *platyphylloides* leaves 10-20 cm.

SIMILAR ⁷⁹⁵⁻⁸⁰¹ 7 other species of *Boehmeria* in NT - see TABLE15.

1. stipules free; stigma slender; longer than calyx; fts dry ^{Boehmeria}⁷⁹⁴
1. stipules fused in pairs; stigma broader & shorter
2. leaves lanceolate, $> 3x$ as long as wide
3. vs finely toothed, basal veins $\pm \frac{1}{2}$ as long as leaf ^{Db. longifolia}⁸⁰²
3. lvs coarsely toothed, basal veins $\pm$ as long as leaf ⁷⁹¹*Maoutia puya*
shrub to 2m; lvs 10-15x5-7cm, very rough above, white & softly hairy on main veins below, 2-3 pairs of veins, stalks 1.2-6cm, stipules deeply 2-cleft, 1.2cm; ♂ fws with 5-lobed calyx & 5 stamens, ♀ fws without calyx, short style; fts flattened, with bracts
2. leaves $< 2.5x$ as long as wide
4. basal veins $< \frac{1}{2}$ length of leaf
5. leaves toothed or wavy, twigs with stinging hairs ⁷⁹²*Dn. sinuata*
leaves 20-50x7.5-35cm, broadly ovate to elliptic, stalks 7.5-20cm. male? flowers with stalks, females in loose fascicles at end of main stalks
5. leaves mostly untoothed, no stinging hairs ⁷⁹³*Dn. stimulans*
lvs 15-30x6.5-10cm, elliptic or obovate, stalks 5-10cm; flowers all sessile, females in a row on a slightly sunken fleshy "receptacle"
4. basal veins $> \frac{1}{2}$ length of leaf
6. lvs evenly spaced, regularly toothed, greenish below 3-5 pairs of 2° veins; stipules to 1.1cm, fw clusters to 3cm ^{Db. squamata}⁸⁰³
6. lvs crowded, irregularly toothed, shiny white & densely hairy below 5-8 pairs of 2° veins; stipules 1-2.5cm; fw clusters 5-9cm ^{Db. wallichii}⁸⁰⁴

Dn. = *Dendrocide*, *Db.* = *Debregeasia*



⁸⁰²*Debregeasia longifolia*

ໄຂ່ປລາ



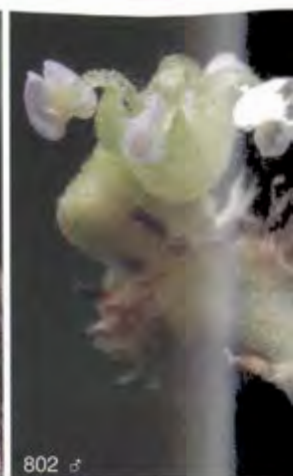
Shrub or small tree to 7 m **BARK** brown, thin, smooth or finely cracked with large circular lenticels. **LEAF** 9-23x2-5 cm, alternate, **lanceolate or linear with long-tapering tip & narrowed base**, often slightly asymmetrical, **finely toothed**. Young leaves densely silvery-hairy, mature leaves dark green & smooth with scattered rough hairs above, whitish & densely hairy below. 3 basal veins, $\frac{1}{3}$ - $\frac{1}{2}$ as long as leaf, 5-7 pairs of side veins, tertiary veins ladder-like, Stalks 0.5-3 cm, stipules 0.5-1 cm, lanceolate, **fused in pairs**. **FLOWER** tiny, green, in dense globose heads grouped in forked clusters at leaf axils, to 2 cm, males & females on same tree but usually in different clusters. Male heads 3-5 mm with several hairy bracts, calyx deeply 4-lobed, 4 stamens, rudimentary pistil. Females heads 1.5-2.5 mm, bracts unequal, **calyx tubular, not lobed, fleshy**, unequally swollen at top, completely covering ovary. **Style very short with small knob-like stigma**. **FRUIT** ± 2 mm, bright orange, globose or slightly flattened, with a single black seed (achene) completely covered by fleshy orange calyx.

NOTE very common in moister open areas & secondary growth.

SIMILAR 2 other species, both with broadly ovate leaves, to 17x14 cm.

⁸⁰³*D.squamata* leaves evenly spaced, regularly toothed, slightly hairy, greyish below, 3-5 pairs of side veins. Twigs <4mm thick, with bristles. Flowers in stout clusters <3cm.

⁸⁰⁴*D.wallichiana* often epiphytic, leaves clustered, irregularly toothed, dense mat of shiny white hairs below, 5-8 pairs of side veins. Twigs 5-10 mm thick, no bristles. Flowers in slender clusters 5-10 cm.



JUGLANDACEAE walnut family

59 species with an unusual distribution pattern - N. temperate, Malesia & S.America. 1 genus & 2 species in NT.

805 *Engelhardtia spicata*

คทมด



Deciduous tree to 20 (30) m with dense but rather pale crown & upright branches. **BARK** grey or grey-brown, cracked, inner bark red-brown, fibrous. **LEAF** 28-46 cm, **odd- or even-pinnate**, alternate, 3-5 pairs of (sub)opposite or alternate leaflets, upper ones largest, to 22x8 cm, (terminal leaflet, if present, smaller than the others), narrowly ovate or oblong with blunt or tapering tip & oblique base, **no teeth**. 11-18 pairs of thin but obvious side veins, smaller veins faint. **Leaflet stalks 0.3-1 cm**, main stalks 15-37 cm, no stipules. **FLOWER** minute, in slender branched catkins hanging from bare twigs. **Separate male & female flowers in the same cluster**, females near end of cluster & males on lower side branches. Each flower surrounded by conspicuous 3-lobed bract. 4 sepals, no petals. Males with (6)8-13 stamens. **FRUIT 3-winged, middle wing much longer than others**, delicately veined. Nut 3-5 mm, bristly.

NOTE a common element of hill evergreen forests, usually >1000 m. Sometimes divided into 2 varieties - **var. *integra*** leaflets mostly with blunt or notched tips, densely hairy, fruit clusters <25cm, central wing 1.5-3cm. **var. *spicata*** leaflets with tapering tips, smooth, fruit clusters 20-50 cm, wing 3-5 cm. The distinction between these varieties is not clear cut.

SIMILAR **806** *Engelhardtia serrata* คีอจัน leaflets 5-13 cm, usually toothed at least near top, lower surface with many minute pale dots (scales), $\pm$ hairy, stalks <1 mm. Male & female flowers on different trees, male clusters <5 cm, 3-4(7) stamens. Female clusters 6.5-15 cm. Fruits with central wing 2-3.5 cm. 500-1600 m, both deciduous & evergreen forests, less common.



805



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BETULACEAE birch family

110 species concentrated in N. temperate regions, 2 genera & 3 species in NT.

807 *Betula alnoides*

กำลังเสือโคร่ง



Briefly deciduous tree to 30 (40) m with rather open crown & slightly drooping branches. **BARK** red-brown or silvery-grey with large oblong lenticels, **peeling in very thin horizontal flakes**, becoming rough & irregular with age, inner bark pale brown, **strongly aromatic**. **LEAF** 6 14x2.5-5 cm, simple, alternate, ovate with tapering tip & blunt or rounded base, **sharply & irregularly toothed**. Young shoots densely silvery hairy, mature leaves thin & papery, smooth or with tufts of hairs in vein axils below.

Lower surface with many tiny resinous dots. 9-13 pairs of $\pm$ straight side veins ending at teeth. Stalks 0.6-1.3 cm, slender. **FLOWER** tiny, greenish, in drooping catkins along bare twigs or behind young leaves, male & female in different catkins but on same tree. Males in slender catkins to 18 cm, individual flowers in **groups of 3** at the axil of a hairy bract, ± 1 mm. 4 hairy linear sepals, 4-6 stamens each with a short filament & 2 anthers. Female catkins up to 9 cm, thicker & denser, in groups of 2-5. Individual flowers solitary in the axil of a 3-lobed bract. **FRUIT** ± 0.4 cm, with 2 papery wings 2-3x broader than nut. Fruit clusters covered with spiky bracts & persisting on tree long after fruits have blown away on the wind.

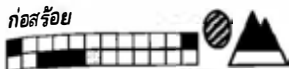
NOTE a distinctive element of hill evergreen forests, often occurring in almost pure stands.

SIMILAR: *Carpinus* spp.⁸⁰⁸ have smooth non-peeling bark, only 1 flower per bract & much larger fruits. *Prunus cerasoides*³⁷⁹ has similar outer bark but the inner bark is not aromatic.



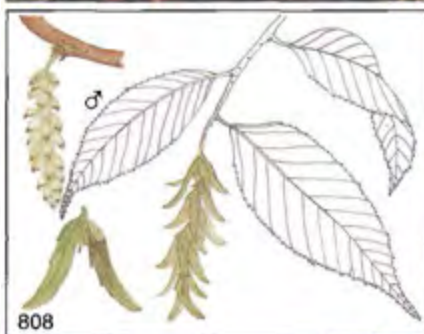
808 *Carpinus londoniana***hornbeam**

ก้อสร้อย



Deciduous tree to 25 m. **BARK** pale grey, **smooth & hard-looking**, **usually slightly fluted**, inner bark not aromatic. **LEAF** 9-12x3.5-5 cm, simple, alternate, spirally arranged, ovate or oblong-lanceolate with **long-tapering tip** & slightly pointed or blunt base, **finely & rather sharply irregularly double-toothed**. Young leaves with short hairs, mature leaves bright green, completely smooth or with tufts of hairs in leaf axils. 1-3 basal veins, 10-13 pairs of $\pm$ straight & parallel side veins ending at teeth, fine but clear network of smaller veins. Stalks 0.5-0.9 cm, flat both ends, stipules $\pm$ 1 cm, narrow & pointed, usually golden hairy, falling early. Leaf buds narrowly conical, scaly. **FLOWER** tiny, green or reddish, males in short drooping catkins at leaf or slightly below axils, individual flowers solitary in axil of broad-ovate scale, no calyx or corolla, 3-12 stamens. Females in pairs at end of twigs, with deciduous outer bract & persistent 3-lobed inner bract, calyx & corolla reduced to 6-10 teeth at top of ovary. **FRUIT** in slender clusters 5-12 cm, with finely hairy main stalk 2.45 cm. Individual fruits $\pm$ 2.5 cm, pale green, with large **papery wing-like bract**, **distinctly 3-lobed** with central lobe much larger than others, **blunt-tipped**, $\pm$ slightly curved, **margins untoothed or with scattered blunt teeth**. Nut **finely hairy**, hidden at base of bract, with 2 thread-like styles at top, $\pm$ 2 mm. **NOTE** scattered in moist fire-free areas 300-700 m.

SIMILAR ⁸⁰⁹*C. poilanei* has slightly smaller leaves, 5-10x2.5-3.5 cm, stalks densely fine-hairy. Fruit bract 1.5-3 cm, with pointed central lobe & scattered teeth on outer margin, nut with fine ridges & many resin glands but no hairs. Hill evergreen forests 1000-1600 m. These 2 species are very difficult to distinguish apart & are considered by some botanists to be a single species.

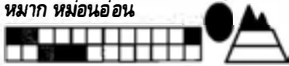


MYRICACEAE myrtle family

55 species found throughout the world except Australia, only 1 species in NT.

810 *Myrica esculenta*

หมาก ห่อน้ำร้อน



Shrub or small evergreen tree to 9 (15) m with uneven open crown & short crooked trunk. **BARK** grey-brown to dark brown, roughly fissured, rather thick, inner bark orange-red. **LEAF** 5-11x1.5-3.5 cm, simple, alternate, clustered near tip of twigs, narrowly elliptic or obovate, blunt or slightly tapering at both ends, untoothed or with scattered teeth. Young leaves pale pink, finely hairy, mature leaves leathery, dark green & glossy above, paler & densely covered with **tiny blackish resinous dots below**, smooth or with hairs on main veins only. 5-11 pairs of side veins, curved & joined at margin with a fine network of smaller veins. Stalks 0.3-1 cm, smooth or densely hairy, stipules falling early. Young twigs & buds dull red-brown with long hairs & scattered **yellowish glands**. **FLOWER** tiny, densely clustered in short catkins at leaf axils, male & female on different trees, **no calyx or corolla**. Males **yellow ripening bright red**, catkins bunched together & usually branched, 2-8 cm, each flower consisting of a single tiny pale green bract (± 2 mm) and 2-4 stamens fused together at base, releasing clouds of pollen when shaken by the wind. Females green, usually in unbranched catkins 1-5 cm. Bracts 2-3 mm, style very short with 2 slender recurved stigmas, ± 2.5 mm, ovary densely hairy. **FRUIT** 1-2 cm, **orange-red**, globose or slightly flattened with an **irregular, minutely warty surface**, thinly fleshy with a single large hard stone. **NOTE** widespread & fairly common in open hill forests, often with pine along exposed ridges with thin soil.



FAGACEAE oak family

Predominantly temperate family with 700 species worldwide, 4 genera & 40-60 species in NT.

Botany evergreen or deciduous trees without latex or colored sap, often with thick, deeply cracked bark. Leaves alternate, spirally arranged, often clustered near end of twigs, with deciduous stipules. Flowers tiny, usually creamy-yellow, in slender clusters at end of twigs & upper leaf axils, males & females in different flowers on the same tree. Males with 6 (4-7) spreading sepals, no petals & 6-18 free stamens, females similar but sepals closely pressed together around 3 styles. Fruit a nut, partly or completely enclosed by cupules. 3 main genera in NT: **Castanopsis** (chestnuts) mostly evergreen, leaves toothed or untoothed, flower clusters upright*, 10-12 (8-14) stamens, fruits usually completely covered by spiny cupules. **Lithocarpus** mostly evergreen, usually untoothed, flower clusters upright*, 6 stamens, fruits mostly only partly covered by cupules, not spiny. **Quercus** (oaks) often deciduous, leaves usually toothed, males in slender pendulous catkins, 6 stamens, fruits only partly covered by cupules, not spiny.

ECOLOGY *Fagaceae* form a dominant component of hill evergreen forests, becoming increasingly abundant in slightly fire-damaged areas but losing ground to pines in areas with thin soils & frequent fires. Some of the deciduous species are often found with dry dipterocarp species at lower altitudes.

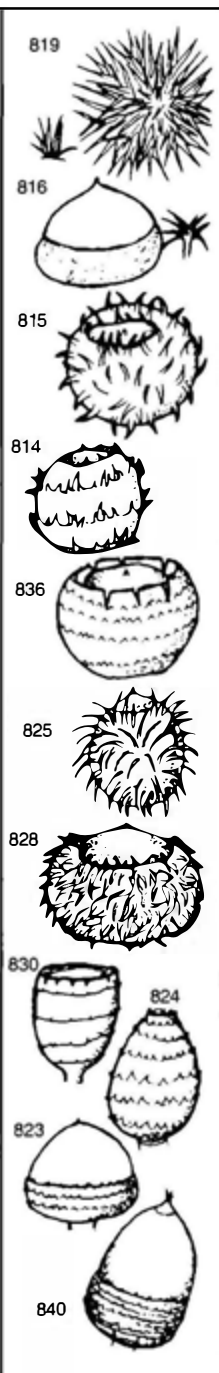
USES generally not good timber but excellent firewood. Several species have edible nuts.

* clusters always start upright but often start to droop as they lengthen.

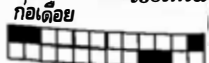
TABLES 17 & 18

FRUIT KEY (*C.* = *Castanopsis*, *L.* = *Lithocarpus*, *Q.* = *Quercus*)

1. fruit cups completely covering nut, usually with sharp spines
 2. spines very dense, completely hiding nuts *C. indica* 819
 3. leaves distinctly toothed, $\pm$ velvety below *C. armata* 816
 3. leaves untoothed or with shallow wavy teeth, smooth below *C. diversifolia* 818
 4. cup wall thick & woody; scar covering $\geq \frac{1}{2}$ of nut
 4. cup wall thinner, not woody; scar covering $< \frac{1}{2}$ of nut
2. spines less dense, not completely hiding surface of fruit
 5. fruits 2-4 cm, scar covering $\frac{1}{2}$ or more of nut *C. armata* 816
 6. cups thick & woody, spines in star-shaped clusters *C. argyrophylla* 815
 6. cups thinner, spines simple, drying dark with pale tips
 5. fruits 1.2-2.5 cm, scar covering $< \frac{1}{2}$ of nut, cup wall rather thin, not woody *C. tribuloides* 820
 7. spines long & quite sharp, leaves not toothed *C. acuminatissima* 814
 7. spines short & blunt; leaves toothed near top
1. cups not completely covering nuts, with blunt "spines", scales or rings
 8. cups with distinct "spines" or scales, often overlapping but not fused in rings
 9. cups covering $> \frac{1}{2}$ of nuts
 10. leaves distinctly toothed
 11. fruits in spikes 9-15 cm long, 4-6 rings of scales *C. calathiformis* 817
 11. fruits solitary or paired, many rings of scales *Q. kingiana* 836
 10. leaves not toothed
 12. fruits > 4 cm, cups with blunt "spines" > 4 mm long
 13. "spines" soft (like a rambutan); scar concave *L. garrettianus* 825
 13. "spines" thick & woody; scar convex *L. echinops* 828
 12. fruits < 3.5 cm, cups with small triangular scales, < 3 mm long
 14. fruits flat-topped *L. truncatus* 830
 14. fruits with rounded tops
 15. cups woody, nut hairy, scar covering $\frac{1}{3}$ - $\frac{1}{2}$ of nut *L. dealbatus* & *L. craibianus* 822
 15. cups thinner, nut smooth, scar cover only base of nut *L. fenestratus* 824
 9. cups covering $< \frac{1}{2}$ of nut
 16. mature leaves hairy below
 17. leaves ovate-oblong, with reddish hairs, stipules ovate *Q. lanata* 837a
 17. leaves obovate, with yellowish or greyish hairs, stipules linear *Q. incana* & *L. lindleyanus* 826
 16. mature leaves smooth or nearly so
 18. leaves distinctly toothed, $\pm$ slightly hairy *Q. aliena* 832
 18. leaves untoothed, completely smooth
 19. fruit clusters < 5 cm long; nuts as wide as long *Q. eumorpha* 834
 19. fruit clusters 5-20 cm; nuts as wide as long *L. polystachyus* 827
 19. fruit clusters 20-30 cm, nut wider than long *L. elegans* 823
8. cups with indistinct scales fused in concentric rings
 20. leaves distinctly toothed
 21. nuts longer than wide *Q. semiserrata* 840
 21. nut about as wide as long, pointed at top *Q. mespilifolia* 839
 22. cups covering at least $\frac{1}{2}$ of nuts
 23. lvs thin, hairy; fruits usually solitary, 2-3 cm diam. *Q. lineata* 838
 23. lvs thicker, glaucous; fruits in bunches, ≤ 2 cm diam *Q. brandisiana* 833
 21. nut much wider than long, flat or sunken at top
 24. cups covering $\frac{1}{3}$ - $\frac{1}{2}$ of nuts *Q. velutina* & *Q. vestida* 841
 24. cups covering at least $\frac{1}{2}$ of nuts *Q. kerrii* 835
 20. leaves untoothed or with shallow wavy teeth
 25. individual fruits with distinct stalks ≥ 5 mm *L. sootepensis* 829
 25. individual fruits without stalks *L. elegans* 823



814 *Castanopsis acuminatissima*
ก้อเคือบ



Evergreen tree to 25 m. **BARK** dark brown with deep fissures, 1-2 cm thick. **LEAF** 5-15x2.5-6 cm, lanceolate with **tapering tip** & blunt or rounded base, **untoothed or slightly toothed near top only**. Mature leaves dark green & glossy above, slightly silvery with minute scales below. Mid-vein slightly sunken above, 8-12 pairs of arched side veins, raised above. Stalks 0.6-1.5 cm, grooved, drying dark brown to black. Twigs slender, dark brown with conspicuous lenticels. Buds subglobose, with 2-3 scales at base. **FRUIT** 1.5-2x1-1.3 cm, **obliquely ovoid** with 4-5 widely spaced rows of short spines, 1.5-3 mm, **not completely covering surface**. Cupules thin-walled, silky hairy inside, splitting irregularly when dry. (1)2 **nuts**, 0.8-1.2 cm, ovoid with slightly pointed tip & flat inner surface, smooth or slightly hairy. Scar covering $\leq \frac{1}{3}$ of nut.

NOTE locally common in hill evergreen forests, 900-1300 m.



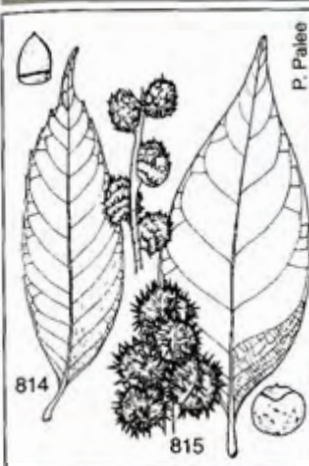
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814 ♂



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815

P. Palee

815 *Castanopsis argyrophylla*
ก้อขม



Semi-evergreen tree 6-17m. **BARK** grey-brown to dark brown, fairly smooth to quite deeply fissured. **LEAF** 11-20x4.5-8 cm, ovate or elliptic-oblong, narrowed at both ends, not toothed. Young shoots finely hairy, mature leaves **smooth** dark green above, **paler or with minute dust-like hairs below**. 9-12 pairs of curved side veins, thin but conspicuous, raised above (also midvein). Stalks 1.2-2.5 cm, stipules small, twigs $\pm$ minutely hairy. **FRUIT** 2-3.5 cm, in upright spikes, not splitting, with tufts of sharp (stout) simple spines 3-13 mm, close or widely spaced, **drying black with pale tips**. 1-3(4) nuts, 1.5-2.3x1.5-2 cm, sub-globose or ovoid with tiny tip, smooth except for scattered hairs near top, large scar $\frac{3}{4}$ height of nut. **NOTE** common in drier forests.



815



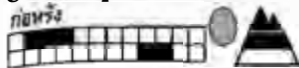
815



815 ♂



815 ♀

816 *Castanopsis armata*

Evergreen tree 15-30 m. **LEAF** 8-22x3.5-8 cm, narrowly elliptic or lanceolate with tapering tip & blunt or slightly pointed base, **not toothed**. Young shoots sparsely hairy, mature leaves completely smooth. 6-12 pairs of slender arched side veins, raised above. Stalks 1-2 cm. **FRUIT** (2)2.5-5 cm, in short stout spikes of 3-8 sessile fruits, solitary or paired but not fused, cupules **thick & woody**, eventually splitting into 1-3 parts when ripe. Spines 3-12 mm, sharp, in **stalked star-shaped clusters arranged in concentric ridges, often dense but not completely concealing surface**. Nuts 1-2.5 cm, solitary, ovoid or slightly flattened, partly fused to cupule, finely hairy with rounded scar covering $\geq \frac{1}{2}$ of nuts. **NOTE** locally common in hill forests, 1000-1300 m.



816



816 ♀



817 ♀

817 *Castanopsis calathiformis*

Evergreen tree to 20m. **BARK** dark brown, deeply cracked, inner bark yellow-brown. **LEAF** 10-24x3-9 cm, elliptic-oblong, blunt or narrowed at both ends ($\pm$ slightly notched), with **widely spaced teeth except near base**. Young shoots finely orange-brown hairy, mature leaves yellow-green & shiny ($\pm$ hairy on midvein only) above, silvery with orange brown hairs or nearly smooth below. 15-20 pairs of side veins ending at teeth, raised above. Stalks 0.5-2 cm, stout. **FRUIT** spikes 9-15 cm, individual fruits 1.8-3.2 cm, without stalks but distinctly narrowed at base. **Cups covering $\frac{1}{2}$ - $\frac{3}{4}$ of nut**, fragile & splitting irregularly when ripe, red-brown hairy outside, silky-hairy inside. **Spines short & scale-like, in 4-6 concentric zones**. Nuts 1.2-2 cm, dark brown & glossy, slightly silky at top, narrowly ellipsoid or ovoid. Scar convex to slightly concave, 4-6 mm. Endosperm with conspicuous red lines (ruminate). **NOTE** scattered in semi-open forests.



816

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P. Palee



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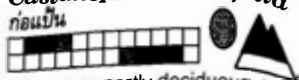
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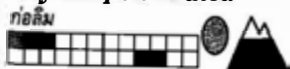
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818 *Castanopsis diversifolia*

Deciduous or partly deciduous tree to 10-20 m. **BARK** moderately cracked, inner bark pale yellow. **LEAF** 8-24x4-12 cm, ovate, oval or oblong with tapering or almost blunt tip & rounded or slightly pointed base, **variable in size & shape even on same twig, untoothed or with scattered teeth near top.** Young leaves finely pale brown-hairy, mature leaves leathery, smooth above, **usually sparsely hairy at least on veins below.** 10-14 pairs of conspicuous side veins, sunk above. Stalks 1.2-2 cm, stout, brown-hairy when young. **FRUIT** 3.5-5.5 cm, without stalks, globose or ovoid, finally splitting into 2-4 parts when ripe. **Cupules not woody, completely covered with sharp spines, 8-20 mm, radiating in dense clusters of 5-8.** Nut 1.5-2 cm, softly hairy, slightly flattened with scar covering $\frac{1}{3}$ - $\frac{1}{2}$ of nut. **NOTE** common & widespread in hill evg forest, often gregarious.

819 *Castanopsis indica*

Evergreen tree 8-20 m. **BARK** brown or silvery grey, $\pm$ deeply cracked. Inner bark fibrous, pale orange, soon darkening. **LEAF** 10-25x3.5-9 cm, elliptic or oblong with pointed tip & blunt or slightly pointed base, **distinctly & quite sharply toothed except near base.** Young shoots densely orange-brown hairy, mature leaves dark green & shiny above, silvery with dense minute **creamy-orange hairs which easily off below.** 14-20 pairs of prominent parallel side veins ending at teeth. Stalks 0.6-2 cm, finely hairy. **FRUIT** 2.5-4 cm, orange-brown, densely clustered, completely covered by **long slender straight sharp spines of differing lengths, 8-12 mm.** Nuts 0.6-1.3 cm, ovoid, hard, reddish hairy esp. near top, usually solitary. **NOTE** fairly common in a wide variety of forest types.



819



819

P. Palce



819



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819



819

820 *Castanopsis tribuloides*

ก่อใบเลื่อม



Evergreen tree to 33 m. with irregular crown often with large branches from near base. **BARK** tan-brown to dark grey-brown, shallowly or quite deeply fissured, rather thin. **LEAF** 8-15x3-5 cm, narrowly ovate to lanceolate with tapering $\pm$ oblique tip & blunt or slightly pointed base, **usually untoothed**, occasionally with shallow teeth near tip only. Young shoots finely hairy, mature leaves leathery, dark green & shiny above, grey-green with minute creamy-brown "dust-like" hairs which easily rubs off below. 8-14 pairs of slender arched side veins, joined at margin, raised above. Stalks 0.6-1.5 cm, smooth, drying black. **FRUIT** spikes to 25 cm, individual fruits 1.3-2.5 cm, globose, solitary or in pairs but not fused. Cupules covered with sharp spines, 3-7 mm, **usually on short ridges in $\pm$ 4 indistinct rows, often branched or in star-shaped clusters**, $\pm$ densely hairy outside, silky inside, splitting irregularly when ripe. Single nut 0.7-1.2 cm, smooth, subglobose or ovoid-conic with convex scar, 0.8-1.2 cm. **NOTE** one of the commonest species of *Fagaceae*, leaf size & shape very variable but easily recognised by the small, densely spiny fruits.



820



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P. Palea



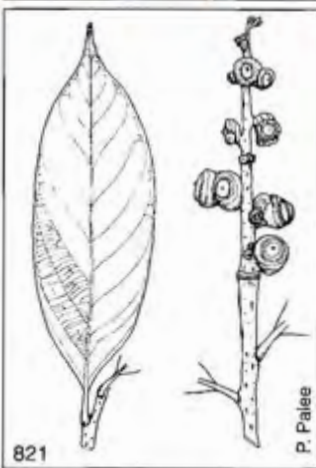
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821 *Lithocarpus aggregatus*

Evergreen tree to 20m. **LEAF** to 9-24x3.5-9 cm, pointed at both ends, untoothed, $\pm$ 11 pairs of side veins, mature leaves smooth & shiny above, minute "dust-like" hairs below. Stalks 1.5-2 cm, twigs slender with conspicuous lenticels. **FRUIT** fused in groups of 1-3 on a common stalk 0.5-1cm, along stout spikes, to 8 cm. Ripe cups $\pm$ 2.2cm diam., $\pm$ $\frac{1}{2}$ covering nut, scales in $\geq$ 5 irregular rings, not overlapping. Nut $\pm$ 2x2.5 cm, hemispherical with flat or slightly convex scar, $\pm$ 2 cm diam. **NOTE** uncommon.



821

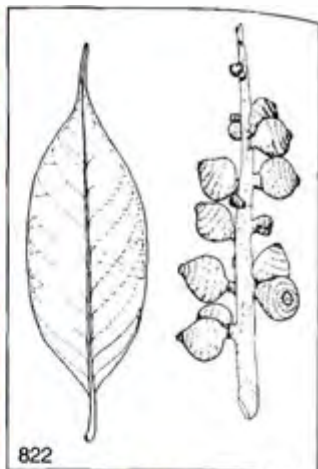


821

P. Palea

822 *Lithocarpus craibianus*

Small evergreen tree to 10m. **BARK** red-brown, deeply fissured. **LEAF** to 12-16.5x3.5-5 cm, long tapering tip, no teeth. ± 11 pairs of side veins, top ones looped, mid-green & shiny above, paler with dense minute "scurfy" hairs below. Stalks 1.3-2 cm. **FRUIT** 1.7-2.8 cm, in short stout clusters. Cups ± 1.7 cm diam., completely covering nut, rather thick, often reddish with rather scattered triangular scales ± 2 mm, not in clear rings. Single globose or ovoid-conical nut, 1-1.3 cm, **hairy**. **Large scar** $\pm \frac{1}{2}$ height of nut.

823 *Lithocarpus elegans*

var. *elegans* *naturalis*

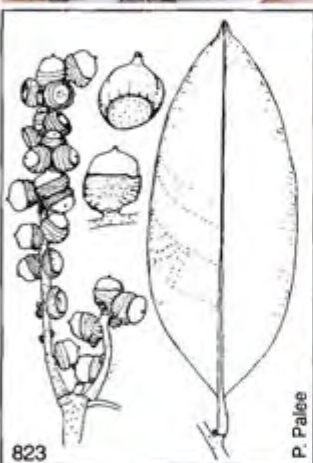
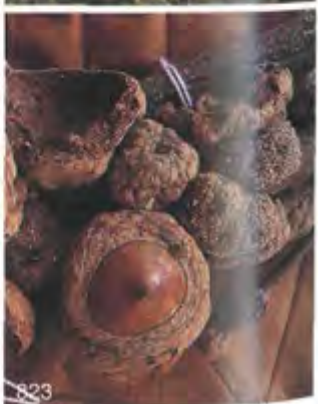


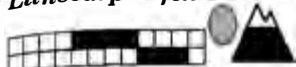
Evergreen tree 6-25 m. **BARK** grey-brown, cracked in small pieces, **LEAF** 7-30x12 cm, very variable in shape & size, typically elliptic-oblong to lanceolate with pointed or tapering tip (often slightly curved), slightly pointed to rounded base, no teeth. Mature leaves **completely smooth**, dark green & glossy above, paler below. 10-20 pairs of slender side veins, curved at margin, raised above (also midvein), quite faint below. Stalks 0.5-2.5 cm, slender, drying black. Twigs slender with conspicuous small lenticels.

FRUIT fused in groups of 3-6, **densely clustered along stout spikes 20-30 cm**. Cup 1-2.3 cm, saucer-shaped, covering $\frac{1}{4}$ to $\frac{1}{3}$ of nut, with tiny triangular scales, free near top but $\pm$ fused in rings near base of cup. Nut 1.5-2.5 cm, dark brown, smooth & shiny, globose-ovoid or hemispherical, usually slightly sunken at top with short point in centre, base with large concave scar, 1.4-1.8 cm diam.

NOTE very common in a wide variety of forest types.

SIMILAR var. *brevipetiolatus* leaves to 30x12 cm, obovate with abrupt or blunt tip & narrowed to rounded or heart-shaped base, side veins prominent, stalks <1 cm. Fruits to 4 cm, cups covering $\frac{1}{2}$ of nut. Rare

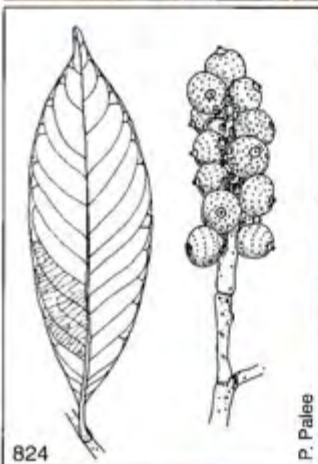


824 *Lithocarpus fenestratus*

Evergreen tree to 20 m with large upright main branches & short stout trunk, often fluted near base. **BARK** medium grey to dark brown, often with whitish patches, quite smooth or shallowly fissured. **LEAF** 12-22(30) x 3-8 cm, narrowly elliptic-oblong to lanceolate with tapering tip & pointed base, untoothed. (6) 10-16 pairs of $\pm$ parallel side veins, curved near margin, thin but prominent below. Young leaves pinkish with scattered hairs, mature leaves dark green & smooth above, paler & **densely covered with minute felt-like hairs** below. Stalks 0.6-1.8 cm, young twigs with yellowish or reddish velvety hairs, later smooth. **FRUIT** densely crowded along upright spikes, to 25 cm. Cup 1.5-2.5 cm, almost completely ($>3/4$) enclosing nut, becoming very thin & irregularly split when ripe, with many **curved, hook-like scales** 2-3 mm, grey-brownish velvety. Nut 1.4-1.9 cm, rich shiny brown, globose or slightly flattened. Scar $\pm$ 7 mm, almost flat. **NOTE** locally common.



824



824

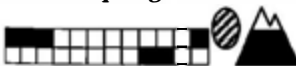
P. Paloe



824



825

825 *Lithocarpus garrettianus*

Small evergreen tree to 9m. **LEAF** 8-18(28) x 2.5-8(12) cm, narrowly obovate, oblong or oblanceolate, tapering at both ends, untoothed. Young shoots densely hairy, mature leaves with short soft yellowish or **orange-brown hairs especially on veins below**. 12-13 pairs of side veins, sunken above. Stalks 0.8-2 cm, hairy. **FRUIT** densely grouped in clusters of (2) 3 along spikes 8-10 cm. Cup to 2.5 cm, without stalks, covering at least $3/4$ of nut, with many **slender curved bristles** 4-5 mm, **stiff but not sharp** (like a rambutan). Nut 0.8-1.3 cm, globose to slightly oblong with short point, drying pale brown. Scar concave, slightly less than diam. of nut. **NOTE** uncommon.

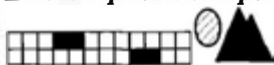


825



825

P. Paloe

826 *Lithocarpus echinops*

Large evergreen tree. **BARK** dark brown, cracked. **LEAF** 15-22 cm, narrowly elliptic, untoothed. Mature leaves rigid, shiny above, dull below. 10-12 pairs of side veins, prominent below. Stalks to 2.5 cm. **FRUIT** densely clustered on stout woody spikes, 7-17 cm. **Cup very thick & woody**, covering 2/3 of nut, leaving a circular opening at top, with many **stout curved scales, thick and ±overlapping at base, pointed but not sharp at tips**. Nut to 2.8 cm, globose or flat-ovoid, **lower half rough, upper half polished**, very thick-shelled, remaining attached to cups when mature.

NOTE scattered in less disturbed forest on Doi Intanon.

827 *Lithocarpus lindleyanus*

ก้อดำง



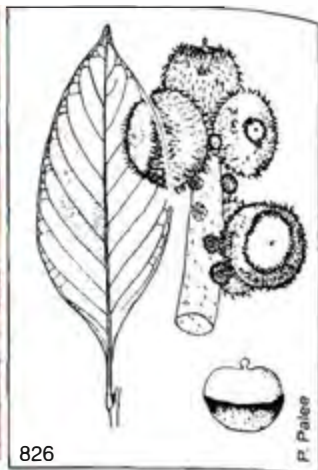
Evergreen tree to 10 m with irregular crown, often branching low down. **BARK** grey to pale brown, quite smooth with a few long thin cracks when young, becoming deeply fissured at base with age. **LEAF** 15-25(30)×6-15 cm, **obovate** with abruptly tapering or blunt tip & narrowed to flat or heart-shaped base, untoothed or with shallow wavy teeth towards tip. Young shoots densely velvety-hairy, mature leaves smooth or sparsely hairy on veins above, ± densely covered with soft pale creamy-brown or greyish hairs below. 9-15 pairs of arched side veins, **slightly sunken above** (also tertiary veins). Stalks 0.6-1.4 cm, stout, shortly hairy. **FRUIT** fused in clusters of 2-6 along stout woody spikes, 20-30 cm. Cup 1.2-1.6 cm diam, cup-shaped, not stalked but narrowed at base, covering 1/4-1/2 of nut, brown or greyish velvety-hairy outside, smooth inside. Scales in young fruits thick & quite distinct, eventually forming 4-6 slightly swollen irregular concentric rings. Nut (0.8)1.5-2.5 cm, dark brown, hairy when young, smooth & glossy when mature, narrowly ovoid or oblong with pointed tip, indistinctly angled. Scar slightly convex, ±5 mm diam. **NOTE** scattered in a wide variety of habitats.

828 *Lithocarpus polystachyus*

ก้อหน

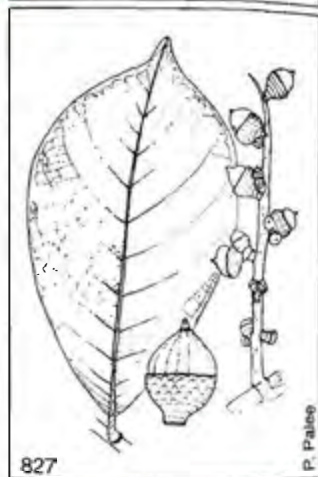


Small or medium tree to 15 m, branching low down. **BARK** greyish, quite smooth, often with long vertical bold furrows in old trees at base, inner bark streaked red & white. **LEAF** 10-20×5-8 cm, narrowly ovate, oblong-elliptic or lanceolate with tapering tip & ±pointed base, **untoothed**. Young shoots finely hairy, mature leaves thinly leathery, smooth or with scattered fine hairs, ± glaucous below. 8-13 pairs of side veins, thin but conspicuous with fine ladder-like tertiary veins. Stalks 0.8-2.5 cm, very slightly winged near top, smooth. **FRUIT fused in clusters of 2-3 on short common stalks** (often indistinct). Cups 0.8-1.5 cm diam., narrower than stout central stalks, saucer-shaped, covering ± 1/3 of nut, with dense overlapping triangular scales, sometimes appressed & indistinct. Nut 0.8-1.7 cm, globose or blunt ovoid, yellow-brown, smooth & shiny. Scar slightly concave.



826

P. Paloe



827

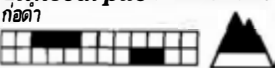
P. Paloe



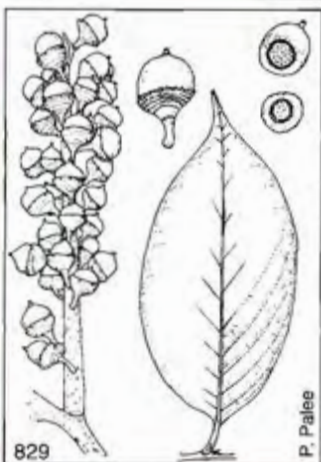
828

829 *Lithocarpus sootepensis*

Small or medium-sized evergreen tree to 13m. **BARK** pale grey, smooth. **LEAF** 9-18x4-8 cm, narrow ovate or elliptic-oblong with tapering or abruptly pointed tip & blunt or slightly pointed base, untoothed. Mature leaves glossy dark green above, **whitish with minute "dust-like" hairs below**. 9-12 pairs of arched side veins, tertiary veins very slender. Stalks 1-1.7 cm, smooth. Twigs slender, dark brown with many pale lenticels. **FRUIT** densely clustered along spikes to 30 cm, **individual fruits with distinct stalks, 0.6-1 cm**, sometimes 2-3 fruits sharing same stalk. Cups 0.4-0.7x1.6 cm, covering $\frac{1}{4}$ of nut, saucer-shaped with many indistinct rings of triangular scales, smooth both sides. Nuts 1.5-2.7 cm, broadly ovoid or depressed-globose with short point at top, white-hairy when young, later grey-brown & smooth. Scar flat or slightly concave, ± 0.7 cm diam.

330 *Lithocarpus truncatus*

Evergreen tree to 17 m. **BARK** grey, nearly smooth or with thin cracks. **LEAF** 12-22x2-8 cm, narrowly ovate, elliptic-oblong or lanceolate with obliquely tapering tip & narrowed base, untoothed. **Young shoots densely red-brown hairy**, mature leaves smooth & glossy above, paler with minute "dust-like" hairs below. 7-14 pairs of side veins, fine but distinct below, raised above. Stalks 1-1.6 cm. **FRUIT** subsessile clusters of 1-3 fruits with fused cups, along spikes to 20 cm. Cups 1.5-2.5x1-2 cm, thick & woody, **funnel-shaped with flattened top, almost completely covering nuts**. Scales distinct near top, fused into uneven, $\pm$ concentric rings in lower part. Nuts 1.1-1.8(2.5) cm, obovoid with flattened top, finely hairy, not shiny. Scar $\pm \frac{3}{4}$ height of nut.



831 *Lithocarpus thomsonii* ก่อขาว

Evergreen tree to 30 m. **LEAF** 10-20x3-7 cm, narrowly obovate or oblong or lanceolate, tapering at both ends, untoothed. Young shoots slightly hairy, mature leaves leathery, smooth & glossy above, paler with very fine silvery hairs below. 10-17 pairs of slender arched side veins, tertiary veins faint. Stalks 0.6-1.5 cm, stout. **FRUIT** tightly packed in stout spikes of 3-12 fruits. Sterile cups brown & sticky-glossy with many overlapping scales. Fertile cups usually solitary, without stalks, 1-2.5 cm diam., saucer-shaped, covering $\leq \frac{1}{4}$ of nut & strongly fixed to it, **densely greyish or brownish-velvety** with broad pointed scales, closely pressed to surface & more or less fused into rings. Nuts 1.2-2x1.2-1.5 cm, hemispherical with distinct tip & slightly narrowed base, minute greyish powdery hairs which easily rub off. Scar, deeply concave, ± 7 mm diam. **NOTE** uncommon.

832 *Quercus aliena*

ก่อเคียน



Evergreen tree to 20 m. **BARK** dark grey, quite rough with long, wide vertical fissures, inner bark dark red, fibrous. **LEAF** 10-23x5-10 cm, often clustered near end of twigs, narrowly ovate or lanceolate, tapering or pointed both ends, with **scattered teeth except near base**. Young shoots thinly hairy, mature leaves smooth & glossy dark green above, pale & smooth or sparsely hairy on veins only below. 10-18 pairs of side veins, ending at teeth, prominent below. Stalks 0.6-1.2 cm. **FRUIT** 1.8-2 cm, solitary or fused in clusters of 2-3 near end of short spikes amongst leaves, individual fruits without stalks. Cups 0.5-0.6x1.2-1.3 cm, covering $\frac{1}{3}$ - $\frac{1}{4}$ of nuts, splitting irregularly, with conical overlapping appressed scales, ± 0.5 mm, smaller near margin. Nuts 1.4-1.8 cm, smooth & brown, narrowly ovoid with pointed tip, flat at base with small flat scar ± 6 mm diam. **NOTE** preferring damp areas.

833 *Quercus brandisiana*

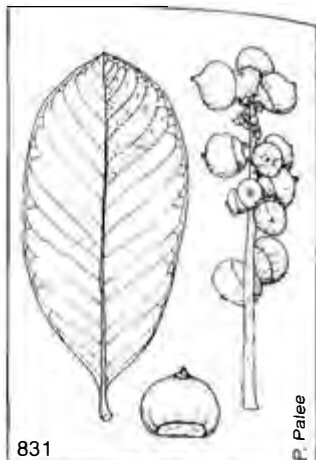
ก่อสีเสียด



Evergreen tree to 13m. **BARK** brownish, fissured, corky, ± 0.8 cm thick, inner bark yellow-brown, fibrous. **LEAF** 10-20x5-8 cm (30x13 cm), narrowly ovate, obovate or elliptic-oblong with pointed or slightly tapering tip & blunt or slightly pointed base, scattered **shallow teeth** especially in upper half. Young shoots thinly hairy, mature leaves quite opaque both sides, smooth & wrinkled above, glaucous below with scattered fine hairs which easily rub off, becoming smooth. 10-15 pairs of straight parallel side veins, bent at margin & ending in teeth, **sunken above**. Stalks 1.6-3.6 cm, slender, smooth. **FRUIT** spikes 2.5-5-7.5 cm, few-fruited, stalks red-brown hairy. Cups 1.2-2 cm diam., top-shaped & covering $\pm$ all of nut when young, later shallowly cup-shaped & $\frac{1}{2}$ covering nut with 48 irregularly toothed concentric rings. Nuts ovoid or globose with short point & red-brown or golden hairs neartop. Scar flat, 6-7 mm diam.

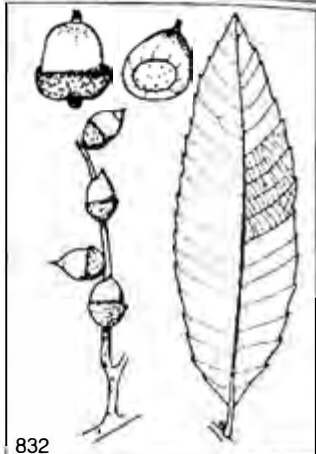
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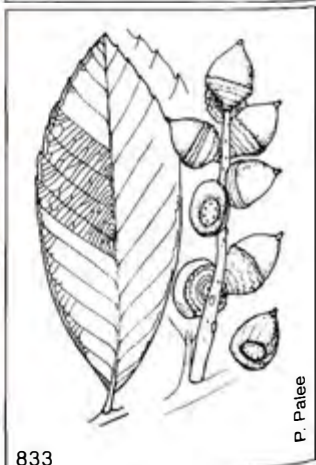


831

P. Palee



832



833

P. Palee

834 *Quercus eumorpha*

Small evergreen tree to 10 m, often remaining stunted. **LEAF** 7.5-10 cm, ovate, elliptic or oblong, slightly tapering at both ends/pointed base, slightly & bluntly toothed near tip only. Mature leaves leathery, uniformly green, **completely smooth**. Side veins thin & slender, quite faint. Stalks 1-1.6 cm, slightly winged at top. **FRUIT** spikes to 5 cm with only 1-2 fruits. Nuts 1.8-2 cm, ovoid, smooth. Cup velvety, 1.4-1.8 cm diam, thickly leathery, brown & smooth, scales quite distinct when young, triangular, closely pressed, becoming more indistinct when ripe & arranged in narrow unequal concentric rings. **NOTE** upper slopes of Doi Intanon.



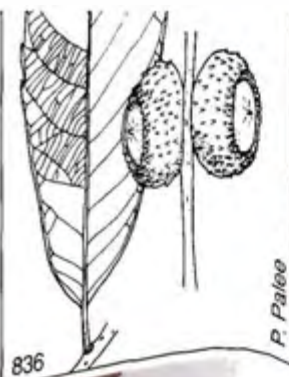
835 *Quercus kerrii* var. *kerrii*



Deciduous tree 6 to 15 m, often coppicing. **BARK** dark brown or grey, 1.5-2 cm thick, deeply cracked, inner bark reddish. **LEAF** 8-24x3-10 cm, often in whorl-like clusters, narrowly ovate, elliptic-oblong or lanceolate with pointed or abruptly tapering top (actual tip often blunt or slightly notched) & slightly pointed or blunt base, **quite sharply toothed in upper half**. Young leaves pinkish or mauve & densely golden-brown-hairy, mature leaves dull green, smooth on both sides except main veins below. 10-19 pairs of slender side veins, raised above. Tertiary veins quite prominent below. Stalks 1-2 cm, hairy. **FRUIT** in short dense clusters in leaf axils. Cups 0.8-2.2x0.8-1.5 cm, cup or saucer-shaped, covering $\geq \frac{1}{2}$ of nut, with 7-9 finely toothed concentric rings, soft brown hairy outside. Nut 1.2-1.6 cm, oblong becoming sub globose, flattened with short tip, softly hairy when young but later nearly smooth, not falling out of cups. Scar ± 1.2 cm diam. **NOTE** locally common in semi-open forests, sometimes with dry dipterocarp spp. **SIMILAR** var. *pubescens* has mature leaves persistently densely hairy below.



Deciduous tree to 15 m. bark grey or blackish, deeply cracked, inner bark dark red, faintly streaked, splitting easily but not fibrous. **LEAF** (6)10-16x(2)4-6 cm, elliptic-oblong or obovate, pointed or blunt at both ends, **coarsely toothed** in upper half. Young leaves densely covered in soft brownish-cream hairs esp. below, mature leaves smooth or slightly hairy below. 7-14 pairs of ±straight side veins, ending at teeth, raised on both sides. Stalks 0.8-2.5 cm. **FRUIT** solitary or in pairs, amongst leaves. Cups 2x1.3-2.5 cm, deeply cup-shaped with incurved lip, ≥½ covering nuts, softly hairy both sides, with many dense layers of small triangular scales, tip of scales distinct, **overlapping, not in rings**. Nuts globose or flattened, sunken with nipple at top, large convex scar covering basal ⅓ of nut. **NOTE** fairly common in semi-open forests, sometimes with dry dipterocarp spp



837a *Quercus lanata*



Large evergreen tree. **LEAF** 10-24x4-9 cm, oval, ovate, elliptic-oblong or lanceolate with pointed top (actual tip often blunt) & slightly pointed base, **coarsely toothed** in upper ⅓. Young leaves densely covered with minute rusty or creamy-brown hairs, mature leaves smooth & waxy above, **dense reddish hairs below**. 9-14 pairs of prominent side veins ending in teeth, sunken above. Stalks 0.8-2 cm, densely fine-hairy when younger. **FRUIT** solitary or in pairs, no individual stalks. Cups 1.7-2.3x1.4-1.8 cm, hemi-spherical or cup shaped, **woolly**, covering ⅓ - ½ of nut, with overlapping scales. Nut 1.2-1.7x1.1-1.6 cm, subglobose or ovate with short persistent style at top. Scar ±3mm, slightly convex.

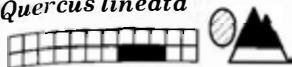
837b *Quercus lenticellata*

กวดาคลลย

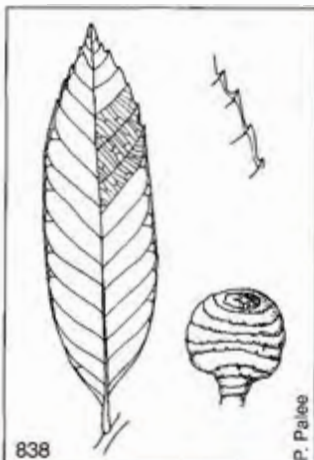


Leaf 6-13x2-4.5 cm, elliptic, slightly pointed or blunt at both ends, toothed in upper 2/3 or almost untoothed. Mature leaves smooth above, densely covered in minute creamy hairs below. ±13 pairs of side veins. Stalks 1.5-2 cm, slender, red-brown. **FRUIT** cups 1.2-1.8 cm diam. deeply cup-shaped, covering ≥½ of nut, thin, with appressed triangular scales, 1-2 mm, in 5-8 obscure rings. Nuts 1.2-2 cm, oval with short nipple at top. Scar convex, later ±flat, 1.1-1.4 cm diam. **NOTE** uncommon.



838 *Quercus lineata*

Evergreen tree 10 to 20 m, often with steep buttresses to 1.3 m high. **BARK** fairly smooth, inner bark yellow-cream. **LEAF** 8-25x3-8 cm, narrowly ovate, elliptic-oblong or lanceolate with abruptly tapering or pointed top (tip 0.7-2.5 cm) & broadly pointed base, **toothed in upper 1/4 to 1/2**. 10-15 pairs of $\pm$ straight parallel side veins ending at teeth, flat above, tertiary veins ladder-like. Mature leaves smooth both sides or slightly scurfy-hairy below. Stalks 1.5-2.8 cm, slender, flattened above, smooth. Twigs black with fawn-colored round lenticels. **FRUIT** in thick-stalked clusters. Cups 3-3.5 cm diam., bowl saucer-shaped with narrow stalk-like base **covering 1/4 or less of nut**, with scales fused into 6-8 thin irregular rings, golden hairy outside when young, densely silvery hairy inside. Nuts 2-3 cm, ovate or flattened-globose, with blunt tip & 3 persistent styles at top & a large 2-ringed scar at base, 1-1.6 cm diam., flat or slightly convex

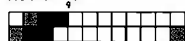
839 *Quercus mespilifolioides*

Briefly deciduous tree to 20 m. **LEAF** 10-20x5-7 cm, narrowly ovate, elliptic-oblong or lanceolate with broadly tapering or pointed tip & blunt base, coarsely toothed in upper 1/4 with short teeth. Young leaves pink & densely brown-velvety, mature leaves smooth & glossy above, paler & smooth or with scattered patches of velvety hairs which rub off easily below. 12-16 pairs of $\pm$ parallel side veins ending at teeth, quite thick & prominent below, tertiary veins fairly clear. Stalks 1-2 cm, reddish hairy. **FRUIT** clustered amongst leaves. Cup 1.3-3 cm diam, **hemispherical or deeply cup-shaped with tapering base**, covering 1/2 of nut, with 6-10 quite widely spaced irregularly toothed concentric rings, brown-hairy outside, smooth inside. Nut 1.3-1.6x1-1.3 cm, **deeply sunken into cup**, hemispherical, slightly flattened & sunken at top with short point in centre, flat at base with slightly convex scar 0.8-0.9 cm.

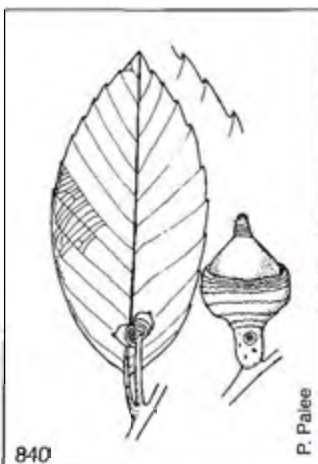
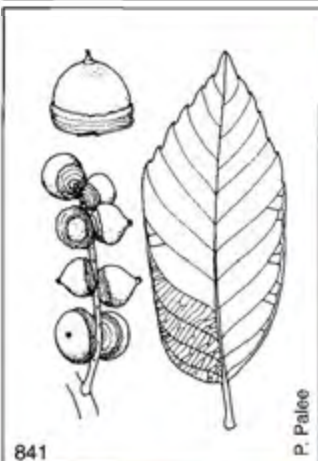


840 *Quercus semiserrata*

กอกกระดุม



Evergreen or briefly deciduous tree 13-17 m, often completely covered with young leaves for a short period. **BARK** brown or dark grey, almost smooth to shallowly fissured, hard & brittle, ± 1.2 cm thick, inner bark reddish with cream stripes. **LEAF** 8-23x3-8 cm, narrowly ovate, elliptic-oblong or lanceolate with tapering or pointed tip & blunt or slightly pointed base, **toothed in upper half**. Young shoots densely covered with soft yellow-brown or greyish hairs, mature leaves smooth & glossy above, smooth or slightly hairy & $\pm$ glaucous below. 9-17 pairs of straight & parallel side veins, upper ones ending at teeth, thin but obvious. Stalks 0.8-2.3 cm, yellow-brown hairy at first, later smooth. **FRUIT** spikes very short & thick with only 1-3 fruits. Cup in first year obconical & completely covering nut, softly golden-brown hairy with scales fused into 5-8 concentric rings, lower ones minutely toothed, upper ones untoothed. In second year cup becomes deeply cup-shaped, 2-3.5 cm diam., covering only $\frac{1}{3}$ - $\frac{1}{4}$ of nut, $\pm$ smooth. Nuts 1.7-4 cm, flattened-obovoid to oblong-ovoid with short stout tip, falling out of cup when ripe. Scar ± 1.1 cm diam.

841 *Quercus vestita*

กอกเมย



Large evergreen or partly deciduous tree. **LEAF** 13-17x3-7 cm, obovate, elliptic or lanceolate with tapering tip & pointed or blunt base, untoothed or with **small quite hard black spines in upper half**. 8-15 pairs of side veins, sunken above. Mature leaves dark green & shiny with tiny brown hairs at base of midvein above, **whitish with a dense mat of hairs below**. Stalks 0.7-1 cm, slightly swollen at base, hairy as midvein. **FRUIT** in thick, yellowish spikes 9-10 cm, individual fruits without stalks, fused at base in clusters of 3. Cup 1.3-1.8x0.3-0.4 cm, saucer-shaped, covering $\pm \frac{1}{2}$ of nut when fully ripe, silky-hairy both sides, scales fused in 4-6 irregularly toothed rings. Nuts 1.4-1.5 cm, densely white silky-hairy when young, globose or strongly flattened with short point at top & large concave scar at base, 0.7-1.2 cm diam.

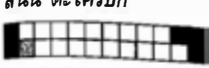


SALICACEAE Willow family

435 species concentrated in N. temperate & arctic regions, only 1 species native to Thailand.

842 *Salix tetrasperma*

สนน ตะไครบก



Briefly deciduous tree to 20 m with stout crooked trunk & upright branches, sometimes slightly drooping at tips but **never hanging in long sprays**. **BARK** dark grey with deep interlacing fissures. **LEAF** 6-18x2-4.5 cm, simple, alternate, spiral, narrowly elliptic or lanceolate with long tapering or pointed tip & blunt base, **finely toothed**. Young shoots densely silvery-hairy, mature leaves dark green & smooth or sparsely hairy above, pale green or greyish (glaucous) & smooth to quite densely hairy below. 12-24 pairs of side veins, smaller veins faint. Stalks **1-3 cm**, slender, often reddish. Stipules to 4 mm, absent or inconspicuous except in saplings & basal regrowth. **FLOWER** minute, white or pale yellow, in slender catkins at end of short side shoots with young leaves below them, **5-15 cm**, male & female on different trees. Individual flowers with slender stalks & a fairly persistent oval bract, densely hairy to nearly smooth, no calyx or corolla. Males with **4-10** free stamens, 4-6 mm, hairy at base. Females with a **single** nectary gland & short style with 2-lobed stigma, ovary densely hairy with distinct stalk. **FRUIT** 0.3-0.4 cm, pale brown or greyish, splitting into 2 sections which curl backwards, releasing 4-6 tiny seeds with a tuft of white hairs at one end which drift away on the wind.

NOTE common along streams throughout NT, sometimes planted to reinforce river banks.

SIMILAR **843 *S. babylonica* หลิว** weeping willow twigs hanging in long sprays with narrower leaves (<2 cm wide), stalks <1 cm. Catkins 1.5-4 cm, 2 stamens, 2 nectary glands. Fruits 1.5-2.5 mm. Sometimes planted, native to N.China.



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UHACAENACEAE & PANDANACEAE

MONOCOTYLEDONAE

Palms, Dracaenas & Screw Pines

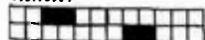
84 families & 55,800 species worldwide, the vast majority of which are herbs, including orchids, ginger & grasses. Only 3 families in NT with woody trees. Trunks typically cylindrical, not increasing in girth with age (no secondary thickening), leaves thick & leathery with parallel veining, usually completely smooth. Flower parts in threes.

DRACAENACEAE

210 species concentrated in tropical Africa & Asia, 1 genus & 2 species in NT. Formerly included with American *Yucca* in Agavaceae.

844 *Dracaena lourieri*

จำพรหม



Shrub or slender much-branched tree, rarely more than 5 m. **BARK** pale cream, thin, smooth with close ring-like leaf scars. **LEAF** (22)50-80x3-7 cm, simple, alternate, crowded near top of stems, linear with long sharp tips, grasping stem at base, no stalks. Mature leaves thick & rigid, completely smooth. **FLOWER** 0.7-1.2 cm, cream or greenish-yellow, in large branched clusters at top of stems, to 100 cm. Calyx tubular with 6 narrow sepals fused towards base, not overlapping. 6 stamens, ± 7 mm, attached to base of sepals, filaments as wide as anthers. Style ± 2.5 mm with 3-lobed stigma. **FRUIT** ± 1 cm, green-brown, globose, usually 1-seeded.

NOTE locally common, especially on exposed limestone rocks. Fully mature trees can reach 17 m with over 100 heads.

SIMILAR ⁸⁴⁵*D. angustifolia* พรวพณลำ shrub usually <2 m, leaves 20-35(60)x1.2-4 cm, flowers 1.2-2.5 cm, stamens 1.6 cm, attached in middle of sepals, filaments much narrower than anthers style ± 20 mm. Fruits 1.2-1.6 cm, 1-3-lobed, glossy dark green to orange. Moist, shady areas.

PANDANACEAE screw pines

875 species worldwide, 1 genus & several distinct species in NT.

⁸⁴⁶*Pandanus* เตยหิน evergreen shrubs to 5m with dense clusters of leaves near top of slender stems, often with aerial roots near base, rather like enormous pineapple plants. **LEAF** up to 3m, simple, spirally-arranged, linear with vicious spines all along the edges. No stalks, sheathing stems at base. **FLOWER** tiny, males & females on different trees, no calyx or corolla, many stamens. **FRUIT** (syncarp) in dense ovoid or oblong heads, often spiny. **NOTE** moist areas, often forming large impenetrable colonies.



PALMAE (ARECACEAE) palms

Large almost exclusively tropical family, 2650 species worldwide, at least 8 genera & 13 species native to NT.

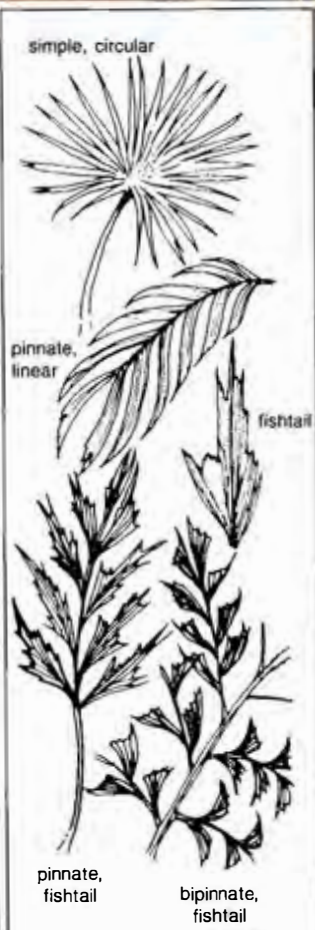
BOTANY evergreen trees without branches, single-stemmed or with several stems clustered together, often with conspicuous concentric rings. Leaves simple or pinnate, with distinct stalks which are often enlarged at base & form a sheath around the stem. Flowers in branched clusters protected by a large conspicuous bract (spathe) in bud, usually starting amongst or just below the leaves but being left behind as the stem grows. Individual flowers tiny, usually unisexual, without stalks, calyx segments typically in 2 rows of 3, males mostly with 6 stamens (sometimes 3, 9 or more). Fruits a fleshy or fibrous drupe, usually 1-seeded.

ECOLOGY most native species are restricted to fire-free, moist forests. The larger species are heavily exploited & have become rare except in well-protected or inaccessible forests.

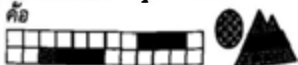
USES one of the most useful of all families, particularly for building materials and food. Many species are highly prized as ornamentals.



1. simple, circular leaves (fan palms)
 2. leaves not ribbed; Doi Chiang Dao *Trachycarpus oreophilus* 850
 2. leaves 1.2-3m diam, ribbed; widespread
 3. leaves 2.5-3m diam; fws in large pyramidal clusters on top of crown cultivated trees *Corypha* 851
 3. leaves 1-2m diam; fws in spreading or drooping clusters amongst lvs
 4. leaves green, not bluish; fruits <3 cm; wild trees *Livistona* 847
 4. leaves blue-green; fruits >15 cm diam; cultivated trees *Borassus flabellifer* 852
1. pinnate or bipinnate leaves
 5. leaflets wider & irregularly divided towards tips (fishtail palms)
 6. single main stem, up to 40m high
 7. leaves clustered near top of stem *Caryota gigas* 853
 7. leaves distributed along upper 1/4-1/2 of stem *Caryota urens* 854
 6. shrubby with many clustered stems, <6m high
 8. leaves once-pinnate, to 2.8m, silvery below *Wallichia* 856
 8. leaves bipinnate, to 6m, grey-green below *Caryota mitis* 855
 5. leaflets mostly linear with narrow tips (pinnate palms & cycads)
 9. basal leaflets spiny
 10. leaves not in same plane, stems with fibrous sheaths *Phoenix loureiri* 863
 10. leaves all in same plane, no fibrous sheaths
 11. stems to 1.5m, swollen at base; lower leaflets gradually smaller; male cones narrow at top *Cycas siamensis* 873
 11. stems to 8m, not swollen at base; lower leaflets abruptly smaller; male cones with flat tops *Cycas pectinata* 872
 9. basal leaflets not spiny
 12. leaves 7-9m with >100 leaflets; trunks thick with fibrous sheaths
 13. leaflets all in same plane *Arenga westerhoutii* 861
 13. leaflets in several different planes *Arenga pinnata* 862
 12. leaves <3m with <20 leaflets; trunks thin & green, no fibrous sheaths
 14. leaves folded upwards at point of attachment (V-shaped) *Areca* 858
 14. leaflets folded downwards at point of attachment (inverse V-shaped) *Pinanga sylvestris* 857



FAN PALMS

⁸⁴⁷*Livistona speciosa*

Single-stemmed palm to 35m with up to 50 leaves densely clustered near top of a slender cylindrical stem, 20-30 cm diam, often bulging at the base. **LEAF** up to 2 m diam, circular & fan-like, distinctly **greyish below, ribbed & divided into up to 100 segments with rather rigid, 2-cleft tips**, basal segments often overlapping each other. Main stalks to 1.8 m, yellowish, armed with **stout, curved, brownish-orange thorns** to 2.5 cm long. Sheaths short, stout, deeply split with coarse brown fibres along margin & distinct persistent ligule up to 25 cm long. **FLOWER** in arching clusters amongst leaves, to 1.4 m. **FRUIT** 2-3x2.5 cm, dark green to bluish-black, ellipsoid-ovoid, **longer than wide**. **NOTE** scattered to locally common, preferring moist sites at 800-1400m, often in Miang fields. **SIMILAR** ⁸⁴⁸*L. jenkinsiana* usually <10m high & ±15 cm diam, leaves with blunter segments, basal pair not overlapping, stalks with fragile, wing-like ligules which quickly disintegrate. Fruits 1.5x2.5 cm, flattened-globose, distinctly broader than long. Rare, possibly not a distinct species ⁸⁴⁹*L. chinensis* leaves green below, tips very slender & pendulous, Native to C. & S. Thailand but often cultivated in NT.

⁸⁵⁰*Trachycarpus oreophilus*

ค้อดอย



Single-stemmed palm to 12m. **LEAF** to 70x100 cm, circular & fan-like, **not ribbed**, divided at least half-way into ±60 segments with rigid tips. Stalks to 50 cm, minutely toothed. Sheaths short, swollen, deeply split with hairy fibres along margins. **FLOWER** male & female on different trees, males in upright clusters to 30 cm, females in spreading clusters to 100 cm. **FRUIT** 1.2x0.7 cm, yellow-brown, kidney-shaped. **NOTE** endemic to **Doi Chiang Dao** & neighbouring limestone mountains, growing in exposed rocky areas above 1700m.



**851a *Corypha umbraculifera*
talipot palm ลานวัด**

Single-stemmed palm to 25m high & 80 cm diam. **LEAF** 2.5-3(5) m, circular & fan-like, ribbed, deeply divided into ± 110 rigid segments, rather greyish-green. Stalks 2.5-3 m, **greenish**, stout, **densely armed with small black teeth to 1 cm**. Sheaths stout, yellowish-green, deeply split with a prominent ear-like appendage on each side of the stalk. **FLOWER** in huge upright pyramidal clusters on top of the crown, to 6m. **FRUIT** 3.5-4.5 cm, globose, greyish olive-green.

NOTE native to India but often planted in NT. It has the largest flower cluster of any plant in the world, with up to 15 million individual flowers. Each tree flowers only once in its lifetime at the age of about 20-30 years, after which it takes the plant one year for the fruits to ripen & die.

SIMILAR **851b** *C. utan* leaf stalks & sheaths with whitish powder, no ear-like appendages, larger curved teeth to 2.5 cm. Cultivated.

**852 *Borassus flabellifer*
toddy palm ตาล**

Single-stemmed palm to 25m with stout trunk, 30-75 cm diam. **LEAF** 1-1.5 m, circular & fan-like, ribbed, bluish-green, ribbed & divided into 60-80 rigid segments. Stalks 1.5-2m, stout, **yellowish**, with teeth. **FLOWER** amongst leaves, male & female in separate clusters, males in drooping clusters up to 160 cm, females in arching spike-like clusters up to 120 cm. **FRUIT** 15-20 cm, $\pm$ globose, dark brown to black with yellowish tip, densely clustered on drooping stems.

NOTE widespread throughout Thailand in wet, open areas up to 500m, a common sight in rice fields where it is planted for the sugary sap which oozes from cut flower clusters, as well as myriad other uses. The native range possibly includes NT, but its natural habitat has long since been converted to wet rice fields.





Large single-stemmed palm to 40m with 3-15 leaves **tightly clustered in the upper 1/5 of the trunk**. **STEM** 50-90 cm diam. distinctly **swollen in the middle** & narrowed towards base & top. **LEAF** to 7 m, **bipinnate fishtail**, 19-22 pairs of pinnae each with up to 27 pairs of leaflets, 20-35x7-15 cm, with jagged margins & drooping tips. Main stalks to 1m, stout. Sheaths to 4 m, with greyish or dark brown dusting & black fibres along the edges. **FLOWER** in drooping clusters to 6m long. **FRUIT** 3-3.5 cm, flattened-globose, reddish, usually 2-seeded.

NOTE evergreen forest at 1400-1600m. Endemic to **Doi Phu Kha** in Nan province - it is not found anywhere else in the world.

⁸⁵⁴*Caryota urens*
เต่าร้าง เมืองหลวง



Single-stemmed palm to 30m but rarely more than 10m high in the wild, similar to *C.gigas* but **trunk not swollen in the middle** & leaves **more loosely arranged along the upper 1/3 to 1/2**. Trunk 20-60 cm diam with distinct concentric rings 30-45 cm apart. **LEAF** up to 5m, 15-17 pairs of pinnae each with 15-27 pairs of leaflets, 20-30x3-7 cm, with drooping, jagged tips. Main stalks to 50 cm, very stout. **FLOWER** clusters to 3m, starting near the top but eventually ending up below the leaves as the tree grows. **FRUIT** 1.7-2x1.8-2.5 cm, reddish, globose. **NOTE** widespread but never common, moist evergreen forests up to 1500m. Often cultivated as an ornamental.



MULTI-STEM FISHTAIL PALMS855 *Caryota mitis* เต่าร้างแดง

Shrubby, many-stemmed palm to 7m.

STEM 5-15 cm diam, green, often with leaves to the ground. **LEAF** 1.5-6m, **bipinnate**, 7-23 pairs of pinnae, each with 7-20 pairs of broadly triangular leaflets, up to 20x7 cm, end pair larger, rhomboid, usually united. greenish below. Main stalks 0.5-2m, covered with red-brown or blackish "hairs". **FLOWER** in drooping clusters 1-1.5m, amongst leaves & below them, main stalks 30-45 cm. **FRUIT** 0.8-1.3x1-2 cm, subglobose, red to dark purple or black, usually 1-seeded

NOTE fairly common in both shady & semi-open areas to 800m.

856 *Wallichia siamensis*

เต่าร้างหนใหญ่

Small, densely clustered palm to 4.5m. **STEM** 4-8 cm diam, usually densely covered in persistent leaf sheath fibres. **LEAF** 1.5-2.8m, **once-pinnate**, 8-10 pairs of deeply 2-lobed leaflets with jagged tips, 25-60x5-10 cm, **folded upwards at point of attachment**, spirally-arranged, upper pair usually partly fused, lower ones clustered & fanned, **dark green above, silvery-grey below**. Main stalks to 1.5m, with red-brown dusting. Sheaths 30-60 cm, deeply split, margins with a layer of coarse, tan fibres on top of a layer of finer

black ones. **FLOWER** in upright or arched clusters amongst leaves or below them, male & female in separate clusters, females to 40 cm, near top of stem & appearing first, males to 60 cm. Males with sepals fused into a tube. **FRUIT** 1.5-2.2x0.6-0.8 cm, ovoid-ellipsoid or obovoid, red or purplish. **NOTE** widespread but never common, moist areas 500-1200m.

857 *Pinanga sylvestris* หมาก

Shrubby palm forming dense clumps up to 5m diam. **STEM** 2-3.5 cm diam, **densely covered with red-brown "hairs"**. **LEAF** 1.2-1.5 m, **once-pinnate**, 12-22 pairs of leaflets, 20-55x2.5-4.5 cm, **folded downwards at point of attachment**, regularly arranged, the top (4) ones with rather flat but deeply jagged ends. Young leaves pinkish-brown. Main stalks 16-20 cm. Sheaths to 45 cm, tubular, forming a shaft around the stem, **green or yellowish-green** with red-brown "hairs". **FLOWER** in drooping clusters amongst leaves, up to 30 cm, main stalk to 3.5 cm. **FRUIT** 2.3x0.9 cm, ellipsoid, green, arranged in rows. **NOTE** locally common in moist, shady areas.



855



855



856



856



856



Small slender tree to 7m, usually in clumps of 4-10 stems together, rarely solitary. Stems 2.5-5 cm diam., smooth, green with white rings & conspicuous green sheath at top, not fibrous along margins. **LEAF** 90-230 cm, once-pinnate, 14-22(28) pairs of leaflets, up to 80x8 cm, ± regularly spaced in a single plane, **folded upwards** at point of attachment, the upper pair often fused with jagged tips. **FLOWER** in pendulous branched clusters below leaves, males with 3 stamens, females without bracts. **FRUIT** 1.82.5x1.5 cm, **orange-red**, smooth, oblong-ovoid with persistent calyx at base.

NOTE scattered in shady fire-free forests.

SIMILAR ⁸⁵⁹*A.laoensis* single-stemmed palm with small leaves, <40 cm. E.Thailand. ⁸⁶⁰*A.catechu* **หมากสง betel nut palm** stems always solitary, to 10 m high & 10-15 cm diam. Fruits 7-8 cm. Origin unknown, widely cultivated for the mildly narcotic seeds.

⁸⁶¹*Arenga westerhoutii* **รังไถ่**

Single-stemmed palm to 20 m, but rarely >3 m in the wild, up to 15 loosely clustered leaves. **STEM** 40-60 cm diam, **densely covered with fibrous sheaths**. **LEAF** up to 8 m, **once-pinnate, up to 150 pairs of leaflets**, 100-130x7-10 cm, closely & regularly arranged in a **single flat plane**, folded downwards at point of attachment. Leaflets linear with irregularly jagged tips, greyish or silvery-brown below, end pair often broader & partly fused. Main stalks to 100 cm, stout. Sheaths deeply split with a network of black fibres along the edges, **not thorny**. **FLOWER** in pendulous clusters 2-2.5 m long, main stalk 60-90 cm, starting amongst leaves but left behind as trunk grows. **FRUIT** 5-7 cm, globose.

NOTE moist, fire-free forests up to 900 m. The "heart" is a delicacy, so the trees are invariably hacked down.



soon as they start to develop a stem.

SIMILAR ⁸⁶²*A. pinnata* 20-30 leaves leaflets in clusters of 2 or 3 in several distinct planes. Origin unknown, commonly cultivate desp. in S. Thailand

⁸⁶³*Phoenix loureiri*

ปาล์มสิบสองปันนา



Small single-stemmed palm, rarely to 6m, usually with hardly any trunk at all. **STEM** 15-25 cm diam, densely covered with old persistent leaves & sheaths, often with a mass of prop roots at base. **LEAF** 90-180 cm, once-pinnate, 35-75 pairs of leaflets, linear & quite sharply tipped, up to 30x1.5 cm, irregularly clustered in groups of 2-4, set in several different planes, stiff, green or greyish-green (glaucous) below. Lower leaflets modified into stiff, sharp spines to 12 cm. Main stalks short or absent. Sheaths deeply split with brownish tightly woven fibres along the edges, no conspicuous ligules. **FLOWER** clusters hidden amongst leaves, male & female on different plants, males clusters to 30 cm, upright with drooping side branches, main stalk to 15 cm. Females clusters to 75cm, spreading, "broom-like", main stalk to 50 cm. **FRUIT** clusters to 120 cm with orange stalks, fruits 1.7-2.5 cm, ellipsoid-oblong or narrowly ovoid, orange ripening dark red-purple to black, thinly fleshy & edible with a taste of dates.

NOTE scattered to locally common in open dry areas such as fire-damaged pine or dry dipterocarp forests, also in grassy, waterlogged sites. The regular fires in these habitats do not usually kill the tree but prevent the stem from developing properly.

SIMILAR all other native palms are restricted to moister & less-disturbed habitats. Cycads are often mistaken for palms but have the leaflets arranged in a single, flat plane. *P. loureiri* is sometimes confused with *P. acaulis* which is confined to the Himalayas & not found in Thailand.



GYMNOSPERMAE

pinces, yews, cycads etc

The second major division of the plant kingdom but numerically much less important than **Angiospermae** with only 840 species in 17 families worldwide. 4 families & 10 species native to NT. Evergreen trees with simple waxy leaves & cones instead of flowers, male & female in separate trees. Females with naked ovules - ie not enclosed with an ovary, wind-pollinated. The most familiar gymnosperms are the pines with their unmistakable needle-like leaves & woody cones, but most other native species have broader leaves & seeds with a fleshy coating.

Class PINOPSIDA

CEPHALOTAXACEAE

Tiny family of 10 species confined to E & SE Asia, 1 species in NT.

⁸⁶⁵*Cephalotaxus griffithii*

false yew

มะขามป้อมแดง



Evergreen tree to 20 (30) m with narrow crown & drooping branches. **BARK** red-brown, rather shiny, smooth & peeling in thin flakes. **LEAF** 2-5x0.2-0.4 cm, subopposite, simple but in **flat sprays** & appearing pinnate, linear with tapering quite sharp tips & rounded or slightly heart-shaped base. Young twigs with white lenticels, Mature leaves completely smooth, dark green & shiny above, **pale below with white stripes**. **CONES** male & females on different trees, males in axillary globose heads with overlapping bracts, ±0.5 cm. Females on common stalks, with opposite pairs of cup-shaped bracts. **SEED CONES** 1-1.3x2-2.5 cm, ellipsoid, smooth, with a short pointed tip & narrowed base. **NOTE** uncommon in less disturbed evergreen forests 1300-1900 m. *Cephalotaxus* is superficially similar to Yew trees (*Taxus*) but in fact belongs to a different family.

Conifers (see palm key on page 367 for Cycads)

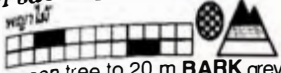
1. leaves in bundles of 2 or 3 on woody stumps
2. leaves in bundles of 3; bark yellowish or pinkish-brown, network cracks seed cones rhomboid, stalks ± 0.5 cm *Pinus kesiya* ⁸⁷⁰
2. leaves in bundles of 2; bark grey-brown to blackish, deeply fissured seed cones ovoid, stalks up to 1 cm *Pinus merkusii* ⁸⁷¹
1. leaves not in bundles on woody stumps
3. leaves <1.5cm long
4. leaves planar, opposite, very close, feather-like *Dacrycarpus imbricatus* ⁸⁶⁷
4. leaves linear or scale-like, not planar
5. bark dark brown or grey-brown; leaves deeply grooved & shiny *Dacrydium elatum* ⁸⁶⁹
5. bark whitish; leaves with white bands below ⁸⁶⁴ *Calocedrus macrolepis*
3. leaves >2cm long
6. leaves 0.2-0.4cm wide, with white band below *Cephalotaxus griffithii* ⁸⁶⁵
6. leaves at least 1cm wide, no white band
7. leaves 1-1.8cm wide, alternate, midvein clear but side veins faint widespread throughout NT *Podocarpus nerifolius* ⁸⁶⁶
7. leaves 3-5cm wide, opposite, side veins parallel to midvein Nan province *Nageia wallichianus* ⁸⁶⁸



PODOCARPACEAE

168 species concentrated in Australasia & S.America, 2 genera & 1 species in NT.

866 *Podocarpus neriifolius*



Evergreen tree to 20 m **BARK** grey-brown, slightly flaking, often fluted at base. **LEAF** 7-15(20)x1-2 cm, **alternate**, spiral or clustered, linear-lanceolate, pointed at both ends, leathery, pale green below. **Mid vein distinct on both sides but side veins very faint.** Stalks 0.2-0.5 cm. **CONES** pale yellow, in leaf axils, male & female on different trees. Males in dense catkin-like clusters (strobili), 2-5 cm, usually solitary but sometimes 2-3(5) together. Females solitary on a thick, fleshy cup (receptacle) ± 0.5 cm, stalks 0.5-1 cm. **SEED CONES** 0.8-1.6 cm, purple-black with whitish powder, elliptic-ovate, thinly-fleshy with hard seed, seated on slender stalk 0.6-1.5 cm, swollen at top. **NOTE** widespread but uncommon in less-disturbed evergreen forests, 1000-1400 m.

SIMILAR 2 other species of *Podocarpaceae* in NT, both with many rather faint main veins from base, no distinct midvein.

867 *Dacrycarpus imbricatus* พญากระชากรูป leaves clustered near end of twigs 0.3-0.6 cm, in delicate leather-like sprays, opposite-planar, linear, narrowed both ends. Leaves on flowering branches scale-like, ± 0.2 cm. Phitsanulok province.

868 *Nageia wallichianus* ขุนไม้ leaves 10-18x3-5 cm, opposite in 2 rows, narrowly ovate with tapering tip & blunt or pointed base. Seed cones 1.5 cm, globose, green or bluish-purple. Nan province.

869 *Dacrydium elatum* สามพันปี Tree to 20 m. **BARK** grey-brown to dark brown. **LEAF** 0.8-1.6 cm pressed close to twigs, overlapping, **needle-like**, with long-tapering tip, shiny. Leaves near end of fertile twigs much smaller, ± 0.15 cm, triangular & scale-like. **CONES** similar to *Podocarpus*. **SEED CONES** 0.5x0.3 cm, nut-like, ovoid, obliquely seated on dark red shallow fleshy cup (podophyll). **NOTE** Phitsanulok Province.



PINACEAE

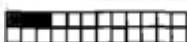
pines

Important family of 220 species worldwide, forming a dominant element in N. temperate areas but very rare in the tropics, only 1 genus & 2 species native to NT.

870 *Pinus kesiya*

yellow pine, 3-needled pine

สามใบ เขียวเปลือกบาง



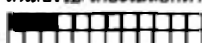
Large evergreen tree to 30 m. **BARK** yellowish-brown or red-brown, cracked & peeling in thick, flat flakes. **LEAF** 12-20(25) cm, needle-like, in **bundles of three** on short woody stumps, bases hidden by persistent sheaths. Young shoots coated with whitish waxy powder. **CONES** male & female in different clusters on the same tree. Males in dense pale yellow catkins grouped near end of twigs, 2-4 cm. Female clusters single or paired. **SEED CONES** 5-9 cm, in clusters of 1-3, **rhomboid**, $\pm$ slightly curved, stalks $\pm$ 0.5 cm. Individual scales woody with thickened, recurved tips. Seeds with oblong wing at one end, 1.5-2.5 cm.

NOTE common in semi-open forests between 1000 & 1700 m, favouring exposed ridges with thin sandy soils where it often forms almost pure stands. Reported to reach 60 m in Burma. Cones take 2 years to mature.

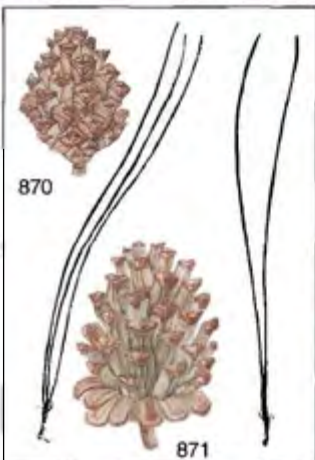
871 *Pinus merkusii*

Black pine, 2-needled pine

สองใบ เขียวเปลือกดำ



Evergreen tree to 20 m, rarely 30 m. **BARK** dark grey or blackish, **deeply fissured**. **LEAF** 15-25 cm, needles in **bundles of two**. **CONES** as *P. kesiya*. **SEED CONES** 7-11 cm, solitary or in pairs, **ovoid**, stalks to 1 cm. Scales with thick, 4-5 angled pyramidal tips (rhomboid & grooved). Seeds ovate, with thin wing 1.5-2 cm. **NOTE** usually below 1000 m but occasionally as high as 1300 m, often with dry dipterocarp spp. Typically at lower altitudes than *P. kesiya* although the 2 species can occur together. Both species are tapped for resin, but *P. merkusii* is said to produce larger quantities.

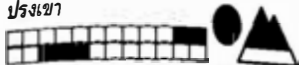


Class **CYCADOPSIDA**
CYCADACEAE cycads

17 species restricted to the old world tropics, 3 species in NT.

872 *Cycas pectinata*

173127



Evergreen tree to 12 m with 30-40 leaves clustered near top of stout trunks, often remaining single stemmed for a long time but eventually usually branching with age. Base of trunk not or only slightly swollen. **BARK** cream, ringed indistinct from leaf scars. **LEAF** 150-240 cm, once-pinnate with **90-150 pairs of leaflets arranged in a single, flat plane**, middle ones 16-35x0.8-1.1 cm, **lower pairs abruptly reduced & spiny**. Young leaves produced in whorls of up to 12 at the same time, mature leaves very thick & leathery, shiny dark green above, grey-green below. Main stalk 32-80 cm. **CONES** male & female on different trees. Male cones 30-55x16-22 cm, pale yellow, narrowly ovoid with flat top. Female cones 11-18x10-25 cm, depressed globular, with deeply fringed bracts (megasporephylls), densely coated with a mat of orange hairs. **SEED** 42-4.5x3.3-4.5 cm, yellow, flattened-ovoid or subglobose.

NOTE scattered to locally common throughout NT, very fire-tolerant, preferring open, well-drained areas 100-1600 m, often with pine.

SIMILAR 2 other smaller cycads, <2 m high. **873 *Cycas siamensis*** trunk to 1.5 m with swollen base, covered with persistent brownish felt-like hairs. Leaves 70-150 cm, 70-110(140) pairs of leaflets, 8-14.5x0.5-0.8 cm, with sparse orange-brown or silvery hairs below when young lower ones gradually becoming smaller, eventually spiny. Main stalks 10-30 cm. Male cones 10-24x4-8.5 cm oblong, narrowed at top, with orange-brown felt. Females with narrower bracts, seeds rather smaller. Degraded dry forests below 500 m.

874 *Cycas simplicipinna* stem mostly underground or creeping along ground, upright portion up to 0.5 m high. Leaves 90-250 cm, <6 at the same time, 18-38 pairs of leaflets, 20-56x1.4-2 cm, lower ones not reducing gradually into spines. Main stalks 35-140 cm. Male cones 15-25x2.2-4 cm, narrowly cylindrical, tapering at both ends, females globular. Scattered in moist forests up to 900 m.



PTERIDOPHYTA ferns

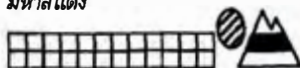
Only 1 native family which develop into true trees with a main trunk more than 1 m tall. Ferns do not have flowers but reproduce by means of spores which are held in **sori** - dot-like structures on the lower surface of mature leaves.

CYATHEACEAE Tree ferns

620 species worldwide, mostly in tropical Asia, 1 genus & 5 spp. in NT.

⁸⁷⁵*Cyathea gigantea*

มหาสแดง



Single main trunk to 4(7) m with leaves clustered near top. **LEAF** up to 260 cm, 2-3x pinnate, main pinnae to 70 cm, leaflets to 12x2 cm, lanceolate, sometimes slightly curved, with tapering tip & flat or heart-shaped **base, lobed to 1/3-1/2 width of leaflet, completely smooth.** Leaflet stalks very short or none. Tertiary veins branching, not fused in groups. Main stalks to 50 cm or more, dark brown or black & shiny, densely covered with long stiff scales, to 1.5x0.2 cm. **SORI clustered near base of side veins, not protected by a scale-like covering (indusia).** **NOTE** scattered in fire-free moist forests, often growing in colonies of several dozen individuals.



SIMILAR ⁸⁷⁶*C. chinensis* กูดตัน leaflets very deeply lobed almost to midvein, finely hairy below. veins without scales but with fine greyish hairs below. Main stalks with quite dense, short spines near base. Sori covered with broad pale brown scales

⁸⁷⁷*C. spinulosa* leaflets with slightly pointed base, main veins without hairs but with pale brown scales below, lower surface minutely hairy. Main stalks spiny near base. Sori half-covered by cup-shaped "scales". Rare.

⁸⁷⁸*C. podophylla* มหาสดำ trunk <1 m, leaflets with pointed base & short but distinct stalks, ±1 mm, not deeply lobed, veins hairy both sides & scaly below, veins near base fused in groups. Main stalks dark purple & shiny with short spines near base. Sori without scales.

⁸⁷⁹*C. latebrosa* leaflets with flat base, deeply lobed almost to midvein, each lobe minutely toothed, veins forked near margin, with soft hairs above & brown scales below. Main stalks pale yellow to red-brown with short spines. Sori with small inconspicuous scales, ±1 mm. Rare.



PART 2

Synonymns

References

Distribution

Uses

By Kanyaratvattit

Areca catechu

betel nut palm

หมาก

PART2: SYNONYMS, REFERENCES, DISTRIBUTION, USES

The order of families & the species' numbers are the same as in Part 1.

All species included in Part 1 are also included in this section.

EXAMPLE:

Family	DILLENIACEAE
Family references	FGICS (1938), FT2/2 (1972), BL7a (1952)

Full scientific name: *Dillenia indica* L.

Synonyms: *D. speciosa* Thunb., *D. yunnanensis*

References: DEPMP (1935), FFBB1:19(1877), IT:8 (1906), PR5/1:179 (1994)

Distribution: India, Sri Lanka, Myanmar, Yunnan, Malay Peninsula, Laos.

Uses: The timber is moderately hard but not durable & usually crooked. It is used for interior construction and also as firewood. The acidic fruits are used in jellies and curries and also possess laxative properties.

Note: Architectural model of SCARRONE.

EXPLANATION:

Scientific name

This section includes the author of the name as well as the name itself. When cross-referencing with other literature, it is always a good idea to make sure that the full name is the same, including the authors. Occasionally, the same scientific name has been assigned to separate species by different authors.

Synonyms

These are names that were formerly used for the same species but are now considered invalid. Only synonyms of particular relevance to Thailand or those included in the references cited are listed.

References

FT5/2:122 (1996) = Flora of Thailand, volume 5, part 2, page 122, published 1996.
See bibliography (p507) for full listing of reference codes.

Distribution

Worldwide distribution outside Thailand. All species are native in N.Thailand unless otherwise specified. The order of countries is from West to East & from North to South.
Indo-China = Cambodia, Laos & Vietnam.

Malasia = Malaysia, Indonesia, Philippines, Papua New Guinea.

Melanesia = Irian Jaya, Papua New Guinea, Bismark Archipelago, New Britain, Solomons.

Uses

A selection of the more widespread & interesting uses, by no means exhaustive. All information in this part is gathered from literature sources only, particularly from India & Malaysia. Many of the uses mentioned are used locally in N.Thailand, but not all.

WARNING! The medicinal & culinary uses are strictly for interest only. The authors accept no responsibility for the efficiency or safety of any of the information provided. People interested in experimenting with herbal medicines should always do so under the personal guidance of someone with long experience both in the identification of plants as well as the preparation & administration of the product.

Note

Other information of interest. "Architectural model" refers to the models of tree growth form proposed by Halle & Oldeman (1970).

DILLENIACEAE

FGICS (1938), FT2/2 (1972), BL7a (1952)

1 *Dillenia hookeri* Pierre

FGIC1:20 (1907); FGICS:21 (1938); BL7/1a:85 (1952); FT2/2:102 (1972)
Indo-China.

2 *Dillenia parviflora* Griff. var. *parviflora*

D. elata auct. non Pierre (in FSE)
FFBB1:21(1877); FT2/2:98 (1972); กล้วย:339 (1983);
กล้วย:1:48 (1995); BL7/1a:125 (1952)
Myanmar.

The wood is used for house flooring, wall panelling and furniture.

var. *kerrii* (Craib) Hoogl.

D. kerrii Craib

3 *Dillenia pentagyna* Roxb.

D. baillonii Pierre
BL7/1a:117 (1952); DEPMP:820 (1935); DIFME:74 (1991); FFBB1:21(1877); FT2/2:97 (1972); VFT:119 (1996); IT:4 (1906); PR5/1:182 (1993); กล้วย:337 (1983)

India, Myanmar, Yunnan, Laos, Vietnam, Malay Peninsula, Andaman islands, Java, Sulawesi.

The wood is durable but difficult to work and used for household utensils, flooring, house-posts and railway sleepers. Good charcoal. The fruits are acidic, used to make refreshing drinks & in jellies or curries. They are a local medicine against coughs. The bark is used for rheumatism. The leaves are sometimes used for roof thatching. The tree has religious significance in India.

4 *Dillenia aurea* Sm.

D. pulcherrima Kurz, *D. ornata* Wall.
BL7/1a:128 (1952); DEPMP:821 (1935); DIFME:73 (1991); FFBB1:20 (1877); FT2/2:98 (1972); IT:4 (1906)
N India, Myanmar.

The wood is moderately hard but not durable.
Fruits edible but sour.

5 *Dillenia ovata* Wall. ex Hk. f. & Th.,
D. meliosmifolia auct. non Hook. f. & Th. (in FSE)
TFM1:190 (1972); WTM:230 (1988); FGIC1:22 (1907); FGICS:23 (1938); BL7/1a:105 (1952); FT2/2:102 (1972)

Laos, Cambodia, Vietnam, Malay Peninsula, Sumatra.

6 *Dillenia indica* L.

D. speciosa Thunb., *D. yunnanensis*
DEPMP (1935); FFBB1:19(1877); IT:8 (1906), PR5/1:179 (1994); กล้วย:248 (1983); กล้วย:1:47 (1995);
TFM1:188 (1972); WTM:229 (1988); FT2/2:103 (1972); FGIC1:21 (1907); BL7/1a:108 (1952)

India, Sri Lanka, Myanmar, Yunnan, Malay Peninsula, Laos, Vietnam, Cambodia, Java, Borneo.

The timber is moderately hard but not durable & usually crooked. It is used for interior construction and also as fire wood. The acidic fruits are used in jellies and curries and also possess laxative properties. They are used against coughs. The pulp of the fruits can be used as shampoo. The roots are a remedy for fever. Cultivated as a greenhouse plant in temperate countries for its fragrant flowers.

Architectural model of SCARRONE.

MAGNOLIACEAE

FGICS (1938), FT2/3 (1975), GBS23a (1978), WCBM (1996)

7 *Magnolia champaca* (L.) Baill ex Pierre var. *champaca*

M. pilifera Bakh. f., *M. velutina* auct. non. DC.
DEPMP:1489 (1935); DIFME:124 (1991); FFBB1:25 (1877); FT2/3:264 (1975); VFT:486 (1996); IT:8 (1906); PR5/3:376 (1998); กล้วย:91 (1983);
RUPNI:177 (1997); TFM2:288 (1973); WTM:479 (1988); FGIC1:38 (1907); FGICS:47 (1938);
BL31d:113 (1985)

India, Nepal?, Myanmar, SE.Tibet, S.Yunnan, Laos, Vietnam.

The wood is fairly durable, easy to work & takes a fine polish. It is used for furniture, cabinet work, carving and turnery. This tree is believed in India to be the personification of Lakshmi, the goddess of wealth. It is reputed to increase the wealth of the family and is a favoured timber for coffins. The flowers are used as offerings in many religious ceremonies. Almost all parts of the plant have medicinal properties, being used for fever, calming nerves, heart problems, colic, gout, rheumatism, healing wounds, menstrual problems, childbirth or as a general health tonic. The essence from the distilled flowers is used in perfumes & hair oils. The tree is widely planted as an ornamental for its fragrant flowers.

8 *Magnolia x alba* (DC.) Figlar & Noot.
(*M. champaca* L. x *M. montana* DC.)

DEPMP (1935); FT2/3:260 (1975); PR5/3:378 (1998);
ฉสพ3:102 (1996); WTM:478 (1988); BL31d:119
(1985); WCBM:54 (1996)

Cultivated throughout the tropics.

The flower buds are used for blood poisoning
following a miscarriage. Leaves may be steeped
in water to relieve coughs and tonsillitis. The tree
is also a popular ornamental plant in Thailand.

Propagated by air-layering.

9 *Magnolia floribunda* (Finet & Gagnep.) Figlar
M. kerrii Craib, *M. manipurensis* auct. non Watt
ex Brandis (in FSE)

FT2/3:264 (1975); FGICS:48 (1938); WCBM:57(1996)

Upper Myanmar, S.China (Yunnan, Guizhou,
Guangxi, Jiangxi), Laos, N.Vietnam.

10 *Magnolia rajaniana* (Craib) Figlar
FT2/3:262 (1975); WCBM:59 (1996); FGICS:52 (1938)
Endemic to Thailand.

11 *Magnolia baillonii* Pierre

Aromadendron baillonii (Pierre) Craib,
Paramichelia baillonii (Pierre) Hu

FT2/3:266 (1975); FGIC1:39 (1907); FGICS:50
(1938); VFT:490 (1996); WCBM:54 (1996)

Assam, Myanmar, Cambodia, Laos, Vietnam,
Yunnan.

A useful, durable timber, resistant to termites and
insects. Used in construction, the making of
precious furniture, and for sawing board.

12 *Magnolia liliifera* (L.) Baill. var.
obovata (Korth.) Govaerts

Magnolia hodgsonii (Hook. f. & Th.) H. Keng
Talauma hodgsonii Hook. f. & Th.

FT2/3:258 (1975); IT:3 (1906); FGICS:31 (1938);
FI1:74 (1855); WCBM:34 (1996); GBS31a:129 (1978)

NE India, Nepal, Sikkim, Bhutan, Tibet, S. China,
Myanmar, Malay Peninsula, Borneo.

The wood is used for making tool handles.

13 *Magnolia henryi* Dunn

Talauma kerrii Craib

GBS23a (1978); FT2/3:253 (1975); FGICS:41
(1938); ฉสพ:93 (1983); WCBM:31 (1996)

N.Myanmar, Laos, SW. Yunnan.

14 *Manglietia garrettii* Craib

FT2/3:252 (1975); ฉสพ3:100 (1996); FGICS:37

(1938); WCBM:54 (1996)

Previously thought to be endemic to Thailand, but
recently also found in Vietnam & S.Yunnan.

ANNONACEAE

FGICS (1938), BLS7 (1992), GBS14/2 (1955),
PCAASA (1995), BL33/1 (1988 - *Orophea*)

15 *Melodorum fruticosum* Lour

Rauwenhoffia siamensis auct. non Scheffer
Sphaerocoryne clavipes Craib, *Popowia*
aberrans Pierre ex Finet, *Polyalthia siamensis*
Boerl.

FGICS:104 (1938); FGIC1:83 (1907); GBS14:370
(1955)

Indo-China, Malay Peninsula, S. & C. Thailand but
not native in NT.

16 *Mitrephora maingayi* Hk. f. & Thoms.

M. obtusa Hook. f. & Th., *M. teysmannii* Scheffer
M. vandaeflora var. *chartacea* Kurz (in FFBI1: 45)

FB11:77 (1875); IT:19 (1906); PR5/3:386 (1998);
TFM1:80 (1972); FGICS:101 (1907); Plants of
Annonaceae Family (Chalermglin, 2001)

Myanmar, Laos, Cambodia, Malay Peninsula & N.
Sumatra & Borneo.

17 *Mitrephora tomentosa* Hk. f. & Thoms.

M. thorelii Pierre, *M. edwardsii* Pierre,
M.collinsae Craib, *M. vandaeflora* Kurz

Plants of Annonaceae Family (Chalermglin, 2001)
Assam, Bangladesh Myanmar, Indochina, Hainan.

18 *Mitrephora wangii* Hu.

Plants of Annonaceae Family (Chalermglin, 2001)
Yunnan.

19 *Alphonsea boniana* Craib

MNJ49:53 (1995)

20 *Orophea brandisii* Hook.

BL33/1a: (1988)

21 *Orophea thorelii* Pierre

BL33/1a:63 (1988); FGIC1:117 (1907)

22 *Orophea polycarpa* A. DC.

O.anceps Pierre, *O.polycephala* Pierre, *O.*
undulata Pierre

BL33/1a:58 (1988); GBS14:395 (1955); FB11:49
(1875); FFBI1:49 (1877); IT:18 (1906); FGIC1:110
(1907); FGICS:122 (1938)

Sri Lanka, India, Myanmar, Andaman Islands,
Indo-China, Malay Peninsula.

23 *Orophea* sp.

24 *Goniiothalamus laoticus* (Fin. & Gagnep.) Ban

Mitrephora laotica Fin. & Gagnep.
FGIC1:92 (1907)

25 *Goniiothalamus griffithii* Hk. f. & Th.
FFBB1:41(1877); FBI1:110 (1875); FGICS:99 (1938)
S. & E. Myanmar.

26 *Miliusa velutina* (Dun.) Hk. f. & Thoms.
Uvaria velutina Dun., *Uvaria villosa* Roxb.
FFBB1:47(1877); IT:11 (1906); မလိ:62 (1983);
FBI1:155 (1875); FGIC1:112 (1907)
N.E. & C. India, Myanmar.

The wood is rather heavy & is used for the poles of carts and agricultural implements. Suitable for light construction, furniture and cabinet work. Has edible fruit.

27 *Miliusa lineata* (Craib) Ast
Saccopetalum lineatum Craib
FGICS:120 (1938); မလိ:370 (1975)

The wood is used for house flooring; paneling and packing cases.

28 *Miliusa cuneata* Craib
BMI:145 (1912); FGICS:118 (1938)

29 *Miliusa thorelii* Fin. & Gagnep.
BSBF54:89 (1907); FGIC1:109 (1907)
Boiled roots used for broken tendons.

30 *Cananga latifolia* (Hk. f. & Th.) Fin. & Gagnep.
Unona latifolia Hook. & Th.
DEPMP:426 (1935); FFBB1:35 (1877); မလိ:324 (1983); TFM1:68 (1972); BSBF53/4:84 (1906); FGIC1:64 (1907)

The wood is light & perishable but is used for making cases, toys and shoes. The roots have medicinal properties against fever.

31 *Cananga odorata* (Lmk.) Hk.f. & Th.
var. *odorata*
Canangium odoratum Bail, *Uvaria odorata* Lmk.
FFBB1:33 (1877); IT:16 (1906); TFM1:70 (1972); FBI1:130 (1875); FGIC1:64 (1907)
India?, S.Myanmar through SE.Asia to N.Queensland (Australia).

The timber is used for household implements. In Malaysia, it is used for drums because of its resonant properties. The fragrant flowers are distilled to make Macassar oil or YlangYlang. The leaves are used to soothe skin itch. A paste made from fresh flowers is applied for asthma. The dried flowers are effective for intermittent fever, stomach disorders & boils. In Malaysia, the flowers are traditionally placed on graves.

var. *fruticosa*
Cultivated hybrid.

32 *Polyalthia littoralis* (Bl.) Boerl.
FJ1:107 (1963)

33 *Polyalthia cerasoides* Benth. & J.D.Hook.

Uvaria cerasoides Roxb.
DIFME:146 (1991); FFBB1:338 (1877); VFT:46 (1996); IT:14 (1906); FGIC1:68 (1907); FGICS:73 (1938)

India, Myanmar, S.China, Cambodia, Laos, Vietnam.

The wood is sometimes used in small-scale construction & for agricultural tools but must be seasoned carefully to avoid splitting & warping. It is most suitable for veneer and plywood. The fruit is edible.

34 *Polyalthia evecta* (Pierre) Fin. & Gagnep.

Unona evecta Pierre
BSBF53/4:91 (1906); FGIC1:69 (1907); FGICS:74 (1938); GBS14:298 (1955)

35 *Polyalthia suberosa* (Roxb.) Thw.
FFBB1:38 (1877); FBI1:65 (1875); TFM1:86 (1972); FGIC1:70 (1907); FGICS:74 (1938); GBS14:298 (1955)

36 *Polythia viridis* Craib
မလိ:280 (1983); BMI:4 (1914); BMI:226 (1922); FGICS:77 (1938)

37 *Polyalthia simiarum* Benth. & J.D.Hook.

Unona simiarum Pierre
FFBB1:37 (1877); TFM1:87 (1972); FBI1:63 (1875); FGIC1:73 (1907)

38 *Cyathocalyx martabanicus* J.D.Hook. & Th.

BERBERIDACEAE

FGICS (1939)

39 *Mahonia nepalensis* DC.

M. siamensis Tak. apud Craib, *Berberis nepalensis* Spreng

DIFME:121 (1991); FBI1:109(1872); FGIC1:157(1908)
India, Myanmar.

The wood is used as a yellow dye. The bark and roots are used for fever, eye complaints, jaundice and skin disease. The fruits are reported to be edible by Indian sources.

CAPPARACEAE (Capparidaceae)

FGICS (1939), FT5/3 (1991)

40 *Crateva magna* (Lour.) DC.

C. lophosperma Kurz, *C. nurvala* Buch.-Ham., *C. hygrophilla* Kurz, *Capparis magna* Lour.

FT5/3:270 (1991); อสท4:54 (1997); TFM2:26 (1973);
TFSS1:103 (1995); WTM:204 (1988), DIFME:62
(1991); FGIC1:178 (1908)

N.E. India, Myanmar, Cambodia, Laos, Vietnam, S. China, Hainan, Malaysia, Sumatra, Borneo, Java.

The bark or roots may be used for baldness, fever, guineaworm, stomach complaints, contraception, and as a general tonic & carmative. Poultices made from the bark are used to relieve high fever, and to stimulate blood flow.

The juice from the bark raises the appetite and acts as a laxative. The fruits are edible & the young shoots and flowers can be cooked in curries or made into pickles. The fruits can be used as a bait for fish.

41 *Crateva religiosa* Forst. f.

C. macrocarpa Kurz, *C. roxburghii* Ham., *C. membranifolia* Miq.

DEPMP:686 (1935); FFBB1:66 (1877); FT5/3:268
(1991); VFT:89 (1996); IT:32 (1906); MPP:341 (1978);
TFM2:26 (1973); WTM:204 (1988), FGIC1:178
(1908); FBI1:172 (1875)

N.India, Myanmar, S.China, Cambodia, Laos, Vietnam, Malay Peninsula, Indonesia, Polynesia to Society Islands.

The wood is quite hard but not durable, used for small articles such as musical instruments & carvings. Poultices of the bark may be used against cough, cramp, and the smoke from burning wood is used for ulceration of the nose.

The leaves are used for stomach-ache & ear-ache. The fruits are edible and are taken to relieve constipation. In India & Polynesia the tree is planted around temples and is believed to possess occult powers.

42 *Crateva adansonii* DC. ssp. *trifolia* (Roxb.) Jacobs

C. adansonii ssp. *odora* (Buch.-Ham.) Jacobs, *C. erythrocarpa* Gagnep., *C. odora* Buch-Ham, *C. trifolia*, *Capparis trifoliata* Roxb.

DIFME:62 (1991); FT5/3:271 (1991); WTM:204 (1988)
Myanmar, Laos, Vietnam, S.China (Hainan)

The bark is used for the same complaints as *C.magna*. The ripe fruit can be pounded & mixed with cement to improve its structural properties.

PITOSPORACEAE

Pittosporaceae FGICS (1939)

43 *Pittosporum napaulense* (DC.) Rehd. & Wils.

P. floribundum Wright & Arn.

TSH:117 (1994) Jour. Arnold. Arboretum 32 : 330
(1954)

Nepal, N.E. India.

44 *Pittosporum kerrii* Craib

FGICS:216 (1939) Jour. Arnold. Arboretum vol 32 : 333
(1954)

Myanmar, Yunnan, N. Indo-China

POLYGALACEAE

FGICS (1939), LBS7 (1992 - *Xanthophyllum*)

45 *Xanthophyllum virens* Roxb.

X. flavescens Roxb. var. *virens* (Roxb.)
A.W.Benn, *X.affine* Benn.

FFBB1:82 (1877); PR5/3:586 (1998); LBS7:131
(1982); FGICS:219 (1939); FBI1:209 (1875)

Bangladesh, Myanmar, possibly also Malay Peninsula.

Wood is used for house construction.

46 *Xanthophyllum flavescens* Roxb.

X. excelsum (Bl.)Miq., *X. glandulosum* Merr., *X. pallidum* Ridley, *X.siamense* Craib, *X. obliquum* Craib

FFBB1:81 (1877); IT:44 (1906); PR5/3:585 (1998),
LBS7:64 (1982); FGIC1:246 (1909); FGICS:222,223
(1939); DEPMP:2268 (1935); TFM1:354 (1972)

E.India, S.Myanmar, Laos, S.Cambodia, Vietnam, Malaysia, Sumatra, Borneo & the Philippines.

HYPERICACEAE

FGICS (1943)

47 *Cratoxylum formosum* (Jack) Dyer

ssp. *pruniflorum* (Kurz) Gogel.

C. pruniflorum Kurz

FB11:258 (1875); FFBB1:84 (1877); PR5/2:149 (1995); BL15/3:154 (1983); BL15/3:45 (1995); TFM2:250 (1973); TFSS1:222 (1995); WTM:364 (1988); FGIC1:289 (1908); FGICS:253 (1939); BL15/3:469 (1967)

Myanmar, S.China, Indo-China.

A decoction of the bark is used to cure colic. The resin is used to relieve itching. The leaves, pounded with coconut oil, can be applied for skin complaints. Bark can be used as brown coloured dye. Shoots and young leaves can be eaten as a vegetable. The wood is durable.

48 *Cratoxylum cochinchinense* (Lour.) Bl.

C. ligustrinum (Spach) Bl., *C. polyanthum* Korth. [inc. var. *ligustrinum* Dyer], *C. hypoleuca* Elmer, *Hypericum cochinchinense* Lour.

FB11:257 (1874); FFBB1:84 (1877); DEPMP:678 (1935); PR5/2:148 (1995); TFM2:251 (1973); TFSS1:223 (1995); WTM:365 (1988); FGIC1:290 (1910); FGICS:253 (1939); BL15/3:463 (1967)

S.E.Myanmar, S.China, Hainan, Hong Kong, Indo-China, Malay Peninsula, Sumatra, Borneo, Philippines.

Uses as *C.formosum*.

49 *Cratoxylum maingayi* Dyer

C. acuminatum Merr., *C. subglaucom* Merr., *C. thorelii* Pierre ex. Gagnep., *C. harmandii* Pierre, *C. cochinchinense* var. *calcareum* Ridl.

FB11:258 (1875); PR5/2:150 (1995); TFM2:251 (1973); TFSS2:225 (1995); WTM:367 (1988); DEPMP:679 (1935); FGIC1:288 (1909); FGICS:252 (1943); BL15/3:470 (1967)

S.Myanmar, Cambodia, C.Vietnam, Malay Peninsula, Sumatra, Borneo.

Planted as ornamental trees for their white flowers.

50 *Cratoxylum sumatranum* (Jack) Blume

var. *neriifolium* (Kurz) Gog.

C. neriifolium Kurz, *Hypericum neriifolium* Wall.

FB11:257 (1874); FFBB1:85 (1877); FGIC1:291 (1910); BL15/3:463 (1967)

Assam, Bangladesh, Myanmar, Laos, Cambodia.

GUTTIFERAE

FGICS (1943), MAPM (1961-*Mammea*)

51 *Garcinia thorelii* Pierre

FGIC1:301 (1907)

52 *Garcinia mckeaniana* Craib

FGICS:259 (1943)

53 *Garcinia speciosa* Wall.

FB11:260 (1875); FFBB1:88 (1877); IT:50 (1906); FGICS:267 (1943)

S.Myanmar, Andaman Islands.

Wood very heavy & close grained. Latex a poor source of gamboge.

54 *Garcinia xanthochymus* Hk. f. ex T. And.

G. tinctoria, *Xanthochymus pictorius* Roxb.

FFBB1:93 (1877); IT:49 (1906); BL15/3:156 (1995); TFM2:222 (1973); PR5/3:249 (1998); FB11:269 (1874); FGICS:257 (1943)

SW. & NE. India, Myanmar, Andaman Islands, Malay Peninsula,

The timber is rather heavy & hard. The bark produces an olive-like colour used for dyeing clothes, cotton and silk. The fruits are edible but acidic, used to make a refreshing drink.

55 *Garcinia merguensis* Wight

G. lanceolata Ridley

FFBB1:89 (1877); FGIC1:299 (1910); TFM2:215 (1973); DEPMP:1077 (1935); FB11:267 (1874)

Indo-China, Malaysia.

Malays make a very pale varnish from the sap.

56 *Garcinia cowa* Roxb.

G. lobulosa Wallich ex. T.Anderson, *G. roxburghii* Wight, *G. umbellifera* Roxb., *G. kydia* Roxb.

DIFME:92 (1991); FFBB1:90 (1877); FB11:262 (1874); VFT:96 (1996); IT:52 (1906); PR5/3:248 (1998); TFM2:208 (1973); WTM:354 (1988); DEPMP:1066 (1935); FGICS:261 (1943)

India, Myanmar, Andaman Islands, Vietnam.

Wood hard but with a coarse grain & many knots. Young leaves edible either raw or in curry. Fruits edible but sour, usually dried for long-term use. Young branches & leaves used as a disinfectant. Bark & gum produce a yellow color which is insoluble in water but can be used in varnishes.

In India, the fruits are used medicinally for headache, stomach complaints & dysentery.

57 *Garcinia propinqua* Craib
FGICS:267 (1943)

58 *Garcinia pedunculata* Roxb.

FB1:264 (1874); DIFME:92 (1991)

NE.India, Yunnan, Myanmar?

Ripe fruits edible, used medicinally for constipation & stomachache.

59 *Mesua ferrea* L.

M. coromandeliana, *M. pedunculata*, *M. speciosa*, *M.nagassarium* (Burm. f.) Kost.

DEPMP:1482 (1935); DIFME:124 (1991); FFBB1:97 (1877); VFT:102 (1996); IT:55 (1906); RUPNI:201 (1997); ๑๙๙1:62 (1995); TAXON35/2:352; TFM2 :233 (1973); WTM:360 (1988); FGIC1:328 (1910)

Sri Lanka, India, Myanmar, Andaman Islands.

A very hard and heavy wood, much like Ebony. Difficult to work but durable even under water. Its chief use is for tool handles. Resin from the bark & fruits can be used as a varnish. This resin is slightly poisonous but has a wide range of medicinal applications for rheumatism, anaemia, coughs, and as a heart stimulant. It has antibacterial & antiinflammatory properties and is applied to wounds as a poultice. The flower buds are used against dysentery. The oil from the seeds is used as a lubricant, for illumination and in the manufacturing of soap. It can be used against skin complaints. Widely planted for ornamental & spiritual purposes, especially in temples. In India it is considered one of the most sacred trees, particularly by Buddhists. The future Buddha (Maitreya) is often depicted with a *Mesua* flower in his hand.

60 *Mammea siamensis* (Miq.) T. And.

Ochrocarpus siamensis T. Anders.,

Calysaccion siamense Miq.

VFT:101 (1996); PR5/3:352 (1998); TFM2:226 (1973);

WTM:360 (1988); FGIC1:293 (1910); MAPM (1961)

India, Cambodia, Laos, Vietnam, N.W. Malay Peninsula (rare).

The timber is of good quality & easy to work. It is used for furniture, carving, boat building & construction. Dried flowers in combination with other flowers are used as a heart tonic. The trees are planted ornamentally for their fragrant flowers, especially in temples.

61a *Calophyllum inophyllum* L.

FFBB1:95 (1877); IT:54 (1906); PB:177 (1977)

widely cultivated.

Oilseed used for illumination & medicine, mixed with coconut oil to give tongan oil for massage, excellent timber

61b *Calophyllum polyanthum* Wall. ex Pl. & Tr.

FFBB1:95 (1877); IT:54 (1906); PB:177 (1977)

much exploited in India for boat-masts & plywood.

FLACOURTIACEAE

BL30/2 (1985), FCLV11 (1970)

62 *Scolopia spinosa* (Roxb.) Warb.

Ludia spinosa Roxb.

Myanmar, Nicobar islands, Indo-China, Malay Peninsula, Sumatra, Borneo, Philippines.

63 *Xylosma* genus: 2 species in NT.

BL30/2:243 (1985); FGICS:210 (1939); FCLV11:71 (1970)

X. brachystachys Craib

endemic to Thailand

X. longifolium Clos

India, Indo-China, SW.China

64 *Hydnocarpus* genus: 3 species in NT.

BL30/2:226 (1985)

H. ilicifolia King

H.serrata (Pierre) Warb.

H. kurzii (King) Warb. ssp. *australis*

Sleum. var. *conica* Craib

H. anthelminthica Pierre ex Lanes.

65 *Homalium* genus

BL30/2:218 (1985). 3 species in NT:

H. ceylanicum (Gard.) Bth.

H. laoticum Gagnep, *H. crenulatum* Geddes

H. grandiflorum Bth. var. *grandiflorum*

H. damrongianum Craib

FGIC2:1012 (1923); FB12:598 (1879)

H. tomentosum (Vent.) Benth.

FFBB1:531 (1877); FGIC2:1014 (1923),

FB12:596 (1879)

66 *Flacourtia indica* (Burm. f.) Merr.

F. jensis Craib, *F. ramontchi* L'Her., *F. sepiaria*

Roxb., *F. thorelii* Gagnep., *F. latifolia* Gagnep.
DEPMP: (1935); DIFME:91 (1991); MPP:626 (1978);
TFM2:143 (1973); WTM:345 (1988); BL30/2:241
(1985); FCLV11:41 (1970)

Original distribution range obscured by a long
history of cultivation throughout tropical Africa,
India, S.E.Asia & Polynesia.

The wood is hard but usually crooked, used
mostly for tool handles. Fruits and shoots are
edible. Fruits & wood are used to against round-
worms, and the leaves as an antidote to snake
bite. The bark is used for rheumatism, gout and
skin disease. The roots are effective for skin
allergies.

61 *Flacourtia jangomas* (Lour.) Rausch.
F. cataphracta Roxb. ex Willd., *Stigmarota*
jangomas Lour.

BL30/2:240 (1985); WTM:346 (1988); FCLV11:36
(1970)

Originally from N.E. India & upper Myanmar, not
native in NT.

68 *Flacourtia rukam* Zoll. & Mor.

BL30/2:240 (1985); WTM:346 (1988); FCLV11:39
(1970); TFM2:144 (1973); FGIC1:234 (1909)

Indonesia, Malay Peninsula, extreme S. of
Thailand, not native in NT.

69 *Casearia grewiaefolia* Vent.

var. *grewiaefolia*

C. kerrii Craib, *C. oblonga* Craib

BL30/2:247 (1985); FCLV11:60 (1970); PR5/3:144
(1998); กล้วย 1:40 (1995); TFM2:142 (1973);
FGIC2:1003 (1923)

The wood is used for interior furnishing, house
building and the making of plywood. Roots have
been used against diarrhoea and the bark as a
tonic. Oil from the seeds is used for skin
complaints.

Myanmar, Indo-China, Malay Peninsula,
Indonesia?

Architectural model of Roux.

var. *gelonioides* (Bl.) Sleum.

C. grewiaefolia Vent. var. *deglabrata* Koor. & Valet,
C. calva Craib

Indo-China, Malay Peninsula, Indonesia, Melanesia
to Solomon islands & Queensland.

70 *Casearia flexuosa* Craib

C. yunnanensis How & Ko

BL30/2:245 (1985); FCLV11:48 (1970); TFM2:140

(1973)

Indo-China, SW.China,

71 *Casearia flavovirens* Bl.

C. pallida Craib, *C. odorata* Teijsm. & Bin.

BL30/2:245 (1985); FCLV11:54 (1970); PR5/3:143
(1998); TFM2:140 (1973)

S.Vietnam, Malay Peninsula, Sumatra, Java, Bali.

72 *Casearia graveolens* Dalz.

BL30/2:246 (1985); FCLV11:56 (1970); FGIC2:1000
(1923); FBI2:592 (1879)

India, Indo-China.

Leaves and flowers are eaten as vegetables,
and the fruit is edible. Root and bark are used to
treat liver complaints and stomach ache.

THEACEAE

FGICS (1943), FT2/2 (1972), RGC (1984-
Camellia), NRBGE (1958 - *Camellia*)

73 *Camellia taliensis* (W.W. Sm.) Mel.

Thea taliensis W.W.Sm.

FT2/2:148 (1972); NRBGE10:73

SW. China.

74 *Camellia connata* (Craib) Craib

Thea connata Craib

FGICS1:314 (1943); FT2/2:147 (1972); FGICS:314
(1943)

Endemic to Thailand.

75 *Camellia tenii* Sealy

FT2/2:146 (1972)

76 *Camellia sinensis* (L.) O.K. var.

assamica (Mast.) Kitamura

C. Thea Lmk., *C. theifera* Griff., *Thea assamica*
Mast., *Thea sinensis* L. forma *assamica* (Mast.)
Steen

DEPMP:421 (1935); DIFME:42 (1991); FT2/2:147
(1972); WTM:719 (1988)

NE. India, Indo-China, S.China, Malay Peninsula,
Sumatra, Java, Borneo, Philippines.

The leaves can be used in the making of Chinese,
English and green tea as well as fermented tea
(miang) for chewing. Used medicinally for
abortion, as an antiseptic & for curing bad breath.
Seed oil used for margarine, stupefying fish. The
leaves should not be used as compost because it
they can kill earth worms.

77 *Camellia oleifera* Abel var. *confusa*

(Craib) Sealy

C. confusa (Craib) C. Stuart, *C. drupifera* Craib,
Thea confusa Craib

FT2/2:147 (1972); FGICS:315 (1943); ๒๓พ1:35
(1995)

Assam, Myanmar, SW. China (Yunnan), Laos,
Vietnam, Cambodia.

78 *Schima wallichii* (DC.) Korth.

S. crenata Korth., *S. noronhae* Reinw. ex Bl., *S.*
bancana Miq., *S. brevipes* Craib, *Gordonia*
wallichii DC.

DIFME:161 (1991); FFBB1:106 (1877); FT2/2:144
(1972); VFT:719 (1996); IT:60 (1906); ๓๓๑:260
(1983); ๒๓พ1:83 (1995); TFM3:291 (1978);
WTM:728 (1988); RW2/1:133 (1952); PR5/3:507
(1998); FGIC1:350 (1910)

NE. India, Myanmar, Indo-China, S.China, Malay
Peninsula, Sumatra, Java, Borneo, Philippines.

The wood is red-brown & of good quality, but
contains a skin irritant & hence is unpopular with
wood-workers. The timber also needs careful
seasoning. It is used for medium / heavy
construction under cover, and ship and boat
building. The boiled leaves are a remedy for
diarrhoea. A decoction of young leaves and roots
is said to be good for fever. The bark has been
used as a fish poison & is said to be effective
against head-lice. Good firewood. Bark used as
an antiseptic for cuts & wounds & as a
vermifuge. The flowers are used for uterine
diseases.

79 *Gordonia dalglieshiana* Craib

FGICS1:325 (1943); FT2/2:143 (1972)

Endemic to Thailand.

80a *Pyrenaria garrettiana* Craib

FT2/2:150 (1972); TFM3:290 (1978); FGICS:302
(1943)

Endemic to Thailand.

80b *Pyrenaria cameliaefolia* Kurz

FT2/2:147 (1972); FGICS:302 (1943); FBI1:290
(1874)

Myanmar.

**81 *Ternstroemia gymnanthera* (Wight &
Arn.) Bedd.**

T. japonica auct. non (Thunb.) Thunb. (in FSE,
FBI), *T. aneura* Miq., *Cleyera gymnanthera* W. &
A.

FT2/2:154 (1972); VFT:720 (1996); PR5/3:552
(1998); FGIC1:332 (1910); FBI1:280 (1874)

S. & E. India, Myanmar, Laos, Vietnam, Cambodia,
Philippines, S. China, Taiwan, Japan (Java,
Borneo, Philippines?)

82 *Ternstroemia bancana* Miq.

T. wallichiana sensu Keng non Engl. (in FT)

FT2/2:154 (1972); TFM3:293 (1978); PR5/3:552
(1998)

Malay Peninsula, S. & E. Thailand but not yet
recorded in the north.

**83 *Adinandra integerrima* T. And. ex
Dyer**

A. lutescens Craib, *A. phlebophylla* Hance,
A. hulleti King

FT2/2:151 (1972); PR5/3:52 (1998); ๒๓พ4:31
(1997); TFM3:279 (1979); FGICS:285 (1943);
FBI1:282 (1874)

Cambodia, Malay Peninsula.

The wood is used in general construction,
furniture and for plywood. It is also good
firewood, and can be made into charcoal.

84 *Adinandra laotica* Gagnep

FGICS1:283 (1943); FT2/2:152 (1972)

Laos.

85 *Adinandra oblonga* Craib

A. coarctata Craib

FGICS:284 (1943); FT2/2:151 (1972)

Endemic to Thailand.

86 *Anneslea fragrans* Wall.

FFBB1:98 (1877); FT2/2:157 (1972); IT:58 (1906);
๒๓พ2:42 (1995); FGICS:278 (1943); FGIC1:335
(1910)

Myanmar, Cambodia, Laos, Vietnam, S. China
(Yunnan, Kwangtung, Hainan), Taiwan and Malay
Peninsula.

Timber beautifully marked but hard & brittle, used
for furnishings. The bark and flowers are said to
be effective against dysentery & fever, also for
dispelling intestinal worms.

**87 *Eurya acuminata* DC. var. *acuminata*
E. monticola Ridley**

DIFME:88 (1991); FBI1:285 (1874); FFBB1:101
(1877); FT2/2:155 (1972); IT:58 (1906); TFM3:282
(1978); WTM:722 (1988); FGIC1:338 (1910)

Sri Lanka, India, SW.China, Taiwan, Malay Peninsula, Sumatra, Java,

The leaves make good compost & fodder. They can be used to treat cholera, diarrhoea & other stomach diseases. The wood is good fuel.

var. *wallichiana* Steud.

India, S.W. China (Yunnan), Laos, Vietnam, Cambodia.

88 *Eurya nitida* Korth.

FT2/2:156 (1972); TFM3:282 (1978); FGIC1:338 (1910)

var. *siamensis* (Craib) H.Keng - endemic to Thailand.

var. *nitida* - India, Indo-China, S.China, Hainan, Malay Peninsula, Sumatra, Java, Borneo, Philippines

DIPTEROCARPACEAE

FGICS (1943), FT2/2 (1972)

89 *Saurauia roxburghii* Wall.

S. thorelii auct. non Fin. & Gagnep. (in FSE)

DIFME:160 (1991); FFBB1:103 (1877); FT2/2:111 (1972); IT:63 (1906); ๑๙๗2:119 (1995); TFM4:7 (1989); FGIC1:26 (1907)

E. India, Myanmar, Vietnam, Cambodia.

This is planted as an ornamental tree, and has edible fruit.

90 *Saurauia napaulensis* DC.

(often misspelt *S. nepalensis*.)

FT2/2:109 (1972); FGIC1:27 (1907); TFM4:5 (1989); IT:62 (1906); ๑๙๗4:118 (1997); DIFME:160 (1991)

E. India, Nepal, Myanmar, S. China, IndoChina, Malay Peninsula.

The fruit pulp is edible. The leaves are an excellent fodder & are also edible. A poultice of the bark is used to remove splinters.

DIPTEROCARPACEAE

JSS8; TFB12 (1979 = MDMSEA, 1980), FCLV25 (1990), DSA (1985)

91 *Anisoptera costata* Korth.

A. oblonga Dyer, *A. cochinchensis* Pierre, *A. robusta* Pierre, *A. glabra* Pierre, *Shorea nervosa* Kurz

DSA:41 (1985); MDMSEA:20 (1980); VFT:121 (1996); FCLV25:13 (1990)

S.Myanmar, Laos, Cambodia, S. Vietnam.

92 *Anisoptera scaphula* (Roxb.) Pierre

A. glabra Kurz ex Dyer, *Hopea scaphula*, *Vatica scaphula* Dyer

DSA:43 (1985); MDMSEA:21 (1980); VFT:122 (1996); FFBB1:112 (1877)

Bangladesh, S.Myanmar, Cambodia, S.Vietnam.

93 *Vatica harmandiana* Pierre

Vatica cinerea King, *Synaptea cinerea* Ridl., *S.lankaviensis* Ridl.

TFB29:179 (2001) MDMSEA:82 (1980); FCLV25:48 (1990)

S. Myanmar, Laos, Cambodia, Vietnam, Malay Peninsula.

94 *Vatica odorata* (Griff.) Sym. forma *odorata*

V. grandiflora Dyer, *V. faginea* Dyer, *Synaptea odorata* Griff.

DSA:266 (1985); MDMSEA:84 (1980); VFT:148 (1996); FCLV25:52 (1990)

S.Myanmar, Laos, Cambodia, Vietnam, Malay Peninsula.

The timber is valuable since it is hard, heavy and insect resistant. It is used in many types of heavy construction including bridges and boats.

95 *Parashorea stellata* Kurz

P. lucida Sym., *Shorea cinerea* Fischer, *S. stellata* Dyer

MDMSEA:57 (1980); DSA:165 (1985); VFT:142 (1996); FFBB1:117 (1877); FCLV25:106 (1990)

S.Myanmar, Laos, Cambodia, Vietnam, Malay Peninsula.

96 *Dipterocarpus costatus* Gaertn. f.

D. artocarpifolius Pierre, *D. parvifolius* Hiem.

DSA:69 (1985); FFBB1:117 (1877); VFT:125 (1996); PR5/2:176 (1995); ๑๙๗๓:276 (1983); ๑๙๗2:73 (1995); MDMSEA:33 (1980); JSS8:9; FCLV25:37 (1990)

Bangladesh, Myanmar, Andaman Islands, Laos, Cambodia, Vietnam, N.Malay Peninsula,

Timber used in construction and ship building, but is not durable in the open. Valuable resin from the bark is used in the paint industry & is said to be effective for treating ulcers.

97 *Dipterocarpus turbinatus* Gaertn. f.

D. laevis Ham.

DSA:117 (1985); FFBB1:114 (1877); VFT:132 (1996); IT:65 (1906); ๑๙๗3:105 (1996); JSS8:3; MDMSEA:42 (1980); FCLV25:23 (1990)

Bangladesh, Myanmar, Andaman Islands, Cambodia, S.Laos, Vietnam.

The timber is strong but not durable in exposed conditions, it is popular for rough construction & commercial grade plywood. The wood oil is similar to that of *D. alatus* but is considered of inferior quality. It is used as a preservative for bamboo & as an oil base for inks. It is applied externally to treat ulcers, ringworm & other skin infections.

98 *Dipterocarpus alatus* Roxb. ex G. Don
D. incanus Roxb.

DEPMP:855 (1935); DSA:59 (1985); FFBB1:116 (1877); IT:66 (1906); TFB24:1; อลพ1:51 (1995); MDMSEA:31 (1980); VFT:123 (1996); FCLV25:41 (1990)

India, Bangladesh, S.Myanmar, Andaman Islands, Cambodia, Laos, S.Vietnam, N. Malay Peninsula.

A valuable timber for a variety of purposes such as indoor construction, railway sleepers & boat-building as well as for plywood. The resin (or wood oil) is said to be the best of any native thai species. It is used for varnish, zinc-based paints, lighting, caulking boats and bamboo wares. It can be used as a fuel in diesel engines. The resin has also been used medicinally for urinary problems, liver complaints & rheumatism. It is a strong antiseptic when applied to cuts & wounds.

99 *Dipterocarpus obtusifolius* Teijsm. ex Miq.

D. vestitus Wall. ex Dyer, *D. punctulatus* Pierre
DEPMP: (1935); DSA:113 (1985); FFBB1:115 (1877); VFT:129 (1996); IT:65 (1906); JSS8:3, PR5/2:756 (1995); อลพ2:74 (1995); FCLV25:26 (1990); MDMSEA:39 (1980)

Myanmar, Andaman Islands, Cambodia, Laos, Vietnam, (var. *subnudus* also in N.Malay Peninsula)

The timber is used for general construction. The leaves are used to wrap food or roll cigarettes. The resin is of poor quality, since it hardens too rapidly. The wood is hard & polishes well, but is not durable in the open. It is used for rough construction & plywood.

100 *Dipterocarpus tuberculatus* Roxb.

D. grandifolius Teijsm. ex Miq., *D. cordatus* Wall. ex A. DC.

DEPMP: (1935), DSA:114 (1985), FFBB1:113 (1877), VFT:131 (1996), IT:66 (1906), JSS8:, มลพ1:211 (1983); อลพ2:75 (1995); FCLV25:34 (1990);

MDMSEA:41 (1980)

Myanmar, Cambodia, Laos, Vietnam, (var. *tomentosus* only in Myanmar & Thailand)

The timber is fairly durable but difficult to polish. It is used in general construction and furniture making. Resin extracted from the tree can be burnt for lighting or blended with paints. Large mature leaves of young trees are used for thatching roofs. The leaves are not flammable or susceptible to insects and can last for up to three years.

101 *Dipterocarpus retusus* Bl.

D. tonkinensis Chev., *D. macrocarpus* Vesque
MDMSEA:40 (1980); FGICS1:341 (1943); PR5/2:184 (1995); VFT:130 (1996); FCLV25:24 (1990)
Assam, Myanmar, Cambodia, Laos, N.Vietnam, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands.

102 *Hopea odorata* Roxb.

DSA:139 (1985); FFBB1:120 (1877); VFT:137 (1996); IT:67 (1906); JSS8:8; PR5/2:251 (1995); มลพ1:131 (1983); อลพ2:85 (1995); WTM:238 (1988); FCLV25:69 (1990); MDMSEA:50 (1980)

Myanmar, Andaman Islands, Cambodia, Laos, S.Vietnam, N.Malay Peninsula.

The timber is resistant to insects and termites, it is used for furniture, floors and railway sleepers as well as for boat-building. The bark has a high tannin content and is used in the tannery industry. The resin has similar uses to *Dipterocarpus* spp. but is inferior.

Architectural model of Roux.

103 *Shorea roxburghii* G. Don

Shorea floribunda Wall. ex Kurz, *S. harmandii* Pierre, *S. attopoensis* Pierre, *S. talura* Roxb., *S. cochinchinensis* Pierre

DSA:216 (1985); อลพ1:85 (1995); WTM:239 (1988); JSS8:6; VFT:146 (1996); MDMSEA:74 (1980)

S.India, S.Myanmar, Cambodia, Laos, Vietnam, Malay Peninsula.

Wood very strong & durable but seasons badly. It is used only for interior and furniture. Young flowers can be eaten if they are cooked. The bark is boiled in water for dysentery. Dried flowers are used in combination with other flowers for heart problems & for relieving fever. The bark is chewed with Betel nut & contains abundant tannin.

104 *Shorea farinosa* Fischer

MDMSEA:72 (1980); FCLV25:103 (1990)
S.Myanmar, Cambodia, N.Malay Peninsula.

105 *Shorea siamensis* Miq.

Pentacme siamensis (Miq.) Kurz, *P.suavis*
A.DC., *P.malayana* King, *P.tomentosa* Craib.
DSA:219 (1985); FFBB1:119 (1877); VFT:147
(1996); PR5/2:433 (1995); ឧត្តមៈ 86 (1995);
MDMSEA:66 (1980), JSS8:7

Myanmar, Cambodia, Laos, Vietnam, NW.Malay
peninsula.

The timber is strong & naturally durable, used for
construction and is of great economic
importance. The bark is used against diarrhoea
and the resin is used for caulking boats.

106 *Shorea obtusa* Wall. ex Bl.

S.leucobotrya Miq.

DSA:196 (1985); FFBB1:118 (1877); IT:68
(1906); JSS8:; PR5/2:432 (1995); ឧត្តមៈ 166 (1983),
ឧត្តមៈ 13:126 (1995); MDMSEA:65 (1980); VFT:145
(1996), FCLV25:86 (1990); FGIC1:378 (1910)

Myanmar, Cambodia, Laos, S.Vietnam.

The timber is hard and durable, suitable for heavy
construction. Resin from the wood is used for
caulking baskets and boats. This resin has
antibiotic properties & is used for wounds &
ulcers. It is also recommended as a cure for
dysentery.

The timbers of *S.obtusa* & *S.siamensis* are often
marketed together under the same commercial
name.

107 *Shorea guiso* (Blanco) Bl.

S.vulgaris Pierre ex Laness., *S.longipetala*
Foxworthy

PR5/2:429 (1995); MDMSEA:64 (1980); VFT:143
(1996); FCLV25:90 (1990)

Cambodia, Laos, S.Vietnam (Malay Peninsula,
Sumatra, Borneo, Phillipines?)

The wood has a comparatively low density and is
suitable for light construction work. The
brownish-yellow resin produced from the wood
is used by the paint industry.

108 *Shorea thorelii* Pierre

MDMSEA:67 (1980); FCLV25:88 (1990)

S.Myanmar, Laos, S.Vietnam.

MALVACEAE

FGICS (1943), BL14 (1966), TFB18 (1989)
Hibiscus)

109 *Kydia calycina* Roxb.

DIFME:111 (1991); FFBB1:124 (1877); VFT:492 (1996);
IT:78 (1906); ឧត្តមៈ 298 (1983); FGIC1:445 (1910)

N.India, Myanmar.

The wood is good for house-building. The flowers
are edible. The bark has medicinal properties and
can treat boils, diabetes and rheumatism. Bark
and root fibers can be used to make rope.

110 *Hibiscus macrophyllus* Roxb. ex Horn.

H. setosus Roxb.

FFBB1:126 (1877); IT:74 (1906); PR5/3:292 (1998);
WTM:481 (1988); BL14/1:47 (1966); TFB18:56
(1989); FGIC1:426 (1910); TFM1:312 (1972);
DEPMP:1167 (1935)

S. & E. India, Bangladesh, Cambodia, Laos,
Vietnam, Malay Peninsula, Sumatra, Java, Borneo.

The wood is rather heavy and may be used for
house-posts and other indoor house-building
purposes. The fibre from the bark is used for
ropes.

111 *Hibiscus tiliaceus* L.

FFBB1:126 (1877); IT:75 (1906); MPP:582 (1978);
WTM:482 (1988); BL14/1:29 (1966); DEPMP:1172
(1935); FGIC1:431 (1910); ឧត្តមៈ 1:60 (1995);
TFB18:72 (1989); DIFME:102 (1991); TFM1:312
(1972)

Widely distributed throughout the tropics,
especially along coastlines.

An infusion of the wood is used for diabetes. The
young leaves are edible. The mature leaves,
fruits and shoots are used for fever, coughs and
bronchitis. The flowers are used to cure
headache in China. The seeds and bark are
reputed to be emetic. Bark fibers can be used to
make rope, and the pulp is processed into cheap
paper.

112 *Hibiscus glanduliferus* Craib

TFB18:54 (1989); FGICS:377 (1945)

Indo-China.

113 *Hibiscus mutabilis* L.

DIFME:102 (1991); FFBB1:125 (1877); MPP:576
(1978); WTM:481 (1988); DEPMP:1168 (1935);
FGIC1:428 (1910); BL14/1:60 (1966); ឧត្តមៈ 1:60
(1995); TFB18:62 (1989)

S.China, Taiwan. Cultivated & naturalized in India,
Malay Peninsula, Phillipines & Molluccas.

The leaves and the flowers possess
antibacterial, deculgent and diuretic properties.

They are used in the treatment of boils in the form of a poultice. The flowers are taken as an antidote to many kinds of poison & to purify the blood. As an infusion, they are said to be effective for chest & lung complaints. Often planted as an ornamental for its flowers.

BOMBACACEAE

FGICS (1945), TFB25c (1997)

114 *Bombax ceiba* L.

B. malabaricum DC.

DIFME:37 (1991); VFT:76 (1996); MPIC (1999); PR5/3:11 (1998); IT:77 (1906); FGIC1:448 (1911); TFB25c:97 (1997); RUPNI:193 (1989); TSNH:54 (1990)

India, Nepal, Bangladesh, Myanmar, S.China, Taiwan, Indo-China, Malay Peninsula, Borneo, (Sabah), Phillipines, Java, Sulawesi, Lesser Sunda islands, Moluccas, New Guinea, N. Australia, Tropical America.

The wood is soft and used for boxes, toys, matchsticks and wooden shoes, as well as coffins and canoes. Paper can be made from the bark fibers. The boiled flowers are edible and oil from the seed is used in cooking. The seeds are a nourishing cattle food. The silky insides of the fruits are used for stuffing mattresses. The roots are a stimulant & have been widely used as an aphrodisiac & for impotency. The gum from the bark and roots has been used as a medicine to induce vomiting and to treat diarrhoea, dysentery & fever. The tree is also planted ornamentally on account of its beautiful red flowers. Evil spirits are thought to live in the tree and they are rarely cut down.

Architectural model of Aubreville.

115 *Bombax anceps* Pierre var. *cambodiense* Robyns

B. valetonii Hochr. *B. kerrii* Craib

VFT:75 (1996); ๑๙๙๑:28 (1995); TFM1:104 (1972); TFB25c:98 (1997); FGIC1:450 (1911); IT:78 (1906); WTM:189 (1988); FGICS:389 (1945)

Myanmar, Cambodia, Vietnam, Malay Peninsula.

The wood is sometimes used to make toys and furniture but is susceptible to termites. Fruits provide cotton fibers used for stuffing of pillows and mattresses.

116 *Bombax insigne* Wall.

B. insulare Ridl.

TFB25c:98 (1997); FGIC1:448 (1911); IT:77 (1906)

India, Myanmar, S.China, Laos.

The cotton is used for stuffing mattresses and pillows. The wood for toys and indoor furnishings.

117 *Ceiba pentandra* (L.) Gaertn.

Bombax pentandrum L., *Eriodendron anfractuosum* DC.

MPP:595 (1978); IT:76 (1906); FGIC1:446 (1911); TFB25c:93 (1997); WTM:190 (1988); VFT:77 (1996)

The wood is soft & light, used for fencing & boats. The fibers from the pods are excellent for stuffing pillows and mattresses. Kapok oil from the seeds is used in the manufacture of soap and as a substitute for cotton seed oil. The "cake" left over from this process is an excellent cattle fodder. The young leaves, sprouts and young pods are edible. An infusion of the leaves mixed with onion & tumeric is used for coughs. The bark is used for urinary complaints, fever & to induce vomiting. The roots are used in India against dysentery & as an aphrodisiac. The ash left from burning the pods are used by dyers.

Architectural model of Massart.

118 *Pachira aquatica* Aublet

๑๙๙๑:156 (1998); PB:517 (1997)

Native of tropical America.

Seeds edible.

STERCULIACEAE

FGICS (1945), TFB23 (1995)

119 *Abroma augusta* L.f.

DEPMP:1 (1935); FBI1:375 (1874); FGICS:7:439 (1943); IT:90 (1906); MPP:601 (1978); WH:2 (1948); FGIC1:513 (1911); TFB23:82 (1995)

NE. India, Bangladesh, S.China, Malay Peninsula, Indonesia, Phillipines, Australia.

The silky fibres from the bark are very strong & are used to make cordage and fishing nets. The root and the root-bark are used to regulate menstrual disorders. The seeds & stems are used in local medicine.

Architectural model of Petit.

120 *Pterygota alata* (Roxb.) R. Br.

Sterculia alata Roxb.

FFBB1:134 (1877); FGIC1:466 (1911); TFB23:75 (1995); WTM:7:12 (1988); DEPMP:1868 (1935); FBI1:360 (1874); IT:83 (1906)

India, Myanmar, Andaman Islands, S.China.

Vietnam, Malay Peninsula.

The wood is light and only suitable for matchstick making & plywood. The seeds are eaten in Myanmar. The tree is planted as an ornamental along streets and avenues in India.

121 *Helicteres* genus: 7 species native in NT.

TFB23:85 (1995, all spp.)

H. angustifolia L.

H. obtusa Wall.

FFBB1:144 (1877); IT:89 (1906); FGIC1:495 (1911)

H. elongata Wall. ex Boj.

FFBB1:144 (1877); IT: 89(1906); FGICS:421 (1945)

H. hirsuta Lour.

FFBB1:143 (1877); IT:89 (1906); FGIC1:490 (1911)

H. isora L.

FFBB1:142 (1877); IT:88 (1906); DIFME:100 (1991); FGIC1:488 (1911)

H. lanata (Teijsm. et Binn.) Kurz

FFBB1:143 (1877); FGIC1:492 (1911)

H. lanceolata A. DC.

FGIC1:493 (1911)

H. viscida Bl.

FFBB1:143 (1877); FGIC1:489 (1911)

122 *Sterculia pexa* Pierre

FFBB1:136 (1877); IT:80 (1906); TFB23:94 (1995); FGIC1:462 (1911)

Laos, Vietnam.

The wood is used for plywood and boxes.

123 *Sterculia foetida* L.

FFBB1:135 (1877); MPP:607 (1978); WTM:716 (1988); FGIC1:461 (1911); TFB23:94 (1995); IT:80 (1906); FBI1:354 (1874)

Sri Lanka, India, Myanmar, Cambodia, Vietnam, Malay Peninsula, Indonesia, Philippines, N.Australia, E.Africa.

The bark and root yield fibres for making ropes, and the wood is suitable for indoor construction work & boxes. The raw seeds have laxative properties but can be eaten after roasting. Oil from the seed can be burnt as illumination & is also used in cooking. The bark & leaves are used medicinally as an astringent, diuretic & to induce abortion. They are also used as an insect repellent.

124 *Sterculia urena* Roxb.

var. ***thorelii*** (Pierre) Phengklai

S. thorelii Pierre, *S. urens* Roxb.

FBI1:355 (1874); FFBB1:136 (1877); IT:80 (1906); FGIC1:463 (1911); TFB23:95 (1995)

Sri Lanka, India, Myanmar, Cambodia, Vietnam.

The tree yields karaka gum, which is an important substitute for gum tragacanth. The wood is almost worthless.

125 *Sterculia villosa* Roxb.

S. armata Mast., *S. ornata* Wall. ex Kurz

DIFME:171 (1991); FBI1:355,357 (1874); FFBB1:136 (1877); IT:81 (1906); TFB23:96 (1995); FGIC1:466 (1911)

India, Nepal, Myanmar, Andaman Islands, Cambodia, S. China.

The wood is suitable for indoor construction. The bark gives excellent fibre for making hats & rope. This was the favoured material used to haul logs in Burma. The leaves are considered to be a good fodder. The roots can be eaten in times of famine. They are said to be effective for dysentery & swellings.

126 *Sterculia hypochra* Pierre

TFB23:95 (1995); FGIC1:460 (1911)

Lower Myanmar, Vietnam, Malay Peninsula,

The wood is suitable for indoor construction, and the bark yields fibers for binding material.

127 *Sterculia balanghas* L.

S. angustifolia Roxb., *S. ensifolia* Mast., *S. rubiginosa* Vent. { inc. var. *ensifolia* (Mast.) Ridl. } IT:84 (1906); FFBB1:138 (1877); FGIC1:473 (1911)

; TFB23:97 (1995); FBI1:358 (1874)

India, Nepal, Sri Lanka, Myanmar, Malay Peninsula, Indonesia.

128 *Sterculia guttata* Roxb.

TFB23:96 (1995); IT:82 (1906); FGICS:407 (1945); FBI1:356 (1874)

Sri Lanka, India, Myanmar, Andaman Islands, Vietnam.

The wood is used for indoor construction. The seeds can be roasted and eaten.

129 *Sterculia lanceolata* Cav. var. ***lanceolata***

S. tonkinesis A.DC.

FGIC1:468,470 (1911); TFB23:98 (1995); HKT (1988) Sri Lanka?, Laos, Vietnam, China, Malay

Peninsula.

The boiled root is used against body pain, joint pain, measles and chicken pox.

var. ***principis*** (Gagnep.) Pengklai

S.principis Gagnep.

Myanmar, Laos.

130 *Firmiana colorata* (Roxb.) R. Br.

Sterculia colorata Roxb.

DIFME:91 (1991); FFBB1:138 (1877); FGIC1:459 (1911); TFB23:74 (1995); IT:84 (1906); ๘๙๗4:67 (1997); RW4/2:285 (1957); FBI1:359 (1874)

Sri Lanka, India, Myanmar, Andaman Islands, S.China, Malay Peninsula, Sumatra..

The bark and roots yield fiber for making rope, hats and mats. The wood is used for making concrete moulds and the core of plywood. The leaves are used as cattle fodder in India.

F.malayana Kosterm. is considered by some authorities to be a synonym of *F.colorata*. {see PEN54:7 (1956); TFM2:357 (1973); WTM:705 (1988)}

131 *Firmiana kerrii* (Craib) Kosterm.

Sterculia kerrii Craib

TFB23:74 (1995); RW5/4:389 (1961); FGICS:409 (1945)

Endemic to Thailand.

132 *Pterocymbium macranthum* Kost.

P. laoticum Tard.

RW6c:295 (1962); TFB23:72 (1995); FGIC1:395 (1911)

The wood is used to make plywood.

133 *Pterocymbium tinctorium* (Blanco)

Merr.

P. campanulatum Pierre, *P. javanicum* R. Br., *P. siamensis* Kosterm., *Sterculia campanulata* Wall. ex Mast.

FJ1:415 (1963); TFB23:71 (1995); FFBB1:139 (1877); TFM2:366 (1973); FGICS:397 (1945); FBI1:362 (1874); DEPMP:1865 (1935); IT:85 (1906); TFB10:67 (1977)

India, Laos, Vietnam, Cambodia, Malay Peninsula, Java, Phillipines.

The timber is very soft and light, suitable for plywood, boxes & hats. The bark can be processed into rope. The bark is mixed with dyes as a fixative. The fruits are poisonous.

134 *Heritiera macrophylla* Wall. ex Kurz

TFB23:68 (1996); FFBB1:141 (1877); FGIC1:485

(1911); RW4:502 (1959); IT:86 (1906)

S.Myanmar.

135 *Pterospermum cinnamomeum* Kurz

P. blumeianum Korth. (in part)

TFB23:80 (1995); FFBB1:147 (1877); DEPMP: (1935); FGICS:436 (1945); IT:92 (1906)

Myanmar.

The wood is coarsely fibrous & quite heavy, also rather perishable. It is used mostly as firewood.

136 *Pterospermum lanceaefolium*

Roxb.

P. insulare Pierre, *P. jackianum* Wall. ex Mast., *P. pierrei* Hance

FFBB1:146 (1877); IT:92 (1906); TFM2:376 (1973); FGIC1:499,501,504 (1911); TFB23:79 (1995)

India, Myanmar, S.China, Malay Peninsula.

The wood is strong & close-grained.

137 *Pterospermum littorale* Craib var.

venustum Phengkklai

P. venustum Craib

TFB23:80 (1995); TFB10:67 (1977); FGICS:430 (1945)

Endemic to Thailand.

Used only as firewood.

138 *Pterospermum acerifolium* (L.) Willd.

DIFME:152 (1991); FFBB1:145 (1877); IT:91 (1906), PR5/3:482 (1998); TFM2:368 (1973); TSH:88 (1994); WTM:711 (1988); TFB23:82 (1995); DEPMP:1867 (1935); FGICS:432 (1945)

NE. India, Bangladesh, Myanmar, S. China, Malay Peninsula.

The timber is coarsely fibrous but quite heavy, easy to work & takes a fine polish. It is used for interior construction & is an excellent firewood. The flowers can be used as an insecticide, but may also be eaten. They can also be used to treat cases of blood in the urine, dehydration, indigestion & headache.

139 *Pterospermum grande* Craib

TFB23:80 (1995); FGICS:433 (1945)

Laos.

140 *Pterospermum grandiflorum* Craib

TFB23:81 (1995); TFB10:64 (1977); FGICS:428 (1945)

Endemic to Thailand.

Timber makes good firewood and can be used for interior construction.

141 *Pterospermum diversifolium* Bl.

TFB23:81 (1995); FGIC1:500 (1911); WTM:710 (1988); TFB10:64 (1977); MPP:607 (1978); DEPMP:1867 (1935)

India, Vietnam, Malay Peninsula.

The timber is fairly strong & durable even in contact with water, used for bridges & boats. The bark can be used for dying cloth and is chewed with betel nut in Vietnam. The fibre is weak & so rarely used.

142 *Pterospermum semisagittatum*

Ham. ex Roxb.

FFBB1:146 (1877); VFT:696 (1996); IT:91 (1906); ၅၄၂W2:114 (1995); TFM2:368 (1973); TFB23:79 (1995); FGIC1:502 (1911); DEPMP:1866 (1935)

Sri Lanka, India, Myanmar, Laos, Cambodia, Vietnam.

The wood is heavy & durable, used for house building and some household appliances. The bark has an astringent taste and is used for chewing with Betel nut.

143 *Reevesia pubescens* Mast. var. *pubescens*

IT:92 (1906); TSH:117 (1994); FGICS:414,415 (1945); TFB23:77 (1995); FBI1:364 (1874)

India, Laos, China.

The tree is highly ornamental when in full bloom but not much planted.

var. *siamensis* (Craib) Anthony

R. siamensis Craib

Endemic to Thailand.

144 *Eriolaena candollei* Wall.

FFBB1:148 (1877); FGIC1:506 (1911); TFB23:76 (1995); IT:87 (1906)

Assam, Bhutan, Myanmar, S. China, Laos, Vietnam.

The wood is tough and elastic, used for agricultural tools, rice-pounders & canoe paddles. The tree is a host for the Lac insect.

145 *Melochia umbellata* (Houtt.) Stapf.

M. arborea Bl., *M. velutina* Wall. ex Bedd., *Visenia umbellata* Houtt.

TFM2:366 (1973); TFB23:90 (1995); FGIC1:508 (1911); FFBB1:148 (1877); WTM:709 (1988)

India, Sri Lanka, Myanmar, Vietnam, Malay Peninsula, Phillipines, Australia & Polynesia.

The wood is used for handicrafts and tools.

ELIACEAE

FGICS (1945), TFB16 (1986), FT6/1 (1993)

146 *Pentace burmanica* Kurz

FT6/1:53 (1993); FFBB1:154 (1877); FGIC1:528 (1911); IT:94 (1906)

India, Myanmar, Cambodia.

The wood is used in construction. The bark can be chewed with Betel nut.

147 *Brownlowia peltata* Benth.

B. denysiana Pierre, *B. elmeri* Merr., *B. helferiana* Pierre

FFBB1:153 (1877); FT6/1:14 (1993); IT:93 (1906)
S.Myanmar.

148 *Muntingia calabura* L.

MPP:569 (1978); FT6/1:42 (1993); FGIC1:562 (1911), WTM:251 (1988)

Tropical America. Introduced to the Phillipines over 130 years ago.

Bark used as rope. Ripe fruits edible, very attractive to birds.

149 *Colona winitii* Craib

Columbia winitii Craib

FT6/1:62 (1993); FGICS:467 (1945)
Cambodia

The timber is good for making cabinets and the bark fibers for making string.

150 *Colona elobata* Craib

FT6/1:60 (1993)

The timber is good for making cabinets.

151 *Colona auriculata* (Desf.) Craib

Columbia auriculata (Desf.) Bail., *Diplophractum auriculatum* Desf.

FT6/1:67 (1993); FGIC1:547 (1911)

Laos, Cambodia, Vietnam, Indonesia,

The timber is good for making cabinets.

152 *Colona floribunda* (Kurz) Craib

C. hamannii Riedl. et Riedl-Dorn., *C. serratifolia* Cav. var. *floribunda* (Wall.) O.Ktze, *Columbia floribunda* Kurz, *Grewia floribunda* Wall.

FFBB1:156 (1877); FT6/1:66 (1993); VFT:725 (1996); FGIC1:549 (1911); IT:101 (1906)

India, Myanmar, Vietnam, China

The timber is good for house posts & interior cabinet work. The tree is a host for the Lac insect.

153 *Colona flagrocarpa* (Clarke) Craib

Columbia flagrocarpa Clarke ex Brandis

FT6/1:64 (1993); IT:101 (1906); FGICS:464 (1945)

India (Bengal), Laos, Vietnam ?

The timber is good for furniture & interior cabinet work.

154 *Grewia eriocarpa* Juss.

G. vestita non Wall. ex Brandis, *G. humilis* non Wall. ex Mast., *G. elastica* Royle

FJ1:392 (1963); FT6/1:21 (1993); FGIC1:536,540 (1911); PR5/3:270 (1998); IT:98,100 (1906)

Sri Lanka, India, Nepal, Myanmar, Cambodia, Hainan, Philippines, Java, Lesser Sunda Islands.

The wood is quite strong & hard but seldom used for construction. As it is elastic, it has been used for poles, bows & spear-heads in the past. The bark yields a strong fibre for rope-making. When soaked in alcohol it can be applied externally to treat various skin diseases. The tree is cultivated as cattle fodder in the Himalayas.

155 *Grewia winitii* Craib

FT6/1:16 (1993); FGICS:449 (1945)

Endemic to Thailand.

The bark produces strong fibers for rope making.

156 *Grewia sessilifolia* Gagnep.

FT6/1:16 (1993); FGIC1:546 (1911)

Hainan, Vietnam, Laos.

The bark yields good fibers for rope making. Sap from the stem, roots and leaves is used locally for curing wounds.

157 *Grewia abutilifolia* Vent. ex Juss.

G. aspera Roxb., *G. scabrophylla* Roxb.

FT6/1:19 (1993); FFB1:161 (1877); FGIC1:542 (1911)

India, Myanmar, S.China, Cambodia, Laos, Vietnam, Malay Peninsula.

Bark fibre good for rope. Roots soaked in water used locally to relieve fever.

158 *Grewia lacei* Drum. & Craib

G. polygama Roxb. var. *lacei*

FT6/1:22 (1993); FGICS:447 (1945); FGIC1:535 (1911)

Myanmar, Laos.

The bark yields good fibres for rope making. The

fruits are edible.

159 *Grewia laevigata* Vahl

G. acuminata Juss., *G. scabrida* Wall. ex Kurz, *G. disperma* Rottl. ex Spreng, *G. glabra* Bl., *G. multiflora* Juss., *G. umbellata* Roxb., *G. sepriaria* Roxb. ex G.Don.

FB1:389 (1874); FT6/1:26 (1993); FGIC1:539 (1911); FFB1:159 (1877); IT:96 (1906); PR5/3:270 (1998)

India, Nepal, Myanmar, Laos, Vietnam, Philippines, Java, Sumatra?

The bark yields a good fibre. The fruits are edible.

160 *Grewia hirsuta* Vahl.

G. tomentosa Juss.; *G. pilosa* (non Lamk.) Roxb., *G. polygama* Roxb. [inc. var. *hosseusiana* Drum.]

FT6/1:24 (1993); FFB1:159 (1877); FGIC1:535 (1911); VFT:728 (1996); IT:100 (1906)

Sri Lanka, India, Myanmar, S.China, Laos, Cambodia, Vietnam, Malay Peninsula, Indonesia.

The timber is soft, used only for temporary construction & firewood.

161 *Berrya mollis* Wall. ex Kurz

B. ammonilla Roxb. var. *mollis* (Wall. ex Kurz) Mast.

FT6/1:70 (1993); FGIC1:530 (1911); FFB1:155 (1877); FB1:383 (1874); PR5/3:105 (1998); IT:94 (1906)

India, Myanmar, Cambodia, Vietnam.

The wood is used in construction.

162 *Berrya cordifolia* (Willd.) Burret

B. ammonilla Roxb.

FT6/1:69 (1993); FGIC1:531 (1911); PR5/3:105 (1998); TFM2:393 (1973)

Sri Lanka, India, Myanmar, Andaman Islands, Cambodia, Vietnam, Malay Peninsula, Java, Borneo, Philippines, Sulawesi.

The wood is used in construction.

163 *Microcos paniculata* L.

Grewia glabra Jack., *Grewia microcos* L., {inc. var. *rugosa* (Lour.) Mast.}, *Grewia ulmifolia* Roxb., *Microcos mala* Hamilt.

FT6/1:34 (1993); FFB1:157 (1877); FGIC1:543 (1911); VFT:730 (1996); PR5/3:381 (1998); ឧត្តរ:96 (1995); TFM2:397 (1973); WTM:734 (1988); IT:99 (1906)

Sri Lanka, India, Myanmar, S.China, Laos, Vietnam, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands.

The timber is poor & used mostly for firewood. The bark yields a good fibre. The leaves have several medicinal uses & are said to be the favourite wrapping for cigars in Burma. The seeds are rich in oil. The tree is a host for the Lac insect.

164 *Microcos tomentosa* Sm.

Grewia paniculata Roxb.

FT6/1:37 (1993); FGIC1:544 (1911); PR5/3:105 (1998)
Myanmar, Cambodia, Laos, Vietnam, S. China?,
Malay Peninsula, Sumatra, Java, Philippines.

Timber used for cabinet work. Ripe fruits edible.

165 *Schoutenia glomerata* King

ssp. *peregrina* (Craib) Roekm. & Hartono

S. peregrina Craib

DFPT:718 (1997); FT6/1:78 (1993); ๑๙๗4:120 (1997)

Endemic to Thailand.

Cultivated as an ornamental.

166 *Schoutenia ovata* Korth.

S. hypoleuca Pierre, *Actinophora fragrans* Wall.

nom. nud., *Actinophora hypoleuca* (Pierre)

Kuntze

FT6/1:75 (1993); FGIC1:561 (1911)

Cambodia, Vietnam, Indonesia.

Elaeocarpaceae

FGICS (1945), FT2/4 (1981), TFB10 (1977)

167 *Elaeocarpus floribundus* Bl.

DIFME:81 (1991); FBI1:401 (1874); FFBB1:167 (1877);

PR5/3:207 (1998); ๑๙๗1:53 (1995), TFM4:88 (1989);

WTM:248 (1988); FGIC1:577 (1911); FT2/4:417 (1981);

TFB10:24 (1977); IT:102 (1906)

India, Myanmar, Cambodia, Laos, Malay Peninsula,

Java, Borneo, Phillipine, (Palawan).

Fruits edible. An infusion of the bark and leaves is used as a mouthwash to cure inflamed gums.

168 *Elaeocarpus hainanensis* Oliv.

E. lacei Craib

FGIC1:567 (1911); FT2/4:424 (1981); TFB10:28 (1977)

Upper Myanmar, China, Vietnam.

169 *Elaeocarpus rugosus* Roxb.

E. aristatus Roxb., *E. grandiflorus* Kurz, *E.*

kunstleri King

FFBB1:166 (1877), FT2/4:410 (1981); FBI1:405

(1874); TFB10:18 (1977); PR5/3:209 (1998)

India, Myanmar, Malay Peninsula, Singapore.

Wood soft & perishable.

170 *Elaeocarpus petiolatus* (Jack) Wall. ex Kurz

E. ovalis Miq.

FFBB1:164 (1877); FGIC1:563 (1911); TFB10:28

(1977); FT2/4:424 (1981); IT:106 (1906); TFM4:92

(1989); WTM:249 (1988)

India, Myanmar, Cambodia, Laos, Vietnam, China, Malay Peninsula, Indonesia.

The wood is rather light and soft. The fruits are edible.

171 *Sloanea tomentosa* (Bth.) Rehd. & Wils.

S. mollis Gagnep., *Echinocarpus tomentosus*

Benth.

FT2/4:407 (1981); FGIC1:564 (1911); FGICS:474

(1945); TFB10:14 (1977); FBI1:400 (1874)

NE. India, Myanmar, Vietnam, China (Yunnan).

172 *Sloanea sigun* (Bl.) Schum.

S. kerrii Craib, *Echinocarpus sigun* Bl.

TFM4:97 (1989); FFBB1:162 (1877); TFB10:14

(1977); FGIC1:563 (1911); FGICS:473 (1945); IT:101

(1906); FT2/4:406 (1981); ๑๙๗1:87 (1995)

India, Myanmar, Cambodia, Malay Peninsula, Java.

173 *Elaeocarpus stipularis* Bl.

E. siamensis Craib, *E. tomentosus* Bl., *E.*

brevipes Merr., *E. scortechinii* King

FFBB1:170 (1877); FT2/4:415 (1981); TFM4:88

(1989); WTM:251 (1988); FBI1:404 (1874);

TFB10:20 (1977); FGIC1:575 (1911); FGICS:490

(1945); IT:102 (1906); PR5/3:209 (1998)

India, Myanmar, Cambodia, Philippines, Malay

Peninsula, Sumatra, Java, Borneo,

The timber is rather soft & prone to split, and therefore is not widely used for construction.

174 *Elaeocarpus braceanus* Watt ex Cl.

E. bracteatus Kurz.

FFBB1:165 (1877); IT:103 (1906); FT2/4:412 (1981);

TFB10:20 (1977); FGICS:488 (1945)

Myanmar.

175 *Elaeocarpus robustus* Roxb.

E. leptostachyus Wall. ex C. Muell.

FFBB1:169 (1877); WTM:250 (1988); FBI1:402 (1874);

FT2/4:419 (1981); IT:103 (1906); FGIC1:577 (1911)

N.E. India, Myanmar, Cambodia, Malay Peninsula,

Indonesia.

Fruits edible but oily.

176 *Elaeocarpus sphaericus* (Gaertn.) K. Sch.

E. ganitrus Roxb., *E. angustifolius*, *Ganitrus sphaerica* Gaertn.

DIFME:81 (1991); TFB10:20 (1977); FFBB1:168 (1877); FT2/4:412 (1981); TSNH:108 (1990), WTM:249 (1988)

NE. India, Nepal, Myanmar, Cambodia, Malay Peninsula, Indonesia, Australia.

The dried stones of the fruits are commonly used in India to make necklaces, charms and prayer beads. The fruits are thought to be effective in controlling epileptic fits.

177 *Elaeocarpus hygrophilus* Kurz

E. madopetalus Pierre

FFBB1:168 (1877); IT:103 (1906); FT2/4:435 (1981); TFB10:36 (1977); FGIC1:582 (1911); FGICS:500 (1945)

Myanmar, Laos, Cambodia.

Fruits steeped in brine are eaten locally.

178 *Elaeocarpus lanceifolius* Roxb.

E. lacunosus Wall. ex Kurz

FBI1:402 (1874); FGIC1:579 (1911); FFBB1:167 (1877); FT2/4:422 (1981); IT:103 (1906); FGICS:486 (1945)

India, Myanmar, Cambodia, Laos, Vietnam, Malay Peninsula, Indonesia.

179 *Elaeocarpus prunifolius* Wall. ex Muell.

E. robertsonii Gamble

FBI1:407 (1874); FT2/4:432 (1981); TFB10:36 (1977); IT:106 (1906)

India, Myanmar, China.

Has edible fruit.

MALPIGHIACEAE

FGICS (1945), FT5/3 (1991)

180 *Hiptage benghalensis* (L.) Kurz spp. *benghalensis*

H. madablota Gaertn., *H. harmandiana* Pierre

DIFME:103 (1991), FT5/3:277 (1991), FBI1:418,419 (1874), FGIC1:598 (1911), FGICS:515 (1945), DEPMP:1197 (1935), ၁၈၄၇:4:75 (1997), FFBB1:173 (1877)

India, Myanmar, S.China, Indo-China, Malay

Peninsula, Indonesia.

Leaves are used as a livestock feed throughout the year, but can also be used to make an insecticide. the leaves have insecticidal properties and can be used to treat skin diseases when applied to the body externally. They are also recommended for asthma & rheumatism.

ssp. *candicans* (Hook.f.) Sirirugsa
India, Myanmar, Yunnan.

RUTACEAE

FGICS (1946), PANSP137 (1985 - *Glycosmis*), BMNH4/16 (?AD1? - *Clausena*)

181 *Glycosmis* genus, at least 4 species in NT. PANSP:137(1985)

G. esquirolii (Levl.) Tana.

G. winitii

FGICS:622 (1946)

G. ovoidea Pierre

FGIC1:656 (1911); FGICS:620 (1946)

G. puberula Lindl. ex Oliv.

G. subsessilis Craib

TFM1:381 (1972); TFSS1:371; FGICS:620 (1946)

G. cochinchinensis (Lour.) Pierre ex Engl.

G. arborea (Roxb.) Correa.

182 *Acronychia pedunculata* (L.) Miq.

A. laurifolia Bl., *A. arborea* Bl., *A. apiculata* Miq., *A. resinosa* J.R.Forster ex Crev & Len.

FBI1:498 (1874); WI1:21 (1948); FFBB1:184 (1877), VFT:634 (1996); IT:116 (1906); PR5/3:43 (1998), TFM1:371 (1972); TFSS1:358 (1995); FGIC1:646 (1911); FGICS:614 (1946)

Sri Lanka, SW. & NE. India, Nepal, Myanmar, Andaman Islands, Vietnam, S.China, Taiwan, Phillipines, Malay Peninsula, throughout Indonesia to Irian Jaya.

The wood, roots, bark & leaves are applied externally to treat scabies, sores, ulcers and as a pain reliever. The young leaves are eaten as a condiment & help to promote digestion. The bark of the roots is used for a variety of stomach complaints. The roots are used as a fish poison. The wood makes good charcoal.

183 *Atalantia roxburghiana* Hk. f.

FBI1:513 (1874); FGICS:648 (1946)

Fruits edible, leaves used for respiratory problems.

184 *Atalantia monophylla* (L.) DC.

A. spinosa Tanaka, *Limonia monophylla* L.

DIFME:30 (1991); FFBB1:195 (1877); IT:121 (1906), TFM1:373 (1972); WTM:659 (1988); FGIC1:669 (1911); FGICS:646 (1946)

The wood is suitable for cabinet work and for turning. The leaves are used for dysentery.

185 *Murraya paniculata* (L.) Jack

M. exotica L., *M. odorata* Blanco, *M. sumatrana* Roxb., *Limonia lucida* G.Forst.

DEPMP:1531 (1935); IT:113 (1906); FFBB1:190 (1877); MPP:464 (1978); PR5/3:391 (1998); ၂၈၂:47 (1983); TFM1:384 (1972); TFSS1:406 (1995), WTM:669 (1988); FGIC1:657 (1911); FGICS:631 (1946); ၂၈၂:19 (1975)

Widely grown in the tropics as an ornamental plant on account of its fragrant white flowers. A face powder has been made from its bark and roots.

186 *Murraya koenigii* (L.) Spreng.

M. foetidissima Teijsm. & Bined., *Chalcas koenigii* (L.) Kurz ex Swingle

IT:113 (1906); FFBB1:190 (1877); WTM:668 (1988); PR5/3:391 (1998)

187 *Aegle marmelos* (L.) Corr.

DEPMP:55 (1935); DIFME:14 (1991); FFBB1:199 (1877); IT:119 (1906); MPP:444 (1978); RUPNI:86 (1997); TSNH:12 (1990); W11:34 (1948); WTM:658 (1988); FGIC1:682 (1911)

A sacred tree for Hindus; the trifoliate leaves are used in the worship of Lord Shiva. The tree is also popularly associated with the goddess Lakshmi, and is believed to bring prosperity and good fortune. The rind of the fruits produces a yellow colour for dyeing clothes, and the gum can be used as glue. The fruit, when dried, can be used to make aromatic bael tea. Eaten fresh, the fruit is sweet and can be made into jam. It has a pleasant laxative effect, and is a good simple cure for dyspepsia. The mucilage can also serve as an adhesive paste.

188 *Feronia limonia* (L.) Swing.

F. elephantium Corr., *Limonia acidissima* L.

RUPNI:207 (1997); FFBB1:198 (1877); IT:119 (1906); FGIC1:686 (1911); FGICS:650 (1946); TFM1:370 (1972)

The wood is pale, quite heavy & hard, taking a fine polish. The bark yields a gum. The fruit is regarded as a heart tonic. The pulp is used for throat irritations & gum inflammations. The leaves are aromatic, carminative and astringent.

189 *Euodia meliaefolia* (Hance) Bth.

Phellodendron burkillii Steenis

VFT:637 (1996); TFM1:379 (1972); FGIC1:636 (1911); FGICS:630 (1946)

Vietnam, China.

The wood is light but is rarely attacked by termites. The seeds contain 26% essential oils, and are used in the making of soap.

190 *Euodia triphylla* DC.

E. gracilis Kurz

IT:112 (1906); FFBB1:180 (1877); FGIC1:632 (1911); FGICS:597 (1946)

Myanmar.

The shoots and flowers are edible. Roots in a decoction will relieve back pain, and the leaves can be applied to the skin to relieve itching.

191 *Euodia viticina* Wall. ex Kurz

IT:112 (1906); FFBB1:179 (1877); SFT36 S.Myanmar.

192 *Euodia glomerata* Craib

FGICS:598 (1946)

193 *Micromelum minutum* (Forst. f.)

Wight & Arn.

M. integerrimum, *M. pubescens* Bl.

DIFME:124 (1991); IT:114 (1906); DEPMP:1493 (1935); FFBB1:186 (1877); TFM1:383 (1972); WTM:668 (1988); FGICS:617 (1946)

194 *Micromelum falcatum* (Lour.) Tana.

M. octandrum Turcz, *M. pubescens* Bl., *Aulacia falcata* Lour.

FGICS:618 (1946)

195 *Micromelum hirsutum* Oliv.

DEPMP: (1935); FBI1:502 (1874); FFBB1:187 (1877); VFT:639 (1996); IT:114 (1906); TFM1:383 (1972); TFSS1:400 (1995); WTM:668 (1988); FGIC1:649 (1911); FGICS:616 (1946)

Laos, Vietnam, China, Malay Peninsula.

The leaves are used for skin complaints, but can also be chewed and spat out to cure feelings of giddiness.

196 *Clausena excavata* Burm. f.

var. *excavata*

C. lunulata Hayata, *C. javanensis* Raeusch ex DC., *Lawsonia falcata* Lour., *Amyris sumatrana* Roxb.

DEPMP:585 (1935); DIFME:54 (1991); FFB1:188 (1877); IT:114 (1906); MPP:456 (1978); TFM1:375 (1972); AD1:115; TFSS1:370 (1995); FGIC1:661 & 662 (1911); FB1:505 (1874); WTM:662 (1988); FGICS:633 (1946)

Nepal, NE.India, Bangladesh, Myanmar, Indo-China, Malay Peninsula, Malaysia.

The wood is used to make axe-handles. A decoction of the roots can relieve fever, & bowel complaints, chiefly colic. The leaves are stuffed into pillows due to their soporific effect, and they can be soaked in bath water as a muscle relaxant.

197 *Zanthoxylum rhetsa* (Roxb.) DC.

Z. budrunga (Roxb.) DC., *Z. limonella* (Dennst.) Alst., *Fagara rhetsa* Roxb.

DIFME:191 (1991); IT:118 (1906); MPP:469 (1978); TFM1:386 (1972); WTM:671 (1988); FGIC1:639 (1911); FGICS:609 (1946); PR5/3:598 (1998); 𑄎𑄎𑄎12:20 (1975)

Sri Lanka, India, Myanmar, Indo-China, Malay Peninsula, Java, Phillipines, Sulawesi, Lesser Sunda Islands, S.Papua New Guinea.

The bark is used to cure pain in the chest and stomach. The fruit has stimulant, astringent, aromatic and digestive properties.

198 *Zanthoxylum acanthopodium* DC.

Z. alatum Roxb.

DIFME:191 (1991); IT:116,117 (1906); FFB1:181 (1877); TFM1:386 (1972); TFSS1:406 (1995); FB1:493 (1874); FGIC1:643 (1911); FGICS:604 (1946)

NE. India, Myanmar, Indo-China, Malay Peninsula.

Tooth powder can be prepared from leaves and fruits. Twigs are used as toothbrush sticks because of their cooling and de-odorising effects.

199 *Zanthoxylum nitidum* DC.

Z. hirtellum Ridley, *Z. asperum*, *Z. scabrum*, *Fagara nitida* Roxb.

MPV:395 (1990); TFM1:386 (1972); FGIC1:641 (1911); FGICS:606 (1946)

Indo-China, Malay Peninsula.

The fruit is used for treating dyspepsia, cough, colic, vomiting, diarrhea, toothache, paresis,

rheumatism and ascariasis.

200 *Zanthoxylum evodiaefolium* Guill.

FGICS:603 (1946)

Indo-China.

201 *Zanthoxylum myriacanthum* Wall. ex Hook. f.

Z. rhetsoides Drake, *Z.diabolicum* Elmer

FGIC1:640 (1911); FGICS:610 (1946); PR5/3:598 (1998)

Assam, Myanmar?, S.China, N.Vietnam, Malay Peninsula, Sumatra, Borneo, Phillipines.

SIAPORUBACEAE

FGICS (1946), FT2/4 (1981)

202 *Ailanthus triphysa* (Dennst.) Alston

A. fauveliana Pierre, *A. integrifolia*, *A. malabarica* DC., *A. philippensis* Merr., *A. siamensis*, *Hebonga siamensis* Radlk. ex Craib
FT2/4:441 (1981), FFB1:200 (1877), TFSS1:424 (1995), WTM:697 (1988), IT:127 (1906), TFM2:346 (1973), FGIC1:692 (1911), FGICS:664 (1946), 𑄎𑄎𑄎12:110 (1975)

Sri Lanka, India, Myanmar, Cambodia, Laos, Vietnam, Malay Peninsula, throughout Indonesia to Australia (Queensland).

The timber is light & soft, used for matchsticks, plywood core & paper pulp. The resin can be burnt as incense. The bark is used against fever and as a tonic after childbirth. The young leaves can be eaten raw to cure stomach complaints.

203 *Picrasma javanica* Bl.

P. andamanica Kurz. ex A.W.Benn., *P. nepalensis* A.W.Benn.

DIFME:143 (1991), FT2/4:447 (1981), 𑄎𑄎𑄎2:109 (1995), TFSS1:435 (1995), IT:127 (1906), VFT:680 (1996), TFM2:351 (1973), FFB1:201 (1877), FGIC1:699 (1911), FGICS:667 (1946)

Sikkim, Assam, Myanmar, Andaman Islands, Vietnam, Malay Peninsula, Indonesia.

The bark contains Quassin and is used to treat fever and as an insecticide. It is also used for dysentery & stomachache.

204 *Eurycoma longifolia* Jack

E. merguensis Planch., *Picroxylon siamense* Warb., *Manotes asiatica* Gagnep.

FT2/4:444 (1981), FFB1:201 (1877), WTM:699 (1988), IT:127 (1906), TFM2:349 (1973), FGIC1:695 (1911)

Lower Myanmar, Cambodia, Laos, Vietnam, Malay Peninsula, Sumatra, Borneo.

The bark is used against fever & as a blood coagulant especially for complications during childbirth. The roots are mixed with other herbs as a general health tonic. The young leaves can be eaten raw to cure stomach aches. Traditionally used as an aphrodisiac (part unspecified).

205 *Brucea mollis* Wall. ex Kurz

FFBB1:202 (1877), DIFME:39 (1991), FT2/4:442 (1981), IT:127 (1906), FGIC1:698 (1911)

Assam, Sikkim, Bhutan, Myanmar, Cambodia, Laos, Vietnam, Hainan & Philippines.

The fruits are used against stomach complaints & malaria.

206 *Brucea javanica* (L.) Merr.

B. amarissima Desv. ex Gomes, *B. sumatrana* Roxb., *Lussa radja* Rumph.

FT2/4:442 (1981), TFSS1:429 (1995), WTM:698 (1988), TFM2:348 (1973), IT:127 (1906), MPV:75 (1990), FGIC1:698 (1911)

Sri Lanka, S.India through SE.Asia to S.China & Taiwan, throughout Malesia to N.Australia.

Fruits & bark are used locally against dysentery, diarrhoea and fever. The extraction of the kernel yields bruceine. The seeds are used as a paraciticide.

207 *Harrisonia perforata* (Blanco) Merr.

H. bennettii Hk. f.

MPP:472 (1978), TFM2:350 (1973), FT2/4:445 (1981), IT:125 (1906), FGIC1:689 (1911), FFBB1:203 (1877), FBI1:519 (1875)

The wood and root bark are used to treat dysentery and diarrhoea.

Hainan, Indo-China, Myanmar, Malay Peninsula, (rare), Sumatra, Java, Borneo, Philippines, Sulawesi & Lesser Sunda islands.

IRVINGIACEAE

FGICS (1946), FT2/4 (1981), TFB9 (1975)

208 *Irvingia malayana* Oliv. ex Benn.

I. oliveri Pierre

FT2/4:398 (1981), 01FW3:88 (1995), TFSS1:434 (1995), WTM:699 (1988), VFT:679 (1996), TFM2:350 (1973), 01FW1: (1983), PR5/3:301 (1998), DEPMP:1272 (1935), FGICS:669 & 670 (1946), TFB9:5 (1975), FGIC1:701 (1911)

India, Myanmar, Laos, Cambodia, Vietnam, Malay Peninsula, Sumatra, Borneo.

The timber is hard but difficult to work & is not durable. It is mostly used for firewood. The seeds are edible and contain oil that is used for soap, candles and lighting fuel.

The fallen fruits are a favourite with wild animals.

OCHNACEAE

FGICS (146), BL16/1 (1968), BL16 (1968), FT2/1 (1970), FCLV14 (1973)

209 *Ochna integerrima* (Lour.) Merr.,

O. andamanica Kurz, *O. squarrosa* L., *O. wallichii* Planchon, *O. harmandii* (V.Tiegh.) Lec., *O. pumila* Ham. ex DC., *O. pruinosa* (V.Tiegh.) Lec.

FT2/1:25 (1970), FFBB1:205 (1877), IT:128 (1906), DEPMP:1569 (1935), FGICS:674 (1946), FGIC1:705 & 706 (1911), BL16/1:36 (1968), 01FW3:110 (1995), TFM3:260 (1978)

NE. India, Bangladesh, Myanmar, the Andaman and Nicobar Islands, NW.Malay Peninsula, Laos, Cambodia, Vietnam, Hainan.

The bark is used to treat a sore throat. The roots when boiled up and drunk can cure weakness.

BURSERACEAE

FGICS (1946), TFB27 (1999), BL7/2 (1953 - *Garuga*), BL9/2 (1959 *Canarium*), BL7/1c (1952 *Protium*)

210 *Protium serratum* (Wall. ex Colebr.) Engl.

P.yunnanense (Hu) Kalkman, *Bursera serrata* Wall. ex Colebr., *Dracontomelon laoticum* Evard & Tard.

01FW1:76 (1995), VFT:88 (1996), TFB27:56 (1999), FGIC1:722 (1911), FBI1:530 (1875), FFBB1:208 (1877), IT:132 (1906), BL7:155 (1952), BL7:546 (1954), FCLV2:144 (1962), 01FW1:176 (1983), 01FW2:75 (1975)

India, Laos, Vietnam, S.China.

The timber is hard, used for house posts, boards and furniture. The fruit are edible and are used medicinally for mouth ulcers. The tree is a very good host for the Lac insect.

211 *Garuga pinnata* Roxb.

FFBB1:207 (1877), IT:131 (1906), DEPMP:1078 (1935), BL7/2:468 (1953), FGIC1:720 (1911), TFB27:57 (1999), FBI1:528 (1875)

India, Bangladesh, Andaman Islands, S.China, Indo-China.

The fruits are edible and the leaves are used as animal feed but are not eaten by humans. However they do have medicinal use as a dressing for wounds & abscesses. The roots, bark, fruits & leaves are all used for various medicinal purposes. The bark is good for darkening the skin, tanning leather and as a fish poison. The wood is rather heavy but not durable & not much used except for low-grade furniture.

212 *Garuga floribunda* Decne. var. *gamblei*

G. gamblei King ex Smith

TFSS2:75 (1995), TFM1:144 (1972), PR5/3:251 (1998), BL7/2:463 (1953)

E.India, Sikkim, Bangladesh, SW.China & Hainan (Myanmar?)

The wood is used for expensive furniture & carving. The bark is used as a tonic after childbirth. The leaves are used as a black dye for mats etc.

var. *floribunda* in Java, Sulawesi, Philippines, New Guinea, Melanesia, N.Australia & Solomon islands. Not found in N.Thailand.

213 *Garuga pierrei* Guill.

Garuga pinnata Roxb. var. *pierrei* (Guill.)

BL7/2:467 (1953), FGIC1:719 (1911), ฝฝฝฝฝฝฝฝฝฝ (1975)

Yunnan, Cambodia, Laos.

214 *Canarium subulatum* Guill.

C. kerrii Craib, *C. rotundifolium* Guill., *C.thorelianus* Guill., *C.vittatistipulatum* Guill., *C.cinereum* Guill., *C.venosum* Craib non Guill.

BL9/2:410 (1958), ฝฝฝฝฝฝฝฝฝฝ (1995), VFT:83 (1996), TFB27:68 (1999), FGIC1:712,713,716,717 (1911), FGICS:678,679,680 (1946), ฝฝฝฝฝฝฝฝฝฝ (1975)

Laos, Cambodia, Vietnam.

The timber is soft and light, and can be used to make low grade furniture & plywood. The olive-like fruits are edible either fresh or salted or in syrup. Barking deer are also fond of the fallen fruits. The black colour from the fruits is used for making ink.

The fruit stones of *Canarium* spp. have been found in stone age archeological sites in S. Thailand. The estimated age of these findings is 40,000 years, making *Canarium* the oldest documented plant use in Thailand.

215 *Canarium strictum* Roxb.

C. reziniferum Brace ex King, *C. sikkimense* King, *Pimela strictum* Bl.

FBI1:534 (1875), BL9/2:417 (1958), IT:132 (1906), TFB27:67 (1999)

S.India, Sikkim, Assam, Upper Myanmar.

A black resin (dammar) exudes from incisions made in the trunk and is used for incense, waxes & varnish as well as for medicine.

216 *Canarium euphyllum* Kurz

FBI1:535 (1875), BL9/2:417 (1958), IT:130 (1906), TFB27:64 (1999)

Myanmar.

MELIACEAE

FGICS (1946), BL31c (1985), BL22/3 (1975), KBAS (1992 - *Aglaia*)

217 *Walsura* genus: 3 species in NT.

FGIC1:784 (1911), FGICS:722 (1948)

W. robusta Roxb.

W. intermedia Craib

W. trichostemon Miq.

218 *Cipadessa baccifera* (Roth) Miq.

C. fruticosa Bl.

DIFME:52 (1991), FFBB1:214 (1877), VFT:508 (1996), TFM4:200,239 (1989), FGIC1:782 (1911), FGICS:721 (1948)

Myanmar, Vietnam, China, Philippines, Indonesia.

The wood is used for general carpentry & as firewood. The roots are effective for bile complaints & the leaves are used to aid digestion and to soothe insect bites.

219 *Melia toosendan* Sieb. & Zucc.

M. dubia Cav.

VFT:521 (1996), IT:140 (1906), FGIC1:729 (1911)

Laos, Vietnam, China, Japan.

The wood is used for boat building & house interiors. The bark, leaves and fruit have insecticidal activity and medicinal properties like *Melia azedarach*.

220 *Melia dubia* Cav.

= synonym of *M.toosendan*

FGICS:685 (1946)

221 *Melia azedarach* L.

FFBB1:212 (1877), WTM:502 (1988), DEPMP (1935),
MPV:241 (1990), WTM:502 (1988), DEPMP (1935),
VFT:520 (1996), FGIC1:727 (1911), GBS37:49
(1984)

China, Vietnam, Laos.

Like the Neem tree (*Azadirachta indica*), almost every part of the plant is used for manifold purposes.

The timber is attractive when polished but is prone to warp & split unless carefully seasoned. It is sometimes marketed as Cedar wood and mostly used for furniture & agricultural implements. The bark is used to treat skin diseases & fevers. A decoction of the root bark is used to remove round-worms from the gut. The leaves are used as a diuretic, to relieve headaches, as an antiseptic poultice for wounds & as an insect repellent. The flowers & bark are used in the form of a poultice to kill headlice and as a remedy for prickly heat. The fruit is poisonous but is used as a medicinal tonic. It is used as an insecticide, to treat intestinal worms & to relieve urinary problems. The oil from the seeds is the most active part of the plant medicinally. It is used to treat skin diseases, rheumatism, leprosy, parasitic infections, syphilitic & other chronic sores. Taken internally, it acts as a laxative, emetic & is used to treat fevers. The young flowers and leaves are eaten.

222 *Azadirachta indica* A. Juss.
var. *siamensis* Valetou

A. siamensis, *Melia azadirachta* L., *Melia indica* (A.Juss.) Brandis

DIFME:31 (1991), W11:140 (1948), WTM:504 (1988),
FFBB1:212 (1877), DEPMP:1468 (1935), TFM4:231
(1989), M11:26 (1983), RUPNI:139 (1997),
FGIC1:730 (1911), FGICS:686 (1946)

The wood is hard & durable, used for building houses, boats, furniture. The bark is used to produce a red dye and as fibre for ropes. It is used medicinally for treating skin diseases, fever and as a general tonic with astringent properties. The leaves are used as an insect repellent and as a poultice for skin afflictions. They are believed to ward off evil spirits & are sometimes hung at the gateway to a village or at the doorway of a house. They are good as animal fodder & as green manure. The flowers are used for purifying the blood & to cure stomach aches. The fruits are used as a general purgative, as a remedy for cholic, and to treat skin diseases, sores & fever. The leaves and young flowers can be eaten after soaking in hot water but have

a very bitter taste. Birds will eat the fruit but it is poisonous to some animals.

var. *indica* not native in N.Thailand but sometimes cultivated.

223 *Dysoxylum cochinchinense* Pierre
FGIC1:748 (1911), FGICS:701 (1948)

Dysoxylum is sometimes misspelt *Dysoxylon*

224 *Dysoxylum excelsum* Bl.

D. procerum Wall. ex Hiern, *D. arnoldianum* K. Sch., *D. hasseltii* (Miq.) Koord. & Val., *D. gobam* (Buch.-Ham.) Merr.

TFM4:244 (1989), PR5/3:201 (1998), FFBB1:215
(1877), DEPMP (1935), FGIC1:744 (1911)

Sri Lanka, India, Nepal, Myanmar, S.China, throughout SE.Asia & Indonesia to Solomon Islands & Queensland.

The fruits are reported to be edible.

225 *Dysoxylum andamanicum* King

D. beccarianum C.DC., *D. cuneatum* Hiern.

WTM:499 (1988), TFM4: (1989), FBI1:242 (1875),
PR5/3:200 (1998), FGICS:700 (1946)

(Myanmar?), Cambodia, Vietnam, Malay Peninsula, Sumatra, Borneo, Philippines (Palawan).

226 *Chisocheton siamensis* Craib,

C. paniculatus Hiern, *Schizochiton siamensis*
FGICS:692 (1946)

Endemic to Thailand.

227 *Sandoricum koetjape* (Burm. f.) Merr.
S. indicum Cav., *S. nervosum* Bl.

MPP:486 (1978), PR5/3:500 (1998), FFBB1:217
(1877), BL31c:147 (1985), IT:137 (1906),
DEPMP:1481 (1935), TFM4:249 (1989), WTM:504
(1988), FGIC1:731 (1911), M11:8 (1983)

Myanmar, Malesia.

The timber is used for house construction, furniture and agricultural implements. It is also used for the production of veneer, plywood, blockboard and for pulp and paper. The bark has been reported to contain an anti-cancer agent. The roots are used for treating diarrhoea, spasms & stomach ache. They are prescribed as a post child-birth tonic. The fruits are edible.

228 *Aglaia lawii* (Wight) Sald. & Rama.

A. andamanica Hiern., *A. digophylla* Miq.,
Amoora lawii (Wight) Bedd., *Amoora maingayi*

Hiern, *Amoora tetrapetala* (Pierre) Pellegrin, *Amoora yunnanensis* (H.L.Li) C.Y.Hu, *Amoora calcicola* C.Y.Wu & H.Li ex C.Y.Wu, *Amoora yunnanensis* H.L.Li

DIFME:16 (1991), TFM4:221 (1989), FFBB1:220 (1877), IT:142 (1906), KBAS16: (1992), DEPMP:138 (1935), FGICS:711,717 (1948)

SW.India, Bhutan, Assam, Myanmar, S.China, Laos, Cambodia, Vietnam, Malay Peninsula, Philippines, throughout Indonesia to New Guinea & the Solomon Islands.

The leaves are used to cure skin disease.

229 *Aglaia chittagonga* Miq.

Amoora chittagonga (Miq.) Hiern

FFBB1:218 (1877), IT:142 (1906), FGICS:717 (1948), KBAS16: (1992)

Bangladesh, Myanmar.

230 *Aglaia grandis* Korth. ex Miq.

A.lanuginosa King, *A. merostela* Pelleg.

KBAS16:111 (1992), FGIC1:761 (1911)

S.Vietnam, Malay Peninsula, Borneo, Philippines, N.Sulawezi.

231 *Aphanamixis polystachya* (Wall.) R. Parker

Aphanamixis cochinchinensis Pierre, *Aglaia aphanamixis* Pellegr., *Aglaia cochinchinensis* Pellegrin, *Aglaia polystachya* Wall., *Amoora aphanamixis* Schult. & Schult. f, *Amoora polystachya* (Wall.) Wight & Arn. ex Steud., *Amoora rohituka* Wight & Arn., *Dysoxylum cuneatum* Hiern

DIFME:25 (1991), DEPMP:190 (1935), WI1:86 (1948), VFT:505 (1996), PR5/3:79 (1998), FGIC1:767-769 (1911), FBI1:549 (1875), BL22/3:485 (1975), BL31c:133 (1985), TFM4:230 (1989), IT:141 (1906), FFBB1:220 (1877)

India, Myanmar, S.China, Indo-China, Malay Peninsula, throughout Indonesia to the Solomon Islands.

The wood is used in house construction & interior fittings. It is also made into posts and tool handles. The seeds contain valuable oils which have medicinal properties & are also used in making soap and as an illuminant. The bark is a remedy for rheumatism, colds & chest pains. The leaves & fruits can be used for insect control. All parts of the plant are poisonous.

232 *Chukrasia tabularis* A. Juss.

FFBB1:227 (1877), IT:142 (1906), TFM4:254 (1989), FGIC1:780 (1911)

Sri Lanka, SW. & NE.India, Bangladesh, Myanmar, Andaman Islands, S.China, Indo-China, Malay Peninsula, N.Sumatra & Borneo.

The wood is hard & dense, used in construction and furniture making. The bark is used as an astringent.

233 *Chukrasia velutina* Wight & Arn. ex Roem.

Chickrassia velutina A.Juss.

FFBB1:227 (1877), IT:145 (1906), Myanmar.

Recently considered a synonym of *C.tabularis*.

234 *Toona ciliata* M.Roem.

Cedrela toona Roxb. ex Rottl. & Willd.

TSH:110 (1994), IT:145 (1906)

SW. & NE.India, Myanmar.

235 *Toona microcarpa* (C. DC.) Harms

Cedrela microcarpa C.DC.

FGIC1:795 (1911)

236 *Toona sureni* (Bl.) Merr.

Cedrela febrifuga Bl., *C. sureni* (Bl.) Burkill

TFM4:258 (1989), DEPMP:499 (1935)

237 *Trichilia connaroides* (Wight & Arn.) Benth.

Heynea trijuga Roxb., *Walsura trijuga* (Roxb.) Kurz, *Walsura tenuifolia* Ridley ex Sims.

WTM:462 (1988), TFM4:251 (1989), FFBB1:225 (1877), IT:134 (1906), DEPMP:1162 (1935), FGIC1:791 (1911), FGICS:727 (1948)

SW. & NE. India, Myanmar, Vietnam, S.China, Malay Peninsula, Sumatra, Borneo, Philippines.

The wood is rather soft, mostly used for firewood but can also be used for general interior carpentry. The bark, leaves & fruit are bitter and have medicinal value. The oil from the seed can be used for illumination.

OLACACEAE

FGICS (1948)

238 *Schoepfia fragrans* Wall.

IT:149 (1906), FBI1:581 (1875), FGICS:740 (1948)

Nepal, Assam, N.Myanmar.

239 *Anacolosia ilicoides* Mast.

FW4:37 (1997), IT:149 (1906), FGIC1:817 (1911)
N.Myanmar.

CACRACEAE

FGICS (1948), BL17/1 (1969), FT2/1 (1970)

240 *Gonocaryum lobbianum* (Miers) Kurz
G.griffithianum Kurz, *G. siamense* Warb., *G. subrostratum* Pierre, *Phlebocalymna lobbiana* (Miers) Mast.

FGIC1:828 (1911), TFM3:113 (1978), IT:152 (1906),
FFBB1:240 (1877), FT2/1:80 (1970), BL17/1:215
(1969), FBI1:590 (1875)

S.China, Hainan, Myanmar, Vietnam, Laos,
Cambodia, Malay Peninsula, Borneo.

241 *Platea latifolia* Bl.

FT2/1:76 (1970), VFT:336 (1996), TFM3:115 (1978),
PR5/3:455 (1998), FGICS:754 (1948), BL17/1:243
(1969)

Sikkim, Bangladesh, Vietnam, S.China, Phillipines,
Malay Peninsula, Indonesia to New Guinea.

The wood is used for ceiling boards and
temporary furnishings.

242 *Gomphandra tetrandra* (Wall.) Sleum.

G. pauciflora Craib

FT2/1:79 (1970), FGICS:746-753 (1948), BL17/
1:204 (1969)

Sri Lanka, India, Myanmar, Cambodia, Laos,
Vietnam, S.China.

Has edible fruit.

243 *Apodytes dimidiata* E. Mey. ex Arn.

A. cambodiana Pierre, *A. yunnanensis* Hu,
A.benthamiana Wight, *A.beddomei* Mast., *A. javanica* K.&V., *A. tonkinensis* Gagnep.

FT2/1:81 (1970), VFT:334 (1996), TFM3:109 (1978),
IT:152 (1906), FGIC1:834,835 (1911),
FGICS:756,757 (1948), BL17/1:184 (1969)

Sri Lanka, SW.India, Assam, Myanmar, Yunnan,
Hainan, Vietnam, Malay Peninsula (rare), Malesia,
Africa.

The wood is used for cabinet work.

244 *Nothapodytes foetida* (Wight) Sleum.

Mappia cambodiana Pierre, *Mappia dimorpha*
Craib, *Mappia foetida* Miers.

IT:151 (1906), FT2/1:82 (1970)

S. India, Sri Lanka, Assam, Myanmar, N. Vietnam,
Cambodia, Thailand, China (Yunnan), Taiwan,

W.Malesia.

245 *Pittosporopsis kerrii* Craib

P. nervosa Gagnep.

FT2/1:84 (1970), FGIC1:832 (1911), FGICS:745
(1948), BL17/1:241 (1969)

Myanmar, Laos, Vietnam, Yunnan.

The roots combat swellings on the arms and legs.

AQUIFOLIACEAE

FGICS (1948)

246 *Ilex umbellulata* (Wall.) Loesn.

I. godajam var. *sulcata*, *I. sulcata* Wall, *Ehretia umbellulata* Wall, *Pseudeohretia umbellulata*

IT:156 (1906), FGIC1:862 (1912)

Bangladesh, Myanmar.

247 *Ilex godajam* Colebr. ex Wall.

I. fabrilis, *I. rotunda* Thunb., *Prinos godajam*
Colebr. ex Wall

FFBB1:245 (1877), FBI1:604 (1875), IT:156 (1906),
FGIC1:854 (1912)

Nepal, Sikkim, Assam.

Has edible fruit.

248 *Ilex englishii* Lace

CELASTRACEAE

FGICS (1948)

249 *Microtropis pallens* Pierre

TFSS1:138 (1995), FGIC1:879 (1912), FGICS:794
(1948)

250 *Bhesa robusta* (Roxb.) Hou

Kurrimia maingayi M.A.Lawson, *K.robusta* Kurz,
K.pulcherrima Wall. ex M.A.Lawson, *Celastrus robustus* Roxb.

TFSS1:112 (1995), WTM:214 (1988), TFM1:161
(1972), PR5/3:107 (1998)

NE. India, Bangladesh, Myanmar, Andaman
Islands, Indo-China, Malay Peninsula, Sumatra,
Borneo,

251 *Maytenus* (*Gymnosporia*) genus:

2 species in NT:

M.stylosa Pierre

FGIC1:888 (1912)

M. marcanii Craib

M. wallichiana Laws

FGICS:800 (1950)

252 *Euonymus similis* Craib

253 *Euonymus colonoides* Craib

254 *Euonymus mitratus* Pierre

FGIC1:874 (1912)

255 *Glyptopetalum sclerocarpum* Kurz

Euonymus sclerocarpus Kurz

IT:159 (1906), FFBB1:250 (1877), FBI1:813 (1875)

Myanmar.

256 *Lophopetalum wallichii* Kurz

Solenospermum wallichii (Kurz) Loesn.

FFBB1:255 (1877), TFSS1:138 (1995), IT:161 (1906), FGIC1:878 (1912)

Myanmar, Laos, Cambodia.

The wood is used for furniture.

257 *Siphonodon celastrineus* Griff.

S. pyriformis Merr.

FFBB1:254 (1877), TFSS1:154 (1995), VFT:93 (1996), TFM1:171 (1972), PR5/3:526 (1998), FGIC1:906 (1912)

India, Myanmar, Cambodia, Laos, Vietnam & throughout Malesia.

Timber used for house posts, interior fittings & agricultural implements. Fruits edible.

RHAMNACEAE

FGICS (1948)

258 *Ziziphus rugosa* Lmk. var. *rugosa*

FFBB1:265 (1877), IT:172 (1906), DIFME:192 (1991), FGIC1:917 (1912)

Throughout India, Nepal, Myanmar.

259 *Ziziphus incurva* Roxb.

TSNH:294 (1990), IT:170 (1906), FGICS:831 (1948)

Nepal, Bhutan, N.Myanmar.

260 *Ziziphus nummularia* (Burm. f.) Wight & Arn.

IT:170 (1906), DIFME:192 (1991)

Pakistan.

261 *Ziziphus mauritiana* Lamk.

IT:169 (1906), TSH:119 (1994), PR5/3:599 (1998), FFBB1:266 (1877)

Throughout India & Myanmar, widely planted elsewhere.

SAPINDACEAE

FGICS (1950), TFB25b (1997), BL28/1 (1982-*Harpullia*), BL28/3 (1983 - *Xerospermum*), BL33 (1988), FT7/1 (1999), BL19/1 (1971 - *Dimocarpus*), BL31b (1985, *Nephelium*)

262 *Allophyllus cobbe* (L.) Raeusch.

A. sootepensis Craib, *A. eustachys* Radlk.,

A. betongensis Craib

DIFME:18 (1991), FFBB1:299 (1877), TFSS2:274 (1995), WTM:677 (1988), IT:185 (1906), DEPMP:104 (1935), TFM4:436 (1989), PR5/3:62 (1998), FT7/1:176 (1999), BL15/1:301 (1967), TFM4:436 (1989) SE.Asia, Malesia, S.Africa, Madagascar, S.America.

The wood is hard but not durable, used mainly for temporary structures, small implements & firewood. Berries edible but quite sour. Leaves, bark & roots used against fever & stomach-ache. Previously a large genus of over 250 species world wide, now considered to be a single extremely variable species. Several distinct races in Thailand (see FT7/1).

263a *Nephelium* genus: 2 species in NT.

***N. hypoleucum* Kurz**

N. cochinchinense Pierre

FT7/1:227 (1999); BL31b:395 (1986)

Myanmar, Indo-China.

Fruits (sarcotesta) edible but not as popular as *N. lappaceum*.

***N. lappaceum* L.**

N. mutabile Bl. *pallens* Hiern

FT7/1:229 (1999); BL31b:398 (1986);

TFM4:453 (1989); FBI1:687 (1875)

Yunnan, Hainan, Indo-china, Malay Peninsula, Sumatra, Java, Borneo, Philippines, Sulawesi.

Cultivated for its delicious fruits (rambutan).

263b *Sisyrolepis muricata* (Pierre) Leenh.

S. siamensis Radlk., *Delpya muricata* (Pierre) Pierre ex Radlk., *Paranephelium muricatum* Pierre

FT7/1:243 (1999), BL23:336 (1977)

Cambodia.

264 *Xerospermum noronhianum*

X. donnaiense Gagnep., *X. glabrum* Pierre, *X. intermedium* Radlk., *X. microcarpum* Pierre, *X. muricatum* Radlk., *X. pilanei* Gagnep., *X. wallichii* King, *Cupania glabrata* Kurz, *Nephelium maingayi* Hiern, *Euphoria noronhiana* Bl.

265 *Arytera littoralis* Bl.

ata Forst. & Forst.

P. macrocarpa Kurz, & H.f.
P. tomentosa Bth. (1962), TFM4:457 (1989),
16:120 (1962), 21:295 (1877)

WTM:688 (1988), Sri Lanka, Andaman Islands, through Malasia. Principal. One of the major

arborescens (Blanco) Radlk.
H. imbricata Thw., H.
amentosa Ridley, Ptelea

267 Harpullin
2515 PLE
1187 (1953)
192:92 (1993)
FM4:444 (1989), PR5/
1 (1912). FGICS:954

Pedicularis blanda (L.) 1990) is usually as a pain-killer and it is also used as a diuretic. It is reputed to be

CONFUSO BI.
PR5/3:284
(1996)
(1999). TFM4:
EGICS.95

7-50), BV Spind...

Queens

brote
pois

HO

100-2-31

The wood is used in house construction and for household appliances. Good firewood & charcoal. Bark used for fish poison.

S. trijuga Willd.

Sri Lanka & S.India, Cambodia, Laos, Vietnam,
Java, Lesser Sunda Islands, Sulawesi, Moluccas.
Cultivated for so long that the original distribution
is uncertain.

The wood is very heavy and durable. It used to be used to make cart wheels and the teeth of harrows as well as pestles of oil mills. It is an excellent source of charcoal. The bark is used for dyeing & has medicinal properties, particularly for soothing skin irritations & burns. The young leaves & fruits (ari) are edible and oil from the seeds is used in cooking and for Indian medicine.

D. lichi Lour., *E. longana* Radlk.,
fragifera Steud., *E. obtusa* Radlk.,
Nephelium echinulatum (P.) E.
N. longan (L.) P.

long (1996),
malaiensis (1996),
VFT:650 (1996), FT/71:194 (1999), FFBB:194 (1999),
1971), FT/71:194 (1999), FGIC1:1046 (1912),
22 (1996), PR2:181 (1990), PR2:146 (1996),
Myanmar, Vietnam, Laos, Cambodia, Thailand, and
Malaysia.

(19) Sri Lanka, Taiwan, throughout the timber is of good quality, widely cultivated for use as fuel wood. Widely believed to improve the memory of those suffering from amnesia, neurasthenia, and other nervous disorders.

Urtica chinensis Sonn. BL24:395

27
Lepher
Nepher
1717:220

1000

11

(1989), FFB1:293 (1877), IT:193 (1906)

SE.China, Indo-China, Malay Peninsula, Borneo, Philippines.

Fruits(aril) are a well-known delicacy either fresh or canned. The wood is also highly prized since it is hard & takes a fine polish.

272 *Lepisanthes rubiginosa* (Roxb.)

Leenh.

L. balansaeana Gagnep, *Erioglossum rubiginosum* Bl. var. *villosum* Gagnep.

FT7/1:214 (1999), BL17/1:82 (1969), FGIC5:934 (1950), VFT:653 (1996), TFM4:446 (1989), PR5/3:326 (1998), TFSS2:323 (1996)

India, Vietnam, SE.China, Philippines, Malay Peninsula, Indonesia to NW.Australia.

The timber is good quality but usually too small except for utensils and tools. The young leaves & fruits are edible. The roots & leaves are used against fever.

273 *Lepisanthes tetraphylla* (Vahl) Radlk.

L. browniana Hiern., *L. burmanica* Kurz, *L. cuneata* Hiern., *L. granulata* Radlk, *L. poilanei* Gagnep., *Molinaea canescens* Roxb., *Sapindus tetraphylla* Vahl.

TFSS2: (1995), IT:189 (1906), TFM4:447 (1989), PR5/3:326 (1998), FT7/1:218 (1999), BL17/1:39 (1969), TFSS2:325 (1996), FGIC1:1016 (1912), FGIC5:947 (1950)

Sri Lanka, S.India, Hainan, Indo-China, Malay Peninsula, Sumatra, W.Java, Borneo, Philippines, N.Sulawesi, Timor, New Guinea.

Wood heavy & close-grained, good for furniture.

274 *Arfeuillea arborescens* Pierre

FT7/1:185 (1999), FGIC1:1006 (1912)

Laos.

275 *Sapindus rarak* DC.

S.angustifolius Bl.,*Dittelasma rarak* (DC.)Hook. f. FT7/1:239 (1999), IT:191 (1906), DEPMP:1993 (1935), FFB1:296 (1877), FGIC1:1018 (1912)

Assam, Myanmar, Indo-China, Taiwan, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands.

The wood is hard but not durable. The fruits are used as an anti-pimple soap, as shampoo and for washing clothes. The seeds are used for buttons & beads.

276 *Mischocarpus pentapetalus* (Roxb.)

Radlk.

M. sumatranus Blume, *M. fuscescens* Miq., *Cupania sumatrana* Miq., *Schleichera pentapetala* Roxb., *Pedicellia loureiri* Pierre, *P. tonkinensis* Pierre, *P. grandis* Pierre

FT7/1:222 (1999), BL23:251 (1977), FGIC1:1028 (1912), IT:189 (1906), TFM4:449 (1989), WTM:681 (1988), TFSS2:330 (1996)

NE.India, Bangladesh, Myanmar, SW.China, throughout SE.Asia to Sumatra, Java, Borneo & Philippines.

The fruits are said to be edible. The wood is used as a tonic after childbirth.

ACERACEAE

FGICS (1950), NJB12 (1992), NHBSS46/ (1998)

277 *Acer laurinum* Hassk.

A. garrettii Craib, *A.niveum* Bl., *A. philippinum* Merr., *A.decandrum* Merr.

FFBB1:289 (1877), TFSS1:3 (1995), FBI1:693 (1875), IT:181 (1906), PR5/3:39 (1998), NHBSS46/1:94 (1998), FGIC5:1008, 1012 (1950)

Nepal, Assam, Myanmar, S.China, Vietnam, Cambodia, Malay Peninsula, Sumatra, Java, Borneo, Philippines, Sulawesi & Lesser Sunda Islands.

278 *Acer oblongum* Wall. ex DC.

A. lanceolatum Molliard.

IT:181 (1906), WI1:22 (1948), TSH:112 (1994), FTSC1:2 (1995), NHBSS46/1:95 (1998), FGIC1:1005 (1912), FGIC5:1007 (1950), FBI1:693 (1875)

Himalayas, S.China, Myanmar, Laos, N.Vietnam.

The wood is easy to season but not durable under exposed conditions. It is suitable for turnery, agricultural implements & minor construction purposes. The leaves produce a medium quality fodder.

279 *Acer chiangdaoense* Santis.

NJB12/1:696 (1992), NHBSS46/1:96 (1998)

Endemic to N.Thailand.

280 *Acer thomsonii* Miq.

A.villosum Wall. var. *thomsonii* (Miq.) Hiern

A. sterculiaceum Wall. ssp. *thomsonii* (Miq.) Murray

NHBSS46/1:101 (1998), IT:183 (1906), FBI1:695 (1875)

E.Nepal, Assam, Sikkim, Bhutan, N.Myanmar.

281 *Acer wilsonii* Rehder

A. angustilobum H.H.Hu

NHBSS46/1:103 (1998)

S.China.

282 *Acer calcaratum* Gagnep.

A. craibianum T.Delendick.

NHBSS46/1:102 (1998), FGICS:1011 (1950)

Myanmar, N.Vietnam.

HIPPOCASTACEAE

FGIC (1950), FT2/4 (1981)

283 *Aesculus assamica* Griff.

A.pundana Wall. ex Hiern.

FFBB1:286 (1877), FT2/4:395 (1981), IT:185

(1906), TFB9:1 (1975), FGICS:1000 (1950)

Sikkim, Assam, N.Myanmar.

BRETSCHNEIDERACEAE

FGIC (1950), FT2/4 (1981), NHBSS37/1 (1989)

284 *Bretschneidera sinensis* Hemsl.

B. yunshanensis Chun et How

FT5/3:239 (1991), FGICS:1001 (1950), NHBSS37/

2:173 (1989)

S.China, N.Vietnam.

STAPHYLEACEAE

FGIC:989 (1950)

285 *Turpinia pomifera* (Roxb.) Wall. ex DC.

T.nepalensis Bedd.

FFBB1:292 (1877), IT:180 (1906), TFM1:448 (1972),

FGIC:993 (1950), FBI1:698 (1875)

Sri Lanka, SW. & NE.India, Bangladesh, Myanmar, S.China, Malay Peninsula, scattered throughout Malaysia.

The timber is fairly heavy but not resistant to insects. It is mainly used to make packing cases. The root can be used to reduce allergic reactions.

286 *Turpinia nepalensis* (Roxb.)Wall. ex Wight & Arn.

FFBB1:292 (1877), IT:180 (1906), VFT:686 (1996), TSH:119 (1994), FGIC:993 (1950), FBI1:698 (1875)

India, Myanmar, Cambodia, Laos, Vietnam.

The timber is used for making temporary implements. The tree is planted as an ornamental on account of its shape and dark green crown.

SABIACEAE

BL19/3 (1971), FCLV1 (1960)

287 *Meliosma simplicifolia* Roxb. ssp. *simplicifolia*

M. elliptica Hook. f., *M. lancifolia* Hook. f.

ဝါးW2:94 (1995), FFBB1:301 (1877), IT:194 (1906), TFM4:429 (1989), TSH:116 (1994), BL19/3:462(1971)

Sri Lanka, SW.India, E.Nepal, Sikkim, Bhutan, Assam, Bangladesh, Myanmar, SW.Yunnan, NW.Sumatra.

The wood is rather light but close-grained & takes a good polish.

ssp. ***fordii*** (Hemsl. ex Forb. & Hemsl.)Beus

M. cambodiana Pierre

FGIC2:5 (1908)

Indo-China & S.China.

288 *Meliosma pinnata* (Roxb.) Maxim. ssp. *arnottiana* (Walp.) Beus.

M. simang Gagn., *M. quangnamensis* Gagn., *M. colletiana* King, *M. wallichii* Planch. ex Hook. f., *M. oldhamii* Maxim. *M. floribunda* Bl., *M. microcarpa* Craib, *M.arnottiana* Walp.

DIFME:123 (1991); IT:195 (1906); TFM4:428 (1989);

PR5/3:368 (1998); BL19/3:494 (1971);

FCLV1:51,54 (1960)

Sikkim, Bhutan, Assam, N.Myanmar, Laos, SE.China, Japan, Taiwan, Phillipines.

The leaves are eaten as a vegetable.

ANACARDIACEAE

FGIC2 (1908), FCLV2 (1962) TFB22 (1994), TFB25a (1997)

289 *Bouea oppositifolia* (Roxb.) Meisn.

B. burmanica Griff., *B. microphylla* Griff.

FFBB1:306 (1877), FCLV2:126 (1962), TFM4:14 (1989), FGIC2:27 (1908), WTM:110 (1988), မလ္လ ၁၂ (1983), IT:204 (1906), TFB22:2 (1994)

Indo-China, S.China,(Yunnan), Andaman Islands, Malay Peninsula, Sumatra, Borneo.

290 *Drimycarpus racemosus* (Roxb.) Hook. f.

Holigarna racemosa Roxb.

FGIC2:41 (1908), FFBB1:314 (1877), IT:204 (1906), TFB22:12 (1994), မလ္လ ၁၂:249 (1983)

291 *Holigarna kurzii* Roxb.

FGIC2:40 (1908), FCLV2:177 (1962), TFB22:11 (1994)
Myanmar, Vietnam.

292 *Mangifera sylvatica* Roxb.

DIFME:122 (1991), FFBB1:304 (1877), IT:206 (1906),
TFB22:17 (1994), MFW2:99 (1975)

Nepal, Assam, Myanmar, Andaman Islands.

The ripe fruits are edible raw but are mostly used
in curries.

293 *Mangifera caloneura* Kurz

FFBB1:305 (1877), MFW2:103 (1975), MSL:252
(1983), TFB22:12 (1994)

Myanmar.

294 *Mangifera odorata* Griff.

Mangifera foetida var. *odorata* (Griff.) Pierre,
Mangifera oblongifolia Hook. f.

TFM4:37 (1989), FGIC2:16 (1908), TFB22:16
(1994), WTM:120 (1988)

Considered by some botanists to be a hybrid
swarm between *M.indica* & *M.foetida*.

295 *Mangifera indica* L.

M.domestica Gaertn., *M.longipes* Griff.

MPP:538 (1978), RUPNI:93 (1997), TFB22:14 (1994),
FFBB1:303 (1877), FGIC2:15 (1908), FCLV2:18,95
(1962), TFM4:36 (1989), WTM:119 (1988),
DIFME:122 (1991)

India to Indo-China & Malesia. Cultivation since
time immemorial has obscured the natural
distribution range.

In Hindu tradition, the mango tree is regarded as a
tree of destiny or fate. Consequently, it figures
prominently in rituals, ceremonies & rites of
passage. The bark has astringent qualities & is
used for checking hemorrhages, mucus
discharges & diarrhoea as well as for treating
skin diseases. The leaves are used for treating
diarrhoea, coughs, chest ailments, skin irritations
& dental problems. The flowers are considered
an aphrodisiac but are also used to repel
mosquitos. The fruits are used to treat scurvy,
bleeding dysentery, stomach problems & cracked
skin. The seeds are astringent & are used against
roundworm, hemorrhages & scorpion stings.

296 *Buchanania lanzan* Spreng.

B. latifolia Roxb.

DIFME:39 (1991), FFBB1:307 (1877), WI1:233 (1948),
TFB22:7 (1994), FGIC2:10 (1908), FCLV2:77 (1962),

India, Myanmar, Laos, Vietnam, China (Yunnan).
The fruits are edible. Various plants of the plant
have medicinal value for fever, skin diseases,
snake & scorpion bites, venereal complaints & as
an antibacterial agent.

297 *Buchanania glabra* Wall. ex Hk. f.

MSFW4:44 (1997), FGIC2:9 (1908), FCLV2:81 (1962),
IT:205 (1906), FFBB1:308 (1877), TFB22:7 (1994)
Myanmar, Laos, Cambodia, Vietnam.

298 *Buchanania reticulata* Hance

FGIC2:11(1908), FCLV2:78 (1962), MFW2:92 (1975),
TFB22:8 (1994)
Laos, Cambodia, Vietnam.

299 *Buchanania arborescens* (Bl.) Bl.

B. lucida Bl., *B.florida* Schauer

FFBB1:308 (1877), TFSS2:10 (1996), WTM:110
(1988), TFM4:16 (1989), PR5/3:127 (1998),
FCLV2:73,76 (1962), FGIC2:9 (1908), TFB22:6 (1994)
S.Myanmar, Andaman Islands, Indo-China,
S.China, Taiwan, throughout Malesia to Solomon
islands & N.Australia.

300 *Gluta obovata* Craib

MSFW4:69 (1997), TFSS2:24 (1996), TFB22:3 (1994)
Endemic to Thailand.
The sap is very poisonous.

301 *Gluta usitata* (Wall.) Hou

Melanorrhoea usitata Wall.

MSFW1:57 (1995), IT:202 (1906), FFBB1:318 (1906),
FCLV2:103 (1962), MFW2:85 (1975), TFB22:5 (1994)
India?, Myanmar, Laos, Cambodia.

The sap causes a violent irritation of the skin with
smarting and burning pain, followed by a
vesiculo-bulbous eruption. Despite this, the resin
is used in the lacquer industry.

302 *Semecarpus cochinchinensis* Engl.

S. glomerulata Ridl.

MSFW4:123 (1997), TFM4:51 (1989), FCLV2:160
(1962), MFW2:94 (1975), TFB22:9 (1994)
Cambodia, Laos, Vietnam, Malay Peninsula.

303 *Rhus chinensis* Mill.

R. javanica Thunb. (*non* L., in FSE), *R. semialata*
Murray

MSFW2:116 (1995), FCLV2:182 (1962), FGIC2:35

(1908), IT:197 (1906), HKT:367 (1988), TFB22:19 (1994)

Widely distributed in temperate and subtropical Asia - India, Myanmar, Laos, Cambodia, Vietnam, China, Taiwan, Japan, Ryukyu Islands, Malay Peninsula, Indonesia (Sumatra).

The stem, roots & leaves are used for washing broken limbs & are applied to boils. The stem and seeds can be used for healing wound and for treating sore throat and cold.

304 *Rhus succedanea* L.

R. pubigera Bl, *Toxicodendron succedanea* Moldenke

IT:199 (1906), HKT: (1988), TFB22:20 (1994), TFM4:50 (1989), FCLV2:185 (1962)

India, Myanmar, Cambodia, Laos, Vietnam, China, Taiwan, Ryukyu Islands, Japan, Malay Peninsula, Indonesia.

The leaves, fruit and bark cause severe skin irritation in sensitive persons. The sap is used to make lacquer.

305 *Rhus rhetoides* Craib

306 *Choerospondias axillaris* (Roxb.) Burt & Hill

Spondias axillaris Roxb., *Pourpartia fordii* Hemsl., *Pourpartia axillaris* (Roxb.) King & Prain
FCLV2:137 (1962), IT:201 (1906), TFB22:24 (1994)
Nepal, India, Indo-China, China, Japan.
(Myanmar?)

307 *Spondias pinnata* (L. f.) Kurz

S. mangifera Willd., *S. dulcis* Soland. ex Forst. f.
var. *acida* (Bl.) Engl., *Mangifera pinnata* L.f.,
DIFME:171 (1991), PR5/3:534 (1998), WTM:125 (1988), DEPMP:2104 (1935), VFT:41 (1996), TFM4:54 (1989), MSL:231 (1983), TFB22:20 (1994), FFBB1:322 (1977), FCLV2:133 (1962), FGIC2:28 (1908), MFM2:82 (1975), IT:201 (1906)

Sri Lanka, Assam, Myanmar, Cambodia, Vietnam, S.China, Hainan, Andaman Islands, Malay Peninsula, throughout Malesia to the Solomon Islands.

The wood is soft & easy to work but is not resistant to rot or insects. It is used for making wooden shoes and interior furniture. The bark is recommended for stomach-ache, dysentery, rheumatism & swollen joints. The flowers, fruits and young leaves are edible.

308 *Spondias lakonensis* Pierre

S. rubescens Gagnep., *Tetramyxis pellegrinii* Gagnep., *Allospodias lakonensis* (Pierre) Stapf.

TFB22: (1994)

Laos, Vietnam, SE.China, Hainan.

Timber can be processed into small household tools and boards. It is easy to work but not resistant to rot or insects. The fruits are edible. The seeds produce an oil which is used in industry.

309 *Lannea coromandelica* (Houtt.) Merr.

L. woder (Roxb.) Adelb., *Odina woder* Roxb.

DIFME:112 (1991), FGIC2:34 (1908), FCLV2:141 (1962), FFBB1:321 (1977), IT:200 (1906), MFM2:84 (1975), WTM:114 (1988), MSL:66 (1983), TFB22:23 (1994)

Sri Lanka, India, Myanmar, Laos, Cambodia, Vietnam, Hainan, Andaman Islands, Malay Peninsula, Java.

The bark produces a brown dye used for clothes and leathers. Fibers from the bark are used in rope-making, and also to make protective pads for elephants to wear on their backs.

310 *Dracontomelon dao* (Blanco) Merr. & Rol.

D. brachyphyllum Ridl., *D. edule* (Blanco) Merr., *D. edulis* (Blanco) Skeels, *D. mangiferum* (Blume) Blume, *D. puberulum* Miq., *D. sylvestre* Bl.
DIFME:77 (1991), PRT12:254, FGIC2:31(1908), FCLV2:146 (1962), TFM4:20 (1989), TFSS2:18 (1996), WTM:113 (1988), IT:201 (1906), MFM2:81 (1975), HKT:192 (1988), TFB22:24 (1994)

E.India, Andaman Islands, Myanmar, Cambodia, Laos, Vietnam, S.China, Malay Peninsula, throughout Malesia to New Guinea & the Solomon Islands.

LEGUMINOSAE

see under subfamilies for references

311 *Ormosia sumatrana* (Miq.) Prain (Papilionoideae)

O. yunnanensis Prain, *O. euphorioides* Pierre ex Gagnep.

FCLV23:46 (1987), TFB13:15 (1980), FGIC2:508 (1920), TFM1:301 (1972)

Yunnan, Laos, Vietnam, Malay Peninsula, Sumatra, Java, Borneo.

312a *Pithecellobium tenue* Craib

(Mimosoideae)

Acacia tenue (Craib) Kost., *Thailectadopsis tenuis* (Craib) Kost.

FT4/2:205 (1985), AD19/34 (1979)

Endemic to Thailand.

312b *Caesalpinia sappan* L.

(Caesalpinioideae)

FGIC2:179 (1916), FCLV18:26 (1980), FT4/1:65

(1984), ไม้สี:201 (1983), FFBB1:406 (1877),

VFT:415 (1996), TFM1:246 (1972), WTM:427 (1988),

PR3:60 (1992)

Probably only native to S. & C. India, Myanmar, Indo-China, S.China, Malay Peninsula. Widely planted elsewhere.

The wood used to be an important source of red dye for clothes and silks. Although it has largely been replaced by synthetic dyes, It is still used as a food dye since it is completely harmless and has medicinal value. The roots are sometimes used in a similar manner to produce a yellow dye. A decoction of the wood and bark is astringent and used as a cure for tuberculousis, diarrhoea and dysentery. It is also recommended for menstrual disorders & as a general blood tonic. The seeds are a sedative.

313a *Mimosa* genus (Mimosoideae)

herbs & shrubs, no native species reaching > 3m

313b *Acacia* genus (Mimosoideae)

only 1 tree species native in NT, but many more introduced from Australia.

A. harmandiana (Pierre) Gagnep.

A. siamensis Craib, *Pithecolobium mekongense* Pierre, *Delaportea armata* Thorel ex Gagnep.

FGIC2:69 (1913), AD19/3:345 (1980),

FCLV19:46 (1981), FT4/2:158 (1985)

Laos.

Wood used for construction, beams, flooring & tools. The tree is an excellent host for the Lac insect.

LEGUMINOSAE (MIMOSOIDEAE)

FT4/2 (1985), AD19 (1979- *Albizia*, *Archidendron* & *Pithecellobium*), FCLV19 (1981)

314 *Adenanthra microsperma* Teijsm. &

Binn.

A. pavonina L. var. *microsperma* (Teijsm. & Binn.)

Niels., *A. gersenii* Scheffer, *A. tamarindifolia*

Pierre

FGIC2:67 (1913), FCLV19:15 (1981), FT4/2:139 (1985), VFT:434 (1996), AD19/3:341 (1980)

S.Myanmar, Andaman Islands, Indo-China, S.China, Malay Peninsula, Java, Timor.

Uses as for *A. pavonina*.

A. microsperma has only recently been split from *A. pavonina*.

315 *Adenanthra pavonina* L.

FGIC2:66 (1913), FCLV19:14 (1981), FT4/2:139 (1985), DIFME:13 (1991), ไม้สี:1: , FFBB1:417 (1877), WTM:450 (1988), IT:262 (1906), DEPMP:46 (1935), WI1:31 (1948), PR5/3:50 (1998), VFT:435 (1996), AD19/3:341 (1980), TFM1:276 (1972)

Widely distributed throughout S & SE. Asia from Sri Lanka to the Solomon islands.

The hard wood is used for high quality furniture and articles of fine art. The root is used as a red dye. The seeds have a high oil content (24%), and are bright red, so are often made into necklaces. The tree is also planted as an ornamental or shade tree.

316 *Albizia lucidior* (Steud.) Niels.

A. lucida (Roxb.) Benth., *A. meyeri* Ricker, *A. teysmanii* Kurz

FGIC2:95,97 (1913), FCLV19:86 (1981), FT4/2:189 (1985), FFBB1:428,429 (1877), IT:269 (1906), WI1:43 (1948), VFT:240 (1996), AD19/3:222 (1979) India, Myanmar, Vietnam, S.China.

Host trees for lac cultivation. The wood is used in construction and furniture making.

317 *Albizia lebbek* (L.) Bth.

A. lebbek Benth., *Acacia speciosa* (Jacq.) Willd., *Acacia lebbek* (L.) Willd., *Inga leucoxylon* Hassk.

FGIC2:93 (1913), FCLV19:82 (1981), FT4/2:186 (1985), DIFME:17 (1991), FFBB1:427 (1877), WTM:453 (1988), IT:272 (1906), DEPMP:87 (1935), WI1:43 (1948), PR5/3:60 (1998), TFM1:279 (1972), AD19/3:220 (1979), FBI2:298 (1878)

Widely distributed in tropical & subtropical Asia & Africa.

The timber is used for indoor construction. The bark has a high tannin content & is used for preparing leather and as a fish poison. The bark also produces a red dye which may cause skin irritation.

318 *Albizia crassiramea* Lace

A. laotica Gagnep., *A. saponaria* auct. non Miq. Gagnep.
FGIC2:89 (1913), FCLV19:90 (1981), FT4/2:192 (1985), AD19/3:223 (1979)
E. Myanmar, Laos, N. Vietnam, S. China.

319 *Albizia procera* (Roxb.) Bth.

Acacia procera (Roxb.) Willd., *Mimosa procera* Roxb., *Mimosa elata* Roxb.
FGIC2:94 (1913), FCLV19:89 (1981), FT4/2:191 (1985), FFBB1:428 (1877), IT:271 (1906), WI1:43 (1948), PR5/3:61 (1998), DIFME:17 (1991), AD19/3:223 (1979)

The heartwood is durable & used for indoor construction. However, the sapwood is prone to rot & should be removed from the heartwood as soon as possible.

India, Myanmar, Indo-China, S.China, Taiwan, Java, Borneo, (rare), Philippines, Sulawesi, Lesser Sunda Islands, Moluccas, New Guinea & N. Australia.

320 *Albizia odoratissima* (L. f.) Bth.

Acacia odoratissima (L. f.) Willd., *Mimosa odoratissima* L. f.
FGIC2:88 (1913), FCLV19:96 (1981), FT4/2:196 (1985), DIFME:17 (1991), FFBB1:427 (1877), WTM:453 (1988), IT:271 (1906), DEPMP:89 (1935), WI1:44 (1948), VFT:441 (1996), MLI:72 (1983), AD19/3:225 (1979), MLI:72 (1983)

India, Sri Lanka, Myanmar, S.CH., Indo-China.

The wood is dark brown, hard & close-grained. It is suitable for furniture, decorative work & barrels. The bark is useful for its brown dye and is poisonous to fish. The leaves make a good fodder.

321 *Albizia garrettii* Niels.

FT4/2:184 (1985), AD19/3:212 (1979)
Myanmar, S. China.

322 *Albizia lebbekoides*

Pithecellobium myriophylla Gagnep.

Acacia lebbekoides DC
FGIC2:96 (1913), FCLV19:93 (1981), FT4/2:194 (1985), AD19/3:223 (1979), PR5/3:61 (1998), PR3:48 (1991), VFT:439 (1996)

The timber is resistant to insects but seasons poorly. The bark yields a red dye.

Cambodia, Laos, Vietnam, Philippines, S. Sulawesi, Java, Lesser Sunda Islands.

323 *Albizia chinensis* (Osb.) Merr.

A. marginata (Lamk.) Merr., *A. stipulata* (DC) Boivin

FGIC2:87 (1913), FCLV19:84 (1981), FT4/2:188 (1985), DEPMP:84 (1935), VFT:437 (1996), PR5/3:61 (1998), FFBB1:426 (1877), WI1:44 (1948), IT:272 (1906), AD19/3:221 (1979)

Sri Lanka, India, Myanmar, Laos, Cambodia, Vietnam, S.China, Java, Lesser Sunda Islands.

The wood is used to make boxes, planks, some furniture and paper pulp. The bark and leaves are both poisonous to animals, and the bark is often used as a fish poison.

324 *Archidendron clypearia* (Jack) Niels. ssp. *clypearia* var. *clypearia*

Abarema clypearia (Jack) Kosterm., *Pithecellobium angulatum* Benth., *P. clypearia* (Jack) Benth., *P. montanum* Benth.

FGIC2:106,107 (1913), FCLV19:115 (1981), FT4/2:210 (1985), อสพ1:18 (1995), TFM1:284 (1972), WTM:462 (1988), IT:276 (1906), PR5/3:86 (1998), AD19:15 (1979)

Sri Lanka, India, Myanmar, S.China, Indo-China, throughout Malesia to New Guinea.

325 *Archidendron lucidum* (Bth.) Niels.

Pithecellobium lucidum Benth.

FGIC2:100 (1913), FCLV19:120 (1981), FT4/2:214 (1985), AD19/3:19 (1979)

Cambodia, Laos, Vietnam, China, Taiwan.

326 *Archidendron jiringa* (Jack) Niels.

Pithecellobium jiringa (Jack) Prain, *P. lobatum* Benth., *Zygia jiringa* (Jack) Kosterm.

FGIC2:101 (1913), FT4/2:218 (1985), PR5/3:86 (1998), TFM1:286 (1972), FFBB1:429 (1877), WTM:464 (1988), IT:274 (1906), AD19:32 (1979)

Bangladesh, Myanmar, Malay Peninsula, Sumatra, Java, Borneo.

The seeds can be eaten, but only after cooking.

They contain djerkol acid, which is poisonous to the kidneys but is broken down by the cooking process.

327 *Archidendron glomeriflorum*

(Kurz) Niels.

Pithecellobium glomeriflorum (Kurz) Kurz

FGIC2:100 (1913), FCLV19 (1981), FT4/2:214 (1985), IT:274 (1906), FFBB1:430 (1988), AD19/3:19 (1979)

Myanmar.

328 *Xylia xylocarpa* (Roxb.) Taub. var. *kerrii* (Craib & Hutch.) Niels

X. kerrii Craib & Hutch., *X. dolabriformis* Benth., FGIC2:72,73 (1913), FCLV19 (1981), FT4/2:149 (1985), PR5/3:590 (1998), ๑๙๗1:100 (1995), IT:262 (1906), FFBB1:419 (1877), VFT:448 (1996), AD19/3:344 (1980)

Myanmar, Cambodia, Laos, Vietnam. (var. *xylocarpa* in India & Myanmar but not in Thailand.) The timber is very hard & durable, used for a variety of heavy construction purposes such as bridges, floors & house posts. The young leaves are edible.

329 *Parkia leiophylla* Kurz

FT4/2:134 (1985), ๑๙๗2:106 (1995), FFBB1:418 (1877), IT:262 (1906)

Myanmar.

Young seeds are eaten both raw and cooked.

330 *Parkia sumatrana* Miq.

P. insignis Kurz, *P. dongnaiensis* Pierre
FGIC2:109 (1913), FCLV19:11 (1981), FT4/2:137 (1985), TFM1:282 (1972), FFBB1:418 (1877), WTM:459 (1988), AD19/3:339 (1980)

Myanmar, Cambodia, Laos, S. Vietnam, Malay Peninsula, Sumatra, Borneo.

Young seeds edible.

331 *Parkia timoriana* (DC.) Merr.

P. javanica auct. non (Lamk.) Merr. (in TFM)
TFM1:281 (1972), WTM:458 (1988), FT4/2:138 (1985), AD19/3:340 (1980)

India throughout SE. Asia & Malesia to New Guinea.

Germinated seeds consumed locally.

LEGUMINOSAE (CAESALPINIOIDEAE)

FCLV18 (1980), FT4/1 (1984)

332 *Acrocarpus fraxinifolius* Wight ex Arn.

FBI2:292 (1878), FFBB1:410 (1877), IT:249 (1906), DEPMP:38 (1935), W11:22 (1948), PR5/3:41 (1998), FT4/1:50 (1984), FCLV18:76 (1980)

Sikkim, Assam, Myanmar, Laos, S. China, Sumatra, C. Java.

The timber is used for indoor construction and for plywood.

333 *Azelia xylocarpa* (Kurz) Craib

A. cochinchinensis (Pierre) Leonard, *A. siamica* Craib, *Pahudia xylocarpa* Kurz

๑๙๗1:243 (1983), VFT:414 (1996), FGIC2:203 (1916), FCLV18:141 (1980), FT4/1:127 (1984)

Myanmar, Laos, Vietnam, Cambodia.

The beautiful timber is used for cabinet work and wood carvings, as well as for construction of bridges, houseposts etc. The burl wood near the base of the trunk is especially valued. The young seeds are eaten raw.

334 *Sindora siamensis* Teysm. ex Miq. var. *siamensis*

S. cochinchinensis Baillon, *S. wallichii* var. *siamensis* (Teijsm.) Bak.

PRT25:25, ๑๙๗4:124 (1995), FFBB1:413 (1877), IT:252 (1906), VFT:428 (1996), TFM1:272 (1972), ๑๙๗1:241 (1983), FGIC2:215,268 (1916), FCLV18:124 (1980), FT4/1:99 (1984)

Laos, Cambodia, Vietnam, Malay Peninsula.

The wood is used for planking, construction & furniture. The tree is sometimes planted as an ornamental.

335 *Bauhinia variegata* L.

B. candida (L.) Benth., *Phanera variegata* (L.) Benth.

๑๙๗1:25 (1995), FFBB1:397 (1877), WTM:423 (1988), IT:258 (1906), DEPMP:315 (1935), W11:160 (1948), RUPNI:194 (1997), FGIC2:145 (1916), FCLV18:155 (1980), FT4/1:11 (1984)

India, Myanmar, Laos, N. Vietnam, S. China.

Young leaves and flower buds have culinary value. The bark is used for treating diarrhoea, dysentery, malaria, bleeding piles, skin diseases & snake bites.

336 *Bauhinia purpurea* L.

FFBB1:398 (1877), IT:258 (1906), W11:160 (1948), RUPNI:194 (1997), FGIC2:127 (1916), FCLV18:152 (1980), FT4/1:7 (1984), DEPMP:314 (1935), WTM:421 (1988)

Cultivated throughout the tropics, original type from the Philippines.

The leaves and fruit are edible. The bark is astringent and used to treat stomach tumors & wounds. The fibre from the bark is used for making ropes & thatching.

B. blakeana Dunn. - syn. of *B. purpurea* x *variegata*

337 *Bauhinia racemosa* Lmk.

B. parviflora Vahl., *Piliostigma racemosa*

(Lamk.) Benth.

FFBB1:397 (1877), IT:256 (1906), FCLV18:160 (1980), FT4/1:14 (1984)

NE India, Myanmar, Yunnan.

Bark produces good rope-making fiber, and the young leaves are edible.

338 *Bauhinia malabarica* Roxb.

FFBB1:399 (1877), IT:256 (1906), MPP:367 (1978), (1985), FGIC2:146 (1916), FCLV18:162 (1980), FT4/1:19 (1984), PR5/3:102 (1998), WTM:420 (1988), W11:160 (1948)

India, Myanmar, Laos, Cambodia, Vietnam, Philippines, Java, Lesser Sunda Islands.

The young leaves are eaten raw & have a sour taste.

339 *Bauhinia brachycarpa* Wall. ex Benth
B. enigmatica Prain

FT4/1:17 (1984), IT:257 (1906), FFBB1:396 (1877) Myanmar.

340 *Bauhinia saccocalyx* Pierre

FGIC2:146 (1916), FCLV18:165 (1980), FT4/1:20 (1984)

Laos.

341 *Cassia fistula* L.

DIFME:46 (1991), VFT:416 (1996), MPP:379 (1978), FFBB1:391 (1877), 391:103, WTM: (1988), IT:253 (1906), DEPMP:481 (1935), FGIC2:159 (1916), FCLV18:79 (1980), FT4/1:103 (1984)

Probably only native to Sri Lanka, India, Myanmar, & Indo-China but introduced to China, the Middle East & Egypt at an early date.

The wood is tough, hard and extremely durable. It is used in construction & agricultural implements. The bark is rich in tannin and is used for dyeing. The young leaves are eaten raw. The seeds are one of the most effective natural laxatives. Various parts of the plant are used for stomach problems, rheumatism & skin disorders. The tree is very widely planted along roads as it is resistant to air pollution & spectacular in bloom.

342 *Cassia garrettiana* Craib

FGIC2:169 (1916), FCLV18:91 (1980), FT4/1:112 (1984)

Laos, Cambodia, Vietnam.

Wooden nails made from the heartwood are used in boat building. The young leaves and flowers are edible.

343 *Senna siamea* (Lmk.) Irwin & Barn.

Cassia siamea Lmk.

FGIC2:167 (1916), FCLV18:87 (1980), FT4/1:110 (1984), TFM1:247 (1972), 391:63 (1983), WTM:432 (1988), DEPMP:486 (1935), FFBB1:392 (1877), IT:254 (1906), FM12/2:686 (1996)

SE Asia but widely cultivated elsewhere.

Timber used for indoor construction & furniture.

Young leaves & flowers edible.

Architectural model of Scarrone

344 *Senna timoriensis* (DC.) Irwin & Barn.

Cassia timoriensis DC.

FGIC2:164 (1916), FCLV18:88 (1980), FT4/1:111 (1984), IT:254 (1906), TFM1:248 (1972), WTM:433 (1988), DEPMP:487 (1935), FFBB1:393 (1877), FM12/2:689 (1996)

From Sri Lanka & India throughout SE. Asia & Malesia to N. Australia.

345 *Senna surattensis* (Burm. f.) Irwin & Barn.

Cassia surattensis Burm. f. ssp. *surattensis*, *C. glauca* Lamk. var. *suffruticosa* (Heyne ex Roth.) Bak.

FGIC2:160 (1916), FCLV18:99 (1980), FT4/1:119 (1984), FFBB1:394 (1877), WTM:432 (1988), FM12/2:688 (1996)

India & SE Asia, widely cultivated but probably not native in N. Thailand.

346 *Senna sulfurea* (Collad.) Irwin & Barn.

Cassia surattensis Burm. ssp. *glauca* (Lamk.) K. SS. Larsen, *Cassia glauca* Lamk.

FGIC2:159 (1916), FCLV18:102 (1980), FT4/1:120 (1984), FFBB1:394 (1877), FM12/2:687 (1996)

Native of C. America, widely cultivated throughout the tropics.

347 *Senna spectabilis* (DC.) Irwin & Barn.

Cassia spectabilis DC., *Cassia floribunda* Cav. WTM:432 (1988), FT4/1:110 (1984), FM12/2:686 (1996)

Native of C. America, widely cultivated throughout the tropics.

348 *Senna alata* (L.) Roxb.

Cassia alata L.

WTM:429 (1988), FGIC2:165 (1916), FCLV18:86 (1980), FT4/1:108 (1984), FM12/2:675 (1996), DEPMP:479 (1935), IT:255 (1906), MPV:81 (1990),

MPP:377 (1978)

Native of S.America, widely cultivated throughout the tropics.

The leaves are used for ring worm & other skin diseases.

349 *Cassia bakeriana* Craib

อศพ4:49 (1997), FGIC2:170 (1916), FT4/1:105 (1984)

Myanmar.

The wood is useful timber, and it is sometimes planted as an ornamental. The pods have laxative properties similar to *C.fistula*.

350 *Cassia grandis* L. f.

C. pachycarpa de Wit

WTM:430 (1988), FCLV18:80 (1980), FT4/1:105 (1984)

Native to tropical America.

351 *Cassia agnes* (de Wit) Bren.

C. javanica L.. var. *indochinensis* Gagnep.

C. javanica L.. var. *agnes* de Wit

FGIC2:158 (1916), FCLV18:82 (1980), FT4/1:106 (1984)

NE.India, Myanmar, Laos, N.Vietnam.

The timber is used for construction & interior carpentry. The tree is widely planted as an ornamental. The pods have similar medicinal properties to *C. fistula*.

352 *Cassia javanica* L. ssp. *javanica*

C. nodosa Buch.-Ham. ex Roxb.

FGIC2:158 (1916), FCLV18:84,85 (1980), FT4/1:107 (1984), FFBB1:392 (1877), IT:253 (1906), VFT:417 (1996), WTM:431 (1988), TFM1:247 (1972)

Indonesia & Philippines, not native in Thailand but widely planted.

The timber can be used for interior furniture, and the tree is planted as an ornamental tree.

ssp. ***nodosa*** (Buch.-Ham. ex Roxb.) K. & S.S.Larsen

India, Myanmar & Malesia, native to S.Thailand but not in the north.

353 *Peltophorum dasyrrhachis* (Miq.) Kurz

Caesalpinia dasyrrhachis (Miq.), *Baryxylum dasyrrachis* (Miq.) Pierre

FGIC2:191 (1916), FCLV18:60 (1980), TFM2:268 (1973), FT4/1:54 (1984)

Cambodia, Laos, Vietnam, Malay Peninsula, Sumatra.

The timber is resistant to termites & insects. It is used for house columns, boats, vehicles & household implements. The tree is widely planted for its shapely crown & beautiful flowers.

354 *Peltophorum pterocarpum* (DC.) Back.

P. ferrugineum (Dcne.) Benth., *P. inerme* (Roxb.) Llanos, *Caesalpinia inerme* Roxb., *Baryxylum inerme* (Roxb.) Pierre

FGIC2:190 (1916), FCLV18:62 (1980), FT4/1:54 (1984)

LEGUMINOSAE (PAPILIONOIDEAE)

TFB22 (1994), FCLV23 (1987), FCLV17 (1979-*Erythrina* & *Butea*), FCLV29 (1997-*Dalbergia* & *Pterocarpus*)

355 *Butea monosperma* (Lmk.) Taub.

B. frondosa Roxb. ex Willd., *Erythrina monosperma* Lam.

อศพ1:31 (1995), DEPMP:388 (1935), W11:251 (1948), RUPNI:110 (1997), PR3:56 (1992), FCLV17:98 (1979), FGIC2:413 (1916), FBI2:194 (1876)

The bark fibers can be processed into paper pulp. The brightly coloured red and yellow flowers can be used to dye clothes. It is a host tree for lac cultivation.

356 *Butea superba* Roxb.

FCLV17:99 (1979), FGIC2:414 (1916), FBI2:195 (1876)

India, Myanmar, S.China, Indo-China, Java, Philippines.

357 *Erythrina stricta* Roxb.

E. microcarpa Koord. & Valeton, *E. stipitata* Merr.

FFBB1:369 (1877), DEPMP:962 (1935), RUPNI:227 (1997), PR5/3:222 (1998), FCLV17:28 (1979), IT:227 (1906), FGIC2:420 (1916), FBI2:189 (1876)

India, Nepal, Myanmar, Indo-China, E.Java, Philippines, Lesser Sunda Islands.

The wood is used for household utensils, and the bright red flowers give colour for dyes. The tree has religious significance in India.

358 *Erythrina subumbrans* (Hassk.) Merr.

E. lithosperma Miq. non Bl.

อศพ1:68 (1995), WTM:410 (1988), TFM1:292 (1972), PR5/3:222 (1998), FFBB1:367 (1877),

DEPMP:962 (1935), FCLV17:25 (1979), FGIC2:418 (1916), FBI2:190 (1876), FJ1:628 (1963)

Sri Lanka, India, Myanmar, Indo-China, throughout Malesia & Melanesia (except New Guinea) to Fiji & Somalia.

This tree is of value as an ornamental.

359 *Erythrina suberosa* Roxb.

E. stricta Roxb. var. *suberosa* (Roxb.)

C.Niyomdham., *E. sublobata* Roxb.

FFBB1:369 (1877), IT:227 (1906), DEPMP:962 (1935), FCLV17:29 (1979), PR5/3:222 (1998), FGIC2:419 (1916), FBI2:189 (1876)

NE.India, Sikkim, Myanmar, S.China, Cambodia.

Recently regarded by some authorities as a synonym of *E.stricta* (PR5/3)

360 *Pterocarpus macrocarpus* Kurz

P.cambodianus (Pierre) Gagnep.

ฉสพ1:78 (1995), FFBB1:349 (1877), IT:239 (1906), VFT:472 (1996), FGIC2:465 (1916), FCLV29:58 (1997)

S.Myanmar, Cambodia, Laos, C.&S.Vietnam.

The timber is first class, with a beautiful colour & a fine grain. It is used for valuable furniture & fine art. The resin, bark & heartwood produce a red-brown dye. The resin is used to treat mouth infections. The roots also have medicinal value.

361 *Pterocarpus indicus* Willd.

FGIC2:463 (1916), FCLV29:56 (1997), TFM1:303 (1972), WTM:416 (1988), FFBB1:349 (1877), IT:239 (1906), DEPMP:1861 (1935)

Malay Peninsula, throughout Malesia to Solomon Islands. Status in India uncertain, possibly introduced a long time ago. Not native in NT but widely planted.

362 *Dalbergia nigrescens* Kurz

var. *nigrescens*

FFBB1:346 (1877), FGIC2:494 (1916), FCLV29:24 (1997)

363 *Dalbergia lanceolaria* L.

var. *lanceolaria*

IT:236 (1906), VFT:457 (1996), AD:141(1996), FGIC2:489 (1916), FCLV29:37 (1997), FBI2:235 (1876)

India, Sri Lanka, Myanmar, probably also in Laos.

The wood is resistant to insects but not to rot. It is suitable for tool handles, boats, packaging and a variety of other general purposes.

var. *lakhonensis* (Gagnep.) C. Niyomdham &

Pham Hoang Ho

D. lakhonensis Gagnep. {inc. var. *appendiculata* Craib}, *D. maymyensis* Craib (inc. var. *siamensis* Craib)

Myanmar, Cambodia, Laos, Vietnam.

var. *errans* (Craib) C.Niyomdham

D.errans Craib

known only from Laos & Thailand.

364 *Dalbergia rimosa* Roxb.

D.curtisii auct. non Prain (in FGIC, FSE),

D.vulubilis Roxb var. *latifolia* Gagnep.,

D.discolor Bl. ex Miq.

IT:233 (1906), FGIC2:474,477,478,491 (1916),

FCLV29:12 (1997), FBI2:232 (1876)

India, Myanmar, S.China, Laos, Vietnam.

365 *Dalbergia ovata* Graham ex Benth

D.floribunda Craib, *D.forbesii* auct. non Prain (in FGIC)

FFBB1:343 (1877), FGIC2:474 (1916), FCLV29:20 (1997), FBI2:231 (1876)

Myanmar, Laos, Vietnam.

366 *Dalbergia oliveri* Gamb. ex Prain

D.dongnaiensis Pierre, *D.bariensis* Pierre, *D.duperreana* Pierre

ฉสพ1:46 (1995), มลป1:105 (1983), IT:237 (1906),

WTM:405 (1988), VFT:460 (1996), FGIC2:

492,493,496,497 (1916), FCLV29:30 (1997)

Upper Myanmar, Laos, Cambodia, Vietnam.

The wood is hard with a beautiful reddish colour. It is used for furniture & agricultural implements.

367 *Dalbergia cana* Grah. ex Bth. var. *cana*

D. kerrii Craib, *D. kurzii* Prain var. *truncata* Craib

FFBB1:344 (1877), IT:236,237 (1906), FGIC2:298,

495 (1916), AD18:138 (1996), FCLV29:22 (1997),

FBI2:237 (1876)

Myanmar, Laos.

var. *kurzii* (Prain) C.Niyomdham

D. kurzii Prain

368 *Dalbergia cultrata* Grah. ex Bth.

var. *cultrata*

D. fusca Pierre

FFBB1:342 (1877), IT:234 (1906), VFT:454 (1996),

มลป1:25 (1983), FGIC2:481,483 (1916), FCLV29:52

(1997), FBI2:233 (1876)

Vietnam, China.

The wood is durable and is used for good quality furniture.

369 *Dalbergia assamica* Benth.

var. ***assamica***

D. lanceolaria L.f. var. *assamica* (Benth.) Thoth.,
D. balansae Prain

AD18:138 (1996), IT:236 (1996), FGIC2:487 (1916),
FCLV29:42 (1997)

India, Sikkim, Myanmar, S.China, Laos, Vietnam.

370 *Dalbergia sericea* G. Don

D. hircina Ham. ex Benth., *D. stenocarpa* Kurz

IT:237 (1906), FCLV29:40 (1997), FBI2:236,238
(1876)

371 *Dalbergia stipulacea* Roxb.

FFBB1:346 (1877), IT:238 (1906), FGIC2:491 (1916),
FCLV29:36 (1997), FBI2:237 (1876)

India, Myanmar, China, Laos, Cambodia, Vietnam.

372 *Callerya atropurpurea* (Wall.) Schot.

var. ***pubescens*** (Craib) P.K.

Adinobotrys atropurpureus (Wall.) Dunn,
Millettia atropurpurea (Wall.) Benth., *Padrugaea*
pubescens Craib, *Whitfordiodendron*
pubescens (Craib) Burkill

PR5/3:128 (1998), JB81/10:98 (1996), IT:220 (1906),
TFM1:296 (1972), WTM:413 (1988), FFBB1:358
(1877), FGIC2:371 (1916)

Myanmar, Indo-China, Malay Peninsula, Sumatra,
E.Kalimantan. (var. *atropurpurea* only known from
S.Myanmar, S.&W.Thailand, not recorded for NT)

373 *Millettia macrostachya* Coll. &

Hemsl. var. ***teetha***.

JLS28:41 (1890)

Myanmar

374 *Millettia leucantha* Kurz

M. pendula Benth.

FFBB1:356 (1877), FBI2:105 (1876), IT:220 (1906),
မလိၼ်း:58 (1983)

Myanmar.

375 *Millettia pubinervis* Kurz

FFBB1:357 (1877), FBI2:106 (1876), IT:220 (1906)

Upper Myanmar.

376 *Millettia brandisiana* Kurz

JLS28:40 (1890), FFBB1:355 (1877), IT:220 (1906)

Myanmar.

377 *Derris robusta* (Roxb. ex DC.) Bth.

Dalbergia robusta Roxb.

FFBB1:338 (1877), IT:241 (1906)

Assam, Bangladesh, Myanmar.

ROSACEAE

FT2/1 (1970), FCLV6&7 (1968), BL21 (1973-
Maloideae), BL13/1 (1965-*Prunus*), RW7/2
(1965 - *Parinari*)

378 *Parinari anamensis* Hance

Parinarium albidum Craib, *P. annamense* (in RW7)

RW7:173 (1965), FGIC2:615,616 (1920),

FCLV6:197 (1968), FT2/1:73 (1970), မလိၼ်း (1983)

Cambodia, Laos, S. Vietnam.

379 *Prunus cerasoides* D. Don

P. hosseusii Diels, *P. puddum* Roxb. ex Brandis

FCLV6:169 (1968), FT2/1:68 (1970), BL13/1:38

(1965), DIFME:150 (1991), မလိၼ်း:77 (1995)

Nepal, Myanmar, Laos, Vietnam, S. China.

The fruit is edible but quite acidic. The wood is
used for knife handles and other agricultural
tools. Medicinal uses include treatment for burns,
cuts & wounds, diarrhoea, fever & venereal
diseases.

380 *Prunus persica* (L.) Batsch

Prunus persica Stokes, *Persica vulgaris* Mill.

FFBB1:433 (1877), FCLV6:165 (1968), FT2/1:67
(1970)

Originally native of China but nowadays cultivated
in temperate regions throughout the world.

381 *Prunus arborea* (Bl.) Kalk. var. *montana*

(Hook. f.) Kalk.

Pygeum arboreum auct. non C.Muell. (in FFBB,
FSE), *Pygeum capitellatum* Hook. f., *Pygeum*
parreaunum Pierre ex Card., *Pygeum ferreum*
Craib, *Pygeum montanum* Hook. f.

FBI2:321 (1878), FGIC2:618,618 (1920), FFBB1:435
(1877), FCLV6:189 (1968), FT2/1:71 (1970), BL13/
1:99 (1965), WTM:619 (1988), TFM2:338 (1973),
မလိၼ်း:173 (1983), PR5/3:476 (1998)

NE. India, Bhutan, Bangladesh, S. China,

Myanmar, Laos, Cambodia, Vietnam.

(var. *arborea* in Malay Peninsula & throughout
Malaysia.)

382 *Prunus phaeosticta* (Hance) Maxim.

P. punctata Hook. f.

FCLV6:178 (1968), FT2/1:69 (1970)

383 *Prunus javanica* (T. & B.) Miq.

P. martabanica Wall. ex Kurz, *P. nitens* Craib, *P. nitida* Koehne

FFBB1:474 (1877), TFM2:338 (1973), FGIC2:622 (1920), FCLV6:174 (1968), FT2/1:69 (1970), BL13/1:47 (1965), PR5/3:476 (1998)

S. Myanmar, Andaman Islands, Cambodia, S. Vietnam, Malay Peninsula, Sumatra, W. Java, Borneo, Philippines (Palawan), Sulawesi, Moluccas, Irian Jaya.

384 *Prunus wallichii* Steud.

P. acuminata (Wall.) Dietr.

TFM2:337 (1973), FCLV6:173 (1968), FT2/1:68 (1970), BL13/1:38 (1965)

Nepal, E. Himalaya, Bangladesh, S. China, Myanmar, Laos, Vietnam, Sumatra, Malay Peninsula.

385 *Prunus ceylanica* (Wight) Miq.

Pygeum parviflorum auct. non Teijsm. & Binn. (in FSE)

FFBB1:433 (1877), FCLV6:184 (1968), FT2/1:70 (1970), BL13/1:52 (1965)

Sri Lanka, India, Bangladesh, Myanmar, Laos, Vietnam.

386 *Eriobotrya bengalensis* (Roxb.) Hk. f. forma *bengalensis*

E. dubia Dcne., *Mespilus bengalensis* Roxb.

FFBB1:443 (1877), FGIC2:677 (1920), FCLV6:75 (1968), FT2/1:43 (1970), BL21/2:431 (1973), IT:290 (1906), VFT:610 (1996), TFM2:326 (1973), PR5/3:220 (1998)

E. Himalaya, Bangladesh, Myanmar, Laos, Cambodia, S. Vietnam, Malay Peninsula, Sumatra, Borneo.

The timber is used for posts and poles, and as substrate in the culture of cats ear mushrooms. It also makes combs and wooden shoes.

forma *multinervata* Vidal

387 *Eriobotrya japonica* (Thunb.) Lind

FCLV6:64 (1968), FT2/1:42 (1970), BL21/2:432 (1973), IT:290 (1906), PR5/3:220 (1998)

Originally from SE. China but introduced into Japan since an early date.

Cultivated for its edible fruits.

RHIZOPHORACEAE

FT2/1 (1970), FCLV4 (1965)

388 *Carallia brachiata* (Lour.) Merr.

C. integerrima DC, *C. lucida* Roxb, *C. scortechinii* King

DIFME:43 (1991), WTM:612 (1988), DEPMP:452 (1935), DEPMP: (1966), VFT:601 (1996), TFM4:313 (1989), PR5/3:136 (1998), TFSS1:330 (1995), FCLV4:178 (1965)

Madagascar, Sri Lanka, India, Myanmar, Vietnam, S. China, Malay Peninsula, throughout Malesia to N. Australia & Solomon islands.

The timber has an attractive grain but is hard to season. It is used for furniture & other interior finishings. The fruits are used for stomach complaints.

COMBRETACEAE

FCLV10 (1969), TFB15 (1985 - *Terminalia*), TFB15? (1985? - *Combretum*)

389 *Terminalia bellirica* (Gaertn.) Roxb.

Myrobalanus bellirica Gaertn

TFB15:63 (1985), FGIC2:749 (1920), FCLV10:71 (1969), DIFME:177 (1991), ௨௪௩1:94 (1995), ௩௪௩2:124 (1975), FFBB1:455 (1877), WTM2:16: (1988), FBI2: (1878), IT:307 (1906), DEPMP:2174 (1935), VFT:107 (1996), TFM1 (1972)

Nepal, India, Sri Lanka, Myanmar, Indo-China, Malay Peninsula, Sumatra, Java, Borneo, Sulawesi, Lesser Sunda Islands, Moluccas, N. Australia.

The wood is used in construction and for furniture. Dry fruits are used in the tanning of leather but are not considered as good as *T. chebula*. When mixed with iron sulphate, they produce a black dye or ink. They are also prescribed medicinally in the treatment of diarrhoea, intestinal problems, fever, coughs, haemorrhoids, dropsy, liver problems & snake bites. The seeds are said to be edible but are alleged to possess narcotic properties. The oil from the seeds can be used as hair oil & for making soap.

390 *Terminalia chebula* Retz. var. *chebula*

T. tomentella Kurz

TFB15:71 (1985), FGIC2:752 (1920), FCLV10:89 (1969), ௨௪௩1:95 (1995), ௩௪௩2:125 (1975), DEPMP:2177 (1935), FFBB1:456 (1877), IT:308 (1906), VFT:109 (1996), MPP:657 (1978), ௩௪௩1:14

(1983), PR3:122 (1992)

Nepal, N.India, Myanmar, S. China, Laos, Cambodia, Vietnam.

The timber is of low value but is used for a variety of construction purposes. The fruits are one of the best natural sources of tannin & are used extensively in the leather industry especially in India. When mixed with alum, they produce a yellow dye, whereas with iron they produce a black dye. They have antibacterial & antifungal properties which are used to treat a wide range of ailments, including inflamed gums, stomach complaints & asthma.

391 *Terminalia catappa* L.

T. procera Roxb.

TFB15:65 (1985), FCLV10:66 (1969), FFBB1:454 (1877), MPP:657 (1978), PR3:120 (1991), VFT:108 (1996), DEPMP:2176 (1935), WTM:217 (1988)

Along coastlines throughout SE.Asia.

The timber is of good quality but is susceptible to termites. It is used in boat-building & furniture-making. The bark & leaves contain tannin, but not as abundantly as *T.chebula*. This tannin is used medicinally as a diuretic, heart tonic and for treating skin eruptions. The seeds are edible, and contain oil of good taste. This oil has medicinal value in the treatment of abdominal swellings, scabies & other skin diseases. The leaves produce a yellow green or black dye.

392 *Terminalia mucronata* Craib & Hutch.

T.corticosa Pierre ex Laness

TFB15:77 (1985), FGIC2:758,760 (1920), ๑๙๗1:96 (1995), ๒๕๗๒:127 (1975), FCLV10:88 (1969)

Myanmar, Cambodia.

The wood is strong and is used as beams and planks.

393 *Terminalia glaucifolia* Craib

TFB15:79 (1985)

India, Myanmar, Laos.

The wood is not durable and not widely used.

394 *Terminalia calamansanai*

(Blanco) Rolfe

T.papilio Hance, *T. oryzetorum* Craib, *T.papilio* Hance, *T. pyrifolia* Kurz, *T. bialata* Vill.

TFB15:83 (1985), FCLV10:75 (1969), ๑๙๗2:127, WTM:216 (1988), TFM1:175 (1972), IT:310 (1906), FFBB1:456 (1877), FGIC2:761 (1920)

Myanmar, Laos, Vietnam, Cambodia, Phillipines, Malay Peninsula, Sulawesi and New Guinea.

The wood is not durable, but is used for interior construction.

395 *Terminalia myriocarpa* Heurck. & M.-A.

FFBB1:457 (1877), TFB15:75 (1985), FGIC2:760 (1920), FCLV10:80 (1969), IT:312 (1906)

Sikkim, Bhutan, Assam, Upper Myanmar, Yunnan, Laos, N.Vietnam, Malay Peninsula.

The specimens from NT have been considered by some authors to be a distinct variety, *var. tomentosa*.

396 *Terminalia alata* Hey. ex Roth

T. tomentosa (Roxb.) Wight et Arn.

TFB15:97 (1985), FGIC2:754: (1920), FCLV10:82 (1969), DIFME:177 (1991), FFBB1:458 (1877), VFT:106 (1996), ๒๕๗๒:281 (1983), IT:310 (1906)

Nepal, India, Myanmar, Laos, Vietnam.

The wood is durable and good for house construction and bridge building. It is often used in door and window frames and for decorative veneer. Medicinal uses include treating sores & wounds, throat infections, urinary problems, fever, anemia & diarrhoea. The wood is said to make a good ash fertiliser & the leaves are a good fodder.

397 *Terminalia cambodiana* Gagnep.

TFB15:93 (1985), FGIC2:79 (1920), FCLV10:751 (1969)

Cambodia.

398 *Terminalia triptera* Stapf.

T. nigrovenulosa Gagnep., *T. obliqua* Craib, *T. tripteroides* Craib

TFB15:87 (1985), FGIC2:756 (1920), FCLV10:96 (1969), TFM1:178 (1972)

Myanmar, Cambodia, Laos, Vietnam, NW.Malay Peninsula.

The wood is good for a variety of construction purposes.

399 *Terminalia franchetii* Gagnep. *var. tomentosa* Nanakorn

TFB15:90 (1985)

Endemic to N.Thailand (Doi Chiang Dao).

400 *Combretum quadrangulare* Kurz

TFB15:190 (1985), FGIC2:746 (1920), FCLV10:58

(1969), อสพ3:59 (1997), FFBB1:465 (1877), IT:313 (1906), VFT:103 (1996)

Myanmar, Cambodia, Laos, Vietnam(?)

The tree has been planted for soil conservation and wind protection. The wood produces good charcoal.

401 *Combretum apetalum* Wall. ex Kurz
FFBB1:460 (1877), IT:312 (1906), TFB15:159 (1985)

402 *Combretum winitii* Craib
TFB15:180 (1985)

403 *Combretum deciduum* Coll. & Hemsl.
TFB15:163 (1985)

404 *Combretum trifoliatum* Vent.
C. lucidum Bl.
FFBB1:461 (1877), IT:312 (1906), TFB15:167 (1985)

405 *Combretum decandrum* Roxb.
FFBB1:460 (1877), IT:312 (1906), TFB15:165 (1985)

406 *Anogeissus acuminata* (Roxb. ex DC.)
Guill. & Perr.

A.pierrei Gagnep., *A.tonkinensis* Gagnep.
FFBB1:466 (1877), IT:315 (1906), FGIC2:765 (1920),
FCLV10:108 (1969), DIFME:23 (1991), DEPMP:171
(1935), WI1:81 (1948), VFT:105 (1996), กล้วย:133
(1983), PR5/3:73 (1998)

India, Myanmar, Cambodia, Laos, Vietnam.

The wood is used in light construction, but also as beams. It is good carving wood and is made into furniture and musical instruments.

MYRTACEAE

TFB21 (1994 - *Syzygium*, *Eugenia* & *Cleistocalyx*),
KB47/4 (1992 - *Decaspermum* & *Tristanopsis*),
GBS12 (1949 - *Syzygium*)

407 *Eugenia bracteata* (Willd.) Roxb.

E. macrosepala Duthie, *E. roxburghii* DC.,
Syzygium ruscifolium (Willd.) Santapau & Wagh.
FFBB1:482 (1877), IT:325 (1906), TFB21:22 (1994),
FGIC2:833 (1921)

India, Myanmar.

408 *Syzygium zeylanicum* (L.) DC.
Eugenia spicata Lam., *Eugenia zeylanica* Wight
WTM:591 (1988), TFM3:217 (1978), IT:321 (1906),
FFBB1:481 (1877), TFB21:118 (1994), FGIC2:804
(1921), PRT6:64

409 *Syzygium gratum* (Wight) S.N. Mitra
var. *gratum*

Eugenia grata Wight, *Eugenia collinsae* Craib
TFB21:70 (1994), PRT6:28, WTM:587 (1988),
TFM3:217 (1978), IT:322 (1906), FFBB1:480 (1877)
India, Myanmar, Philippines.

410 *Syzygium cerasiforme* (Bl.) Merr. &
L.M. *Eugenia cerasiformis* (Bl.) DC., *Eugenia*
expansa Wall. ex Duthie
TFB21:49 (1994), FGIC2:833 (1921)

411 *Syzygium helferi* (Duthie) P. Chant. & J.
Parn.

Eugenia helferi Duthie
IT:319 (1906), TFM3:196 (1978), TFB21:73 (1994),
FGIC2:833 (1921), PRT6:29
Myanmar, Malaysia.

412 *Syzygium thumra* (Roxb.) Merr. & L.M.
Perry ssp. *thumra*
Eugenia thumra Roxb.
TFB21:115 (1994), FFBB1:488 (1877), IT:321 (1906)
Myanmar, Laos.

413 *Syzygium grande* (Wight) Walp. var.
grande

Eugenia grandis Wight, *Eugenia laosensis*
Gagnep., *Eugenia montana* Th. & Hook.f.
FFBB1:489 (1877), IT:320 (1906), WTM:586 (1988),
TFM3:195 (1978), TFB21:68 (1994), FGIC2:826 (1921)
Sri Lanka, India, Myanmar, Laos, Malay Peninsula,
Sumatra?, Borneo.

414 *Syzygium glaucum* (King) P. Chant. &
J. Parn.

Eugenia glauca King, *Eugenia pseudo-glauca*
(King) Ridl.
PRT6:25, TFB21:66 (1994), TFM3:193 (1978)
Myanmar, Malay Peninsula.

415 *Syzygium globiflorum* (Craib) P. Chant.
& J. Parn.

Eugenia globiflora Craib
TFB21:67 (1994)
China.

416 *Syzygium angkae* (Craib) Chant. & Parn.
ssp. *angkae*
Eugenia angkae Craib
TFB21:36 (1994)

Myanmar, Laos.

417 *Syzygium polyanthum* (Wight) Walp.,
Eugenia polyantha Wight, *Eugenia resinosa*
Gagnep

IT:322 (1906), WTM:590 (1988), TFM3:210 (1978),
TFB21:95 (1994), FGIC2:820 (1921)

Myanmar, Vietnam, Malaysia.

418 *Syzygium winitii* (Craib) Merr. & L. M.
Perry

Eugenia winitii Craib

TFB21:117 (1994)

Myanmar.

419 *Syzygium balsameum* (Wight) Walp.

Eugenia balsamea Wall. ex Wight

IT:323 (1906), FFBB1:485 (1877), TFB21:42 (1994),
FGIC2:819 (1921)

Assam, Sikkim, Bangladesh, Myanmar, China,
Vietnam.

420 *Syzygium ripicola* (Craib) Merr. &
L.M.Perry

Eugenia ripicola Craib, *Eugenia*
cochinchinensis Gagnep.

TFB21:104 (1994), FGIC2:814 (1921)

Myanmar, Cambodia, Laos, Vietnam.

421 *Syzygium megacarpum* (Craib)
Rathakr. & N.C. Nair

Eugenia macrocarpum Roxb., *E.megacarpa*
Craib

FFBB1:492 (1877), TFB21:86 (1994)

India, Bangladesh, Myanmar, China.

422 *Syzygium formosum* (Wall.) Masam.,

Eugenia formosa Wall. (inc. var. *ternifolia*),
Eugenia ternifolia Roxb., *Jambosa formosa*
G.Don

IT:317 (1906), FFBB1:492 (1877), TFB21:62 (1994),
FGIC2:837 (1921)

NE.India, Sikkim, Bangladesh, Myanmar.

423 *Syzygium siamense* (Craib) Chant. &
Parn.

Eugenia siamensis Craib

TFM3:217 (1978), TFB21:108 (1994), FGIC2:843
(1921)

Myanmar, Malay Peninsula.

424 *Syzygium diospyrifolium* (Wall. ex

Duthie) S.N. Mitra

Eugenia diospyrifolia Wall. ex Duthie

TFB21:57 (1994), IT:318 (1906), TFM3:190 (1978)
NE.India, Myanmar, Malaysia.

425 *Syzygium jambos* (L.) Alston

Eugenia jambos L.

WTM:587 (1988), TFM3:247 (1978), TFB21:77
(1994), FGIC2:834 (1921), IT:318 (1906),
FFBB1:495 (1877)

Native to the Indo-Malayan region but widely
cultivated throughout the tropics.

426 *Syzygium cumini* (L.) Skeels

Eugenia cumini (L.) Druce, *E. jambolana* Lam.
FFBB1:485 (1877), WTM:585 (1988), TFM3:247
(1978), TFB21:56 (1994), FGIC2:818 (1921),
MPP:667 (1978), RUPNI:131 (1997)

Widely distributed in the Indo-Malayan region.

427 *Syzygium fruticosum* (DC.) A.M.
Cowan & Cowan

Eugenia fruticosa DC.

TFB21:64 (1994), FGIC2:843 (1921), IT:323 (1906),
FFBB1:485 (1877)

India, Bangladesh, Myanmar, China.

428 *Syzygium albiflorum* (Duthie ex Kurz)
Bahadur & R.C.Gaur

Eugenia albiflora Duthie ex Kurz

FFBB1:491 (1877), IT:320 (1906), TFB21:33 (1994),
FGIC2:821 (1921)

429 *Syzygium zimmermannii* (Warb.)
Merr & Perry

Eugenia zimmermannii Warb.

TFB21:120 (1994), FGIC2:835 (1921)

430 *Syzygium claviflorum* (Roxb.) Cowan
& Cowan

Eugenia claviflora Roxb. {inc. var. *leptalea*
(Craib) Hend.}, *Eugenia leptantha* Wight,
Eugenia leptalea Craib

TFB21:53 (1994), FGIC2:833 (1921), PRT6:16,
FFBB1:480 (1877), IT:319 (1906), WTM:584 (1988),
TFM3:186,187 (1978)

India, Myanmar, Bangladesh, China, Vietnam,
throughout Malesia to N.Australia.

431 *Syzygium cinereum* (Kurz) Chant. & Pam.
S. pseudosubtilis King, *Eugenia cinerea* Kurz.

Eugenia brachiata sensu Duthie

TFB21:51 (1994), FGIC2:811 (1921), FFBB1:483 (1877), IT:324 (1906), WTM:590 (1988), TFM3:168 (1978)

India, Myanmar, Malay Peninsula, Singapore, Philippines.

432a *Cleistocalyx operculatus* (Roxb.)

Merr.

C. operculatus (Roxb.) Merr. var. *operculatus*, *Eugenia operculata* Roxb.

TFB21:18 (1994), FGIC2:817 (1921), TFM3:205 (1978), FFBB1:482 (1877), IT:322 (1906)

India, Sri Lanka, Myanmar, China, Indo-China, throughout Malesia to N.Australia.

432b *Cleistocalyx nervosum* (DC.) Kost.

var. *paniala* (Roxb.) Parn. & Chant.

C. operculatus (Roxb.) Merr. var. *paniala* Parn. & Chant., *Eugenia paniala* Roxb., *Eugenia operculata* Roxb. var. *paniala* (Roxb.) Duthie

TFB21: (1994), FGIC2:833 (1921), NOVON6:201 (1996), KB48:591 (1993), FFBB1:483 (1877), FBI2:498 (1879)

India, Bangladesh, Myanmar.

Cultivated for its edible fruit.

433 *Decaspermum parviflorum* (Lmk.)

A. J. Scott spp. *parviflorum*

KB47/4:703 (1992)

434 *Tristaniaopsis burmanica* (Griff.)

Wils. & Wat.

Tristania burmanica Griff.

FFBB1:474 (1877), KB47/4:705 (1992),

FGIC2:793, FBI2:466 (1879)

Myanmar, Cambodia, Laos, Vietnam.

The timber is used for temporary construction.

LECYTHIDACEAE

BL15/2 (1967-Barringtonia), KB50/4 (1995-Barringtonia)

435 *Careya arborea* Roxb.

DIFME:44 (1991), FFBB1:499 (1877), FGIC2:852 (1921), FBI2:511 (1879), DEPMP:464 (1935), TFM2:264 (1973), ไม้เลื้อย (1983), PR5/3:139 (1998), ไม้เลื้อย (1983)

Afghanistan, Pakistan, India, Sri Lanka, Nepal, Myanmar, Indo-China, Andaman Islands, Malay Peninsula, (rare).

Timber used for a variety of construction purposes, floors, beams etc. In the past, used for gun barrels & railway sleepers. Unspecified part used medicinally for cleaning cuts & wounds as well as for treating skin diseases, dysentery & facial swellings.

436 *Barringtonia acutangula* (L.) Gaertn.

B. micrantha Gagnep, *Beberhardii* Gagnep, *B. bicolor* Craib, *B. edaphocarpa* Gagnep var. *ladelli* Craib

DIFME:33 (1991), FFBB1:497 (1877), IT:330 (1906), WI1:158 (1948), MPP:648 (1978), FGIC2:860 (1921), PR5/3:101 (1998), ไม้เลื้อย (1983), KB50/4 :680 (1995), BL15/2:226 (1967), FBI2:508 (1879)

Afghanistan, Pakistan, India, Sri Lanka, Myanmar, Indo-China, S.China, Myanmar, throughout Malesia to N.Australia.

Young shoots and leaves are edible. The timber is hard and durable and often used in construction. The tree is often planted ornamentally.

437 *Barringtonia augusta* Kurz

B. marcanii Craib

FFBB1:498 (1877), IT:330 (1906), KB50/4:683 (1995), BL15/2:254 (1967)

S.Myanmar.

MELASTOMATACEAE

438 *Memecylon plebejum* Kurz

IT:336 (1906), FFBB1:513 (1877), FGIC2:930 (1921), FBI2:561 (1879)

S.Myanmar.

439 *Memecylon scutellatum* (Lour.) Naud.

FFBB1:513 (1877)

Myanmar.

LYTHRACEAE

BFB23 (1931), GBS24 (1969)

440 *Lagerstroemia indica* L.

BFB23:12 (1931), FBI2:575 (1879), WTM:474 (1988), IT:338 (1906), FFBB1:521 (1877), FGIC2:940 (1921), FBI2:575 (1879), GBS24:190 (1969)

Himalayas, China, Indo-China, Japan, widely cultivated throughout the world.

441 *Lagerstroemia loudonii* Teysm. & Binn.

L. rotlieri Clarke, *L. tomentosa* Presl. var. *loudonii* Clarke

FFBB1:523 (1877), FGIC2:954 (1921), GBS24:303 (1969), FBI2:578 (1879)

Laos, Cambodia, Myanmar?, widely cultivated elsewhere.

442 *Lagerstroemia villosa* Wall. ex Kurz,
FFBB1:525 (1877), IT:339 (1906), BFB23:17 (1931),
ꠤꠠꠠꠠ 49 (1983), FGIC2:947 (1921), FBI2:578 (1879),
GBS24:205 (1969)

N.Myanmar, Yunnan.

443 *Lagerstroemia calyculata* Kurz
L.augustifolia Pierre ex Laness

FFBB1:522 (1877), BFB23:9 (1931), FGIC2:956,
959 (1921), FBI2:576 (1879), GBS24:306 (1969),
IT:339 (1906)

Myanmar, Laos, Cambodia, Vietnam.

444 *Lagerstroemia tomentosa* Presl.
FFBB1:522 (1877), FBI2:578 (1879), IT:339 (1906),
BFB23:15 (1931), ꠤꠠꠠꠠ 350 (1983), FGIC2:958
(1921), GBS24:292 (1969)

Myanmar, Yunnan.

445 *Lagerstroemia floribunda* Jack
var. *floribunda*
L. turbinatus Koehne
WTM:474 (1988), FFBB1:522 (1877), TFSS2:227
(1996), FGIC2:953 (1921), FBI2:577(1879),
GBS24:329 (1969)

Malay Peninsula, widely cultivated elsewhere.
Several other varieties found in Myanmar, S.China
& Indo-China). var. *brevifolia* Craib has been
recorded from Phrae province. (see GBS24).

446 *Lagerstroemia cochinchinensis*
Pierre. var. *ovalifolia* Kurz
FGIC2:956 (1921), GBS24:308 (1969)

447 *Lagerstroemia balansae* Koehne
FGIC2:957(1921), GBS24:317 (1969)
Hainan, N.Vietnam.

448 *Lagerstroemia venusta* Wall. ex Cl.
L. collettii Craib, *L. comiculata* Gagnep
FBI2:576 (1875), BFB23:16 (1931), FGIC2:943,960
(1921), GBS24:203 (1969)

N.Myanmar, Yunnan, Indo-China.

449 *Lagerstroemia macrocarpa* Kurz var.
macrocarpa
L. hossei Koehne, *L. intermedia* Koeh. var.

oblonga Craib

FFBB1:524 (1877), BFB23:13 (1931), DEPMP:1320
(1935), IT:339 (1906), FGIC2:942, 960 (1921),
FBI2:577 (1879), GBS24:271 (1969)

N.Myanmar, Laos.

450 *Lagerstroemia speciosa* (L.) Pers.
L. flos-reginae Retz

MPP:640 (1978), FFBB1:524 (1877), BFB23:11
(1931), DEPMP:1320 (1935), IT:339 (1906), TFM2:280
(1973), PR5/3:324 (1998), WTM:474 (1988),
FGIC2:941 (1921), FBI2:577 (1879), GBS24:264
(1969)

A traditional remedy for diabetes & urinary
problems. The bark yields a yellow dye.

India, Myanmar, S.China, Indo-China, Malay
Peninsula, Sumatra, Borneo, Phillipines, Java,
Sulawezi. (N.Australia?)

CRYPTERONACEAE

FCLV4 (1965), FT5/4 (1992)

451 *Crypteronia paniculata* Bl.
FGIC2:696 (1920), FCLV4:58 (1965), FT:5/4:431
(1992), FFBB 1:519 (1877), TFSS2:146 (1996),
WTM:224 (1988), IT:341 (1906), DEPMP: (1935),
VFT:115 (1996), TFM4:80 (1989), PR5/3:172 (1998)
Assam, Bangladesh, Myanmar, Andaman Islands,
Cambodia, Laos, Vietnam, Malay Peninsula,
Borneo, Sumatra, Java, Lesser Sunda Islands,
Phillipines.

The wood is used for interior furniture.

SONNERATIACEAE

452 *Duabanga grandiflora* (Roxb. ex DC.)
Walp.

D. sonneratioides Buch.-Ham., *Lagerstroemia*
grandiflora Roxb.

FGIC2:977 (1920), FCLV4:204 (1965), FT:5/4:435
(1992), PRT12:13, FFBB1:525 (1877), WTM:471
(1988), TFM1:444 (1972), ꠤꠠꠠꠠ 164 (1983), IT:340
(1906), VFT:681 (1996), ꠤꠠꠠꠠ 115 (1975)

Nepal, Sikkim, Assam, Myanmar, Cambodia, Laos,
Vietnam, S. China (Yunnan), Malay Peninsula.

The timber seasons well and is used for boxes,
planks, canoes & other general purposes. The
leaves are a good fodder.

DATISCEACEAE (TETRAMELIACEAE)

FCLV4 (1965), FT5/4 (1992)

453 *Tetrameles nudiflora* R. Br. ex Benn.
 FFBB1:535 (1877), IT:346 (1906), PR5/3:554 (1998),
 VFT:117 (1996), TFM2:29 (1973), 381J:12 (1983)
 Sri Lanka, India, Myanmar, Laos, Vietnam,
 S.China, N.Malay Peninsula, extreme N. & S. tips
 of Sumatra, Java, Sulawesi, Lesser Sunda
 islands.

The timber is used for packing cases, panelling,
 plywood & wooden shoes.

ARALIACEAE

GBS30 (1977), JUSS (1999 - all native spp.)

454 *Schefflera* genus, 6 species in NT:

S. bengalensis Gamble
 India, Myanmar, China.

S. elliptica (Bl.) Harms
S. venulosa (Wight & Arn.) Harms,
S. venulosum Hook.
 FGIC2:1174 (1923), FBI2:729 (1879)

S. minimiflora Ridl.
 FGIC2:1174 (1923), TFM3:29 (1978)
 Sumatra, Java, Malay Peninsula,
 Borneo, Sulawesi.

S. siamensis W.W. Sm. ex Craib
 endemic to Thailand?

S. pueckleri (K. Koch) Frod.
 TFM3:31 (1978), FFBB1:542 (1877),
 FBI2:740 (1879)

S. petelotii Merr.
 China, Vietnam.

S. subintegra (Craib) C. B. Shang

455 *Macropanax* genus
 probably at least 4 distinct species in NT.

456 *Aralia montana* Bl.

A. armata (Wall.) Seem, *A. thomsonii* Seem
 TFM3:15 (1978), FFBB1:586 (1877), FBI2:723
 (1879), FGIC2:1162 (1923)
 Nepal, Bhutan, India, Indo-China, Malay Peninsula,
 Java.

The root is used to relieve fever.

457 *Aralia foliolosa* (Wall.) Seem.

A. chinensis L., *Panax foliolosum* Wall.
 FBI2:723 (1879), FGIC2:1160 (1923)
 China, N.Vietnam.

**458 *Pentapanax* (*Aralia* sect.
pentapanax)**

4 species in NT:

A. lanata Jebb

A. pectinata Jebb

A. fragrans (D.Don) Jebb
Hedera fragrans D.Don

A. parasitica (D.Don) Wen

459 *Heteropanax fragrans* (Roxb. ex DC.)
 Seem.

FFBB1:541 (1877), FBI2:734 (1879), IT:352 (1906),
 VFT:63 (1996), TSH:115 (1994), FGIC2:1171(1923)
 Nepal, Bhutan, India, Myanmar, Laos, Vietnam,
 S.China.

The wood is used in the making of musical
 instruments and matchsticks. Trunk and root bark
 are used medicinally. The tree is often planted as
 an ornamental or shade giver.

460 *Trevesia palmata* (Roxb. ex Lindl.) Vis.

Gastonia palmata Roxb., *Gillibertia palmata* DC.
 FFBB1:539 (1877), FBI2:732 (1879), IT:353 (1906),
 FGIC2:1180 (1923), FBI2:732 (1879)
 India, Nepal, Bhutan, Bangladesh, Myanmar,
 China, Laos, Cambodia, Vietnam.

The flowers are edible. The stem and leaf are
 believed to cure venereal disease, and when
 boiled in water give a solution with which
 venereal sores are cleaned. The leaves are used
 as animal fodder.

461 *Trevesia lateospina* Judd

endemic to Thailand.

462 *Brassaiaopsis* genus. 5 species in NT.

B. hainla (Buch.-Ham.) ex D.Don
B. palmata (Roxb.) Kurz, *B. calcarea* Craib
 FFBB1:537 (1877), FBI2:735 (1879), IT:352
 (1906), WTM:167 (1988)

B. glomerulata (Bl.) Regel
 DEPMP:357 (1935), TFM3:19 (1978)
 India, Nepal, China, Vietnam, Malay
 Peninsula, Sumatra, Java.

B. ciliata Dunn
 Nepal, India, Myanmar, China.

B. griffithii C.B. Clarke
 India, Nepal, Myanmar, Yunnan.

B. ficifolia Dunn

ALANGIACEAE

BL 1/2 (1935), FCLV8 (1968)

463 *Alangium salvifolium* (L.f.) Wang.
ssp. *hexapetalum* (Lam.) Wang.

A. hexapetalum Roxb., *A. sundanum* Miq., *A. lamarckii* Thwaites

๑๙๗4:34 (1997), DEPMP:82 (1935), WI1:42 (1948),
มลป:194 (1983), PR5/3:58 (1998), IT:354 (1906),
FJ2:160 (1965), BL1/2:250 (1935), MPSRG:40
(1992), FGIC2:1185 (1923), FBI2:741 (1879)

Sri Lanka, India, Myanmar, S.China, N.Vietnam,
throughout Malesia.

The timber is heavy and close grained, used for
carvings, inlays, pestles, oil mills and cattle bells.
The wood is used medicinally for haemorrhoids,
piles and as a general tonic. The root bark is used
to induce vomiting, for skin diseases, fever and
as a purgative. The stem bark has medicinal value
but can be fatal if not administered correctly. In
small doses it lowers the heart rate, produces
irregular respiration & increases intestinal
movement. It has been used for asthma,
indigestion & diarrhoea. A poultice of the leaves
is applied externally for rheumatic pains. The fruit
is edible but astringent, used medicinally as a
carminative & vermifuge (!)

464 *Alangium barbatum* (R. Br.) Baill.

Marlea barbata R.Br.

IT:355 (1906)

Assam, Bhutan, Myanmar.

465 *Alangium kurzii* Craib

A. begoniaefolium Ridl., *A. chinense* Evrard,
Marlea tomentosa Hassk., *A. begonifolium*
(Roxb.) Bail., *A. decapetalum* Kurz,
A. octopetalum Blanco, *A. tomentosum* Lam.

FFBB1:543 (1877), FJ2:160 (1965), TFSS1: (1995),
TFM1:58 (1972), BL1/2:262 (1935), FFBB1:545
(1877), IT:355 (1906)

India, Vietnam, China, Philippines.

The timber is soft & readily attacked by insects,
used mostly for temporary household implements
& boxes.

466 *Alangium chinense* (Lour.) Rehd.

Marlea begoniaefolia Roxb.

๑๙๗4:33 (1997), HKT:69 (1988), PR5/3:57 (1998),
FJ2:160 (1965), BL1/2:255 (1935), FFBB1:544

(1877), FGIC2:1187 (1923)

Assam, Bangladesh, Myanmar, China, Vietnam,
Laos, Sumatra, Java, Phillipines.

The leaves are used as feedstock for domestic
animals. The wood is soft & non durable but is
used for cheap furniture. The bark & roots have
medicinal properties.

CORNACEAE (Nyssaceae)

FCLV8 (1968), TFB10 (1977 - *Nyssa*), FT2/4
(1981 - *Nyssa*)

467 *Nyssa javanica* (Bl.) Wang.

N. arborea (Bl.) Koord., *N. bifida* Craib, *N.*
sessiliflora Hook. f. & Th., *Daphniphylopsis*
capitata Kurz

FFBB1:240 (1877), TFSS1:255 (1995), FJ2:402
(1965), TFM1:346 (1972), PR5/3:411 (1998),
TFB10:40 (1977), FCLV8:8 (1968), FGIC2:1196
(1923), FBI2:839 (1879), TFB10:40 (1977), FT2/
4:402 (1981)

Sikkim, Assam, Myanmar, S.China, Laos, Vietnam,
Malay Peninsula (rare), Sumatra, Java, Borneo
(rare).

The timber is heavy, sometimes used for local
construction. The fruits (aril) are cooked in syrup
and eaten.

468 *Mastixia euonymoides* Prain

IT:356 (1906), FGIC2:1194(1923), BL23:51 (1976)
Upper Myanmar.

CAPRIOLIACEAE

469 *Viburnum inopinatum* Craib

V.sambucinum Hoss.

FGIC3:10 (1922)

The flowers are used in Buddhist ceremonies.

470 *Viburnum cylindricum* Ham. ex D. Don

V. coriaceum Bl.

TSH:119 (1994), FGIC3:8 (1922), FBI3:5 (1880)

The stem and root are used as a general tonic.

471 *Viburnum foetidum* Wall.

FGIC3:6 (1922), FBI3:4 (1880)

472 *Sambucus javanica* Rienw. ex Bl.

S. chinensis Lind.

๑๙๗5:162 (1998), FGIC3:2 (1922), FBI3:2 (1880),
WTM:205 (1988)

India, Java, Phillipines, Sulawesi, Taiwan & Japan.

473 *Sambucus simpsonii* Réhd.

S. canadensis

ရွှေပိမ္မ:163 (1998), WTM:205 (1988)

Introduced from Mexico.

RUBIACEAE

TFB9 (1975), NRBGE16 (1932- *Wendland*

BL24b (1978 - *Mitragyna*)

474 *Meynia* genus

475 *Mycetia* genus

M. chasalioides (Craib) Craib

M. rivicola Craib

M. longifolia (G. Don) K. Sch.

Edible vegetable.

476 *Hyptianthera* genus

H. bracteata Craib

H. stricta (Willd.) Wight & Arn.

477 *Lasianthus* genus

L. hookeri Cl. ex Hk. f.

FGIC3:389 (1924)

L. kurzii Hk. f.

L. stercorarius Kurz

FGIC3:381(1924), FBI3:183 (1880),

FFBB2:31 (1877)

478 *Hymenodictyon* genus

H. orixense (Roxb.) Mabb.

H. excelsum (Roxb.) Wall.

ရွှေပိမ္မ:12 (1975)

The bark wood and root are used for relieving thirst.

479 *Psychotria* genus

P. monticola Kurz

P. ophioxylodes Wall.

480 *Haldina cordifolia* (Roxb.) Rids.

Adina cordifolia (Roxb.) Hook.f., *Nauclea cordifolia* Roxb.

DIFME:98 (1991), PR5/3:278 (1998), SCTB:6 (1980), IT:368 (1906), FGIC3:58 (1922), FBI3:24 (1880), FFBB2:66 (1877), ရွှေပိမ္မ:6 (1975)

Sri Lanka, Myanmar, Indo-China, S.China, Malay Peninsula (rare).

The timber is used for house construction, interior

carpentry, furniture, tools & fine turnery. It is said to be resistant to acid. The leaves are used to cure cough, cold and headache. The bark has antiseptic properties & is prescribed for infected sores & fever.

481 *Anthocephalus chinensis* (Lmk.) A. Rich. ex Walp.

A. cadamba (Roxb.) Miq., *A. indicus* Rich, *Nauclea cadamba* Roxb., *Sarcocephalus cadamba* Kurz

DIFME:24 (1991), IT:367 (1906), ရွှေပိမ္မ:36 (1996), WTM:624 (1988), FGIC3:32 (1922), FBI3:231 (1880), ရွှေပိမ္မ:2 (1975)

India, SE. Asia & Malaysia.

The timber is used for general purposes and light construction work, but is also used for symbolic sculptures of Vishnu on temples. The bark is used for treating uterine complaints, blood diseases, dysentery and leprosy, and is also used in anti-fertility. The fruits are edible.

482 *Nauclea orientalis* (L.) L.

N. coadunata Roxb. ex J.E. Smith, *Sarcocephalus cordatus* Miq., *S. undulatus* Miq., *S. annamensis* Dub. et Eberh.

FGIC3:27 (1922), FBI3:22 (1880), FFBB2:63 (1877), ရွှေပိမ္မ:40 (1983), PR5/3:394 (1998), IT:367 (1906), ရွှေပိမ္မ:4 (1975)

Sri Lanka, India, Myanmar, Indo-China, throughout Malaysia (except Malay Peninsula) to N. Australia.

The timber is too light for construction but is sometimes used for interior work, furniture & toys. It is suitable for veneers & paper pulp. The leaves are used to treat fever. A decoction of the leaves & bark in alcohol is used for cleaning wounds, abdominal pains & cancer. The root bark provides an intense yellow dye. The tree is sometimes planted along river banks to control soil erosion. The fruits are eaten in times of famine.

483 *Mitragyna rotundifolia* (Roxb.) O.K.

M. brunonis Craib, *Nauclea rotundifolia* Roxb., *Stephegyne diversifolia* non auct. (Wall.) Hook.

FGIC3:43 (1922), FBI3:26 (1880), IT:370 (1906), BLb24:65 (1978), ရွှေပိမ္မ:7 (1975)

Assam, Bangladesh, Myanmar, Laos.

484 *Mitragyna hirsuta* Hav.

Paradina hirsuta Pitard

FGIC3:39 (1922), BLb24:59 (1978)

Myanmar?, Laos, Cambodia, Vietnam.

Boiled bark is applied to relieve itching on the skin.

485 *Mitragyna diversifolia* (Wall. ex G. Don) Havil

Nauclea diversifolia Wall., *Stephegyne diversifolia* Hook.f., *S. parviflora* auct. non Roxb. (in FGIC)

BLb24:65 (1978), FGIC3:42 (1922), FBI3:26 (1880), FFBB2:67 (1877)

Myanmar, Yunnan, Laos, Cambodia, Vietnam, Malay Peninsula, Java, Philippines.

486 *Mitragyna parvifolia* Korth.

var. *microphylla* (Kurz) Ridsd.

Nauclea parviflora Pers. var. *microphylla* Kurz, *Stephegyne parviflora* Korth

FFBB2:67 (1877), IT:369 (1906), BLb24:63 (1978)

India (Bengal), Myanmar.

487 *Metadina trichotoma* (Zoll. & Mor.)

Bakh. f.

Adina polycephala Benth., *Nauclea polycephala* Wall.

FGIC3:37 (1922), FBI3:25 (1880), IT:368 (1906), TFM4:374 (1989), PR5/3:373 (1998)

India, Myanmar, Cambodia, Vietnam, Malay Peninsula, Sumatra, Java, Borneo, Philippines.

The timber is easy to work but durable even under water, used for planks, floors, joinery, turnery & tools. An infusion of the bark is used as a general health tonic.

488 *Schizomussaenda dehiscens* (Craib) H.-L.Li.

Rubiaceae of Thailand (Puff, 2005)

489 *Morinda tomentosa* Hey. ex Roth

M. tinctoria Roxb. var. *tomentosa* Hook.

FFBB2:60 (1877), FGIC3:424 (1924), FBI3:156 (1880)

The root bark yields a permanent red, purple or brown dye depending on the mordant used.

490 *Morinda citrifolia* L.

FFBB2:60 (1877), FGIC3:423 (1924), FBI3:155 (1880), DEPMP:1518 (1935), MNJ38 (1984)

India, Myanmar, Indo-China, throughout Malesia to Pacific Islands.

The timber is tough but prone to split. The bark is astringent, used for ague & recurring malarial fever. The leaves, bark and wood produce red or yellow dyes with alum mordants. The pulp of the fruits is used for cleaning the hair & metal

objects. It can be mashed with sugar and taken as a mild laxative. The tree is sometimes intercropped with coffee.

491 *Canthium glabrum* Bl.

C. siamense Pitard, *Plectronia glabra* (Bl.) Benth. & Hook.f. ex Kurz

FFBB2:35 (1877), FGIC3:291,300 (1924), FBI3:133 (1880), IT:385 (1906), WTM:627 (1988), FJ2:320 (1965), TFM4:343 (1989), PR5/3:132 (1998), DEPMP:447 (1935)

Myanmar, Indo-China, Malay Peninsula, Java.

492 *Canthium umbellatum* Wight

FGIC3:294 (1924), FBI3:132 (1880)

493 *Canthium parvifolium* Roxb.

C. horridum Bl., *Plectronia horrida* Kurz, *P. parvifolia* Kurz

FFBB2:36 (1877), FGIC3:297,298 (1924), FBI3:135 (1880)

The leaves are said to be used in black magic.

494 *Vangueria pubescens* Kurz

Meyna pubescens

FFBB2:34 (1877)

The root and stem are made into a tea which is used for muscle pains.

Regarded by some botanists as a synonym of *V. spinosa*.

495 *Vangueria spinosa* Roxb.

Meyna spinosa

FFBB2:33 (1877), FGIC3:301 (1924), FBI3:136 (1880), IT:386 (1906)

NE.India, Myanmar, Java.

496 *Catunaregam* genus

C. spathulifolia Tirv.

C. spinosa (Thunb.) Tirv.

Gardenia spinosa Thunb.,
Randia dumetorum Lam.

MIB8/4:82 (1979), FGIC3:231(1923), FBI3:110 (1880)

The roots are used to treat ear diseases. The boiled fruits induce vomiting.

C. longispina (Roxb. ex Link) Tirv.

C. tomentosa (Bl. ex DC.) Tirv.

fruits edible.

497 *Ceriscoides* genus

see species 507 & 508

498 *Fagerlindia* (Randia) genus

F. plumbea Craib

499 *Wendlandia tinctoria* (Roxb.) DC. ssp. *tinctoria*

FFBB2:74 (1877), IT:374 (1906), NRBGE16:264 (1932), *ฉศ*W3:137 (1996), TFM4:425 (1989), TSH:119 (1994), *ฉศ*W3:226 (1996), FBI3:38,39 (1880), FGIC3:68,69 (1922)

Nepal, Sikkim, Bhutan, Myanmar.

ssp. *floribunda*

W.floribunda Craib, *W.glabrata* DC. var. *floribunda* Craib

Myanmar, Yunnan?

ssp. *orientalis*

NE.India, Myanmar, Yunnan, Indo-China.

500 *Wendlandia scabra* Kurz

W. paniculata (Roxb.) DC. ssp. *scabra* (Kurz) Cowan

FFBB2:73 (1877), IT:374 (1906), NRBGE16: (1932) Myanmar.

501 *Pavetta indica* L.

Ixora pavetta Roxb., *P.petiolaris* Wall.

TFB:74, WTM:644 (1988), DEPMP:1707 (1935), MPP:924 (1978), RSN37 (1934), IT:387 (1906), FGIC3:331 (1924), FBI3:150 (1880)

Sri Lanka, India, S.China, Taiwan, Indo-China, Malasia to Phillipines, Melanesia & N.Australia.

Leaves and roots are used in poulticing boils, haemorrhoids & obstinate itching. A decoction of the roots is used internally for viscera obstructions, as a diuretic and purgative. A lotion of the leaves is good for healing nose ulcers. An infusion of the flower is used as a cosmetic after bathing.

502 *Ixora kerrii* Craib

FGIC3:326 (1924)

503 *Tarennoidea wallichii* (Hook.f.) Trv. & Sastre

Randia wallichii Hk. f., *Tarenna incerta* Koord.& Val., *Tarenna disperma* Pitard, *Webera disperma* Hook.

FGIC3:208,241 (1923), FBI3:102,113 (1880), MIB8/4:90 (1979), PR5/3:547 (1998), IT:383 (1906)

India, Myanmar, Indo-China, S.China, Java, Phillipines.

The timber is used for housebuilding (cultivated for this purpose in Java).

NB. *Tarenna wallichii* (Hook.f) Ridl. is not a synonym of *Tarennoidea wallichii*.

504 *Tarenna vanprukii* Craib var. *vanprukii*

Tarenna collinsae Craib

FGIC3:218 (1923)

505 *Gardenia sootepensis* Hutch.

*ฉศ*W2:80 (1995), FGIC3:253 (1923)

506 *Gardenia obtusifolia* Roxb. ex Kurz

FFBB2:42 (1877), IT:379 (1906), *ฉศ*W3:226 (1983), FGIC3:256 (1923), FBI3:116 (1880), *ฉศ*W3:10 (1975) Myanmar.

The sapwood is pale brown and very soft. It yields a fine pellucid yellow resin.

507 *Ceriscoides sessilifolia* (Wall. ex Kurz) Tirv.

Gardenia sessiliflora Wall. ex Kurz

FFBB2:40 (1877), FGIC3:261 (1923), FBI3:119 (1880), IT:380 (1906), MIB8/4:85 (1979) Myanmar.

508 *Ceriscoides turgida* (Roxb.) Turv.

Gardenia montana Roxb., *G. turgida* Roxb.

FFBB2:41 (1877), IT:380 (1906), *ฉศ*W3:23(1983), MIB8/4:82 (1979)

India, Myanmar.

The wood is used for household furniture. The fruits are edible. The roots are believed to have antifertility properties & are also used for people who have been bitten by rabid dogs. The leaves are administered to wounds. The flowers are eaten to kill off intestinal worms.

509 *Rothmannia sootepensis* (Craib) Brem.

Randia sootepensis Craib

FGIC3:230 (1923)

COMPOSITAE (Asteraceae)

BNSMT (1997- *Vernonia*)

510 *Gochnatia decora* (Kurz) Cabr.

Leucomeris decora Kurz

FFBB2:78 (1877), IT:400 (1906)

Myanmar, Yunnan.

511 *Vernonia volkameriifolia* DC.

V. acuminata DC

FFBB2:79 (1877), IT:399 (1906), BNSMT23:163 (1997), TSH:119 (1994), FGIC3:471 (1924), FBI3:240 (1880)

ssp. *siamica* (Hoss.) H. Koyama in Myanmar, Yunnan, N.Vietnam.

ssp. *volkameriifolia* in E.Nepal, NE.India, Bhutan.

512 *Vernonia parishii* Hook.

IT:395 (1906), BNSMT23:163 (1997), FGIC3:447 (1924), FBI3:240 (1880)

India, Myanmar, Yunnan, Laos.

513 *Vernonia arborea* Buch.-Ham.

V. javanica DC, *V. wallichii* Ridl.

IT:399 (1906), BNSMT23:161 (1997), TFM4:70 (1989), FFBB2:80 (1877), PR5/3:575 (1998), FGIC3:466 (1924)

India, Sri Lanka, Indo-China, S.China, Malesia.

ERICACEAE

BLS4 (1958 - *Rhododendron*)

514 *Vaccinium sprengelii* (D. Don) Sleum.

V. exaristatum Kurz, *V. bancanum* Miq., *Agapetes obovata* Hook. f.

FFBB2:91 (1877), IT:407 (1906), FBI3:447,454 (1881), SFT21:79 (1963), DFPT:817 (1997)

SE.Tibet, S.China, Assam, Myanmar, Laos, Cambodia, Vietnam.

515 *Vaccinium apricum* Flet.

516 *Craibiodendron stellatum* (Pierre) W.W. Sm.

C. shanicum Sm., *Schima stellata* Pierre ex Lanes.

SFT21:80 (1963), ឧត្ត័្ប3:62 (1996), FGIC1:352 (1910), FGIC3:729 (1930)

Myanmar, Laos, Cambodia.

The wood is good firewood. The bark and sap are incorporated into alcoholic drinks.

517 *Lyonia ovalifolia* (Wall.) Druce

Andromeda ovalifolia Wall., *Pieris ovalifolia* (Wall.) D.Don

DIFME:120 (1991), SFT21:80 (1963), VFT:178 (1996), TFM3: 99 (1978), FFBB2:92 (1877), IT:409 (1906), FGIC3:725 (1930), FBI3:460 (1881)

Himalayas from Kashmir to Assam, Myanmar, Laos, Cambodia, Vietnam, S.China, Taiwan, Malay Peninsula.

The young leaves have insecticidal properties but the mature leaves & fruits are used medicinally as a health tonic. The leaves & stem are used for boils, pimples & skin eruptions.

518 *Rhododendron microphyton* Fran.

BLS4:49 (1958), ឧត្ត័្ប5:160 (1998)

Yunnan.

519 *Rhododendron ludwigianum* Hoss.

SFT21:80 (1963), BLS4:45 (1958), FGIC3:739 (1930), ឧត្ត័្ប4:108 (1997)

Endemic to Northern Thailand.

520 *Rhododendron vietchianum* Hk.

R.formosum Kurz (*non* Wall.), *R.smilesii* Hutch.

SFT21:81 (1963), BLS4:46 (1958), FGIC3:740,741 (1930), IT:411 (1906), FFBB2:94 (1877), FBI3:473 (1881),

Assam, Myanmar, Laos, Yunnan.

521 *Rhododendron molumainense* Hk.

R. oxyphyllum Franch., *R. siamensis* Diels

SFT21:81 (1963), BLS4:58 (1958), FGIC3:734 (1930), TFM3:102 (1978), IT:412 (1906), FFBB2:94 (1877), FBI3:463 (1881)

Myanmar, Cambodia, Vietnam, S.China, Hong Kong, N.Malay Peninsula.

522 *Rhododendron arboreum* Sm. var. *delavayi* (Franch) Chamb.

R. delavayi Franch

BLS4:51 (1958), ឧត្ត័្ប4:107 (1997)

Assam, Myanmar, Annam.

var. *arboreum*

BLS4:51 (1958), RUPNI:216 (1997), TSNH:240 (1990), TSH:94 (1994), FFBB2:93 (1877)

Nepal, N.India, Bhutan.

In the Himalayas, the wood is used for tool handles & gunstocks as well as for charcoal. The flowers have religious significance.

523 *Rhododendron surasianum* Balf. & Craib

BLS4:46 (1958), FGIC3:742 (1930)

Endemic to Thailand.

524 *Rhododendron simsii* Planch.

SFT21:81 (1963), BLS4:51 (1958), FGIC3:737 (1930), สผพ4:110 (1997)

N.Laos, S.China, N.Vietnam.

525 *Rhododendron lyi* Levl.

R. formosum Wall. var. *johnstonianum* Brandis,
R. saravanense Dop

SFT21:80 (1963), BLS4:45 (1958), FGIC3:745 (1930)

Assam, Laos, Vietnam, S.China, E.Thailand (Loei), not native in NT.

MYRSINACEAE

NRBGE20 (1948), FT6/2 (1996)

526 *Ardisia corymbifera* Mez

var. *corymbifera*

FT6/2:133 (1996), FGIC3:863 (1930), FBI3: (1882)
Vietnam, China.

527 *Ardisia crenata* Sims var. *crenata*

A. crispa A. DC.

FT6/2:135 (1996), FGIC3:862 (1930), FBI3:524 (1882), VHMLT (1996), TFM4:270 (1989)

India, Myanmar, Vietnam, S. China, Japan, Phillipines, Malay Peninsula.

528 *Ardisia attenuata* Wall. ex A. DC.

A. garrettii Flet.

FT6/2:129 (1996), FFBB2:109 (1877), FBI13: (1882)
Myanmar, China, Vietnam.

529 *Ardisia kerrii* Craib

FT6/2:89 (1996), FGIC3:824 (1930)

Endemic to Thailand

530 *Ardisia quinqueгона* Bl.

FT6/2:91 (1996), FGIC3:826 (1930)

China, Vietnam.

531 *Ardisia polycephala* Wall. ex A.DC.

A. arborens auct. non Wall. ex A.DC. (in FSE)

FT6/2:131 (1996), FFBB2:109 (1877), IT:148 (1906), FBI3:529 (1882)

Myanmar, S.China, Vietnam.

532 *Ardisia colorata* Roxb.

A. andamanica auct. non Kurz (in FSE),
A. complanata Wall., *A. eglandulosa* Fletch.,
A. anceps Wall.

FT6/2:101 (1996), FGIC3:830 (1930), WTM:568 (1988), FBI3:520 (1882), DEPMP:220 (1935), TFM4:276 (1989), IT:419 (1906), FFBB2:107 (1877)
India, Myanmar, Cambodia, Laos, Vietnam, Malay Peninsula, Java.

533 *Ardisia nervosa* Flet.

FT6/2:93 (1996)

Endemic to Thailand

534 *Ardisia virens* Kurz

A. lenticellata Fletch.

FT6/2:134 (1996), FGIC3:868 (1930), FBI3: (1882), TFM4:271 (1989), IT:420 (1906), FFBB2: (1877)

Assam, Myanmar, Laos, Vietnam, S.China, Malay Peninsula.

535 *Rapanea yunnanensis* Mez.

R. capitellata auct. non Mez. (in FSE),
R. subpedicellata Fletch.

FT6/2:167 (1996)

Vietnam, China.

536 *Maesa perlarius* (Lour.) Merr.

M. sinensis A.DC., *M. tonkinensis* Mez.

FT6/2:173 (1996), FGIC3:776 (1930)

China, Vietnam.

537 *Maesa ramentacea* (Roxb.) A. DC.

IT:414 (1906), FFBB2:99 (1877), FT6/2:171 (1996), FGIC3:768 (1930), FBI3:508 (1882), DIFME:121 (1991), WTM:569 (1988), DEPMP:1414 (1935), TFM4:283 (1989), สผพ:146 (1997)

India, Myanmar, S.China, Indo-China, Malaysia.

The shoots and leaves are edible as vegetables. The leaf is used as a wound-dressing, either fresh or as a dry powder.

538 *Maesa paniculata* A. DC.

FT6/2:171 (1996), FFBB2:99 (1877), FBI3:509 (1882), IT:414 (1906)

Myanmar.

539 *Maesa permollis* Kurz

Maesa mollissima Kurz (non Wall.)

FT6/2:170 (1996), FGIC3:768 (1930), FBI3:510 (1882), FFBB2:100 (1877), IT:415 (1906)

Myanmar, Vietnam, China, Laos.

540 *Maesa glomerata* K. Larsen & C.M. Hu
FT6/2:170 (1996), NJB11:78 (1991)
Endemic to Thailand.

541 *Maesa montana* A. DC.
M. indica auct. non A. DC. (in FFBB)
FT6/2:175 (1996), FFBB2:99 (1877), FBI3:505 (1882)
India, Myanmar, China, Laos, Vietnam.
The roots are used as a tonic after child birth.
They are boiled in a solution with guava fruits.
The roots, stems & flowers are used for colds,
stomach ache and body pain, also for dispelling
intestinal worms. The fruits are edible.

542 *Maesa indica* (Roxb.) A. DC.
M. montana auct. non A. DC. (in FSE)
FT6/2:175 (1996), IT:414 (1906), FTSCH:51 (1995)
India, Myanmar, China, Vietnam.

SAPOTACEAE (inc. **Sarcospermataceae**)
TFB27 (1999), FCLV3 (1963), GS (1991), BL7/
1b (1952 - *Sarcosperma*), BL9/1 (1958 - *Payena*)

543 *Payena* genus: 2 species in NT.

P. lanceolata Ridl.
BL9/1:128 (1958), FGIC3:909 (1930),
TFM1:430 (1978), TFB27:156 (1999)
Malay Peninsula, Sumatra.

P. lucida (Don) DC.
P. paralleloneura Kurz, *P. punctata* Fletch.
BL9/1:11 (1958), FBI3:548 (1882), IT:427
(1906), TFM1:433 (1978), TFB27:156 (1999),
GS: (1991)
Myanmar, Malay Peninsula, Andaman
Islands, Sumatra, Borneo.

544 *Pouteria* genus:

P. grandifolia (Wall.) Baehni
Planchonella grandifolia (Wall.) Pierre.,
Planchonella kerrii Flet.,
Sideroxylon grandifolium Wall.
TFB27:158 (1999), BL8:482 (1957),
FFBB2:117 (1877), FBI3:536 (1882)
Assam, Myanmar, Cambodia.

545 *Palaquium* genus 2 species in NT.

P. obovatum (Griff.) Engl.
P. punctata Flet., *Isonandra obovata* Griff.,
Dischopsis obovata C.B. Clarke
FFBB2:120 (1877), FBI3:542 (1882), FGIC3:

899 (1930), BL10:453 (1960), TFB27:153
(1999), FCLV3:51 (1963), GS:151 (1991),
TFM1:423 (1972), IT:425 (1906), WTM:695
(1988), มคพ2:64 (1975)
S. Myanmar, Indo-China, N. Malay Peninsula.

The stem produces latex, which is used for
making golf balls and embedding cable and
chemical equipment. The wood is suitable
for general carpentry. The white latex from
the bark is used in sweet-making.

P. garrettii Flet.
TFB27:151 (1999), BL10:544 (1960)
Endemic to Thailand.

546 *Xantolis tomentosa*

547a *Xantolis cambodiana* (Pierre ex
Dubard) Royen
Planchonella cambodiana Pierre, *Sideroxylon*
camdodianum (Pierre ex Dubard) var. *thorelii*
Lec.
FGIC3:894 (1930), FCLV3:76 (1963), BL8:228
(1957), TFB27:161 (1999)

The timber is used for construction. The ripe
fruits are edible. A decoction of the wood, roots
& leaves is used to stimulate the flow of breast
milk.

547b *Xantolis burmanica* (Collett & Hemsl.)
Royen
Planchonella burmanica (Collett & Hemsl.) Lam.
P. punctata Flet., *P. lenticellata* Flet.
BL8:223 (1957), TFB27:160 (1999)

548 *Sarcosperma arboreum* Bth.
FBI3:535 (1882), TSH:118 (1994), IT:427 (1906),
BL7/1b:150 (1952)
Sikkim, Assam, N. Myanmar, S. China.

549 *Sarcosperma kachinense* (King &
Prain) Exell var. *kachinense*
S. siamense Fletch.
BL7/1b:151 (1952)
N. Myanmar, S. China.

EEENACEAE

TFB11 (1978), FT2/4 (1981)

550 *Diospyros ferrea* (Willd.) Bakh.
var. *littorea* (R.Br.) Bakh.
Maba buxifolia (Rottb.) Juss

FT2/4:295 (1981), WTM:242 (1988), TFM3:71 (1978), SFT46:523 (1968)

India, Myanmar, Cambodia, Laos, Philippines, Malay Peninsula, Indonesia, Australia.

The wood is used for cabinet work. Fruits edible?

551 *Diospyros variegata* Kurz.

FT2/4:369 (1981), FFBB2:137 (1877), FGIC3:925 (1930)

India, Myanmar, Vietnam.

The timber is used for carving and cabinet work.

552 *Diospyros pilosanthera* Blanco

D. helferi Clarke, *D. polyalthioides* Korth. ex Hiern

FT2/4:357 (1981), FBI3:539 (1882), FGIC3:970 (1930)

Cambodia, Vietnam, Malay Peninsula, Indonesia, Philippines.

553 *Diospyros dictyoneura* Hiern

D. brachiata King & Gamble

WTM:241 (1988), FT2/4:373 (1981)

Myanmar, Malay Peninsula, Indonesia.

The fruits produce dye used to colour nets and clothes. The wood is used for some construction purposes.

554 *Diospyros frutescens* Bl.

D. curtisii King & Gamble, *D. cymosa* Ridl.,

D. kunstleri K. & G.

FT2/4:313 (1981), TFM3:73 (1978)

Malay Peninsula, Indonesia.

555 *Diospyros malabarica* (Desr.) Kostel. var *siamensis* (Hochr.) Pengklai

D. siamensis Hochr., *D. embryopteris* Pers. var.

siamensis (Hochr.) Lec., *D. peregrina* Guerke

FT2/4:329 (1981), FGIC3:958 (1930), WTM:242

(1988), FBI3:554 (1882), TFM3:77 (1978), PR3:70

(1991), DEPMP:847 (1935)

Myanmar, Laos, Cambodia.

The timber is used for cabinet work. The juice of the young fruits is used medicinally for mouth ulcers, fever, diarrhoea, dysentery, to dispel intestinal worms & as a general tonic. They yield a brown dye used for clothes, nets and leather. The ripe fruits are edible but not tasty. The gum from the fruits is used to preserve the bottom of boats & as a glue in book binding.

556 *Diospyros rhodocalyx* Kurz

D. finetii Lec.

FT2/4:334 (1981), อสพ4:61 (1997), FFBB2:133 (1877)
Myanmar, Laos, Vietnam.

The timber is good for tool handles and furniture. The young fruits are used to prepare a dye for nets and fabrics, but they are edible when ripe.

557 *Diospyros glandulosa* Lace

FT2/4:339 (1981), อสพ1:50 (1995), FGIC3:964 (1930)

India, Myanmar, Laos

The timber is used for ornamental carvings & cabinet work. The ripe fruits are edible.

558 *Diospyros ehretioides* Wall. ex G. Don

D. harmandii Lec., *D. putii* Fletch.

FT2/4:319 (1981), อสพ1:49 (1995), FBI3:559

(1882), VFT:152 (1996), มลป:150 (1983), VHMLT (1997), FFBB2:129 (1877), FGIC3:925 (1930), IT:432 (1906), SFT46:523 (1968)

Myanmar, Cambodia, Laos?, Vietnam?

The timber is fine grained & durable but rarely straight. It is used for house-building & agricultural tools. A poison can be extracted from the fruits that will kill fish. The wood and roots are boiled in water and drunk in cases of fever.

559 *Diospyros mollis* Griff.

FT2/4:310 (1981), อสพ2:72 (1995), มลป: (1983), PR3:70 (1991), FFBB2:130 (1877), FGIC3:941 (1930), MSRG:102 (1992), IT:436 (1906), DEPMP:846 (1935)

Myanmar, Cambodia, Laos.

The timber is the heaviest of any native Thai species (1300kg/m³). It is used for carving, musical instruments, tools & furniture. The bark is used to preserve alcoholic beverages & as a fish poison. The fruits are used for dyeing clothes and fabric black. They are also used as a medicine against intestinal worms but may have toxic side effects.

560 *Diospyros dumetorum* W.W. Sm.

D. striata Fletch.

FT2/4:337 (1981)

China (Yunnan).

561 *Diospyros montana* Roxb.

D. calcarea Fletch., *D. cordifolia* Roxb.

FT2/4:308 (1981), DIFME:76 (1991), FGIC3:940 (1930), TFM3:79 (1978), FT2/4: (1981), FFBB2:130 (1877), IT:431 (1906), DEPMP:846 (1935)

Sri Lanka, India, Myanmar, Hainan, N. Malay Peninsula, Java, Lesser Sunda Islands, Sulawesi,

Philippines (Luzon) & N.Australia.

The timber is strong but not durable. It is valued for carving & cabinet work. The bark is used to heal cracks in the feet, for jaundice, vomiting & delirium due to high fever. The young leaves are eaten as a vegetable. The fruits sometimes reported as edible but are also used as a fish poison.

562 *Diospyros undulata* Wall. ex G. Don
var. *cratericalyx* (Craib) Bakh.

D. cratericalyx Craib

FFBB2:137 (1877), IT:433 (1906), FT2/4:355 (1981),
FBI3:568 (1882), TFM3:91 (1978)

Myanmar, Andaman Islands, Malay Peninsula,
Philippines (var. *undulata* restricted to Sri Lanka).

The timber is used for general construction and cabinet work.

Note: no variety given for all references except FT.

563 *Diospyros martabanica* Clarke

D. eugenii Lec., *Gunisanthus mollis* Kurz

FFBB2:126 (1877), IT:436 (1906), FT2/4:371 (1981),
FFBB2:126 (1977), FBI3:554 (1882), TFM3: (1978)

India, Myanmar, Laos, Vietnam, (Malay Peninsula?)

The timber is red-brown & quite heavy but readily attached by fungi. The fruits are used as a dye.

564 *Diospyros coactanea* Flet.

FT2/4:385 (1981)

Endemic to Thailand.

565 *Diospyros dasyphylla* Kurz

D. mangifica Lec.

FT2/4:349 (1981), FBI3:554 (1882), FFBB2:138
(1877), IT:436 (1906), FGIC3:942,949 (1930)

India, Myanmar, Laos.

The timber is used for construction. The ripe fruits are edible - they have an astringent and sweet taste.

SYMPLOCACEAE

FT2/4 (1981), FCLV16 (1977)

566 *Symplocos lucida* (Thunb.) Sieb. & Zucc.

S. theaeifolia Buch.-Ham ex D.Don, *S. japonica* DC.,
Laurus lucida Thunb.

PR3:115 (1991), FT2/4:460 (1981), PR5/3:546
(1998), FFBB2:143 (1877), FCLV16:46 (1977)

N.India., N.Myanmar, Indo-China, China, Hainan,

Ryukyu Islands, Taiwan, throughout Malesia
except Borneo, Moluccas & New Guinea.

567 *Symplocos longifolia* Fletcher

S. caryophylloides auct. non Zoll. (in FSE)

FT2/4:459 (1981), FCLV16:46 (1977),

FGIC3:997(1933)

Cambodia, Laos, S.Vietnam.

568 *Symplocos sumuntia* B.-H. ex D. Don

S. caudata Wall. ex D.Don

FT2/4:463 (1981), TFM3:274 (1978), IT:439 (1906)

India, Myanmar, Cambodia, Laos, Vietnam, Malay
Peninsula (rare), Hainan, Taiwan, Korea, Ryukyu
Islands, Japan.

569 *Symplocos dryophylla* Cl.

S. siamensis Brand.

IT:439 (1906), FT2/4:458 (1981), FCLV16:34 (1977)

FBI3:578 (1882)

India, Myanmar, Indo-China, China.

570 *Symplocos hookeri* Cl.

S. sempervirens Flet., *S. chapaensis* Guill.

FBI3:578 (1882), IT:442 (1906), FT2/4:459 (1981),

FCLV16:44 (1977), FGIC3:1027(1933)

India, Cambodia, Laos, Vietnam, China.

571 *Symplocos racemosa* Roxb.

S. impressa Flet., *S. langbianensis* Guill.

DIFME:173 (1991), FFBB2:144 (1877), IT:438 (1906),

FT2/4:462 (1981), FCLV16:58 (1977), FGIC3:1026
(1933)

India, Myanmar, Indo-China, China, Hainan.

The bark yields a red dye, and the timber is used
for furniture making. The roots are used as a
blood purifier & the stem to prevent miscarriage.

572 *Symplocos macrophylla* Wall. ex DC.
ssp. *sulcata* (Kurz) Noot.

S. kerrii Craib, *S. sulcata* Kurz, *S. evrardii* Guill.

FFBB2:145 (1877), IT:440 (1906), FT2/4:460 (1981),

FCLV16:49 (1977), FGIC3:1029 (1933)

India, Myanmar, Indo-China, China.

573 *Symplocos henschelii* (Mor.) Bth. ex Cl.
ssp. *magnifica* (Fletch.) Noot.

Symplocos magnifica Fletch.

FT2/4:451 (1981)

Endemic to N.Thailand, only known from Doi

Inthanon & neighbouring high mountains.

574 *Symplocos cochinchinensis* (Lour.) S. Moore

ssp. *cochinchinensis* var. *cochinchinensis*

S. ferruginea Roxb., *S. javanica* Kurz,
S. angustifolia Guill., *S. harmandii* Guill.,
S. hydrophila Guill., *S. theifolia* auct. non D. Don
(in FGIC)

FT2/4:455 (1981), WTM:718 (1988), VFT:714
(1996), TFM3:269 (1978), PR3:115 (1991), PR5/
3:545 (1998), FFBB2:146 (1877), IT:441 (1906),
FCLV16:26 (1977), FGIC3:998,1005,1007,1008,
1010,1011 (1933)

India, Myanmar, Indo-China, China, Japan, Malay
Peninsula, Java, Borneo, Philippines, New Guinea.

The wood is good for heavier construction work,
like house-posts and frames.

ssp. *laurina* var. *laurina*

S. spicata Roxb., *S. laurina* Wall. ex D. Dunn

India, Sri Lanka, Myanmar, Indo-China, China,
Hainan, Taiwan, throughout Malesia to Solomon
islands, Fiji, Vanatu & NE. Australia.

STYRACACEAE

CLV26 (1992)

575 *Styrax benzoides* Craib

S. benzoides auct. non Dryander (in FSE)

ฉลพ2:122 (1995), DEPMP:2142 (1935),
FCLV26:165 (1992), FGIC3:983 (1933)

Laos, Vietnam.

The timber is soft and used for matchsticks,
crates and paper-pulp. The bark contains an
aromatic resin, which is used in perfumes and
aromatherapy.

576 *Styrax rugosum* Kurz

FFBB2:141 (1877)

577 *Styrax benzoin* Dryander

DEPMP:2143 (1935), FCLV26:162 (1992),
FGIC3:983 (1933), TFM3:263 (1978), FBI3:589
(1882), IT:442 (1906)

India, Myanmar, Cambodia, Laos, Vietnam, Malay
Peninsula, Java, Sumatra, Borneo.

Resin similar to that of *S. benzoides*, used
medicinally for sore throat, coughs, cracked
nipples, skin abrasions & urinary complaints. It
plays an important role in many spiritual
ceremonies.

OLEACEAE

CNSWNH2 (1957)

578 *Fraxinus floribunda* Wall.

Fraxinus urophylla Wall., *Ornus floribunda* Dietr.
IT:443 (1906), TSNH:144 (1990), FGIC3:1065 (1933),
FBI3:605 (1882)

Afghanistan, Pakistan, throughout the Himalayas
to N. Myanmar.

The wood is used for oars, ploughs and carrying
poles, but also for firewood. The leaves are used
as fodder for cattle, and the juice from the stem
has mild laxative properties.

579 *Schrebera swietenoides* Roxb.

ฉลพ4:121 (1997), IT:444 (1906), FGIC3:1061(1933),
FBI3:604 (1882), FFBB2:156 (1877), ๙๙1๗2:111 (1975)
India, Myanmar.

580 *Chionanthus ramiflorus* Roxb.

C. macrophyllus Kurz, *Linociera macrophylla*
Wall., *L. pauciflora* (Wall.) C.B.Cl., *L. ramiflora*
(Roxb.) Wall. ex DC.

WTM:601 (1988), TFM4:289 (1989), FGIC3:1068
(1933), FBI3:610 (1882), FFBB2:159 (1877)

581 *Chionanthus caudifolius* (Ridl.) Kiew

Linociera caudifolia Ridl., *L. caudata* Colt. &
Hemsl., *L. pierrei* Gagnep.

TFM4:287 (1989), FGIC3:1071(1933)
Malay Peninsula.

582 *Chionanthus sutepensis* (Kerr) Kiew

583 *Ligustrum confusum* Dcne.

Olea puberula Ridl.

IT:448 (1906), TFM4:290 (1989), FGIC3:1080 (1933),
FBI3:616 (1882)

S. India, Indo-China, Malay Peninsula.

584 *Olea rosea* Craib

FGIC3:1076 (1933)

585 *Olea oblanceolata* Craib

FGIC3:1076(1933)

586 *Olea salicifolia* Wall. ex G. Don

O. cambodiana Hance, *Linociera cambodiana*
Hance, *Olea dentata* Wall.

FBI3:613 (1882), FGIC3:1067,1075 (1933),
FFBB2:157 (1877)

587 *Olea dioica* Roxb.

FBI3:612 (1882), FFBB2:157 (1877), IT:447 (1906),
FGIC3:1077(1933)

APOCYNACEAE

FT7/1 (1999), RT (1991 - *Tabernaemontana*),
BL22 (1974 - *Alstonia*)

588 *Rauwolfia verticillata* (Lour.) Baill.

R. ophiorrhizoides (Kurz) Kerr, *R. peguana*
Hook. f., *R. perakensis* King & Gamble, *R.*
densiflora (Wall.) Benth. ex Hook. f.,
Tabernaemontana ophiorrhizoides (Kurz) Kurz
FT7/1:54 (1999), TFM2:21 (1973), FFBB2:175
(1877), FGIC3:1188 (1933), WTM:158 (1988)
Sri Lanka, India, Bhutan, Myanmar, China,
Vietnam, Cambodia, Laos, Malaysia, Indonesia,
Philippines.

589 *Carissa spinarum* L.

C. cochinchinensis Pierre ex Pitard, *C. diffusa*
Roxb., *C. laotica* var. *ferruginea* Kerr
FT7/1:11 (1999), IT:455 (1906)

Widespread from Senegal to New Caledonia.

Sri Lanka, India, Bhutan, Myanmar, China,
Vietnam, Cambodia, Laos, Malaysia & Indonesia
to Philippines.

**590 *Hunteria zeylanica* (Retz.) Gard. ex
Thw.**

H. corymbosa Roxb.
FT7/1:24 (1999), FGIC3:1129 (1933), TFM2:16
(1973)

591 *Tabernaemontana* genus: 5 species in NT

FT7/1:27 (1999), RT (1991)

T. corymbosa Roxb. ex Wall.

T. bovina Lour

T. divaricata (L.) R.Br.

T. peduncularis Wall.

T. bufalina Lour.

**592 *Kibatalia macrophylla* (Pierre ex Hua)
Woodson**

Paravallis macrophylla Pierre ex Hua

FT7/1:92 (1999), FGIC3:1180 (1933)

Myanmar, Yunnan, Laos, Cambodia, Vietnam.

593 *Kopsia arborea* Blume

FT7/1:61 (1999), FGIC3:1136 (1933)

China, Vietnam, Malaysia, Indonesia, Philippines,

Australia (Queensland).

594 *Alstonia scholaris* (L.) R. Br.

DIFME:19 (1991), WTM:152 (1988), DEPMP:114
(1935), W11:63 (1948), TFM2:11 (1973), MPP:721
(1978), กล้วย:158 (1983), FT7/1:45 (1999), PS3:146
(1949), BL22:21 (1974), FGIC3:1164 (1933),
FFBB2:183 (1877), MPV:35 (1990), กล้วย:2:40 (1975)

India, Sri Lanka, S.China, throughout SE. Asia &
Malaysia to Queensland, Bismark & Solomon
Islands.

The timber is used for agricultural implements, for
coffins, sword scabbards & as plywood core.
The species name is supposed to derive from its
traditional use for blackboards in schools. A
solution of the crushed leaves is used for
cleaning infected wounds. The bark & latex are
very bitter, yielding a tonic and anti-septic medicine
which is used to treat anaemia, menstrual
disorders, malaria, colic, diarrhoea, dysentery,
acute arthritis, dental caries, and male genital
pains.

595 *Alstonia rostrata* Fischer

A. glaucescens (K. Sch.) Mona., *A. undulifolia*
Koch. & Wong, *Winchia calophylla* A.DC.

FT7/1:44 (1999), PS3:144 (1949), FFBB2:170 (1877)
Myanmar, China, Vietnam, Malay Peninsula,
Sumatra.

596 *Alstonia rupestris* Kerr

FT7/1:45 (1999), PS3:158 (1949)

S.& C.China.

597 *Alstonia macrophylla* Wall. ex G. Don

FT7/1:44 (1999), FGIC3:1162 (1933), BL22:28
(1974), MPP:720 (1978), WTM:151 (1988), TFM2:9
(1973), DEPMP:114 (1935), PS3:164 (1949)

The wood is good for furniture and flooring. The
bark is used to reduce fever & as a general tonic.
It is applied externally as a poultice on sprains &
bruises.

China, Vietnam, Cambodia, Malaysia, Philippines,
Indonesia to New Guinea.

**598 *Holarrhena pubescens* (Buch.-Ham.)
Wall. ex G. Don**

H. antidysenterica (Roth) Wall. ex A. DC.,

H. codaga G.Don

DIFME:103 (1991), กล้วย:4:76 (1997), FT7/1:75
(1999), FBI3:644 (1882), FFBB2:181,182 (1877),
FGIC3:1169 (1933), MPV:201 (1990)

Timber of low quality. The bark is used to treat

amoebic dysentery & other intestinal complaints. It is said to be effective against colds, bronchitis, diarrhoea, gastric ailments, headaches, menstrual problems & to revive the sense of taste. A decoction of the roots in alcohol is used to treat scabies. The flowers are edible & are used as a hair ornament.

E. & S. Africa, India, Nepal, Bangladesh, Myanmar, China, Laos, Cambodia, Vietnam.

599 *Holarrhena curtisii* King & Gamb.

H. densiflora Ridl., *H. similis* Craib

FT7/1:73 (1999); FGIC3:1171, 1172 (1933)

Malaysia, Laos, Cambodia, Vietnam.

600 *Wrightia arborea* (Dennst.) Mabb.

W. mollissima Wall., *W. tomentosa* (Roxb.)

Roem. & Schult.

FT7/1:81 (1999), FFBB2:192 (1877), DIFME:190

(1991), JF12:43 (1974)

India, Sri Lanka, Myanmar, China.

Unspecified part used to treat colic, dysentery, earache, menstrual complaints, tumors & wounds.

Architectural model of Troll.

601 *Wrightia religiosa* (Teyss. Binn.) Bth.

FT7/1:88 (1999), FFBB2:194 (1877), FGIC3:1183

(1993), TFM2:24 (1973)

Myanmar, Vietnam, Cambodia, Malaysia,

Philippines. Widely cultivated elsewhere.

Architectural model of Troll.

602 *Wrightia coccinea* (Roxb.) Sims.

FT7/1:82 (1999), FFBB2:193 (1877)

China, India, Pakistan.

603 *Wrightia pubescens* R. Br.

W. javanica A. DC., *W. tomentosa* var.

chinensis Pierre ex Pitard

FT7/1:86 (1999), TFM2:23 (1973), FGIC3:1186 (1933)

China, throughout SE. Asia & Malesia to NE.

Australia.

also used to cure skin diseases & inflammations, and for weight-loss. The dried root is made into an alcoholic drink. The leaves make an excellent fodder.

LOGANIACEAE (inc. *Strychnaceae*, *Gentianaceae*)

FCLV13 (1972), FT6/3 (1997)

605 *Fagraea ceilanica* Thunb.

F. oblonga King et Gamble, *F. obovata* Wall.,

F. lanceolata Bl.

FT6/3:201 (1997), FCLV13:53 (1972), JF12:15 (1974)

India, Sri Lanka, Myanmar, Laos, Vietnam,

S. China, Malesia.

606 *Fagraea fragrans* Roxb.

FT6/3:198 (1997), FFBB2:205 (1877), FGIC4:177

(1914), WTM:468 (1988), TFM2:273 (1973),

FCLV13:53 (1972)

Andaman Islands, N. India, S. Myanmar, Vietnam, Malesia.

Timber hard & durable, used in house-building & for furniture. Decoctions of the bark are used against fever. The leaves are used for severe diarrhoea. The tree is sometimes planted along roadsides for its dense shade.

607 *Strychnos nux-blanda* Hill

FCLV13:42 (1972), FT6/3:217 (1997)

India, Myanmar, Cambodia, Laos, Vietnam.

608 *Strychnos nux-vomica* L.

FCLV13:40 (1972), FT6/3:218 (1997)

DIFME:172 (1991), DEPMP (1935), FGIC4:164

(1914), VFT:476 (1996), MPP:715 (1978), MPV:365

(1990), FFBB2:166 (1877), FBI4:90 (1883),

JF12:16 (1974)

India, Sri Lanka, Myanmar, Vietnam, Cambodia, Laos, Malay Peninsula.

Wood close-grained, hard & resistant to insects, used for ploughs, cartwheels & cabinet work. The flowers, leaves and seeds contain strychnine & are extremely poisonous. The seeds can be used in small doses as a heart & nerve tonic for paralysis, anaemia & rheumatic pain. Four seeds can kill an adult man so great care must be taken in its administration for medicinal purposes.

NUOLEACEAE

(1972)

asiatica Lour.

IPNI:183 (1997)

618 *Dolichandrone serrulata* (DC.) Seem

Stereospermum serrulata DC.

FFBB2:230 (1877), TFB8:18 (1974), NHBSS33:89 (1985), FCLV22:55 (1985), FT5/1:54 (1987)

Myanmar, Laos, Vietnam.

619 *Dolichandrone columnaris* Santis.

NHBSS33:88 (1985), FCLV22:56 (1985), FT5/1:54 (1987)

Cambodia, S. Vietnam, N. Malay Peninsula.

620 *Radermachera eberhardtii* Dop

TFB31:129 (2003), NHBSS33:71 (1985);

FGIC4:587(1930)

N. Vietnam, China (Guangxi and Yunnan)

621 *Radermachera ignea* (Kurz) Steen.

Mayodendron igneum (Kurz) Kurz, *Spathodea ignea* Kurz

FFBB2:233 (1877), IT:496 (1906), FGIC4:579 (1930), TFB8:8 (1974), NHBSS33:76 (1985), FCLV22:24

(1985), FT5/1:41 (1987), ๑๙๗1:81 (1995)

S. China (Yunnan), Myanmar, Laos, N. Vietnam.

622 *Stereospermum fimbriatum* (Wall. ex G. Don) DC.

S. mekongense Dop.

FFBB2:231 (1877), IT:495 (1906), FGIC4:578 (1930), TFB8:23 (1974), NHBSS33:79 (1985), FCLV22:33

(1985), FT5/1:43 (1987), PR5/3:537 (1998),

TFM3:44 (1978), ๑๙๗2:34 (1975)

Myanmar, Laos, Malay Peninsula, (Sumatra?).

Timber: hard, dark, quite durable even in contact with the ground. Good for posts & beams. The juice from the leaves is extracted for the relief of ear-ache, and (mixed with limes) for soothing skin itchiness. A decoction of the roots is given as a protective medicine after childbirth.

623 *Stereospermum cylindricum* Pierre ex P. Dop

FGIC4:581 (1930), TFB8:22 (1974), NHBSS33:79 (1985), FCLV22:10 (1985), FT5/1:43 (1987)

624 *Stereospermum colais* (B.-H. ex Dillw.) Mabb.

S. chelonoides auct. non (L. f.) DC, *S.*

personatum (Hassk.) Chatterjee, *S. tetragonum*

DC.

India, Sri Lanka, Myanmar, Indo-China, China (Yunnan), Malay Peninsula, Singapore, (Sumatra?)

FFBB2:230 (1877), FGIC4:579 (1930), TFB8:26 (1974), NHBSS33:79 (1985), FCLV22:31 (1985), FT5/1:44 (1987), PR5/3:537 (1998)

The branches and wood are used to relieve burns. The bark relieves stomach ache.

625 *Stereospermum neuranthum* Kurz

S. grandiflorum Cubitt & W.W. Smith, *S. wallichii* Clarke, *Radermachera wallichii* (Clarke)

Chatterjee

FFBB2:230 (1877), IT:495 (1906), FGIC4:582 (1930), TFB8:23 (1974), NHBSS33:77 (1985), FCLV22:29 (1985), FT5/1:45 (1987), ๑๙๗1:89 (1995), ๑๙๗2:36 (1975)

E. India, Myanmar, Laos.

The wood is good quality timber.

626 *Oroxylum indicum* (L.) Kurz

FFBB2:237 (1877), IT:496 (1906), FGIC4:570: (1930), TFB8:5 (1974), NHBSS33:69 (1985), FCLV22:9

(1985), FT5/1:36 (1987), DIFME:135 (1991), ๑๙๗1:70 (1995), WTM:178 (1988), VFT:71 (1996), TFM3:40 (1978), MPV:269 (1990), DEPMP:1617 (1935), TFSS1:38 (1995)

Sri Lanka, India, Myanmar, S. China, Vietnam, Malay Peninsula, Philippines, W. Malesia to Sulawesi & Timor.

The wood is used for matchsticks, and for paper pulp and firewood. The young fruit is edible. The leaf and bark are used to relieve stomach indigestion. They are roasted and applied to the painful area. The bark of the stem and roots also has anti-allergenic properties, used to treat sore throat, asthma, diarrhoea & measles. Fresh bark steeped in alcohol used against skin allergies.

627 *Millingtonia hortensis* L. f.

FFBB2:238 (1877), IT:496 (1906), FGIC4:572 (1930), TFB8:5 (1974), NHBSS33:69 (1985), FCLV22:12 (1985), FT5/1: (1987), ๑๙๗1:62 (1995), TFSS1:38 (1995), TFM:36 (1978), ๑๙๗1:198 (1983), ๑๙๗2:33 (1975)

(India?), S. Myanmar, Cambodia, Laos, Vietnam.

The wood can be used for furniture, the bark for

relief of fever and the roots are used to treat Tuberculosis. The flowers relieve whooping cough & other respiratory problems.

628 *Heterophragma sulfureum* Kurz

H. vestitum P.Dop

FFBB2:235 (1877), IT:494 (1906), FGIC4:596 (1930), TFB8:33 (1974), NHBSS33:82 (1985), FCLV22:46 (1985), FT5/1:57 (1987)

E.Myanmar, Cambodia, Laos.

LABIATAE (MIMENACEAE)

629 *Clerodendrum* genus: 7 species in NT:

***C. colebrookianum* Walp.**

C. glandulosum Colebr. ex Lindl.

IT:507(1906), SFT22 (1963), FGIC4:860 (1932), FBI4:594 (1884)

***C. disparifolium* Bl.**

FBI4: (1884)

***C. fragrans* (Vent.)Willd.**

FGIC4:857(1932), FBI4:589 (1884), MPV:109 (1995), SFT22 (1963)

***C. garrettianum* Craib**

FGIC4:868 (1932), SFT22 (1963)

***C.infortunatum* Gaertn.**

FFBB2:267(1877), IT:507(1906), FGIC4:859 (1932), FBI4:835 (1884)

***C. paniculatum* L.**

FGIC4:864 (1932), FBI4:593 (1884), IT:508 (1906)

***C. villosum* Bl.**

FGIC4:861(1932), FBI4:595 (1884), IT:507 (1906), SFT22 (1963)

630 *Gmelina arborea* Roxb.

Premna arborea Roth., *P.tomentosa* Miq.

FFBB2:264 (1877), IT:509 (1906), FGIC4:843 (1932), FBI4:581 (1884), SFT22 (1963), DIFME:95 (1991), PRT13:7, อลพ3:74 (1996), VFT:740 (1996), มลป:108 (1983), TSNH:146 (1990), SCTB:68 (1980), มฟท2:136 (1975)

Pakistan,Sri Lanka, Andaman Islands, India, Myanmar, Cambodia, Laos, Vietnam, S.China, Malay Peninsula.

The timber is pale & rather light but is fairly durable even under water. It is used for construction, boat-building, boxes, waterbottles, tools & furniture. It is also highly prized for

turnery & carving. The root makes a bitter tonic that is an antidote for poisons & purifies the blood. It is also used for treating gonorrhoea, bladder infections & as a laxative. The leaves are a carminative.

631 *Tectona grandis* L. f.

FFBB2:259 (1877), IT:505 (1906), FGIC4:804 (1932), FBI4:570 (1884), DIFME:176 (1991), DEPMP:2165, อลพ1:92 (1995), WTM:750 (1988), VFT:743 (1996), MPP:803 (1978), มลป:329 (1983), SCTB:19 (1980), มฟท2:135 (1975)

India, Sri Lanka, Myanmar, Cambodia, Laos, Vietnam, Indonesia.

One of the most important of South East Asia's timber trees. The timber was widely used for boats & house-building locally, as well as for ship-building & furniture in Europe and America during the 18th and 19th centuries. It is now used predominantly for expensive furniture. The bark of the roots & the young leaves produce a yellow-brown dye. The seed is a traditional remedy for eye-complaints. A plaster of the wood is used to relieve swellings & headaches. Various parts of the plants are used for urinary complaints, intestinal worms, diabetes, sore throat & menstrual problems.

632 *Callicarpa arborea* Roxb.

C.magna Schauer, *C.tomentosa* auct. non (L.) Murr (in WTM), *C.villosa* Roxb.

FFBB2:274 (1877), IT:511 (1906), FGIC4:792 (1932), FBI4:567 (1884), SFT22 (1963), DIFME:41 (1991), VFT:739 (1996), TFM3:301 (1978), WTM:743 (1988), PR5/3:130 (1998), สพล:56 (2539)

Pakistan, India, Nepal, Myanmar, Cambodia, Laos, Vietnam, S.China, Malay Peninsula, Phillipines, Sumatra, Mantawi Islands, Java, New Guinea.

The timber is fissured and cracks easily. It is normally used only as firewood. The leaves can be used as fodder in times of scarcity.

633 *Callicarpa rubella* Lindl.

FFBB2:274 (1877), FGIC4:796 (1932), FBI4:569 (1884), SFT22 (1963), TFM3:302 (1978)

Pakistan,India, Myanmar, Indo-China, S.China, Hong Kong, Malay Peninsula, (very rare), Sumatra, Kratatoa, Sulawesi.

634 *Premna latifolia* Roxb. var. *latifolia*

P. viburnoides Kurz

FFBB2:261 (1877), IT:511 (1906), FGIC4:808 (1932), FBI4:577 (1884), SFT22 (1963)

Cambodia.

635 *Premna villosa* Cl.

IT:510 (1906), FBI4:573 (1884)

S. India (Nilgiris).

636 *Premna pyramidata* Wall. ex Schauer

P. tomentosa auct. non Willd. (in FFBB)

FFBB2:260 (1877), IT:510 (1906), မြူလီ:332 (1983),
DFPT:815 (1997), မြူလီ2:137 (1975)

Myanmar.

637 *Vitex trifolia* L.f. var. *trifolia*

V. agnus castus L. var. *trifolia* Kurz

FFBB2:269 (1877), IT:504 (1906), FGIC4:834 (1932),
FBI4:583 (1884), DEPMP:2281 (1935), WTM:55
(1988), DIFME:188 (1991)

Used medicinally for asthma, headache &
sprains. Also used as an insect repellent.

638 *Vitex limoniifolia* Wall. ex Kurz

FFBB2:271 (1877), FBI4:584 (1884), FGIC4:822
(1932), SFT22 (1963), DFPT:802 (1997), မြူလီ2:138
(1975)

Myanmar, Indo-China.

639 *Vitex pinnata* L.

V. pubescens Vahl., *V. arborea* Roxb.

FFBB2:271 (1877), IT:504 (1906), FGIC4:824 (1932),
FBI4:585 (1884), WTM:754 (1988), TFM3:311
(1978), DEPMP:2280 (1935), မြူလီ:157 (1983)

The tree is thought to possess protective powers
& is used as a charm against illness. A decoction
of the leaves & bark are drunk as a protective
measure after childbirth. A poultice is applied
externally to wounds & to reduce fever.

640 *Vitex peduncularis* Wall. ex Schauer

V. alata (Roth. & Willd.) Roxb.

FFBB2:272 (1877), IT:505 (1906), FGIC4:838 (1932),
FBI4:587 (1884), SFT22 (1963), DIFME:188 (1991)

Pakistan, India, Nepal, Assam, N. Myanmar,
Bangladesh, Indo-China.

The bark is used for fever, the leaves for
dysentery, eye disorders, muscle pains, & as a
blood purifier. The leaves & fruits are edible.

641 *Vitex glabrata* R. Br.

Vitex leucoxydon (L.f.) Kurz

FFBB2:273 (1877), IT:505 (1906), FGIC4:840 (1932),
FBI4:588 (1884), DFPT:802 (1997)

Assam, Bangladesh, Andaman Islands, Myanmar,
Malay Peninsula, New Guinea.

The wood is used for cart-wheels and furniture.

642 *Vitex vestita* Wall. ex Kurz

FFBB2:272 (1877), IT:505 (1906), FGIC4:839 (1932),
FBI4:587 (1884), SFT22 (1963), WTM:756 (1988),
TFM3:310 (1978)

Assam, N. Myanmar, S. China (Yunnan), Indo-
China, Malay Peninsula, Sumatra, Java, Borneo,
Lesser Sunda Islands.

643 *Vitex canescens* Kurz

FFBB2:270 (1877), IT:504 (1906), FGIC4:837 (1932),
FBI4:586 (1884), DFPT:800 (1997), မြူလီ2:138 (1975)

Assam, N. Myanmar, S. China (Yunnan).

644 *Vitex quinata* (Lour.) Will.

V. heterophylla Roxb.

FGIC4:833 (1932), FBI4:585 (1884), WTM:755
(1988), VFT:746 (1996), TFM3:311 (1978)

Vietnam, Malay Peninsula, (Indonesia?)

MYRISTICACEAE

GBS16 (1958); GBS18/3 (1961 - *Knema*),
GBS27 & 28/1 (1974-75 - *Horsfieldia*); GBS37,
38 & 39 (1984-86 - *Horsfieldia*)

645 *Knema erratica* (Hk. f. & Th.) Sinclair

K. siamensis Warb., *K. yunnanensis* H.H. Hu,
Myristica erratica Hk. f. & Th., *M. longifolia* Wall.
ex Bl. var. *erratica* (Hk. f. & Th.) Hk. f. & Th.
GBS18:205 (1961)

NE. India, Bangladesh, Myanmar, Yunnan.

646 *Knema linifolia* (Roxb.) Warb.

Myristica linifolia Roxb., *M. longifolia* Wall. ex Bl.
GBS18:256 (1961), FFBB2:283 (1877)

NE. India, Bangladesh, Myanmar, Indo-China.

The timber is used for house-building. The juice is
caustic. The sap & smoke often produce sores.

647 *Knema conferta* (King) Warb

Myristica conferta King

FBI5: (1886), GBS16:286 (1958), GBS18:194
(1961), TFM1:335 (1972), PR5/3:318 (1998)

Malay Peninsula, Singapore, Sumatra, Borneo.

648 *Knema globularia* (Lamk.) Warb.

K. corticosa Lour., *K. missionis* (King) Warb,
Myristica globularia Lamk., *M. corticosa* (Lour.)

Hk. f. & Th., *M. sphaerula* Hk. f.

FGIC5/2:105 (1914), FBI5:111 (1886), GBS16:325 (1958), GBS18:214 (1961), FFBB2:284 (1877), TFM1:336 (1972), WTM:564 (1988), PR5/3:319 (1998) Yunnan, S.Myanmar, Indo-China, Malay Peninsula, Singapore, Sumatra, (W.Java, NE.India?)

649 *Knema furfuracea* (Hk. f. et Th.) Warb.

K. pierrei Warb., *K. plumulosa* Miq., *Myristica furfuracea* Hk. f. et Th., *M. longifolia* Wall. ex Bl., *M. dongnaiensis* Pierre

FBI5:112 (1886), FGIC5:105 (1914), GBS16:275 (1958), GBS18:209 (1961), TFM1:318 (1972), WTM:564 (1988), PR5/3:318 (1998)

Indo-China, Malay Peninsula, Sumatra, N.Borneo. The bark is used for sores & pimples.

650 *Knema laurina* (Bl.) Warb.

K. conferta (King) Warb. var. *tonkinensis* Warb., *K. elegans* Pierre, *Myristica laurina* Bl., *M. cantleyi* (Hk. f.) Warb.

FGIC5/2:104 (1914), FBI5:110,112 (1886), GBS16:329 (1958), GBS18:248 (1961), TFM1:338 (1972), PR5/3:319 (1998)

S.Myanmar, Nicobar Islands, Indo-China, Malay Peninsula, Sumatra, W.&C.Java, Borneo.

651 *Knema ciperea* (Poir.) Warb. var. *andamanica* (Warb.) Sinclair

K. glauca Bl. var. *andamanica* Warb., *K. lenta* Pierre ex Warb., *Myristica corticosa* (Lour.) Hk. f. & Th., *M. glaucescens* (Jack) Hk. f. & Th., *M. angustifolia* Roxb.

FGIC5/2:104 (1914), FBI5:111 (1886), GBS18:174 (1961), FFBB2:284 (1877), TFM1:334 (1972)

NE.India, Bangladesh, Andaman Islands, Myanmar, Indo-China.

Note: not included in part 1

652 *Horsfieldia glabra* (Bl.) Warb.

H. amygdalina (Wall.) Warb., *H. thorelii* Lec., *H. tonkinensis* var. *multiracemosa* Lec., *Myristica glabra* Bl., *Myristica amygdalina* Wall.

FGIC5/2:100,102 (1914), GBS16:411 (1958), GBS28/1:35 (1975), FFBB2:283 (1877), FBI5:106 (1886), VFT:559 (1996)

Assam, Bangladesh, Myanmar, Andaman Islands, Yunnan, Indo-China, Malay Peninsula, (rare), Sumatra, Java, Borneo, (localized).

The soft, straight grained wood is used in construction & furniture making.

653 *Horsfieldia kingii* (Hk. f.) Warb.

Myristica kingii Hk. f.

GBS28/1:74 (1975), FBI5:106 (1886)

The kernel of the fruits is used as a substitute for areca nut. The bark gum is good for mouth sores.

654 *Horsfieldia valida* (Miq.) Warb.

GBS28/1:150 (1975)

Yunnan, Sumatra, Borneo, Phillipines, Sulawesi. Not yet reported for N.Thailand.

Lauraceae

RW4(1957), BIBL(1964), RW7(1966), RW8(1970)

655 *Machilus* genus

M. cochinchinensis H.Lec

VFT:398 (1996), FGIC5:124 (1914), RW6:185 (1962)

Laos, Vietnam.

The timber is of good quality, used for construction & furniture.

656 *Actinodaphne* genus

PR5/3:45 (1998), DEPMP:42 (1935)

A. henryi Gamble

KB:265 (1913), FGIC5:128 (1914)

A. montana Gamble

GBS3:415 (1925), KB:312 (1910)

657 *Litsea wightiana* (Wall. ex Nees) Hk. f.

Tetranthera wightiana Wall.

FBI5:177 (1886), IT:539 (1906)

SW.India.

658 *Litsea semecarpifolia* Wall. ex Nees

Tetranthera semecarpifolia Wall.

FBI5:156 (1886), IT:537 (1906)

Nepal, NE.India, Myanmar.

Timber pale yellow-brown, soft.

659 *Litsea firma* Bl.

FBI5:162 (1886), DEPMP:1354 (1935), TFM4:156 (1989), WTM:385 (1988)

Malay Peninsula, Singapore, Sumatra, Borneo, Sulawesi.

660 *Litsea albicans* Kurz

Tetranthera albicans Kurz

FFBB2:303 (1877), IT:538 (1906), FBI5:171 (1886) Myanmar.

661 *Litsea cubeba* (Lour.) Pers. *L. citrata* Bl.

FGIC5:138 (1914), FBI5:155, (1886), DIFME:118 (1991), VFT:387 (1996), HKT:278 (1988), IT:535 (1906)
Nepal, NE.India, Myanmar, China, Laos, Cambodia, Vietnam, (Java?).

The light soft wood is used only as firewood. The bark & roots are taken in powdered form as a pain reliever. The fruits are used as a spice & as a stomach medicine. The oil extracted from the fruits & leaves are used in industry & medicine.

662 *Litsea salicifolia* Nees ex Roxb.

Tetrathera lancifolia Roxb., *T. glauca* Wall.
FBI5:167 (1886), FFBB2:300 (1877), IT:538 (1906)
Myanmar.

663 *Litsea glutinosa* (Lour.) C.B. Rob.

var. *glutinosa*

L. chinensis Lam., *L. multiflora* Bl., *L. sebifera* Bl., *Sebifera glutinosa* Lour.

FGIC5:132 (1914), FBI5:180 (1886), IT:536 (1906), DIFME:118 (1991), DEPMP:1376 (1935), FBI5:158 (1886), TFM4:157 (1989), MPP:325 (1978), HKT:279 (1988)

Nepal, India, Myanmar, S.China, MAP (rare), Java, Borneo.

The timber is used for furniture. An infusion of the wood is used for hair-dressing. The bark is used medicinally for intestinal catarrh, diarrhoea, dysentery, boils, itches, allergies. A poultice of the roots & leaves is applied to wounds & bruises. The roots are effective for increasing menstrual flow. The sweet pulp of the fruits is edible. The oil from the seeds is used for making candles & soap.

664 *Litsea monopetala* (Roxb.) Pers.

L. macrophylla Elmer, *L. polyantha* Juss., *Tetrathera monopetala* Roxb., *T. polyantha* Wall.

FFBB2:299,301 (1877), IT:536 (1906), FGIC5:135 (1914), DIFME:118 (1991), VFT:391 (1996), TFM4:161 (1989), HKT (1988)

Nepal, India, Myanmar, Laos, Vietnam, China, Taiwan, Malay Peninsula, Java.

The timber is used for posts, implements & as a fuel wood. The leaves have an exceptionally high percentage of protein & are a top quality fodder. The oil from the fruits is used medicinally for various skin diseases & for rheumatism. The

bark is astringent, used for sores & ulcers.

665 *Neolitsea cassia* (L.) Kost.

N. zeylanica (Nees) Nees, *Litsea ceylanica* Bl., *L. foliosa* Nees, *L. oblonga* Nees, *L. zeylanica* Nees

FGIC5:142 (1914), FBI5:178 (1886), IT:540 (1906), WTM:386 (1988), TFM4:169 (1989), RW4:242 (1957)

Sri Lanka, SW. & NE. India, Bhutan, Bangladesh, Myanmar, Malay Peninsula, Borneo, Philippines.

666 *Lindera caudata* (Nees) Hook. f.

Daphnidium caudatum Nees

FFBB2:307 (1877), FGIC5:156 (1914), FBI5:184 (1886), IT:541 (1906)

Myanmar.

666 Disused number

668 *Cinnamomum porrectum* (Roxb.) Kosterm.

C. parthenoxylon Meissn., *C. inunctum* Ridl.

FFBB2:289 (1877), IT:534 (1906), WTM:378 (1988), TFM4:128 (1989), DEPMP (1935)

India, S.Myanmar, S.China, Malay Peninsula, W.Malesia.

The bark yields saffrol, used in scenting soap & for a variety of medicinal purposes.

669 *Cinnamomum camphora* (L.) Nees & Eberm.

FGIC5:110 (1914), DEPMP:553 (1935), VFT:365 (1996), HKT:155 (1988), WTM:377 (1988), RUPNI:195 (1997), TSNH:82 (1990), MPV:97 (1990), MPSRG:82 (1992)

N.Vietnam, E.China, Taiwan, S.Japan.

The timber is attractive & resistant to insects. The wood, twigs, roots & leaves yield camphor which is used medicinally for joint pains, insect bites, sore throat, fever, indigestion, intestinal worms, impotence & as a heart stimulant. It is also used industrially for explosives, celluloid & soap. The tree is planted as a shade tree.

670 *Cinnamomum iners* Reinw. ex Bl.

C. paraneuron Miq.

FFBB2:287 (1877), IT:533 (1906), FGIC5:116 (1914), FBI5:130 (1886), VFT:368 (1996), TFM4:126 (1989), MPP:320 (1978), HKT:364 (1983), WTM:377 (1988), DEPMP (1935)

India?, Myanmar, Cambodia, Vietnam, Malay

Peninsula, Indonesia.

The timber is insect resistant, used for aromatic joss sticks. The bark yields an inferior grade of cinnamon spice, used for food flavouring & incense. The roots & leaves are used medicinally for post-childbirth complications, fever & as a poultice for rheumatism. Various parts of the plant are used for flatulence, to relieve intestinal obstructions, urinary complaints & to stimulate sweating.

671 *Cinnamomum caudatum* Nees

FFBB2:289 (1877), IT:534 (1906), FBI5:134 (1886)
Nepal, NE.India, Myanmar.

672 *Cinnamomum verum* Presl.

C. zeylanicum Bl.
FFBB2:287 (1877), IT:533 (1906), FGIC5:112 (1914),
WTM:379 (1988), HKT:158 (1988), TSNH:83 (1990),
DEPMP:552 (1935)
Sri Lanka, SW.India, S.Myanmar.

The bark is the source of commercial cinnamon spice. The leaves are used for coughs whilst the stems & bark are used for diarrhoea, nausea & vomiting.

673 *Phoebe lanceolata* (Nees) Nees

P. ligustrina Nees.
FFBB2:290 (1877), FBI5:141 (1886), IT:532 (1906),
TFM4:175 (1989), FJ2:123 (1965), TSH:117 (1994),
PR5/3:444 (1998)

N.India, Bangladesh, Myanmar, S.China, Indo-China, Malay Peninsula, Java.

The leaves can be used as animal fodder.

674 *Phoebe paniculata* Ness

P. pubescens NE., *P. wightii* Meissn.
FFBB2:290 (1877), FBI5:142 (1886), IT:532 (1906),
ജിഐ:328 (1983)

Nepal, Bangladesh, Andaman Islands, Myanmar.

The timber is pale & heavy but susceptible to fungus attack. However, it has been used for construction of houses & bridges.

675 *Phoebe cathia* (D. Don) Kosterm.

676 *Persea gamblei* (King ex Hook. f.) Kost.
Machilus gamblei King ex Hook. f.
RW6:192 (1962), FBI5:138 (1886), FBI5:860 (1890)

677 *Nothaphoebe umbelliflora* (Bl.) Bl.
FGIC5:119 (1914), TFM4:172 (1989), DEPMP:1532

(1935), FBI5:145 (1886)

Malay Peninsula, Sumatra, Java, Borneo.

678 *Alseodaphne* genus

CAN28 (1973)

Most species have good quality timber, suitable for carving & interior fittings but not for external work.

679 *Cryptocarya pallens* Kost.

C. ferrea Bl., *C. kurzii* Hook.

FGIC5:146 (1914), FFBB2:295 (1877), FBI5:119 (1886), IT:528 (1906), DEPMP:703 (1935), VFT:375 (1996), TFM4:134 (1989)

S.Myanmar, Vietnam.

The timber is hard but not commercially valuable. The bark is poisonous.

680 *Potameia* genus

681 *Beilschmiedia* genus

PROTEACEAE

FT5/1 (1987), FCLV26 (1992)

682 *Helicia nilagirica* Bedd.

H. cochinchinensis auct. non Lour. (in FFBB), *H. erratica* Hook. f.

FT5/1.2 (1987), FFBB2:311 (1877), IT:543 (1906),
DIFME:100 (1991), FBI5:190 (1886), FGIC5:161 (1914), ജിഐ:2:55 (1975)

NE. India, Myanmar, Cambodia, Laos, Vietnam, S. China (Yunnan)

The fruits are reported to be edible in India.

683 *Helicia formosana* Hemsl. var. *oblanceolata* Sleum.

FT5/1:117 (1987), DFPT:912 (1997), ജിഐ:2:55 (1975)
Laos, S.China (Hainan), Taiwan, Vietnam.

684 *Heliciopsis terminalis* (Kurz) Sleum.

Helicia balansae Lec., *Helicia terminalis* Kurz
FT5/1:120 (1987), ജിഐ:1:58 (1995), FFBB2:312 (1877),
IT:543 (1906), FBI5:190 (1886), FGIC5:164 (1914)
NE. India, Myanmar, Cambodia, Laos, Vietnam, S. China.

THYMELAEACEAE

FCLV26 (1992), FT6/3 (1997)

seed oil an important source of illumination prior to the widespread use of petroleum & still used in some light industrial applications. Fruits extremely poisonous fresh, although the boiled seeds are edible. Seed oil used medicinally for skin diseases, ear-problems & sore chests. A poultice of the leaves is applied to wounds & blisters, also for rheumatic pains & to induce breast milk flow. Effective as a laxative, used particularly for children.

688 *Aleurites moluccana* (L.) Willd.,
A. triloba Forst.

FFBB2:377 (1877), FGIC5:292 (1925), FBIS:384 (1987), WTM:266 (1988), DEPMP:92 (1935), MPP:491 (1978).
Distribution: throughout the Malay Peninsula, S. China, India, Australia, & N. Australia, & D. I. (except Borneo).
Natural distribution: throughout the Malay Peninsula, S. China, India, Australia, & N. Australia, & D. I. (except Borneo).
The wood is soft & has a resinous odor.

692 *Antidesma ghaesembilla* Gaertn.
A. paniculatum Roxb., *A. pubescens* Roxb.

FFBB2:358 (1877), IT:564 (1906), FGIC5:505 (1926), FBIS:357 (1887), DEPMP:187 (1935), WI1:84 (1948), TFM2:56 (1973), WTM:268 (1988), PR5/3:77 (1998), สทล:39 (1996)

Sri Lanka, India, Myanmar, S. China, Malay Peninsula, throughout Indonesia (except Borneo) to N. Australia, & D. I. (except Borneo).
Timber: hard but of low value. Marked poisonous, an acidic condiment. Young leaves eaten with rice as syphilis & rheumatism. Fruits edible, suitable for making jams & wine.

694 *Antidesma acidum* Retz.,

A. diandrum Roth.

FGIC5:521 (1927), FBI5:361 (1887), FFBB2:360 (1877), IT:565 (1906), DIFME (1991), สฟล:38 (1996)

India, Sri Lanka, Myanmar.

Leaves & roots used for dysentery & bile complaints, various parts for dropsy, muscular pains, pneumonia, sores & bite of rapid dogs! Fruits & young leaves edible.

695 *Antidesma montanum* Bl.

A. phanerophlebium Merr., *A. oblongifolium* Bl.

FGIC5:515 (1926), FBI5:362 (1887), DEPMP:188 (1935), WTM:269 (1988), TFM2:58 (1973)

Myanmar, S.China, Indo-China, Malay Peninsula, Borneo, Sumatra, Java, Lesser Sunda Islands, Sulawesi.

A poultice of the leaves is used for headaches & infant thrush. The roots are thought to be effective for measles, chickenpox & malaria.

696 *Antidesma velutinosa* Bl.

FGIC5:506 (1926), FBI5:356 (1887), FFBB2:359 (1877), IT:564 (1906), DEPMP:188 (1935), WTM:270 (1988)

Myanmar, Malay Peninsula, W.Malesia.

Fruits said to be edible.

697 *Aporosa villosa* (Lindl.) Baill.

FFBB2:361 (1877), FGIC5:559 (1927), FBI5:345 (1887), IT:563 (1906), สฟล:396 (1983), WI1:88 (1948)

Myanmar, Indo-China.

Timber reddish, quite hard & even-grained. Yields a reddish resin.

698 *Aporosa dioica* (Roxb.) M.-A.,

A. aurita (Tul.) Miq., *A. microcalyx* (Hassk.) Hassk., *A. roxburghii* Baillon, *A. chinensis*, *A. villosula* Kurz

FFBB2:362 (1877), FGIC5:560 (1927), FBI5:347 (1887), IT:563 (1906), WI1:88 (1948), TSH:113 (1994), TFM2:60 (1973), PR5/3:83 (1998), VFT:186 (1996)

E.Himalaya to S.China, Malay Peninsula, Sumatra, Borneo, Java.

Timber dark brown, very hard & close-grained, resistant to insect attack. Suitable for agricultural tools & other small implements.

699 *Aporosa wallichii* Hk. f.

FGIC5:350 (1925), FBI5:562 (1887), IT:564 (1906)

Assam, Bangladesh, Myanmar.

700 *Baccaurea ramiflora* Lour.

B. sapida (Roxb.) Muell. Arg., *B. cauliflora* Lour., *B. wrayi* King ex Hook. f.

FFBB2:356 (1877), FGIC5:548,551 (1927), FBI5:371 (1887), IT:562 (1906), DIFME:31 (1991), สฟล:23 (1995), TFM2:65 (1973), WTM:278 (1988), VHMLT (1996)

N.India, S.China, Laos, Cambodia, Vietnam, Malay Peninsula.

Fruits edible, sweet & juicy, used medicinally for various skin complaints (shingles, herpes, drawing out puss etc). Bark used for constipation & as a dark brown dye.

701 *Bischofia javanica* Bl.

B. trifoliata Hook. f.

FFBB2:355 (1877), FGIC5:542 (1927), FBI5:345 (1887), IT:558 (1906), DIFME:36 (1991), สฟล:168 (1963), WI1:194 (1948), VFT:193 (1996), TFM1:447 (1972), TSH:37 (1994), สฟล:48 (1996)

India, Myanmar, Andaman Islands, Laos, Vietnam, S.China, Malay Peninsula, throughout Indonesia to N.Australia.

Timber hard & durable but difficult to season by air-drying. Suitable for construction, bridges & furniture. The bark is high in tannin & contains a pink dye used to stain rattan baskets.

702 *Bridelia curtisii* Hook. f.

B. ovata Decne. var. *curtisii* (Hook. f.) A.S.

FBI5:273 (1887), KB26:229 (1972), BL41a:278 (1996), BRT (1999)

Vietnam, Cambodia, Andaman Islands, Malay Peninsula, N.Sumatra.

Fruits edible, used medicinally in Cambodia.

703 *Bridelia affinis* Craib

B. colorata A.S

KB23:65,66 (1969), BL41a:276 (1996), BRT (1999)

S.China (Yunnan, Hainan).

704 *Bridelia retusa* (L.) A. Juss.

B. pierrei Gagnep., *B. spinosa* (Roxb.) Willd., *B. cambodiana* Gagnep., *B. retusa* (L.) Spreng, *B.patens* Benth.

FFBB2:368 (1877), FGIC5:487,494 (1926), FBI5:268 (1887), IT:560 (1906), DIFME:38 (1991), WI1:227 (1948), TSH:39 (1994), PR5/3:119 (1998), BFTC:46, BL41a:289 (1996), KB26:229 (1972), BRT (1999)

Sri Lanka, India, Sikkim, Bhutan, Myanmar, S.China, Indo-China, Malay Peninsula, N.Sumatra.

Timber used for construction, flooring, wheels & agricultural tools. The bark has medicinal properties for reducing swellings & for eye complaints. The leaves are used as a fodder & as a purge for intestinal worms in cattle. The fruit is edible but sour. Attractive to birds.

705 *Bridelia stipularis* (L.) Bl.

FFBB2:369 (1877), FGIC5:493 (1926), FBI5:270 (1887), IT:560 (1906), PR3:133 (1992), WTM:279 (1988), TFM2:74 (1973), KB26:230 (1972), BL41a:293 (1996), BRT (1999)

India & S.China, through SE.Asia to Philippines & Timor.

Sri Lanka, India, Nepal, Indo-China, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands, Borneo, Philippines.

The bark has a high tannin content & is poisonous but is used externally for fever, coughs & asthma. A poultice of the leaves is used for skin complaints. Fruits edible but not tasty.

706 *Bridelia tomentosa* Bl.

B. monoica (Lour.) Merr., *B. glabrifolia* Merr., *B. lancifolia* Roxb.

FFBB2:367 (1877), FBI5:271 (1887), FGIC5:488 (1926), IT:560 (1906), TFM2:74 (1973), WTM:280 (1988), DEPMP (1935), PR5/3:119 (1998), KB26:231 (1972), BL41a:297 (1996), BRT (1999)

E.Nepal, Bhutan, Assam, S.China, Myanmar, Taiwan, Indo-China, Malay Peninsula & throughout Malesia to N.Australia.

Timber suitable for baskets, wheels & tools. Bark used for tanning leather & as a black dye. Bark astringent, used medicinally against colic & other ailments. Fruits edible but sour.

707 *Bridelia glauca* Bl.

B. petiolaris, *B. pubescens* Kurz., *B. platyphylla* Merr., *B. nooteboomii* Chakrab
IT:560 (1906), PR5/3:119 (1998), KB26:230 (1972), BL41a:311 (1996), BRT (1999)

NE.India, Bhutan, Myanmar, Indo-China, Taiwan, throughout Malesia except Lesser Sunda Islands, to Bismarck islands.

708 *Bridelia ovata* Decne.

B. siamensis Craib, *B. burmanica* Hook. f., *B. kurzii* Hook. f., *B. lanceolata* Kurz
FFBB2:368 (1877), FBI5:269,272,274 (1887), FGIC5:489 (1926), KB26:229 (1972), VFT:198 (1996), TFM2:74 (1973), BL41a:285 (1996), BRT (1999)

Myanmar, Andaman Islands, Vietnam?, S.China?, N.Malay Peninsula, E.Java & Lesser Sunda Islands.

Timber easy to work & quite durable, used for house-building & tools. The leaves are used for wrapping cigarettes. The roasted leaves have laxative properties. Various parts of the plant are used medicinally as an emetic, expectorant & for treating syphilis.

709 *Cleidion spiciflorum* (Burm. f.) Merr.

C. javanicum Bl.

FFBB2:390 (1877), FGIC5:450 (1926), FBI5:444 (1887), TFM2:79 (1973), MPP:497 (1978)

Sri Lanka, India, through SE.Asia & Malesia to New Guinea.

The bark is used for stomach complaints, the leaves for abortion & the seeds for constipation. However, all parts of the plant are poisonous, so care must be taken with these remedies.

710 *Croton argyratus* Bl.,

FFBB2:372 (1877), IT:577 (1906), VFT:207 (1996), TFM2:85 (1973), WTM:283 (1988), PR5/3:168 (1998), DEPMP:698 (1935)

Myanmar, Cambodia, Laos, Vietnam, Malay Peninsula, W.Malesia to Moluccas & Bali.

Wood pale & hard, suitable for construction & agricultural tools. The leaves are used to make a tea & the seed oil for illumination.

711 *Croton tiglium* L.

Tigium officinale Klotzsch

FFBB2:374 (1877), FGIC5:285 (1925), FBI5:393 (1887), IT:577 (1906), DEPMP (1935), WTM:284 (1988)

Myanmar, Indo-China.

The dried leaves have medicinal properties and the seeds are used as a purgative, although they are extremely toxic. The oil from the seeds can cause skin irritation.

712 *Croton hutchinsonianus* Hoss.

FGIC5:278 (1925), KB26:247 (1972), VFT:211 (1996)

713 *Croton kerrii* A.S.

714 *Croton poilanei* Gagnep
FGIC5:270 (1925), KB26:249 (1972)

Laos, Cambodia, Vietnam.

The timber is hard but not much used except as a substrate for mushroom cultivation. The bark & leaves are used for stomach pains.

715 *Croton roxburghii* N.P.Balacr

C. oblongifolius Roxb.

FFBB2:373 (1877), FBI5:386 (1887), IT:577 (1906),
FGIC5:279 (1925), KB32:74 (1977), VFT:210 (1996)

India, Myanmar, Laos, Vietnam.

The timber has a coarse grain & is mostly used for firewood. Leaves & heartwood have medicinal properties & the seed oil is a purgative. The tree is a good host for the lac insect & is often planted as a quick-growing living fence.

716 *Croton sp. (robustus)* Kurz

FFBB2:372 (1877), FBI5:387 (1887 - for *C. robustus*), FGIC5:289 (1925), VHMLT (1996)

This species is widespread in Thailand & resembles *C. robustus* from India & Myanmar. However, recent research suggests that it is probably a distinct species which has not yet been named.

717 *Croton cascarilloides* Raeusch.

C. cumingii Mull.-Arg., *C. punctatus* Lour.,
C. pierrei Gagnep

FGIC5:264,265,290 (1925), ๒๙๗2:68 (1995),
TFM2:84 (1973)

Myanmar, Indo-China, Ryukyu Islands, Borneo,
Phillipines, Moluccas (not Java).

718 *Croton kongensis* Gagnep.

C. tonkinensis Gagnep

FGIC5:269, 287 (1925), KB26:247 (1972)

Yunnan, Vietnam, Laos, Cambodia.

719 *Glochidion dasystylum* Kurz var.

kerrii (Craib) T. Chak. & Gang

G. kerrii Craib

FFBB2:344 (1877), JETB13/3:710 (1989),
KB26:277 (1972)

Myanmar.

720 *Glochidion assamicum* (M.-A.) Hk. f.

Phyllanthus assamicus Mull.-Arg.

FBI5:319 (1887), IT:575 (1906), FGIC5:620 (1927)

Sikkim, Assam, Bangladesh, N.Myanmar.

721 *Glochidion acuminatum* M.-A.

var. *siamense* A.S

JETB13/3:709 (1989), KB26:273 (1972), IT:575
(1906), FBI5:323 (1887)

E.Himalayas, Bangladesh, N.Myanmar, S.China,
(var. *siamense* confined to E.Myanmar,

SE.Yunnan & N.Thailand.)

722 *Glochidion rubrum* Bl.,

G. leiostylum Kurz, *G. cyrtostylum* Miq., *G. penangense* (Mull - Arg.) A.S.

FFBB2:345 (1877), FGIC5:621 (1927), TFM2:101
(1973), WTM:325 (1988)

Myanmar, Indo-China, S.China, Malay Peninsula,
Sumatra, Java, Borneo, Phillipines, Sulawesi &
Moluccas.

723 *Glochidion eriocarpum* Champ.

G.vetulinum Wight, *P.nepalense* Kurz

FGIC5:624 (1927), FBI5:322 (1887)

724 *Glochidion sphaerogynum* (M.-A.)

Kurz

FBI5:317 (1887), FFBB2:346 (1877), IT:575 (1906)

Sikkim, Bhutan, Bangladesh, Myanmar.

725 *Homonoia riparia* Lour.

FFBB2:401 (1877), IT:593 (1906), FGIC5:330 (1925),
FBI5:455 (1887)

India, Myanmar.

726 *Macaranga denticulata* (Bl.) M.-A.

FFBB2:387 (1877), IT:591 (1906), DEPMP: (1935),
VFT:230 (1996), TFM2:111 (1973), WTM:300 (1988),
PR5/3:342 (1998)

S.China, Laos, Vietnam, Malay Peninsula,
Sumatra, Java.

727 *Macaranga siamensis* S.J. Davies

TFB29:43

Throughout Thailand except Peninsular. Laos,
Cambodia(?), Burma(?).

728 *Macaranga kurzii* (O.K.) Pax & Hoffm.

M. andersonii Craib, *M.curtisii* Hk. f., *M. membranacea* Kurz

VFT:231 (1996)

Cambodia, Laos, Vietnam, Malay Peninsula.

729 *Mallotus khasianus* Hk. f.

IT:589 (1906)

N.Myanmar.

730 *Mallotus cuneatus* Ridl.

TFM2:115 (1973)

N.Malay Peninsula, (Indo-China?).

731 *Mallotus barbatus* M.-A.

FFBB2:381 (1877), FGIC5:357 (1925), FBI5:428 (1887), IT:588 (1906), VFT:234 (1996), TFM2:113 (1973), WTM:305 (1988)

India, Cambodia, Laos, China, Philippines, Malay Peninsula, Java, possibly also Sumatra.

The timber is resistant to termites & insects but is rather soft & used mostly for paper or firewood. The bark is fibrous & is used to make ropes & artificial feathers. The bark & roots have medicinal properties.

732 *Mallotus oblongifolius* (Miq.) M.-A.,

M. porterianus M.A., *M. puberulus* Hk. f., *M. columnaris* Warb., *M. furetianus* M.-A.

FGIC5:352 (1925), TFM2:116 (1973), WTM:306 (1988), PR5/3:350 (1998)

India, Myanmar, Indo-China, throughout Malesia (except Lesser Sunda Islands) to N.Australia.

733 *Mallotus paniculatus* (Lmk.) M.-A.

M. cochinchinensis Lour., *Croton paniculatum* Lmk., *C. appendiculatus* Elmer

FFBB2:383 (1877), FGIC5:355 (1925), FBI5:430 (1887), IT:588 (1906), DEPMP:1419 (1935), VFT:235 (1996), HKT (1988), WTM:307 (1988), PR5/3:350 (1998)

India, Myanmar, Indo-China, S.China, Taiwan, throughout Malesia (except Lesser Sunda Islands) to N.Australia.

The timber is very light, used for matches, packing cases & as a fuelwood. The bark fibres can be used for rope but they are rather weak. A decoction of the bark is used for cleaning wounds. The roots are used for headaches, fever in children & as an after-birth tonic.

734 *Mallotus peltatus* (Geisel.) M.-A.

M. acuminatus (Bl.) M.A.,

WTM:307 (1988), TFM2:113 (1973)

Andaman Islands, Indo-China, Myanmar, Sumatra, Java.

735 *Mallotus philippensis* (Lmk.) M.-A.

FFBB2:381 (1877), FGIC5:362 (1925), FBI5:442 (1887), IT:590 (1906), DIFME:121 (1991), DEPMP:1419 (1935), VFT:240 (1996), MPP:521 (1978), HKT: (1988), WTM:307 (1988), TSNH:174 (1990), PR3:91 (1992), TFM2:115 (1973)

Sri Lanka, India, Laos, Vietnam, S.China, Taiwan, Ryukyu Islands, Philippines, Malay Peninsula, throughout Indonesia to Melanesia & N.Australia.

The skin of the ripe fruits contains a bright orange dye used for silk & wool. The oil from the seeds is suitable as a preservative for vegetable oils & dairy products, also as a base for rapid drying varnishes & paints. It is used externally for parasitic skin infections, and is taken internally as a vermifuge. The plant is associated with fertility and figures prominently in many Hindu festivals. The leaves are a good fodder.

736 *Ostodes paniculata* Bl.,

O. kerrii Craib, *O. corniculatus* H.Bn.

FFBB2:404 (1877), FGIC5:322 (1925), FBI5:400 (1887), IT:580 (1906), TSH:81 (1994)

India, Myanmar, Hainan, Vietnam, Laos, Cambodia, Java.

The wood is soft & pale, suitable only for firewood. Gum used for sizing papers.

737 *Phyllanthus emblica* L.

Emblica officinalis Gaertn., *E. pectinata* (Hk. f.) Ridl., *Cicca emblica* Kurz

FFBB2:352 (1877), IT:570 (1906), FGIC5:580 (1927), DIFME:142 (1991), DEPMP:935 (1935), VFT:243 (1996), TFM2:123 (1973), ฝักรั้ว:237 (1983), WTM:319 (1988), PR3:105 (1992), RUPNI:100 (1997), TSNH:208 (1990)

Sri Lanka, India, Nepal, Myanmar, Laos, Vietnam, S.China, Malay Peninsula, Sumatra, Borneo, Java, Lesser Sunda Islands.

Timber dark red, hard & durable even under water, used for wells, furniture, agricultural tools & charcoal. Fruits edible either raw or pickled, extremely high in vitamin C. Used medicinally for dyspepsia, biliousness & as a diuretic. A fermented juice from the fruits is said to be effective for jaundice & coughs. The tree is sacred in Hindu religion, connected with Shiva & Vishnu.

738 *Phyllanthus columnaris* M.-A.

FFBB2:347 (1877), FBI 5 (1887), IT:571 (1906), FGIC5:581 (1927), TFM2:123 (1973)

Myanmar, Andaman Islands, N.Malay Peninsula (rare).

739 *Phyllanthus roseus* (Craib & Hutch.)

Beille

Phyllanthodendron dubium (Ridley) Gage, *Phyllanthodendron roseum* Craib & Hutch.

FGIC5:590 (1927), TFM2:123 (1973)

Indo-China, Malay Peninsula.

740 *Phyllanthus acidus* (L.) Skeels

P. distichus

PB:551 (1997), FGIC5:594 (1927)

Native of S.America, widely cultivated for its edible fruits, used in pickles & preserves.

741 *Suregada multiflora* (A. Juss.) Baill.

Gelonium bifarium Roxb., *G. glomeratum* Hassk., *G. multiflorum* Juss.

FFBB2:409 (1877), FGIC5:425,427 (1926), FBI5:459 (1887), IT:582 (1906), FBI5: (1887), TFM2:133 (1973), MPSRG:196 (1992)

India, China, Indo-China, throughout Malesia.

742 *Balakata baccata* (Roxb.) Esser

Carumbium baccatum Kurz, *Excoecaria baccata* M.-A., *Sapium baccatum* Roxb.

FFBB2:412 (1877), FGIC5:400 (1926), FBI5:470 (1887), IT:584 (1906), VFT:244 (1996), TFM2:129 (1973), WTM:310 (1988), TSH:118 (1994), PR5/3:502 (1998), BL44:155 (1998)

NE.India, S.China, Laos, Cambodia, Vietnam, Malay Peninsula, Sumatra, Borneo.

Timber of poor quality, only used for temporary construction, firewood & as a substrate for mushroom cultivation. The leaves contain tannin & are used as a black dye. The roots & leaves have medicinal properties. The seed oil is used for lighting, candles & as a soap. The fallen fruits are edible & very attractive to barking deer & other wildlife.

743 *Triadica cochinchinensis* Lour.

Sapium discolor (Champ. & Bth.) M.-A.

FGIC5:399 (1926), FBI5:469 (1887), VFT:245 (1996), WTM:311 (1988), TFM2:129 (1973), HKT:377 (1988), PR5/3:502 (1998), BL44:201 (1999)

Vietnam, China, Taiwan, Malay Peninsula, Sumatra, Java, Borneo, Philippines.

Timber rather soft but resistant to insects, used for cheap furniture. The leaves contain large amounts of tannin & are used as a black dye.

744 *Falconeria insigne* Royle

Sapium insigne (Roy.) Bth.

FFBB2:412 (1877), FGIC5:395 (1926), FBI5:471 (1887), IT:585 (1906), DIFME:159 (1991), TFM2:129 (1973), TSNH:252 (1990), BL44:162 (1999)
W.Himalayas to Myanmar, Indo-China & Malay

Peninsula (very rare).

Timber very light, used for drums. The milky sap is poisonous & used to kill germs.

745 *Trigonostemon thyrsoides* Stapf

746 *Trigonostemon albiflorus* A.S.

KB25:547 (1971)

747 *Trewia nudiflora* L.

Mallotus cardiophyllus Merr., *T. macrophylla* Roth., *T. macrostachya* Klotzch

FFBB2:379 (1877), FGIC5:343 (1925), FBI5:423 (1887), IT:590 (1906), VFT:249 (1996), TFM2:134 (1973), TSNH:284 (1990), สห (1996)

Sri Lanka, India, Myanmar, Vietnam, S.China, Philippines, Malay Peninsula, Sumatra, Java, Borneo.

Timber soft & not durable, used for drums & rough planking. Leaves used as fodder. The seed oil has insecticidal & anti-cancer properties.

ULMACEAE

TFB7 (1973)

748 *Trema orientalis* (L.) Bl.

Celtis orientalis L.

TFSS2:399 (1996), FJ2:117 (1965), VFT:733 (1996), TFM2:421 (1973), MPP:223 (1978), WTM:739 (1988), FTSCH:87 (1995), DEPMP:2213 (1935), FFBB2:470 (1877), IT:597 (1906)

India, Myanmar, Laos, Vietnam, China, throughout Malesia to Melanesia, Micronesia & Polynesia.

The timber is useless, even as a firewood! The bark is fibrous but difficult to clean & weak. The young shoots are added to soups, whilst the mature leaves are used as animal fodder. The fruits are attractive to birds.

749 *Celtis tetrandra* Roxb.

C. serotina Planch, *C. glabra* Planch,

C. napalensis Planch

FGIC5:681 (1928), FBI5:482 (1888), FFBB2:472 (1877), IT:596 (1906), DIFME:49 (1991).

FBI5:482 (1888), PR5/3:153 (1998)

India, Myanmar, Indo-China, N.Sumatra, Java, Lesser Sunda Islands.

Timber hard but not much used for construction. Leaves are a good fodder. The fruits are said to be edible.

750 *Celtis timorensis* Span.

C. cinnamomea Lindl. ex Planch

FGIC5:682 (1928), FBI5:483 (1888), FFBB2:472 (1877), IT:596 (1906), TFSS2:390 (1996), PR5/3:153 (1998)

Sri Lanka, India, Bangladesh, Myanmar, Indo-China, C.Sumatra, Borneo, Java, Lesser Sunda Islands & Philippines.

Leaves used medicinally as a poultice after injury.

751 *Holoptelea integrifolia* (Roxb.)

Planch.

Ulmus integrifolia Roxb.

FGIC5:675 (1927), FBI5:481 (1888), FFBB2:473 (1877), IT:595 (1906), DIFME:103 (1991), FBI7:481 (188?), မလိ:4 (1983)

Sri Lanka, India, Nepal, Myanmar, Indo-China.

A poultice of the bark & leaves is applied externally for boils, swelling & rheumatic pains. The bark is also used for ringworm, scabies, ulcers, scorpion stings & as a fish poison.

752 *Ulmus lancifolia* Roxb. ex Wall.

FFBB2:473 (1877), IT:594 (1906), ခလိ:136 (1996), မလိ: (1983)

Sikkim, Bhutan, Assam, Bangladesh, Myanmar.

MORACEAE

GBS19/9 (1962), GBS21/1 (1965-*Ficus*), FHK (1967 - *Ficus*)

753a *Morus macroura* Miq.

M. laevigata (Wall. ex Bureau) Hook. f.

FFBB2:467 (1877), IT:613 (1906), PR5/3:389 (1998)

NE.India, Sikkim, S.China, Hainan, Myanmar, Cambodia, Sumatra, W.Java.

Timber quite hard but easy to work, flexible when steamed so suitable for curved structures.

753b *Morus alba* L.

M. macrophylla Moretti, *M. nervosa* Deless. ex Spach, *M. morettiana* Jacq. ex Burr.

PR5/3:389 (1998), IT:612 (1906)

India, Myanmar, Indo-China, China, Japan.

Widely cultivated for its edible fruits & as a food plant for silkworm caterpillars.

753c *Morus australis* Poir

synonymns as *M.alba*, also *M.indica* L.

IT:612 (1906)

754 *Broussonetia papyrifera* (L.) Vent

IT:613 (1906), ခလိ:57 (1995), FBI5: (1888), DEPMP:372 (1935), WI1:230 (1948), VFT:524 (1996), PR5/3:119 (1998)

India, Myanmar, Vietnam, China, Java.

The bark was traditionally an important source of paper, clothes & fibre. The seed oil is used for lacquers & soaps. The fruit, bark & roots are used medicinally as a tonic for kidney problems & as a diuretic. The leaves make a good fodder.

755 *Streblus asper* Lour.

S. monoicus Gagnep., *Diplothorax tonkinensis* Gagnep.

FFBB2:464 (1877), IT:613 (1906), DIFME:172 (1991), ခလိ:129 (1997), DEPMP:2122 (1935), TFM3:168 (1973), MPP:242 (1978), WTM:555 (1988), PR5/3:539 (1998), မလိ:56 (1983), VFT:556 (1996)

Sri Lanka, India, Myanmar, Vietnam, S.China, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands, Sulawesi & Philippines.

Timber hard & very durable even under water, used for carvings & turnery work. The bark has anti-cancer & anti-malarial properties. It is used traditionally for fever, dysentery, diarrhoea & as an antidote to snake poison. A poultice of the roots is applied to infected wounds & boils. The leaves are used for cleaning utensils & as sandpaper. The ripe fruits are edible.

756 *Streblus ilicifolia* (Vidal) Corn.

Taxotrophis ilicifolius Vidal, *Balanostreblus ilicifolia* Kurz

FFBB2:465 (1877), IT:615 (1906)

NE.India, Bangladesh, Myanmar, Indo-China, Hainan, Malay Peninsula, Philippines, Sulawesi, Timor & Moluccas.

Ripe fruits edible.

757 *Streblus taxoides* (Hey. ex Roth) Kurz

Phyllocllamys spinosa Bur.

FFBB2:465 (1877), IT:615 (1906)

India, Myanmar, Andaman Islands.

758 *Streblus indicus* (Bur.) Corn.

759 *Artocarpus lakoocha* Roxb.,

A. lacucha Ham., *A. dadah* Miq.

FFBB2:433 (1877), IT:612 (1906), DEPMP:29 (1935), DIFME:29 (1991), FBI5:543 (1888), WI1:126 (1948), TFM3:124 (1973), WTM:516 (1988)

Sri Lanka, India, Myanmar, Malay Peninsula, Sumatra, Borneo.

Timber quite strong, seasons & polishes well. Used for furniture, boats & cabinet work. The roots yield a yellow dye. The bark is applied to infected wounds, whilst the latex is used as a substitute for betel nut. The leaves are a good fodder. The female flowers are pickled & eaten. The seeds are taken internally as a stomach purgative.

760 *Artocarpus gomezianus* Wall. ex Trec.

FFBB2:433 (1877), IT:612 (1906), DEPMP: (1935), DEPMP:255 (1966), TFM3:126 (1973), WTM:517 (1988)

Myanmar, Andaman Islands, Malay Peninsula, W.Malesia.

Timber durable, used for house-building. Latex a substitute for betel. Ripe fruits eaten raw, salted or made into jellies.

761 *Artocarpus chaplasha* Roxb.

FFBB2:432 (1877), IT:611 (1906), FGIC5:735(1928)

N.India, Nepal, Bangladesh, Myanmar.

Heartwood hard & heavy but not durable.

762 *Artocarpus lanceolata* Trec.

FGIC5:738(1928)

763 *Maclura fruticosa* (Roxb.) Corn.

764 *Ficus elastica* Roxb. ex Hornem.

FGIC5:777(1928), FBI5:508 (1888), FFBB2:444 (1877), IT:603 (1906), FHK:36 (1967), WTM:541 (1988), GBS21/1:24 (1965), DEPMP:1023 (1935), HKT(1988), TFM3:146 (1978)

Assam, Sikkim, Myanmar, N.Malay Peninsula, Sumatra, Java.

Widely cultivated as an ornamental throughout the tropics & as a pot plant in temperate countries.

765 *Ficus benghalensis* L.

Findica L., *F. banyana* Oken

FGIC5:778 (1928), FBI5:506 (1888), FFBB2:440,442 (1877), IT:600 (1906), FHK:28 (1967), RUPNI:80 (1997), PR5/3:235 (1998), WTM:538 (1988), GBS21/1:14 (1965)

Pakistan & India, widely cultivated elsewhere.

The bark is astringent, used for dysentery, diarrhoea & diabetes. The latex is applied externally for rheumatism & lumbago.

766 *Ficus altissima* Bl.

F. laccifera Roxb.

FGIC5:780 (1928), FBI5:780 (1888), FFBB2:441,442 (1877), IT:600 (1906), FHK:31 (1967), DEPMP:1020 (1935), GBS21/1:15 (1965), SFT16: (), FBI5: (1887), VFT:536 (1996)

NE.India, Myanmar, Andaman Islands, Yunnan, Indo-China, Hainan, Sumatra, Java, Sulawesi & Philippines.

The timber is not durable, used only for temporary construction. The tree is a host for the Lac insect.

767 *Ficus annulata* Bl.

F. flavescens Bl., *F. valida* Bl.

FGIC5:783 (1928), FBI5:502 (1888), FFBB2:443 (1877), DEPMP:1020 (1935), FBI5: (1888), GBS21/1:12 (1965), TFM3:140 (1973), WTM:538 (1988), PR5/3:235 (1998)

Myanmar, Indo-China, Yunnan, Malay Peninsula, Sumatra, Java, Borneo, Sulawesi & Philippines (Balabac Islands).

768 *Ficus auriculata* Lour.

F. macrophylla Roxb. & B.H. ex J.E.Sm., *F. rotundifolia* Roxb., *F. macrocarpa* Levl. et Vant., *F. roxburghii* Wall ex Miq

FGIC5:806 (1928), FBI5:534 (1888), FFBB2:460 (1877), IT:609 (1906), DEPMP:1031 (1935), GBS21/1:82 (1965), DIFME:89 (1991), VFT:537 (1996), WTM:550 (1988)

Himalayas from Pakistan eastwards to S.China, Hainan, Laos & Vietnam.

Figs & fresh young leaves edible, mature leaves used for animal fodder & as platters.

769 *Ficus benjamina* L. var. *benjamina*

F. nitida Thunb., *F. retusa* L. var. *nitida* (Thunb.) Miq., *F. cuspidato-caudata* Hayata, *F. parviflora* Oken, *F. umbrina* Elmer

FGIC5:766 (1928), FBI5:508 (1888), FFBB2:445,446 (1877), IT:604 (1906), GBS21/1:21 (1965), DIFME:89 (1991), FBI5: (1888), DEPMP:1021 (1935), TFM3:141 (1973), MPP:231 (1978), WTM:539 (1988), RUPNI:160 (1997)

India, S. China, throughout Malesia to Solomon Islands & NAustralia.

The root bark is boiled in oil & applied to wounds & bruises. The latex is used for liver complaints. A poultice of the pounded leaves & bark is used for rheumatic headaches. The young leaf buds are said to be edible.

var. *nuda* (Miq.) Barrett

F. nuda Miq., *F. comosa* Roxb., *F. benjamina* var.

comosa (Roxb.) Kurz

NE.India, S.China, Indo-China, Phillipines, New Guinea.

770 *Ficus callosa* Willd.

F. cordatifolia Elm., *F. longespathulata* Sata

FGIC5:773 (1928), FBI5:516 (1888), FFBB2:454 (1877), IT:601 (1906), GBS21/1:29 (1965), VFT:538 (1996), TFM3:142 (1973), WTM:546 (1988), PR5/3:235 (1998)

Sri Lanka, India, Myanmar, Andaman Islands, Cambodia, Laos, Vietnam, N.Malay Peninsula, Sumatra, N.Borneo, Phillipines, Lesser Sunda Islands, Sulawesi & Moluccas.

Poor timber, leaves used as fodder.

771 *Ficus capillipes* Gagnep.

FGIC5:815 (1928), GBS21/1:29 (1965)

Andaman Islands, Cambodia, Vietnam.

772 *Ficus curtipes* Corn.

F. obtusifolia Roxb.

FGIC5:779 (1928), FBI5:525 (1888), FFBB2:443 (1877), IT:603 (1906), DEPMP:1028 (1935), GBS21/1:22 (1965), TFM3:144 (1973),

NE.India, Myanmar, Yunnan, Indo-China, NW.Malay Peninsula, N.Sumatra.

773 *Ficus fistulosa* Reinw. ex Bl.

var. *fistulosa*

F. harlandii Benth., *F.grandidens* Merr., *F. rubrovenia* Merr.,

FFBB2:459 (1877), IT:607 (1906), FHK:86 (1967), GBS21/1:93 (1965), DIFME:90 (1991), FBI5: (1888), DEPMP:1025 (1935), TFM3:146 (1973), WTM:550 (1988), PR5/3:236 (1998)

Assam, Bangladesh, Myanmar, S.China, Hainan, Taiwan, Indo-China, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands, Borneo, Phillipines.

Pounded leaves applied as a poultice for headaches.

774 *Ficus fulva* Rienw. ex Bl.

F.chrysocarpa Reinw. ex Bl.

FGIC5:755,804 (1928), FBI5:531 (1888), FFBB2:450 (1877), IT:607 (1906), TFM3:147 (1978), DEPMP:1026 (1935), GBS21/1:46 (1965), WTM:547 (1988)

Nicobar Islands, Malay Peninsula, Sumatra, Java, Sulawesi, Moluccas, Borneo.

775 *Ficus geniculata* Kurz

F. tenii Levi.

FGIC5:761 (1928), FBI5:516 (1888), FFBB2:447 (1877), IT:602 (1906), GBS21/1:9 (1965)

India (Madras, Orissa, Assam, Sikkim), Myanmar, Andaman Islands, China (Szechuan, Yunnan), Laos, Vietnam.

776 *Ficus glaberrima* Bl.

F. suberosa Levl. et Vant., *F. thomsonii* Miq.

FGIC5:760 (1928), FBI5:506 (1888), FFBB2:443 (1877), IT:600 (1906), GBS21/1: 17 (1965)

var. *glaberrima* N. & E.India, Myanmar, Andaman Islands, S.China (Yunnan, Kweichow, Hainan), Indo-China, Sumatra, Java.

var. *siamensis* endemic to Thailand.

777a *Ficus heteropleura* Bl.

var. *heteropleura*

F. urophylla Wall.

FGIC5:799 (1928), FBI5:498 (1888), TFM3:148 (1978), GBS21/1:77 (1965)

Assam, Bangladesh, Bhutan, Myanmar, Indo-China, Hainan, Malay Peninsula, Sumatra, Java, Borneo, Sulawesi & Phillipines.

777b *Ficus heterophylla* L. f.

var. *heterophylla*

FGIC5:775 (1928), FBI5:518 (1888), FFBB2:456 (1877), IT:606 (1906), TFM3:148 (1978), GBS21/1:73 (1965), DIFME:90 (1991)

Sri Lanka, India, Myanmar, China (Kwangtung, Hainan), Indo-China, Malay Peninsula, Java, Borneo.

Used medicinally for asthma & coughs.

778 *Ficus hirta* Vahl var. *hirta*

F. hirsuta Roxb.

FGIC5:803 (1928), FBI5:531 (1888), FFBB2:449 (1877), IT:608 (1906), FHK:60 (1967), DIFME:90 (1991), GBS21/1:45 (1965), TFM3:148 (1973), WTM:548 (1988)

Nepal, Sikkim, Assam, Myanmar, S.China, Hainan, Indo-China, Malay Peninsula, Sumatra, Java.

Fruits edible. Various parts of the plant used medicinally for boils, snake-bite & lung problems.

var. *roxburghii* (Miq.) King

F. hirta var. *triloba*, *F. quangtrienensis* Gagnep., *F. roxburghii* Miq., *F. triloba* Buch.-Ham. ex Voigt
FGIC5:805 (1928)

Sikkim, Assam, Myanmar, Yunnan, Hainan, Indo-China, Sumatra.

var. **imberbis** Gagnep.

F. tridactylites Gagnep.

S.China, Hainan, N.Vietnam, Laos.

var. **appressa** Corner

Laos, N.Thailand.

779 *Ficus hispida* L. f. var. **hispida**

F. mollis Willd., *F. oppositifolia* Willd. *F. poilanei* Gagnep, *F. scabra* Jacqu.

FGIC5:810 (1928), FBI5:522 (1888), FFBB2:460 (1877), IT:606 (1906), FHK: (1967), GBS21/1:89 (1965), DIFME:90 (1991), DEPMP:1026 (1935), VFT:547 (1996), TFM3:149 (1973), HKT (1988), WTM4:550 (1988)

Sri Lanka, India, Cambodia, Laos, Vietnam, S.China, Malay Peninsula, Sumatra, Java, Borneo (rare), SE.Sulawesi, Lesser Sunda Islands, Papua New Guinea, N.Australia (Queensland).

Bark applied externally to boils & fractured bones. Young leaves edible, mature leaves used as animal fodder. Fruits edible, good for making jam. Dried fruits used for mouth ulcers, as an emetic & to induce milk flow.

780 *Ficus lacer* B.H.

F. avium Gagnep., *F. insignis* Kurz

FGIC5:755 (1928), FFBB2:447 (1877), IT:602 (1906), GBS21/1:8 (1965), RUPNI:206 (1997), VFT:548 (1996)

India, Myanmar, Indo-China (Annam, Cambodia.)

Bark used for fibre & as a mouth wash for ulcers. Young leaves edible, mature leaves used as animal fodder. Tree a host for the lac insect.

781 *Ficus microcarpa* L. f. var. **microcarpa**

F. retusa auct. non L., (inc. var. *pisiferum* Miq. & var. *nitida* King), *Urostigma microcarpum* (L. f.) Miq., *F. indica* Heyne ex Roth, *F. rubra* Roth, *F. littoralis* Bl., *F. nitida* Thunb., *F. retusifolius* Levl. et Vant.

FGIC5:764 (1928), FBI5:511 (1888), FFBB2:444 (1877), FHK:32 (1967), GBS21/1:22 (1965), DIFME:90 (1991), TFM3:150 (1973), HKT:221 (1988), WTM:542 (1988), PR5/3:237 (1998)

Sri Lanka, India, S.China, Ryukyu Islands, Myanmar, Indo-China, Malay Peninsula, throughout Malesia to New Britain & Queensland.

A poultice of the leaves is applied to fractured bones.

var. **eubractea** Corner

endemic to N.Thailand.

782 *Ficus nervosa* Hey. ex Roth. var. **nervosa**

F. cuneato-nervosa Yamam., *Fda* Gagnep, *F. blinii* Levl. et Vant., *Urostigma nervosum* Miq., *F. undulata* Buch.-Ham., *Fangustifolia* Roxb.

FGIC5:777 (1928), FFBB2:453 (1877), IT:600 (1906), FHK:42 (1967), GBS21/1:31 (1965), FBI5:512 (1888), VFT:549 (1996)

Sri Lanka, India, Myanmar, N.Vietnam, China (Kweichow, Kwangtung, Hainan, Hong Kong), Taiwan, Malay Peninsula.

Timber dark, easy to season & work but not durable. Used for musical instruments & boxes.

783 *Ficus pisocarpa* Bl.

F. cycloneura (Miq.) King, *F. microstoma* Wall. ex King, *Urostigma pisocarpum* (Bl.) Miq.

FGIC5:762 (1928), FBI5:510 (1888), GBS21/1:20 (1965), TFM3: (1973), WTM:543 (1988)

N.Vietnam, Malay Peninsula.

784 *Ficus racemosa* L. var. **racemosa**

F. glomerata Roxb., *F. semicostata* Bailey

FGIC5:807 (1928), FBI5:535 (1888), FFBB2:459 (1877), IT:609 (1906), GBS21/1: 34 (1965), DIFME:90 (1991), VFT:551 (1996), TFM3:154 (1973), WTM:552 (1988), PR5/3:237 (1998)

Pakistan, India, Sri Lanka, Myanmar, Yunnan, Cambodia, Laos, Vietnam, Malay Peninsula, N.Sumatra, Lesser Sunda Islands, S.Sulawesi, New Guinea, N&W.Australia.

Timber fairly durable, used for cheap implements. The latex is used medicinally for treating boils, blisters, diarrhoea, dysentery, fever, sore throat & piles. The leaves are said to be effective for bronchitis, pneumonia & other lung complaints. The figs are edible and are used in dried form for treating diabetes, increasing milk flow, urinary problems & venereal diseases.

785 *Ficus religiosa* L.

FGIC5:767 (1928), FBI5:513 (1888), FFBB2:448 (1877), IT:601 (1906), DEPMP:1030 (1935), GBS21/1:6 (1965), RUPNI:72 (1997), DIFME:90 (1991), WTM:549 (1988)

N.Pakistan, N.India, Nepal, Yunnan, possibly also native in N.Thailand & Indo-China.

The most sacred tree in Buddhist religion, also important in Hinduism. A tree in Sri Lanka is said to be 2300 years old & is the oldest historically recorded tree in the world. The tree figures

prominently in many festivals, particularly marriage. The bark is used for blisters, boils, ulcers, gonorrhoea & other skin diseases. The fruits have laxative properties & are used for treating asthma.

786 *Ficus rumphii* Bl.

FGIC5:768 (1928), FBI5:512 (1888), FFBB2:448 (1877), IT:601 (1906), FHK:25 (1967), GBS21/1:11 (1965), DIFME: (1991), DEPMP: (1935), TFM:155 (1973), WTM:549 (1988)

N. & C. India, Myanmar, Andaman Islands, Indo-China, N. Malay Peninsula, Java, Timor, Moluccas, Sulawesi.

The leaves are a good fodder. The fruits are said to be edible.

787 *Ficus semicordata* B.-H. ex J.E. Sm. var. *semicordata*

F. cunia Ham. ex Roxb., *F. hapalophylla* Kurz
FGIC5:814 (1928), FBI5:523 (1888), FFBB2:461 (1877), IT:606 (1906), GBS21/1:69 (1965), DIFME:91 (1991), ๑๙๓3:72 (1996), TFM:156 (1973), WTM:545 (1988)

C. India, Himalayas, Myanmar, S. China (Yunnan, Kweichow), N. Vietnam, Malay Peninsula.

The leaves are a good fodder. Fruits edible, with a faint taste of strawberries. A decoction of the fruit & bark was used in former times against leprosy.

788 *Ficus superba* Miq. var. *superba*

F. tenuipes S. Moore, *Urostigma superbum* Miq., *F. geniculata* Kurz var. *abnormalis* Kurz
TFM3:159 (1978), GBS21/1:7 (1965), HKT:223 (1988), PR5/3:237 (1998), WTM:544 (1988)

Japan, China, throughout SE. Asia & Malesia to Australia, mainly along coasts.

var. *superba* - Cambodia, Vietnam, Malay Peninsula, Java, Lesser Sunda Islands, Ceram.

var. *japonica* Miq.

F. subpisocarpa Gagnep.

FGIC5:769,774 (1928)

Japan, Ryukyu Islands, Taiwan, China, Hainan, Indo-China, Malay Peninsula.

789 *Ficus variegata* Bl. var. *variegata*

F. subracemosa Bl., *F. polysyca* Ridl.,

F. racemifera Roxb., *F. laevigata* Blanco,

F. sum Gagnep

FGIC5:808 (1928), FBI5:535 (1888), IT:609 (1906),

GBS21/1:82 (1965), DEPMP:1032 (1935), VFT:554 (1996), TFM3:160 (1973), MPP:238 (1978), HKT (1988), WTM:553 (1988), PR5/3:238 (1998)

India, Myanmar, Indo-China, Andaman Islands, throughout Malesia to Solomons & Queensland.

Bark used to treat dysentery. The latex is applied externally to wounds, whilst a poultice of fresh leaves is used for boils. Leaves edible but not tasty, mostly used as animal fodder. The tree is a host for the Lac insect.

790 *Ficus virens* Ait. var. *virens*

F. infectoria Willd.

FGIC5:760 (1928), FBI5:515 (1888), FFBB2:446 (1877), IT:602 (1906), FHK:22 (1967), GBS21/1:9 (1965), DIFME: 91 (1991), HKT:227 (1988), WTM:544 (1988), PR5/3: 238 (1998), DEPMP:1027 (1935), TFM3:161 (1973)

Sri Lanka, India, Myanmar, Andaman Islands, S. China, Hainan, Indo-China, N. Malay Peninsula, N. & W. Sumatra, Java, Lesser Sunda Islands, Sulawesi, Philippines, Moluccas, New Guinea, New Britain, Solomon Islands & N. Australia.

Leaves used as animal fodder.

URTICACEAE

APG32 (1981 - *Boehmeria*), GBS25/1 (1969 - *Dendrocnide*), KB43 (1988 - *Debregesia*)

791 *Maoutia puya* (Wall. ex Hk.) Wedd

Boehmeria nivea Gaud.

FGIC5:845,870 (1929), FBI5:576,592 (1888), FJ2:50 (1965), FFBB2:429 (1877), IT:619 (1906)

NE. India, Myanmar, China, Indo-China, Java.

Bark used as fibre. Leaves are a good fodder.

792 *Dendrocnide sinuata* (Bl.) Chew,

Laportea crenulata Gaud., *L. pustulosa* Ridl.

FGIC5:858 (1929), FBI5:550 (1888), GBS25/1:36 (1969), FFBB2:421 (1877), TFM4:475 (1989), WTM:740 (1988)

Sri Lanka, India, China, SE. Asia & Malesia to Bali.

The leaves are irritant to the touch.

793 *Dendrocnide stimulans* (L. f.) Chew

Laportea annamica Gagnep., *L. thorelii* Gagnep.

FGIC5:858 (1929), GBS25/1:11 (1969), TFM4:475 (1989), WTM:740 (1988)

Taiwan, Hainan, Laos, Vietnam, Malay Peninsula, Sumatra, Java, Lesser Sunda Islands, Borneo, Sulawesi, Moluccas, Philippines.

The leaves are irritant to the touch.

794 *Boehmeria clidemioides* Miq.
var. *clidemioides*

B. platyphylla D.Don. var. *cinerascens* Hook. f.,
B. sidaefolia Wedd.

FJ2:45 (1965), APG32:8 (1981), FBI5:576,579
(1888), FGIC5:842 (1929)

E.Himalayas, S.China, N.Indo-China, montane
Malay Peninsula, Sumatra, Java, Lombok.

var. *platyphyllodes* Yahara
endemic to Thailand

795 *Boehmeria chiangmaiensis* Yahara

B. polystachya Wedd. *sensu* Hook.f.

APG32:18 (1981), FBI5:579 (1888)

Myanmar, Laos.

796 *Boehmeria macrophylla* D. Don

B. platyphylla D.Don

DIFME:37 (1991), APG32:13 (1981), FBI5:577
(1888), FGIC5:845 (1929), FFBB2:424 (1877),
IT:617 (1906)

E.Himalayas, Assam, N.Myanmar, N.Indo-China,
Yunnan.

Leaves & stem used medicinally for dysentery &
the leaves for eczema.

797 *Boehmeria malabarica* Wall. ex Wedd.

B. glomerulifera Miq. *sensu* Back. & Brink.

APG32:5 (1981), FJ2:45 (1965), FFBB2:422 (1877),
FGIC5:839 (1929), IT:617 (1906)

Sri Lanka, E.India, (Myanmar?), Indo-China, Malay
Peninsula, Java, Borneo.

798 *Boehmeria thailandica* Yahara

APG32:4 (1981)

Endemic to Thailand.

799 *Boehmeria zollingeriana* Wedd.

B. heteroidea Bl. (inc. var. *latifolia* Gagnep)

FJ2:45 (1965), APG32:12 (1981), FBI5:579 (1888),
FGIC5:844 (1929)

E.India, Indo-China, S.China, (Java?).

802 *Debregeasia longifolia* (Burm. f.)
Wedd.

D. velutina Gaud.

FGIC5:867 (1929), FBI5:590 (1888), IT:618 (1906),
DIFME:71 (1991), TFM4:474 (1989), KB43:675
(1988), KB44: (1989)

Sri Lanka, India, Nepal, Bangladesh, Myanmar,
China, Taiwan, Japan, Indo-China, Malay
Peninsula, Sumatra, Java, Lesser Sunda Islands,
Borneo, Sulawesi, Philippines.

Leaves used as fodder & to induce milk
production. Fruits said to be edible.

803 *Debregeasia squamata* King ex Hk. f.
forma *squamata*

D. spiculifera Merr.

FGIC5:868 (1929), FBI5:591 (1888), KB43:686
(1988), TFM4:474 (1989)

NE.India, Myanmar, S.China, Hainan, N.Vietnam,
Malay Peninsula, N.Borneo.

804 *Debregeasia wallichiana* (Wedd.)
Wedd. ssp. *wallichiana*

FGIC5:869 (1929), FBI5:591 (1888), FFBB2:428
(1877), KB43:689 (1988), IT:618 (1906)

E.India, Myanmar, Cambodia.

JUGLANDACEAE
FLCV26 (1992)

Engelhardtia is often misspelt *Engelhartia*.

805 *Engelhardtia spicata* Lechen. ex Bl.,

E. colebrookeana Lindl. ex Wall., *E. acerifolia*
(Reinw.) Bl., *E. esquirolii* Lev., *E. integra* Kurz
FCLV26:22 (1992), FGIC5:930 (1929), IT:620 (1906),
FFBB2:491 (1877), DIFME:83 (1991), SFT18:.,
ฉพ1:54 (1995), VFT:345 (1996), TFM1: (1972),
WTM:370 (1988), TSH:54 (1994), DFPT:168 (1997),
PR5/3:218 (1998)

N.India, Cambodia, Laos, Vietnam, China, Hainan,
Malay Peninsula, Sumatra, Java, Lesser Sunda
Islands, Borneo & Philippines.

The timber is quite hard & easy to work but not
durable. The bark contains large quantities of
tannin. The tree is a host for the Lac insect. The
roots are used as a fish poison.

Some authors have proposed 3 varieties - var
spicata, var. *colebrookiana* (Lind.) ex Wall., var.
integra (Kurz) Manning

806 *Engelhardtia serrata* Bl.

E. nudiflora Hook. f., *E. parviflora* C.DC., *E.*
permicrophylla Elmer.

FCLV26:27 (1992), TFSS1:242 (1995), TFM1:
(1972), WTM:370 (1988), PR5/3:218 (1998)

Myanmar, Indo-China, Malay Peninsula, Sumatra,
W.Java, Borneo, Philippines, Sulawesi, Moluccas.

807 *Betula alnoides* Ham. ex D. Don,*B. acuminata* Wall.

FGIC5:1039 (1931), IT:622 (1906), FBI5:599 (1888),
 ၂၆၅၁:26 (1995), FFBB2:476 (1877), SFT44:516
 (1968), WI1:185 (1948), ၂၆၅၁:44 (1983), TSH:113
 (1994), FTSCH:12 (1995)

Nepal, N.India, Myanmar, Indo-China, China.

Timber strong & durable with a distinctive grain,
 easy to work & taking a fine finish. Used for all
 types of construction & interior work as well as
 for plywood. The bark contains an aromatic oil
 which is used for a variety of medicinal purposes
 & is a popular flavouring for local whisky (Lao
 Khao). The leaves are a good fodder.

808 *Carpinus londoniana* Wink.,

FGIC5:1036 (1931)

China.

809 *Carpinus poilanei*

SFT44:516 (1968), FGIC5:1036 (1931)

N.India, Indo-China, China.

MYRICACEAE**810 *Myrica esculenta* B. -H. ex D. Don**

M. auriculata Ridley, *M. farquhariana* Wall., *M.*
nagi auct. non Thunb. (in FBI), *M. sapida* Wall.

FGIC5:933 (1929), FBI5:597 (1888), FFBB2:475
 (1877), WTM:559 (1988), DIFME:129 (1991),
 TFSS2:246 (1996), TFM2:295 (1973), PR3:96
 (1992), FTSCH:55 (1995)

N.India, Nepal, China, Myanmar, Indo-China, Malay
 Peninsula, Sumatra, Java, Lesser Sunda Islands,
 Sulawesi, Borneo & Philippines.

The bark has astringent & antiseptic properties,
 taken internally for dysentery & diarrhoea, applied
 externally as a poultice for rheumatism &
 bronchial infections. It is also used to dye cotton
 yellow-brown & as a fish poison. Fruits edible,
 used to make freshening drinks & desserts. Fruit
 pulp used for making candles & soap.

FAGACEAE

BFB19 (1930), FTA (1940), SFT44 (1968)

811 *Lithocarpus dealbatus* (Hk.f. & Th.)

Rehd.

Quercus dealbata Hook. f. & Th., *Pasania**dealbatus* Oerst.

FGIC5:990 (1929), FBI5:609 (1888)

812 *Quercus incana* Roxb.*Q. leucotrichophora*, *Q. dealbata* L.

FGIC5:944 (1929), IT:626 (1906), FBI5:603 (1888),
 FTSCH:69 (1995), FTA:35 (1940)

E. Nepal, NE.India, N.Myanmar.

The wood makes excellent charcoal & firewood.
 The bark is high in tannin. The leaves & fruits are
 used as animal fodder. Various parts of the tree
 have medicinal value as an astringent, diuretic &
 to relieve asthma.

813 Disused number**814 *Castanopsis acuminatissima* (Bl.) A. DC.**

C. junghuhnii Wils., *Castanea acuminatissima*
 Bl., *Pasania acuminatissima* (Bl.) Oerst.

SFT44:494 (1968), TFM1:201 (1972), FGIC5:1012
 (1929), FTA:162 (1940)

NE.India, Myanmar, Indo-China, S.China, Taiwan,
 Malay Peninsula, India, Java, New Guinea.

815 *Castanopsis argyrophylla* King ex Hk.f.

C. tribuloides var. *ferox* Kurz, *Castanea*
tribuloides var. *ferox* Kurz, *Castanea ferox* Roxb.

FFBB2:481 (1877), FBI5:622,623 (1888), BFB19:4
 (1930), SFT44:497 (1968), IT:634 (1906),

FGIC5:1014 (1929), FTA:170 (1940)

Myanmar, Indo-China, S.China.

The wood is rich in tannin. The nuts are edible.

816 *Castanopsis armata* (Roxb.) Spach Prodr.

C. tribuloides var. *armata* Spach, *Quercus armata*
 Roxb., *Castanea tribuloides* Wall. var. *armata* Kurz

FGIC5:1031 (1929), FBI5:622 (1888), IT:635 (1906),
 FTA:175 (1940)

India, Myanmar, Indo-China.

817 *Castanopsis calathiformis* (Skan) Rehd. & Wils.

Lithocarpus calathiformis Camus, *Pasania*
calathiformis Hick. & Cam, *Quercus*
calathiformis Skan

IT:627 (1906), SFT44:494 (1968), FGIC5:1004
 (1929), FTA:191a (1940)

Myanmar, Indo-China, China.

818 *Castanopsis diversifolia* (Kurz) King

ex Hk. f.

Castanea diversifolia Kurz

FFBB2:479 (1877), IT:634 (1906), SFT44:496 (1968), FBI5:620 (1888), FGIC5:1022 (1929)

N.Myanmar, Yunnan.

Nut edibles.

819 *Castanopsis indica* (Roxb.) A. DC.

Castanea indica Roxb.

IT:635 (1906), TSNH:183 (1990), SFT44:495 (1968), FBI5: (1888), BFB19:5 (1930), VFT:261 (1996), TSH:113 (1994), FBI5:620 (1888), FGIC5:1027 (1929), BFTC:48 (1949), FTA:159 (1940)

India, Nepal, Myanmar, Indo-China, S.China, Hainan, Taiwan.

The timber is hard & resistant to insects, used for furniture, roof shingles & general construction. The wood makes a good charcoal. The bark is rich in tannin. The leaves are used as animal fodder. The nuts are edible.

820 *Castanopsis tribuloides* (Sm.) A. DC.

var. *tribuloides*

Castanea tribuloides Lind., *Quercus tribuloides* Smith

FFBB2:480 (1877), IT:634 (1906), SFT44:498 (1968), FBI5:622 (1888), BFB19:6 (1930), VFT:267 (1996), TSH:46 (1994), FTSCH:18 (1995), TSNH:72 (1990), FGIC5:1017 (1929), FTA:172 (1940)

Nepal, NE.India, Myanmar, Laos, Vietnam & S.China.

The timber is heavy, brittle, coarse-grained & not durable. It is used for planking, utensils & general construction. The wood makes a reasonable firewood but a poor charcoal. The bark is rich in tannin. The leaves can be used as animal fodder. The nuts are edible.

var. *echidnocarpa*

Bhutan, Sikkim, Assam, N.Myanmar, Bangladesh, N.Vietnam.

see *C.argyrophylla* for *C. tribuloides* var. *ferox*

see *C.armata* for *C. tribuloides* var. *armata*

821 *Lithocarpus aggregatus* Barn.

spp. *aggregatus*

SFT44:489 (1968), FTA:149 (1940)

endemic to Thailand.

ssp. *pseudo-magneinii* Camus

N.Vietnam.

822 *Lithocarpus craibianus* Bam.

SFT44:480 (1968), FTA:133 (1940)

endemic to Thailand.

823 *Lithocarpus elegans* (Bl.) Hatus. ex Soep. var *elegans*

L. spicatus (Smith) Rehd. & Wils., *Quercus spicata* Smith, *Pasania spicata* Oerst.

IT:629 (1906), FFBB2:486 (1877), VFT:279 (1996), WTM:340 (1988), SFT44:481 (1968), FBI5:609 (1888), FGIC5:983 (1929), FTA:108 (1940)

Nepal, N.India, Myanmar, Laos, Vietnam, China, Malay Peninsula, Sumatra, Java, Bangka Island.

The timber is durable but heavy & difficult to work, used for general construction. The wood makes a good charcoal. The leaves are a good animal fodder. The fruit cupules are high in tannin.

var. *brevipetiolatus* (A.DC) Rehd. & Wils
India, Myanmar, China.

824 *Lithocarpus fenestratus* (Roxb.)

Rehd.

Pasania fenestrata Oerst., *Quercus fenestrata* Roxb.

FFBB2:483 (1877), IT:632 (1906), SFT44:479 (1968), VFT:280 (1996), HKT:274 (1988), BFB19:10 (1930), FBI5:608 (1888), FGIC5:988 (1929), FTA:126 (1940)

India, Myanmar, Laos, N.Vietnam, China, Hong Kong.
The timber is heavy & difficult to work, used for general construction. The fruit cupules are high in tannin.

825 *Lithocarpus garrettianus* (Craib)

Camus

Pasania garrettiana Hickel & Camus, *Quercus garrettiana* Craib,

SFT44:476 (1968), FGIC5:994 (1929), FTA:93 (1940)
Laos, N.Vietnam.

826 *Lithocarpus echinops* Hjelmqvist

Similar species : *L. echiniferum* (Hick. & Cam.) Cam., *L. xylocarpus* (Kurz) Mgf., *L. magnificus* (Brandis) Cam., *Quercus magnifica* Brandis

Endemic to N.Thailand.

SFT44:491 (1968)

827 *Lithocarpus lindleyanus* (Wall.)

Camus

Pasania lindleyana Hickel & Camus, *Quercus lindleyana* Wall.

FFBB2:486 (1877), IT:629 (1906), BFB19:14 (1930), SFT44:484 (1968), FBI5:607 (1888), FGIC5:970 (1929), FTA:122 (1940)

Myanmar, Indo-China.

The wood is fairly rich in tannin.

828 *Lithocarpus polystachyus* (A. DC.)

Rehd.

Pasania polystachya Schottky, *Quercus polystachya* Wall.

FFBB2:485 (1877), SFT44:487 (1968), VFT:288 (1996), IT:630 (1906), BFB19:16 (1930), FBI5:610 (1888), FGIC5:978 (1929), FTA:105 (1940)

India, N.Myanmar, Laos, Vietnam, S.China.

The timber is used for construction, household appliances. The wood is a good firewood & substrate for mushroom cultivation. The bark contains high levels of tannin in the cold season but much less in the hot season. The young leaves can be made into tea.

829 *Lithocarpus sootepensis* (Craib)

Camus

Pasania sootepensis (Craib) Hickel & Camus, *Quercus sootepensis* Craib

SFT44:488 (1968), FGIC5:989 (1929), FTA:139 (1940)

Endemic to Thailand.

830 *Lithocarpus truncatus* (King) Rehd. &

Wils.

Pasania truncata Schottky, *Quercus truncata* King

IT:632 (1906), SFT44:490 (1968), VFT:292 (1996), BFB19:19 (1930), FBI5:618 (1888), FGIC5:992 (1929), FTA:131 (1940)

N.India, Myanmar, Laos, N.Vietnam, S.China.

831 *Lithocarpus thomsonii* (Miq.) Rehd.

Quercus thomsoni Miq., *Pasania thomsonii* Hickel & Camus

FFBB2:486 (1877), IT:632 (1906), SFT44:485 (1968), FBI5:615 (1888), FGIC5:973 (1929), FTA:102 (1940)

NE.India, Myanmar, Indo-China.

832 *Quercus aliena* Bl.

Quercus griffithii Hook. f. & Th.

IT:632 (1906), SFT44:510 (1968), FBI5:602 (1888), FGIC5:943 (1929), FTA:24 (1940)

Assam, Bangladesh, Sikkim, Bhutan, Myanmar, Laos, China, Japan, Korea.

The wood is rich in tannin.

833 *Quercus brandisiana* Kurz

Cyclobalanopsis brandisiana (Kurz) Schottky

FFBB2:488 (1877), IT:628 (1906), FBI5:604 (1888), BFB19:8 (1930), SFT44:510 (1968), FTA:48 (1940)

N.India, Myanmar, Laos?.

834 *Quercus eumorpha* Kurz

FFBB2:487 (1877), IT:632 (1906)

NE.India, Myanmar.

835 *Quercus kerrii* Craib

Cyclobalanopsis kerrii (Craib) Hjelmqvist

SFT44:505 (1968), VFT:302 (1996), FGIC5:958 (1929), FTA:54 (1940)

N.Myanmar, Laos, N.Vietnam, China.

Timber used for joinery & construction. The wood is a good firewood & substrate for mushroom cultivation. The bark & fruit cupules contain tannin.

836 *Quercus kingiana* Craib,

SFT44:509 (1968), FBI5:603 (1888), BFB19:13 (1930), FGIC5:945 (1929), FTA:31 (1940)

N.Myanmar.

837a *Quercus lanata* Smith

Q. lanuginosa Don.

IT:626 (1906), SFT44:512 (1968), FBI5:603 (1888), FTSC:70 (1995), TSNH:231 (1990), FGIC5:943 (1929), FTA:33 (1940)

Nepal, N.India.

Wood used as firewood & the leaves as fodder.

837b *Quercus lenticellata* Barn.

Cyclobalanopsis lenticellata (Barn.) Hjelmqvist

FBI5:605 (1888), SFT44:508 (1968), FTA:66 (1940)

Endemic to Thailand.

838 *Quercus lineata* Bl.

Q. hendersoniana Camus, *Q. ozyrhynga* Miq., *Q. polyneura* Miq., *Q. turbinata* (Bl.) Hook., *Cyclobalanopsis lineata* (Bl.) Oerst.

FGIC5:956 (1929), FBI5:605 (1890), IT:627 (1906), TFM1:230 (1972), TSH:117 (1994), FTA:57 (1940)

Nepal, N.India, (Myanmar?).

839 *Quercus mespilifolioides* Camus

Q. mespilifolia Wallich ex DC. non Walloth, *Cyclobalanopsis mespilifolia* (A.DC.) Oerst.

FFBB2:488 (1877), IT:629 (1906), FBI5:605 (1888),
BFB19:15 (1930), SFT44:506 (1968), FGIC5:960
(1929)

NE.India, Myanmar, Indo-China, S.China.

840 *Quercus semiserrata* Roxb.

Cyclobalanopsis semiserrata (Roxb.) Oerst.,
FFBB2:488 (1877), IT:627 (1906), 33 (1983),
FTSCH:71 (1995), SFT44:501 (1968), FBI5:604
(1888), FGIC5:948 (1929), FTA:70 (1940)

NE.India, Myanmar, Indo-China, (Malay
Peninsula?).

Timber hard & durable, used for cart wheel pins,
tools & general construction.

841 *Quercus vestita* Rehd. & Wils.

Q. velutina Lindl. (non Lam.), *Cyclobalanopsis
velutina* Oerst.

FGIC5:953 (1929), FBI5:606 (1888), FFBB2:487
(1877), IT:628 (1906), FTA:60 (1940)

India, Myanmar.

SALICACEAE

FT5/1 (1987)

842 *Salix tetrasperma* Roxb.

FFBB2:493 (1877), FBI5:626 (1888), IT:636 (1906),
FT5/1:122 (1987), TFM4:433 (1989), SFT9:181
(1962), 21:82 (1995), VFT:644 (1996), MPP:221
(1978), WTM:672 (1988), TSH:118 (1994),
FGIC5:1048 (1931), MPSRG:182 (1992)

India, Myanmar, China, Cambodia, Laos, Vietnam,
Malay Peninsula, W.Malesia, Philippines.

Timber pale & soft, used mostly for firewood.
Bark high in tannin, used medicinally for heart
complaints, fever & nasal congestion. A poultice
of the fresh leaves is applied externally for
shingles (herpes zoster). The tree is often
planted along river banks to prevent soil erosion.

843 *Salix babylonica* L.

FBI5:629 (1888), FGIC5:1045 (1931), FT5/1:121
(1987), TFM4:432 (1989)

Native to N.China, widely cultivated throughout
the world.

844 *Dracaena lourieri* Gagnep.

DFPT:194 (1997), MPSRG:103 (1992), FGIC6:796
(1934)

Vietnam, Laos.

The wood is used against fever & scurvy. It has
antibacterial properties useful in treating various
infectious diseases.

845 *Dracaena angustifolia* Roxb.

D. ensifolia Wall.

DIFME:77 (1991), FBI6:327 (1888), FFBB2:543
(1877), IT:641 (1906), FGIC6:798 (1934)

NE.India, Myanmar, Andaman Islands, S.China,
Indo-China, throughout Malesia to N.Australia.

Leaves used for treating swollen joints. Fruits
edible. Symbolic in religious ceremonies in India

PANDANACEAE

NHBSS24/1a (1971), FCLV20 (1983)

846 *Pandanus* genus

NHBSS24/1a (1971), FCLV20 (1983)

PALMAE (ARECAEAE)

PCT (1998), PM (1973)

847 *Livistona speciosa* Kurz,

FFBB2:526 (1877), IT:656 (1906), PCT:126 (1998),
FBI5:435 (1888), PR5/3:334 (1998), PM:73 (1973)
Myanmar, Indo-China, Malay Peninsula.

848 *Livistona jenkinsiana* Griff.

FBI5:435 (1888), IT:656 (1906), PCT:124 (1998)
NE.India, Bhutan, N.Myanmar.

849 *Livistona chinensis* R.Brown

IT:656 (1906), PM:71 (1973)
S.China, Ryukyu & Bonin Islands.

**850 *Trachycarpus oreophilus* Gibb. &
Spann.**

PCT:166 (1998), Principes 41/4:201 (1997)

Endemic to N.Thailand.

851a *Corypha umbraculifera* L.

FFBB2:524 (1877), IT:657 (1906), PCT:74 (1998),
PM:52 (1973)

S.India, Andaman Islands, Sri Lanka?, Myanmar?
Widely planted as an ornamental.

851b *Corypha utan*

852 *Borassus flabellifer* L.

B. flabelliformis L.

FFBB2:529 (1877), IT:657 (1906), PM:41 (1973), PCT:20 (1998)

Natural distribution uncertain but probably India & SE Asia.

The sap from the cut flower cluster is traditionally an important source of sugar & fermented palm wine. The timber is light but hard & durable, used for roof rafters. The leaves are used as fibre.

853 *Caryota gigas* Hahn ex Hodel

PCT:66 (1998), PJ13: (1998)

Endemic to N.Thailand

854 *Caryota urens* L.

C. aequatorialis (Becc.) Ridl., *C. macrantha* Burret, *C. rumphiana* Mart. var. *javanica* Becc. PR5/3:142 (1998), FFBB2:530 (1877), IT:654 (1906), PCT:70 (1998, as *C.maxima*)

Sri Lanka, SW. & NW.India, Nepal, Bangladesh, Myanmar, Malay Peninsula.

Considered by some authorities to be a synonym of *C. maxima* Blume ex Mart.

855 *Caryota mitis* Lour.

C. griffithii Becc., *C.sobolifera* Wall.

FFBB2:530 (1877), IT:654 (1906), PCT:70 (1998), DFPT:312 (1997), PR5/3:142 (1998), PM:44 (1973)

Myanmar, Andaman Islands, S.China, Indo-China, Malay Peninsula, Sumatra, Java, S.Borneo, N.Sulawesi & Philippines.

856 *Wallichia siamensis* Becc.

PCT:170 (1998)

Endemic to N.Thailand.

857 *Pinanga sylvestris* (Lour.) Hodel

PCT:152 (1998)

Laos, Cambodia, Vietnam, (S.China?, Myanmar?).

858 *Areca triandra* Becc.

FFBB2:537 (1877), IT:646 (1906), PCT:11 (1998)

Bangladesh, Myanmar, Andaman Islands, Cambodia, Laos, Vietnam, Malay Peninsula, Borneo, Sumatra, Philippines.

859 *Areca laosensis* Becc.

PCT:8 (1998)

restricted to Laos & NE.Thailand.

860 *Areca catechu* L.

FFBB2: 536 (1877), IT646 (1906), PCT:8 (1998),

WI1:110 (1948), DFPT:877 (1997), PM:33 (1973)

unknown in the wild, widely cultivated throughout tropical Asia & E.Africa.

The kernel of the fruit is a well-known stimulant with mild narcotic properties. It is usually mixed with lime, wrapped in a pepper (*Piper betel*) leaf & chewed. In habitual betel chewers, this mixture stains the gums & teeth red. Over-usage temporarily damages the taste buds & can be painful.

861 *Arenga westerhoutii*

PM:38 (1973), PCT:16 (1998)

Malay Peninsula.

862 *Arenga pinnata* (Wurmb) Merr.

A. saccharifera Labill

FFBB2:533 (1877), IT:648 (1906), PCT:16 (1998), WI1:115 (1948), DFPT:239 (1997), PM:37 (1973)

Natural distribution range uncertain but possibly India, SE.Asia & Indonesia.

The sap from the cut flower cluster is traditionally an important source of sugar, particularly in Malaysia & Indonesia. The young shoots & the kernel of the fruits are edible, but care must be taken since the juice of the fruit coating is irritant. This juice is sometimes used as a fish poison.

863 *Phoenix loureiri* Kunth

Phumilis Royle

IT:645 (1906), PCT:138 (1998)

India, Myanmar, S.China, Taiwan, Indo-China & Philippines.

P. loureiri is sometimes mistaken for *P.caulis* Buch.-Ham. which is not found in Thailand.

CUPRESSACEAE

FCLV28 (1996), FT2/2 (1972)

864 *Calocedrus macrolepis* Kurz

Libocedrus macrolepis (Kurz) Benth. & Hook.f.

FT2/2: (1972), FGI5:1084 (1931), FCLV28:(1996)

Myanmar, S.China, Indo-China, Hainan, Taiwan.

The wood is fragrant & durable, highly esteemed for furniture.

CEPHALOTAXACEAE

FT2/2 (1972), TFB7 (1973), FCLV28 (1996)

865 *Cephalotaxus griffithii* Hk. f.

C. mannii Hook. f., *C.oliveri* auct. non Masters

FT2/2:195 (1972), SFT6 (1962), ၁၈၅၃:55 (1996), DFPT:541 (1997), ၂၈၂:238 (1983), FBI5:648 (1888), IT:697 (1906), FCLV28:116 (1996), FGIC5:1066 (1931), ၂၈၅၂:2:44 (1975)

E.India, Myanmar, Hainan, Vietnam.

The timber is of good quality but too rare to be of widespread use.

PODOCARPACEAE

TFB7 (1973), FT2/3 (1975), FCLV28 (1996)

866 *Podocarpus neriifolius* D. Don

P. annamiensis N.Gray, *Nageia bracteata* Kurz
Often misspelt *P.neriifolia*

FFBB2:500 (1877), FBI5:649 (1888), IT:695 (1906), FGIC5:1069 (1931), DIFME:146 (1991), FT2/3:199 (1975), SFT6 (1962), VFT:18 (1996), TFM1:48 (1972), ၂၈၂:202 (1983), HKT (1988), WTM:772 (1988), TFM1:51 (1972), FCLV28:105 (1996), FGIC5:1069 (1931), FBI5:649 (1888), ၂၈၅၂:2:48 (1975)

Nepal, E.India, Myanmar, S.China, Laos, Vietnam, Cambodia, Malay Peninsula, Sumatra, Java, Borneo, Sulawesi, Moluccas, Philippines, New Guinea.

Leaves used for rheumatism. "Fruits" (receptacles) edible.

867 *Dacrycarpus imbricatus* (Bl.) de Laubenf.

Podocarpus imbricatus Bl., *P. cupressina* R.Br.
ex Mirbel

FGIC5:1068 (1931), SFT6 (1962), FT2/3:201 (1975), WTM:771 (1988), TFM1:51 (1972), FCLV28:97 (1996), FGIC5:1068 (1931), TFB7:13 (1973), FBI5:650 (1888), ၂၈၅၂:2:50 (1975)

Myanmar, S.China, Laos, Vietnam, Cambodia, Malay Peninsula, Sumatra, Java, Borneo, Philippines, Sulawesi, Moluccas, New Guinea.

868 *Nageia wallichiana* (Presl) O.Kuntze

Nageia latifolia Gord., *Decussocarpus wallichianus* (Presl.) de Laubenf., *Podocarpus wallichiana* Presl, *Platifolius* Wall., *P. blumei* Endl.

FFBB2:500 (1877), IT:695 (1906), FGIC5:1068 (1931), FT2/3:203 (1975), TFM1:53 (1972), FCLV28:100 (1996), TFB7:17 (1973), FBI5:649 (1888), ၂၈၅၂:2:51 (1975)

Assam, Myanmar, S.China, Laos, Vietnam, Cambodia, Malay Peninsula, Philippines, Java, Sulawesi, Moluccas & New Guinea.

869 *Dacrydium elatum* (Roxb.) Wall. ex Hook.
FFBB2:499 (1877), FBI5:648 (1888), IT:696 (1906), FGIC5:1069 (1931), SFT6 (1962), FT2/3:197 (1975), WTM:768 (1988), TFM1:46 (1972), FCLV28:92 (1996), TFB7:9 (1973), ၂၈၅၂:2:47 (1975)

Myanmar, S.China, Cambodia, Vietnam, Laos, montane Malay Peninsula, Sumatra, Borneo, Philippines, New Guinea, Fiji.

Timber hard & durable but with a tendency to warp.

Pinaceae

FT2/2 (1972), TFB7 (1973), FCLV28 (1996), TFB25d (1997)

870 *Pinus kesiya* Roy. ex Gord.

P. insularis Endl., *P. khasya* Kurz, *P. khasya* Royle ex Hook., *P. yunnanensis* Franchet
FFBB2:499 (1877), FBI5:652 (1888), IT:690 (1906), FGIC5:1077 (1931), FT2/2:194 (1972), PRT3:11 (1991), VFT:8 (1996), ၂၈၂:308 (1983), PR5/2:355 (1995), TFB25d (1997), ၁၈၅၂:2:110 (1995), FCLV28:32 (1996), ၂၈၅၂:2:117 (1975)

Nepal, N.India, Myanmar, Laos, Vietnam, Yunnan, Philippines.

Timber & resin used as *P.merkusii*.

871 *Pinus merkusii* Jungh. & De Vriese

FFBB2:499 (1877), FBI5:652 (1888), IT:691 (1906), FGIC5:1077 (1931), FT2/2:193 (1972), PRT3:12 (1991), ၁၈၅၂:2:111 (1995), VFT:11 (1996), ၂၈၂:306 (1983), WTM:770 (1988), DFPT:797 (1997), PR5/2: (1996), TFB25d (1997), FCLV28:35 (1996), ၂၈၅၂:2:116 (1975)
E.Myanmar, Cambodia, Laos, Vietnam, S. China, Sumatra, Philippines.

The timber is durable & easy to work, valued for construction, flooring & boats. The resin is used as lighting, in paints & for numerous medicinal purposes.

CYCADACEAE

FT2/2 (1972), FCLV28 (1996), CT (1997), PCT (1998), NHBSS24/1b (1971)

872 *Cycas pectinata* Griff.

FFBB2:503 (1877), FBI5:657 (1890), IT:698 (1906), FGIC5:1090 (1931), FT2/2:190 (1972), NHBSS24/1b:172 (1971), CT:10 (1997), PCT:184 (1998), FCLV28:16 (1996)

NE. India, Nepal, Bangladesh, Myanmar, Laos, Vietnam, S. China (Kweichow), Malay Peninsula?

873 *Cycas siamensis* Miq.

C. immersa Craib

FFBB2:503 (1877), FBI5:657 (1890), IT:698 (1906),
FGIC5:1088 (1931), FT2/2:189 (1972), NHBSS24/
1b:173 (1971), CT:24 (1997), PCT:185 (1998),
FCLV28:16 (1996)

Myanmar, Laos, S.Vietnam, Yunnan.

874 *Cycas simplicipinna* (Smitinand)

K.D.Hill

C. micholitzii Dyer var. *simplicipinna* Smitinand

FGIC5:? (1931), FT2/2:192 (1972), NHBSS24/
1b:164 (1971), CT:33 (1997), PCT:188 (1998),
FCLV28: (1996)

Myanmar, S.China, Laos, (N.Vietnam?)

CYATHEACEAE

FT3/1 (1979)

875 *Cyathea gigantea* (Wall. ex Hk.) Holtt.

C. glabra auct. non (Bl.) Copel (in FGIC)

FT3/1:105 (1979), FGIC7/2:83 (1939)

Sri Lanka, S.India, E.Himalayas, Myanmar, S.China,
Indo-China, Malay Peninsula, Sumatra, W.Java.

876 *Cyathea chinensis* Copel.

C.brunoniana auct. non (Hk.) Cl. & Bak. (in FGIC)

FT3/1:102 (1979), FGIC7/2:86 (1939)

E.Himalayas, Yunnan, Vietnam, Laos.

877 *Cyathea spinulosa* Wall. ex Hook.

FT3/1:102 (1979)

S.India, E.Himalayas, Myanmar, China, Taiwan,
S.Japan.

878 *Cyathea podophylla* (Hk.) Copel.

FT3/1:104 (1979), FGIC7/2:81 (1939)

S.China, Indo-China, Taiwan, Ryukyu Islands.

879 *Cyathea latebrosa* (Wall. ex Hk.) Copel.

FT3/1:104 (1979), FGIC7/2: 85 (1939)

Hainan, Laos, Vietnam, Cambodia, Malay
Peninsula, Sumatra, Borneo.

Glossary of botanical & technical terms

3X pinnate (tripinnate) compound leaf divided three times. Compare *bipinnate*.

Aborted not fully or properly developed, rudimentary.

Abrupt changing suddenly rather than gradually, as a leaf that is narrowed quickly to a point. **fig.5**

Achene a small, dry fruit with a single seed, not splitting open when ripe. **fig.14**

Acute see *pointed*. **fig.5**

Acuminate see *tapering*. **fig.5**

Aerial root a root that starts above ground level, often attached directly to the branches rather than the main trunk.

Alluvial periodically flooded areas along the banks of a river.

Alternate (leaf) arranged singly at intervals along a stem. **fig.3** (**stamen**) between the petals. Compare *opposite*.

Angiosperm any seed-bearing plant of the division Angiospermae, having *ovules* enclosed in an *ovary* & seeds in a fruit. Compare *Gymnosperm*.

Angled squarish in cross-section, often with obvious ridges.

Anther the part of the *stamen* bearing the pollen, usually at the top of a distinct stalk (*filament*). **fig.10**

Apiculate ending abruptly in a small, slender point.

Appendage a secondary part attached to a main structure.

Appressed (adpressed) pressed flat against a surface but not fused to it.

Arched veins side veins starting more or less at right angles to the main vein but steeply curved upwards near the margin. **fig.7**

Aril an extra seed cover, which grows up from the seed stalk (funicle) and either completely or partially encloses the seed, often fleshy & brightly colored. **fig.13** Compare *sarcotesta*.

Arilloid an extra seed cover of uncertain origin, either a true *aril* or a *sarcotesta*.

Armed a plant with *spines*, *thorns* or *prickles*.

Aromatic having a distinct smell, at least when crushed.

Asymmetric unequal-sided. **fig.6**

Axil (twig) the upper angle between leaf and twig. **fig.1** (**vein**) the upper angle between the midvein & the side veins. **fig.1**

Axillary arising from the angle between a leaf and a twig. **fig.12** compare *terminal*.

Axis (pl. Axes) the central stalk of a flower or fruit cluster. **fig.1**

Basal at or forming the base.

Basal veins veins which start at the base of the leaf, including the midvein. **fig.7**

Beak a narrow and more or less rigid tip, usually referring to a fruit.

Berry a fleshy fruit without a *stone*, usually with many small seeds, technically referring only to fruits developed from a single *pistil* but often used in a broader sense. **fig.14**

Bipinnate (twice pinnate) a compound leaf where the primary divisions (*pinnae*) are themselves again divided into *leaflets*. **fig.2**

Bisexual having male and female organs in the same flower.

Bract a modified or rudimentary leaf beneath a flower or fruit or their clusters. **fig.10**

Branched hairs a type of hair with several tips but a single main stem at the base. **fig.9** compare *star-shaped*.

Briefly deciduous losing leaves only for a short time (<1 month), usually in the cold season.

Bristle a short, stiff hair or hair-like structure.

Bud an undeveloped or dormant leaf, flower or shoot, usually protected by scales.

Buttress a vertical ridge or projection growing out at an angle from the base of the trunk to give added support.

Calyx the collective name for the sepals or outer envelope of a flower, external to the *corolla* & usually much less conspicuous. **fig.10** In this book, we also refer to the outer layer of a flower where the calyx & corolla are not differentiated as "calyx" although technically this should be termed "*perianth*"

Calyx teeth short projections around the upper rim of a calyx of fused sepals, technically tiny calyx lobes.

Calyx tube the lower, fused portion of a calyx of fused sepals, not necessary tubular in shape.

Canopy the highest continuous level of foliage in a forest.

Capsule a dry fruit which splits into sections or opens by slits or holes when ripe. **fig.14**

Catkin a crowded spike-like cluster of tiny unisexual flowers, usually drooping, as in oaks & willows. **fig.12**

Clasping partly or wholly surrounding the stem.

Claw the narrow, stalk-like basal part of some petals or sepals.

Cleft a deep cut or split, usually refering to leaves or petals.

Coarsely toothed with large, irregularly spaced teeth. **fig.8**

Column (stamens) a structure formed by the fusion of *filaments* into a tube around the *style*, typical of Malvaceae, Sterculiaceae & Meliaceae.

Compound leaf a leaf divided into leaflets, each of which often has the general appearance of a whole leaf. See *pinnate*, *bipinnate*, *digitate*, *trifoliate*.

Concave hollowed out or curved inwards.

Cone the fertile organ of *conifers* formed of woody scales on which the seeds are borne.

Conical cone-shaped, with the point of attachment at the broad end.

Conifer a member of the *Gymnospermae* bearing naked flowers in cones, as in pines, podocarps & yews.

Connective the portion of the *stamen* connecting the two pollen sacs of an *anther*.

Conspecific originally described as 2 distinct species but now considered to be a single species.

Convex rounded, curved outwards.

Coppice a woody plant that has been cut to the ground & is regrowing with several stems. The leaves on coppice regrowth are often of different shape & size than mature trees.

Corolla the collective name for the *petals* or inner *perianth* whorl of a flower, where the petals are at least partly fused together **fig.10**

Corolla lobe one of the free portions of a corolla of fused petals. See *corolla tube*.

Corolla tube the lower, fused portion of a

corolla of fused petals, often tubular in shape but not necessary so.

Corymb a dome-shaped or flat-topped flower cluster in which the individual flower stalks are attached at different points along the main stem, and the outer flowers open first. **fig.12**

Cracked (bark) in this book, referring to a pattern with both vertical & horizontal slits in the outer bark, which may be narrow or wide. Compare *fissured*. **Network cracked** - irregularly interlacing cracks. **Grid cracked** - horizontal & vertical cracks more or less at right angles, forming a squared pattern.

Crooked irregularly bent or contorted.

Cupule the outer layer of the fruit in Fagaceae, sometimes "cup-like" & surrounding only the base of the *nut* but not necessarily so.

Cyme (cymose) a flower cluster in which the central and terminal flower opens first.

Deciduous (tree) losing the leaves periodically, usually once a year in the dry season. **(forest)** an area where at least 1/2 of all the trees are deciduous. Including both *deciduous/bamboo* & *dry dipterocarp* forests unless otherwise specified.

Deciduous/bamboo (mixed deciduous forest) a forest type with a wide variety of deciduous tree species as well as bamboo. Many such forests were once teak forests - the bamboo becoming established after the teak was logged out. *Dry dipterocarp* species may be present but they are never dominant.

Decussate leaves arranged along the stem in pairs, with each pair at right angles to the pair above and below, thus forming 4 rows of leaves. **fig.3**

Depressed flattened from above; pressed down.

Dichasium a forked cymose flower cluster in which each stalk produces a terminal flower & a pair of side stalks which themselves produce flowers or further side stalks.

Dicotyledon any flowering plant of the class Dicotyledonae, having seedlings with two cotyledons & usually with net-veined leaves. Over 95% of native trees in N.Thailand fall into this class. Compare *monocotyledon*.

Digitate (palmately compound) a compound leaf which has all its *leaflets* attached at the

same level on the top of a common stalk.**fig.2**

Disc (disk) a ring, disc or cup-shaped structure developed from the *receptacle* at the base of the *ovary* or from *stamens* around the ovary.**fig.10**

Distinct separate, not attached to organs of the same type.

Domatium (pl. domatia) a small cavity or swelling, such as at the vein axils of a leaf. Domatia are often inhabited by ants or bacteria that provide protection or nourishment for the plant.**fig.9**

Doubly toothed each tooth bearing smaller teeth along its margin.**fig.8**

Downy covered with short, soft hairs.

Drupe a fleshy fruit in which the seed is enclosed in a bony casing (*stone*) eg. a plum.**fig.14**

Dry dipterocarp (forest) a lowland deciduous forest type, typically with a substantial proportion of at least one of the deciduous dipterocarp species (*Shorea obtusa*, *S.siamensis*, *Dipterocarpus obtusifolius* & *D.tuberculatus*).

Eccentric (excentric) off-centre, not positioned along the primary axis, as for example a *style* which is attached to the side rather than the top of an *ovary*.

Ellipsoid a 3-dimensional object which is elliptic in long section and circular in cross section, like a rugby ball.

Elliptic 2-3x as long as broad, widest in the middle & tapering towards both ends.**fig.4**
Compare *oblong*, *ovate*, *obovate*.

Elongated lengthened; stretched out.

Emergent a large tree with a substantial portion of the crown rising above the canopy layer.

Endemic native or confined naturally to a particular and usually restricted geographical region.

Endocarp (stone) the innermost layer of a *drupe*, surrounding the seed, typically hard or fibrous.**fig.13**

Endosperm (albumen) the tissue surrounding the embryo of a seed & providing food for the young seedling in the form of starch & oils.

Epicalyx a whorl of sepal-like appendages, resembling the calyx but outside of the true calyx, typical of *Malvaceae*.

Epiphyte (epiphytic) a plant growing upon

another plant but not nourished by it, eg. as in many Orchids.

Escape a cultivated plant growing wild & reproducing by itself.

Even-pinnate a pinnate leaf with an even number of leaflets, ie. without an unpaired terminal leaflet.**fig.2** Compare odd-pinnate.

Evergreen (tree) a plant that always has at least $\frac{2}{3}$ of the crown covered in leaves. (**forest**) an area where the majority ($>\frac{2}{3}$) of the trees are evergreen. Compare *semi-evergreen*, *partly deciduous*.

Exserted projecting beyond the surrounding parts, as *stamens* or *styles* protruding beyond the *corolla*.

Fallow field an agricultural field which has been left uncultivated for a number of years in order to restore the soil quality.

Fasicle a cluster of flowers arising from the same point of the stalk but not sharing a common stalk.

Female flower a flower with a fertile *ovary* but without fertile *stamens* (sometimes with infertile ones).

Fig a highly modified flower/fruit cluster found in the genus *Ficus*, consisting of a hollow *receptacle* with masses of tiny individual flowers/fruits borne on the inner surface.

Filament the stalk of a *stamen*.**fig.10**

Finely toothed with small teeth regularly spaced along the margin.**fig.8**

Fissured (bark) split or cracked in vertical lines, usually separate from each other but sometimes interlacing. Compare *cracked*.

Flaking (bark) peeling in thin, irregular pieces, usually remaining partially attached at one end for some time.

Flush(ing) producing a large burst of young leaves simultaneously, often covering the whole crown within a few days.

Fluted a tree trunk with an irregular or wavy cross-section, like a greek column.

Foetid with an offensive odour, stinking.

Follicle a dry fruit splitting along one side only.**fig.14**

Forked divided into two or more essentially equal branches, Y-shaped.

Form populations of a species which vary slightly from the typical, whether or not such variation is limited geographically. Compare *variety*, *subspecies*.

Fragrant with a pleasant smell. Compare *foetid*.

Free not joined to each other or to any other organ, usually referring to *stamens*, *sepals* or *petals*.

Free ending a small point or undeveloped bud at the end of the common stalk of a pinnate leaf, characteristic of Sapindaceae.

Fringe (fringed) a margin with many fine slits, giving it a ragged appearance.

Fruit the seed-bearing portion of a plant with its associated structures. The term does not imply that it is either fleshy or edible.

Funnel-shaped gradually widening from base to apex. **fig.11**

Gall (general) a growth or protuberance formed by insects, found on any part of the plant. Often highly distinctive & useful for identifying both the plant and the insect. **(fig)** with only male & infertile female flowers.

Gallery evergreen (forest) a narrow strip of evergreen forest along a watercourse, surrounded by deciduous forest or degraded areas.

Genus a group of closely related species, sharing the same first name in their scientific name.

Gland technically, a secreting organ either on the surface or inside a structure. Commonly used to describe any small dot, knob or wart-like protuberance that is a normal part of the plant & often has no known function.

Gland-dotted with many minute dots, presumed to be glands.

Glandular-toothed a leaf margin with teeth that have glands at their tips or in the hollows (sinuses) between them. **fig.8**

Glaucous covered with a whitish, greyish or bluish coating (bloom), usually waxy & easily rubbed off, like the surface of a plum. To test for wax, hold a small flame close to the surface - if the color suddenly becomes transparent, it is wax.

Globose spherical, rounded. **fig.11**

Gnarled irregularly twisted & often with knotty

swellings on the trunk, giving the impression of great age or tough environmental conditions.

Groove a long narrow channel or furrow.

Gymnosperm any seed bearing plant of the division *Gymnospermae*, in which the ovules are borne naked on the surface of megasporophylls, which are often arranged in cones, eg. cycads, pines.

Habit the characteristic mode of growth or occurrence; the form and shape of a plant.

Habitat the environmental conditions or type of place where a plant grows.

Half-inferior ovary a flower with the *hypanthium* fused to the lower half of the ovary, giving the impression that the sepals, petals & stamens arise from about the middle of the ovary. Compare *inferior*, *superior*.

Heart-shaped (leaf base) with 2 rounded lobes projecting below the point of attachment of the stalk. **fig.6 (leaf shape)** broadly *ovate* with a base as above, shaped like a valentine heart.

Heartwood the innermost layer of wood, usually somewhat darker than the outer layers. Compare *sapwood*.

Hill forest forest above about 1000m, typically evergreen.

Hybrid offspring of two plants of different species or varieties.

Hypanthium a cup-shaped extension of the floral axis, usually formed from the fusion of the base of the *calyx*, *corolla* & *stamens*.

Inferior ovary situated below the *petals*, *sepals*, and *stamens* in the flower, resulting in a fruit with the flower remains at the base. Compare *superior*, *half-inferior*.

Inflexed bent abruptly inwards.

Inflorescence a group of flowers having a common axis or main stem.

Inner bark (slash bark) in this book, used to refer to the most obvious layer between the outer bark & the wood, whatever the morphological origin.

Intermediate veins veins between & usually more or less parallel to the secondary (side) veins, larger than the tertiary veins. **fig.7**

Internode the length of stem that lies between two leaf joints (*nodes*).

Introduced brought intentionally from another

area; not native.

Involucre a circle or cluster of *bracts* beneath flowers or fruits.

Irregular (flower) with some parts different from other parts in the same series, ie. not radially symmetrical. Usually referring to flowers with a *papilionaceous* (pea-like) or 2-lipped *corolla*.

Keel (general) a prominent ridge, like the bottom of a boat. (**corolla**) the 2 lower fused petals of a *papilionaceous* flower. **fig.11**

Ladder-like veins parallel, evenly spaced & quite straight. **fig.7**

Lanceolate narrow & pointed, 3-5x longer than broad & widest towards the base (lance-shaped)

Lateral (eccentric) on or at the side rather than at the top. Compare *terminal*.

Latex milky fluid oozing from cut parts, often white & sticky.

Lax loose, open & spreading, not compact.

Leaf scar the scar remaining on the twig after the leaf falls. **fig.1**

Leaflet one of the sub-divisions of a compound leaf, often appearing like a true leaf but without a bud at the base of its stalk. **fig.1**

Leathery thick, strong & quite smooth, like animal skin.

Lenticel a circular or elongated corky spot on the bark or fruit, originated as a breathing pore.

Less-disturbed a forest which is close to its natural or primary state. We have avoided the use of "primary" in this book because almost no forests in N.Thailand are completely unaffected by human activities.

Linear long and narrow with parallel sides, >5x as long as broad. **fig.4**

Lip one of the free sections of an irregular *corolla* or *calyx*, usually consisting of at least 2 more or less fused lobes.

Lobe (lobed) a distinct segment, fused to other segments at the base but free at least at the top.

Locule the chamber or cavity of an ovary containing the ovules.

Looped veining side veins that curve upwards & join each other near the margin. **fig.7**

Longitudinal along the main axis, lengthways. Compare *tranverse*.

Lowland forest forest below about 1000m, typically deciduous except in moist areas.

Male flower a flower with fertile stamens but no fertile ovary, sometimes with infertile pistils.

Margin the outside edge of a leaf blade.

Marginal vein a vein running parallel to the margin of a leaf. **fig.7**

Membranous thin, paper-like, often almost transparent.

Midvein the central conducting and supporting structure of the blade of a leaf.

Monocotyledon any flowering plant of the class Monocotyledonae, having seedlings with a single cotyledon & usually with *parallel-veined* leaves. Grasses, orchids & gingers fall into this class, but only a small number of tree species - eg. palms & dracaenas. Compare *dicotyledon*.

Morphology the form & structure of an organism.

Mouth see *throat*.

Naked (bud) without scales. (**flower**) without calyx or corolla. (**ovule**) not enclosed in an ovary, as Gymnosperms.

Native belonging naturally, not introduced from another country.

Naturalized native to another area, but now established & reproducing on their own.

Network (veining) a pattern of veining with the secondary veins at an angle to the primary vein(s) & the tertiary veins again at an angle to the secondary veins. The typical pattern for most Dicotyledons. Compare *parallel-veining*. (**bark**) irregularly interlacing cracks.

Nocturnal flowers which open at night, often pollinated by bats or moths.

Node the place on a twig where one or more leaves are attached, also used for the point of attachment of leaflets in a compound leaf. **fig.1**

Notched (retuse) with a small depression, as at the tip of a leaf or fruit. **fig.5**

Nut a simple, dry one-seeded fruit with a hard shell, not splitting open. **fig.13**

Obconical cone-shaped with the attachment at the narrow end.

Ob lanceolate inversely lanceolate, >3x as long as broad & widest towards the top.

Oblique unequal sided, asymmetric. **fig.6**

Oblong 2-3x longer than broad, with nearly parallel sides.

Oblong-lanceolate >3x longer than broad & widest in the middle.

Obovate inverse egg-shaped, 2-3X longer than broad & widest towards the top.

Odd-pinnate a pinnate leaf with an odd number of leaflets - ie with an unpaired terminal leaflet.**fig.1**

Once-pinnate a compound leaf with a single set of undivided leaflets. The term "*pinnate*" usually means once-pinnate unless otherwise specified. Compare *bipinnate*.**fig.2**

Opposite (leaf) two leaves arising together at the same level on the twig. Compare *alternate*, *decussate*. (**flowers**) at the same level as a leaf but on the opposite side of the twig.**fig.3**

Oval broadly elliptical, with the width more than half the length.**fig.4**

Ovary the female part of the flower containing the ovules and later the seeds, usually surmounted by one or more styles & stigmas.**fig.10**

Ovate egg-shaped (2-dimensional), with the widest part towards the base.**fig.4**

Ovoid egg-shaped (3-dimensional), with the widest part towards the base.

Ovule the fertile cells inside the ovary which become the seeds in the fruit.

Palmate a simple leaf that is divided or lobed into segments like the palm of a hand. NB: The term "*digitate*" is used in this book to refer to palmately compound leaves.**fig.2**

Panicle a branched flower cluster with the bottom flowers maturing first.**fig.12**

Papilionaceous a flower like that of a sweet pea, typical of the subfamily Papilionoideae (Leguminosae), with an upper standard petal, 2 side petals (wings) & 2 fused lower petals (keel).**fig.11**

Parallel veining with the secondary veins more or less parallel to the main vein & often almost as prominent, typical of *gymnosperms* & *monocotyledons*.**fig.7** Compare *network veining*.

Parasite (parasitic) a plant that obtains its food from another living plant to which it is attached. Compare *epiphyte*.

Partly deciduous (tree) losing some but not all of the leaves at the same time. (**species**) only

some individuals are deciduous, whereas others are evergreen or only partly deciduous, usually depending on location.

Pedice the stalk of a single flower or fruit. Compare *peduncle*.

Peduncle the stalk of a flower or fruit cluster. Compare *pedicel*.

Peltate attached to its stalk on the underside, not on the margin.**fig.6**

Pepo a non-splitting fruit with a tough skin & fleshy interior with many seeds, eg a melon.

Perianth the *calyx* & *corolla* collectively, especially when they are similar in appearance. In this book, we usually use "*calyx*" to refer to an undifferentiated calyx & corolla, although "*perianth*" is the correct technical term. See *tepal*.

Petal an individual segment of the *corolla*, often brightly colored & the most obvious part of the flower.**fig.10**

Petiole the stalk of a leaf. In compound leaves, refers to the main stem between the lowest leaflets & the twig.**fig.1**

Petioule the stalk of a leaflet in a compound leaf.**fig.1**

Phenology the pattern of flowering & fruiting throughout the year.

Pinna (pl. Pinnae) the primary division of a compound leaf.

Pinnate a compound leaf with leaflets arranged along each side of a common stalk, usually more or less in the same plane.**fig.1** see *once-pinnate*.

Pioneer a species which becomes established in the early stages of succession, frequently light-demanding & unable to persist in dense mature forest.

Pistil a unit of the female reproductive organ of a flower, typically consisting of a *stigma*, *style* & *ovary*.**fig.10**

Pit a small depression.

Pith the spongy or hollow centre of twigs or some stems.

Planar arranged flat in a single plane. Compare *spiral*.**fig.3**

Plano-convex flat on one side & rounded on the other.

Plated (bark) flaking in rather rigid pieces, breaking all around the margin more or less

simultaneously (rather than remaining attached at one end), often leaving a mottling of different colors on the bark. Compare *flaking*, *peeling*.

Pod a dry fruit without a fleshy layer, usually splitting open when ripe & typically elongated or flattened with many seeds. Sometimes used exclusively for plants of the family Leguminosae, but not in this book.**fig.14**

Pointed (acute) gradually becoming narrower, with more or less straight sides.**fig.6** Compare *tapering*, *blunt*.

Prickle a sharp curved thorn, typically with a stout, woody base. Technically, a woody outgrowth of the epidermis that can be removed without tearing the wood. Compare *spine*, *thorn*.

Pseudo- (prefix) false, not genuine, not the true or the typical. **Pseudoterminal** appearing terminal but in fact with undeveloped leaf buds in front on the flower clusters.

Pyrene the *stone* of a drupe or segment of a compound fruit, consisting of one or more seeds encased in a bony layer.

Raceme an unbranched more or less elongated flower cluster, where the individual flowers are stalked and the lowest flowers open first.**fig.12** Compare *spike*, *panicle*.

Rachis (rhachis) the central axis or stalk of a compound leaf or flower/fruit cluster.**fig.1**

Receptacle the uppermost part of the flower stalk which bears the flower parts, sometimes enlarged & dome-like or cup-shaped. The hollow 'fig' of the *Ficus* species is actually a receptacle.

Recurved (reflexed) bent or curved downwards or backwards. Compare *spreading*, *incurved*.

Regular radially symmetrical; said of a flower in which all the parts in a series are similar in size & arrangement on the *receptacle*. Compare *irregular*.

Resin a sticky substance, insoluble in water, which is secreted from the cut bark of some trees, eg. Pines.

Rhythmical a growth pattern characterised by spurts of growth interspersed with dormant periods, usually resulting in clusters of leaves (or their scars) at more or less regular intervals along the twigs.

Rudimentary imperfectly developed; vestigial.

Ruminate (endosperm) irregularly grooved, wrinkled or ridged, often with a "brain-like" appearance.

Salverform a *corolla* with a slender tube and abruptly spreading, flattened lobes.**fig.11**

Samara a dry winged fruit that does not split open when ripe.**fig.14**

Sap the vital juice that carries food and water through plants.

Sapwood the outer layer of wood that is actively transporting water, usually paler than the inner layer (*heartwood*).

Sarcotesta a fleshy outgrowth of the seed coat (*testa*), as in a rambutan. Compare *aril*.

Scale a thin dry flap of tissue, usually a modified or rudimentary leaf, such as those protecting a leaf or flower bud.**fig.9**

Scar (leaf) the mark on a twig at the point of attachment of a fallen leaf.**fig.1** (**nut**) the rough or unpolished section at the bottom of a nut where it was attached to the fruit wall.**fig.14**

Scattered irregularly & usually sparsely arranged.

Scurfy covered in small bran-like scales.

Secondary growth an immature forest area, often dominated by pioneer species, such as is found in older fallow fields.

Semi-evergreen (tree) losing some leaves but never all of them at the same time, often producing flushes of new leaves. (**forest**) an area where most of the trees are evergreen but there is also a significant proportion (1/5-1/2) of deciduous trees. Compare *partly deciduous*.

Semi-open between 30 and 70% cover. In some forests (eg. lowland evergreen), this will be a degraded area, but in others (eg. pine forests), this may represent the natural condition.

Sepal one of the parts of the *calyx* (outer envelope of a flower), usually green & inconspicuous.**fig.10**

Sessile having no stalk.

Sheath a tube-like covering; a portion of an organ that surrounds, at least partly, another organ.

Shrub a woody plant less than about 3m high and usually having several main stems from near the base.

Side veins (secondary veins). the second

largest type of veins in a leaf, usually arising from the mid-vein but sometimes arising directly from the base of the leaf (in *parallel veining*). **fig.7**

Simple not compound. (**leaf**) undivided, not separated into leaflets, although sometimes lobed. **fig.2** (**pistil**) with only one *ovary*, *style* & *stigma*. (**flower/fruit cluster**) without a common stalk, ie. solitary or *fascicled*.

Smooth (bark) without cracks or fissures. (**leaves, etc**) without hairs.

Sorus (pl. Sori) a cluster of *spore* sacs (sporangia) on the lower surface of a fern leaf.

Spike a type of inflorescence with stalkless flowers arranged along a simple, undivided axis. An unbranched, elongated cluster of stalkless flowers, the bottom ones maturing first. **fig.12** Compare *raceme*.

Spindle-shaped broadest near the middle & tapering at both ends, like a spinning spindle.

Spine a sharp, straight woody projection on a stem or leaf. Technically a stiff, slender sharp-pointed structure arising from below the skin (epidermis), representing a modified leaf or stipule. Compare *prickle*, *thorn*.

Spiral arranged at intervals along a stem & not in the same plane. Sometimes with an obvious spiralling twist but often appearing random. **fig.3** Compare *planar*; *decussate*.

Spore the reproductive unit in ferns & fungi. In ferns the spore is the first cell of the gametophyte generation, containing half the chromosome number of the parent generation.

Spray a slender branch with flowers or fruits on it.

Spreading extending nearly to the horizontal; bent outwards but not backwards.

Stalked (glands, calyx cup etc) having a narrow, neck-like base (stipe). **fig.9**

Stamen the male organ of a flower that produces pollen, consisting of an *anther* & (usually) a *filament*. **fig.10**

Standard (banner) the upper & usually largest petal in a *papilionaceous* flower (like a sweet-pea). **fig.11**

Star-shaped (stellate) hairs with several branches radiating from the base, also referring in this book to tight clusters or tufts of spreading

hairs which appear star-shaped under the hand lens. **fig.9** compare *branched hairs*.

Status uncertain reported in N.Thailand by other authors but not seen by us either in the natural state or in herbaria.

Stellate see star-shaped.

Sterile lacking functional sex organs; infertile, as a stamen that does not bear pollen, or a fruit without seeds.

Stigma the part of the female reproductive unit of the flower which is receptive to pollen, often at the top of a distinct stalk (*style*). **fig.10**

Stipel a small stipule-like structure at the base of a *leaflet*.

Stipule a leaf-like, scale-like or hair-like appendage at the base of a leaf stalk.

Stone (endocarp) the hard woody or bony casing surrounding the seed(s) in a *drupe*, such as a plum. **fig.13**

Straggly a shrub or tree with slender, spreading or drooping branches, often leaning against other trees for support.

Strap-shaped flat & elongated with more or less parallel sides, like a belt.

Striate with fine longitudinal lines, channels or ridges.

Style the part of the *pistil* between the *ovary* and *stigma*, usually narrow & stalk-like. **fig.10**

Subspecies a taxonomic group that is a subdivision of a species, usually occurring because of geographical isolation. Compare *variety*, *form*.

Succulent thick & fleshy or juicy.

Superior ovary attached above the stamens, petals and sepals; resulting in a fruit with the remains of the flower at the top of the fruit. Compare *inferior*, *half-inferior*.

Symbiotic (symbiosis) a non-parasitic relationship between 2 organisms to their mutual benefit.

Sympodial a forked pattern of branching, where the main branch divides into 2 or more subsidiary branches at more or less regular intervals. Frequently associated with terminally arranged flowers.

Syncarp a multiple or aggregate fruit, such as a raspberry.

Synonymn a name that has been superseded or rejected.

Tannin an astringent substance used in the preparation of leather, usually from the bark.

Tapering (acuminate) gradually becoming narrower, with concave sides, usually with a more or less sharp point.**fig.5** Compare *pointed*.

Tepal a *perianth* segment that is not clearly distinguishable as being either a *sepal* or a *petal*. In this book we usually used "*sepal*" to refer to a *tepala*, although this is technically incorrect.

Terminal at the end of the leaf or twigs. A plant with terminal flowers usually has a forked (*sympodial*) branching pattern because the vegetative growth of the main shoot is stopped by the development of the flower.**fig.12**

Tertiary veins the third level of veining in a leaf, typically more or less at right angles to the *secondary* (side) veins.**fig.7**

Thorn in this book, used for any sharp woody projection with a long narrow tip & without a stout base, either straight or curved. Technically, a modified woody stem with a sharp point. Compare *prickle*, *spine*.

Throat (of corolla) the point where the tube & the lobes meet.

Thyrse (thyrsus) a branched flower cluster with the main axis indeterminate (*raceme*-like) and the lateral axes determinate (*cymose*).

Translucent almost transparent.

Transverse at a right angle to the main axes of a structure.

Tree a woody plant with a single main stem, typically at least 3m tall & 10cm diameter at breast height.

Trifoliate a compound leaf having three leaflets.**fig.2**

Tube (tubular) a hollow, cylindrical structure, eg. the lower fused portion of a corolla.**fig.11**

Tuft a dense cluster, usually referring to hairs.**fig.9**

Twisted contorted in a spiral, like a strand of DNA.

Umbel a flat-topped or dome-shaped cluster of flowers with the individual flower stalks attached at the same level at the top of a common stalk, like the spokes of an umbrella.**fig.12**. **Compound umbels** = twice over, each stalk again dividing at top.

Unarmed not having prickles, spines or thorns.

Uncertain see *status*.

Understorey the layer of shrubs & small trees below the main canopy layer in a forest.

Unifoliate a compound leaf with a single *leaflet*, appearing *simple* but with a stalk distinct from the stalk of the whole leaf.

Unisexual (flower) with *stamens* & *pistils* in different flowers, either on the same tree (monoecious) or different trees (dioecious).

Untoothed a leaf without teeth along the margin.**fig.8**

Urceolate urn-shaped, globose with an open circular mouth at the top.

Valve (fruit) one of the parts into which a fruit *capsule* splits when ripe.

Variety the portion of a species which in a *certain* geographic area differs slightly from the typical. Compare *form*.

Vein a strip of membranous tube in the leaf along which sap is transported.

Visible X1 visible with the naked eye, without the use of a handlens or microscope.

visible X10 visible with a handlens but not with the naked eye.

Wart (wart) a firm protuberance, often with an uneven surface.

Waste ground an highly disturbed area not used for any specific agricultural or other human activity, but not yet with sufficient tree cover to be called secondary growth or forest.

Wavy (margin) with flat, shallow, rounded undulations.**fig.8** Compare *toothed*.

Wedge-shaped (cuneate) narrowed regularly to a point with straight (ie. not concave) sides.

Whorle a ring of 3 or more similar organs attached at the same level.**fig.3** Compare *alternate*, *opposite*.

Winged (leaf stalks, twigs, fruits) a thin, flat margin bordering a structure, not necessarily implying that its purpose is for flying! **(flower)** the side petals in a *papilionaceous* (pea-like) flower.**fig.11**

Wooly with long, soft, entangled hairs; lanate.

Figure 1: PARTS OF A PINNATE LEAF

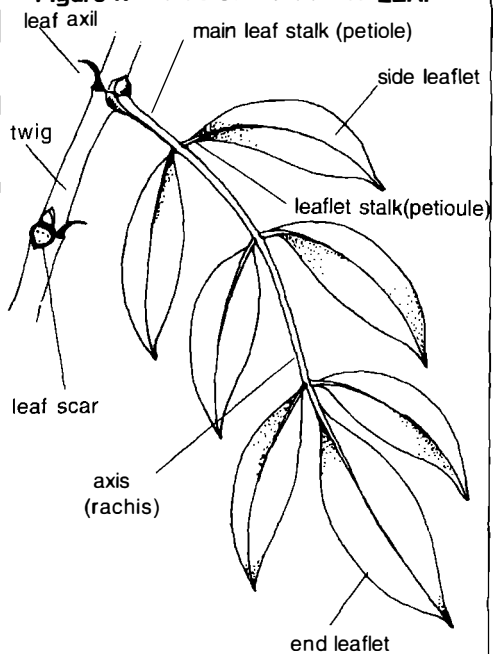


Figure 2: LEAF TYPES

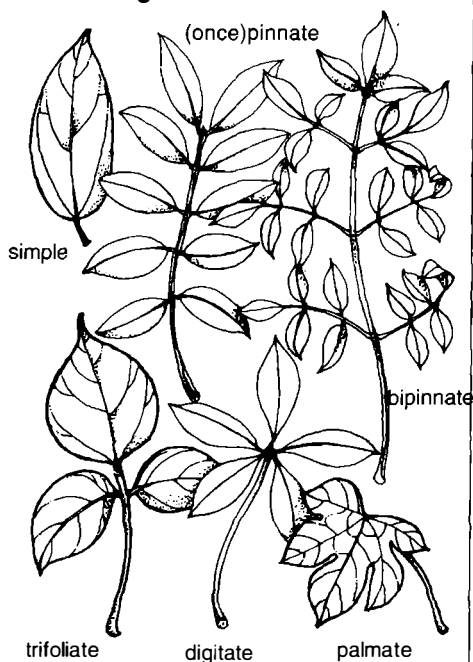


Figure 3: LEAF ARRANGEMENTS

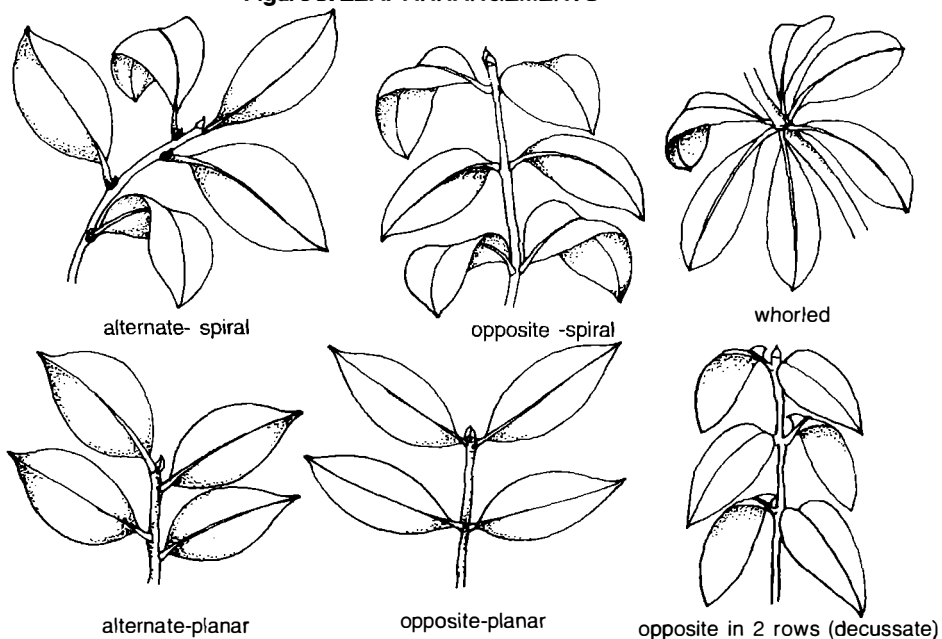


Figure 4: LEAF SHAPES

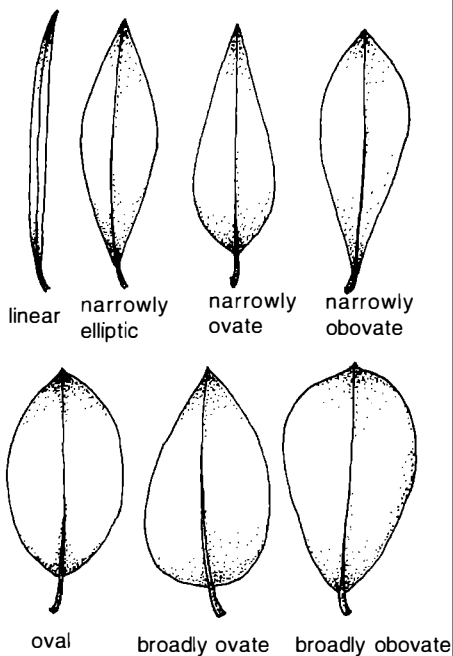


Figure 5: LEAF TIPS

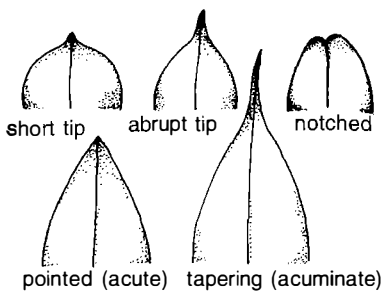


Figure 6: LEAF BASES

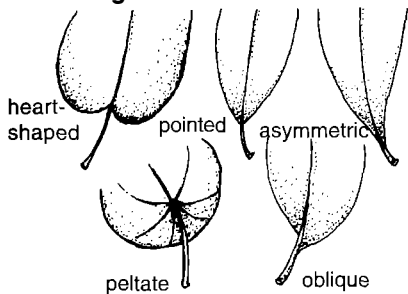


Figure 7: LEAF VEINING

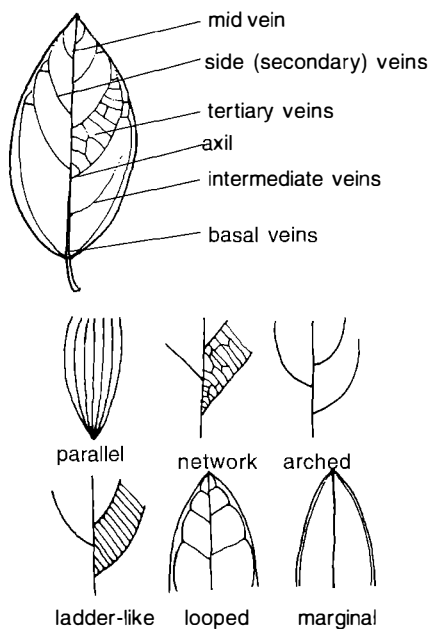


Figure 8: LEAF MARGINS

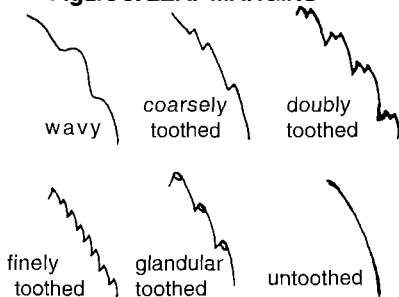


Figure 9: TEXTURE TYPES

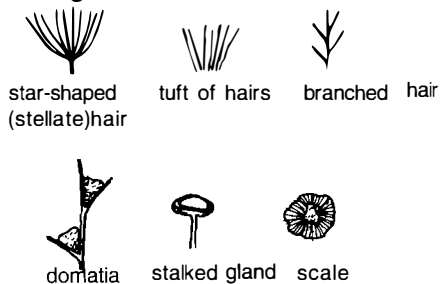


Figure 10: FLOWER STRUCTURE

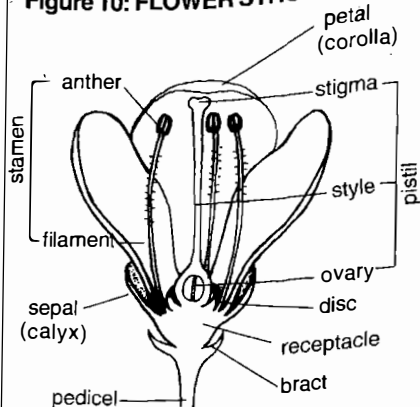


Figure 11: FLOWER SHAPES

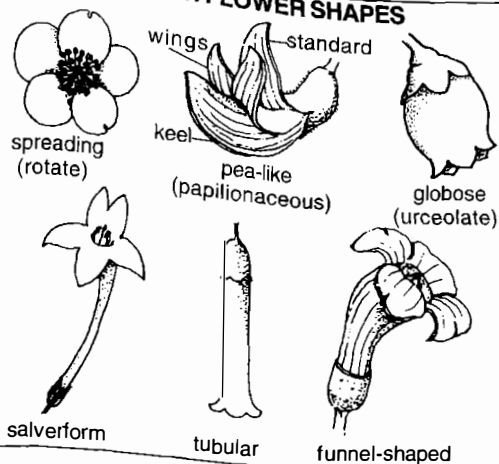


Figure 12: FLOWER ARRANGEMENTS

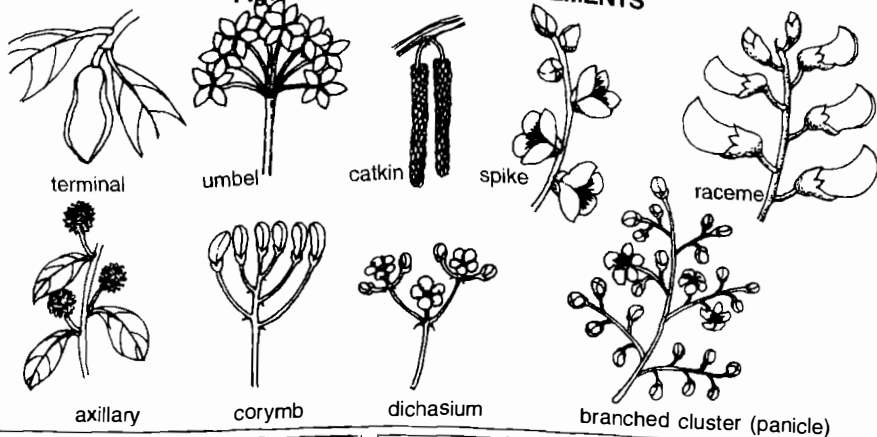


Figure 13: STRUCTURE OF A DRUPE

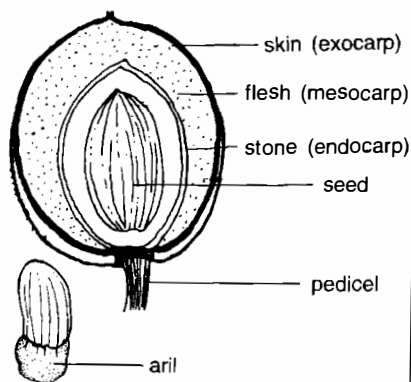


Figure 14: FRUIT TYPES

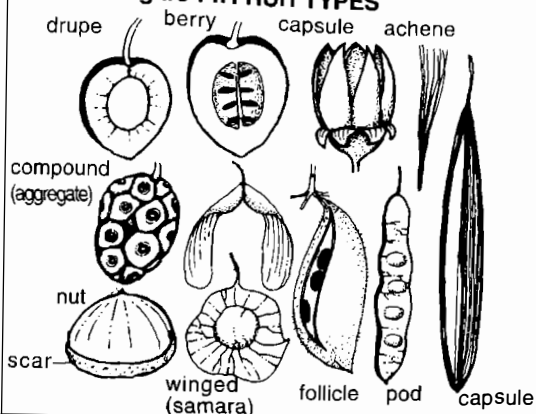


TABLE 1: All Families

order of families is the same as in the main section.
 characteristics of trees native in N.Thailand - not necessarily applicable to herbs or trees from other areas.

FAMILY & Page no	LEAF	FLOWER		FRUIT	NOTE
		Arrange, Calyx & Corolla	Sexual parts		
Dilleniaceae 31	simple, alternate, spiral, with many parallel side veins ending in short teeth; stalks often winged & sheathing twigs, no stipules.	large & showy, white or yellow, solitary, paired or fascicled; 5 free overlapping fleshy sepals; 5 free petals, fragile & falling early.	bisexual, many slender stamens; 4-10 separate carpels grouped on central column	fleshy, covered by persistent overlapping sepals, eventually splitting open.	
Magnoliaceae 33	simple, alternate, spiral, usually smooth; buds covered by large conical stipules, leaving ring-like scars on twigs & stalks.	large & showy, solitary, terminal or axillary, buds covered by 1-2 large bracts. Sepals and petals similar, in at least 3 whorls of 3, overlapping.	8-many free stamens with linear anthers; carpels clustered on a central column (gynoecium).	in dense cone-like clusters or loose bunches, 2-splitting, each carpel with 1 or more seeds with a red or creamy-white fleshy sarcotesta.	Inner bark granular, darkening when cut
Annonaceae 36	simple, alternate, often planar, usually untoothed, with short stalks, no stipules.	usually yellow or green, fascicled or solitary, mostly opposite or behind lvs & hanging face downwards; 3 free sepals, usually smaller than petals; 3-6 petals in 1 or 2 whorls.	bisexual (rarely unisexual), many tiny stamens clustered in a button-like rosette hidden by petals.	typically a bunch of spherical or oblong stalked fruits, radiating from a woody common stalk, mostly thinly fleshy & not splitting.	crown often conical, bark smooth & thin
Berberidaceae 43	odd-pinnate, alternate-spiral, spiny-toothed, very thick, smooth.	sepals and petals similar, usually in whorls of 3, falling early;	stamens opposite to petals; carpels distinct, often one only.	blue, fleshy with 1 seed & persistent stigma.	inner bark bright yellow
Capparaeae 45	trifoliate, digitate or simple, alternate, mostly untoothed, often with stipules.	white or yellowish, often showy, usually irregular; typically 4 free sepals & 4 free petals, often with narrow stalks.	bisexual, many long slender stamens protruding beyond petals; ovary small, at top of long slender stalk (gynophore)	leathery capsule or thick-skinned berry (pepo)	plants often spiny (<i>Capparis</i>)
Pittosporaceae 46	simple, alternate-spiral, often clustered, untoothed, no stipules.	Small, regular, in terminal cymose clusters; 5 free overlapping sepals; 5 overlapping petals, usually fused into short tube at base.	bisexual or functionally unisexual, 5 stamens opposite sepals; 1 style with 2-5 stigma lobes; ovary superior	Capsule with 2 valves & many seeds surrounded by sticky pulp	
Polygalaceae 47	simple, alternate-spiral, untoothed, no stipules.	irregular (papilionaceous), 5 free overlapping sepals, the 2 inner ones larger, petal-like; 3 or 5 petals, lower pair developed into a keel.	bisexual; stamens usually 8 of which 6 fused into sheath at base & 2 free; 1 style; ovary superior	drupe, thinly fleshy.	deeply cracked bark
Hypericaceae 48	simple, opposite-planar, often gland-dotted, no stipules.	regular, solitary or in short cymes; 5 free sepals; 5 overlapping petals, twisted in bud.	bisexual; stamens numerous, filaments usually fused into 3 or 5 bundles; ovary superior, 3-5 styles	dry capsule, 3-valved	

Guttiferae 49	simple, opposite-planar, untoothed, usually leathery, often with tiny translucent dots & faint side veins; short stalks, no stipules.	regular, solitary or in short cymes, usually axillary; 4-5 free sepals, mostly in decussate pairs; 4-5 free petals, overlapping or twisted in bud.	unisexual or polygamous on same or different trees; many stamens, often fused into bundles or a ring; ovary superior.	usually a fleshy berry, sometimes fibrous & woody; sepals often persistent.	yellow or white latex in all parts
Flacourtiaceae 53	simple, alternate, often planar, often toothed, leathery, sometimes with translucent dashes or marginal glands; stalks often swollen both ends.	green or whitish, usually inconspicuous, in short cymes, regular; 4-6 sepals; 4-6 free petals, sometimes absent, with appendages at base of petals or on receptacle	bisexual or unisexual, 5 to many stamens, usually free; ovary superior or semi-inferior.	typically berry-like, with or without a stone, sometimes a capsule.	
Theaceae 56	simple, alternate, spiral or planar, sometimes clustered, often toothed, mostly leathery & smooth, stalks short, no stipules.	white or yellow, often showy, mostly solitary in leaf axils, regular; 5 free overlapping sepals, 5 overlapping petals, free or joined at base.	usually bisexual; many stamens, free or joined to base of petals; 1 style, forked at top (rarely to base); ovary superior (except <i>Anneslea</i>),	berry or capsule with persistent sepals at base; seeds often winged.	
Saurauiceae 63	simple, alternate, spiral, toothed with many pairs of prominent side veins	white or pink, in short cymes, axillary or behind leaves, hanging face down corolla bell-shaped with 5 short lobes	many stamens; 1 style with 5 spreading stigmas.	fleshy but eventually splitting into 3-5 sections with many tiny seeds; persistent sepals at base	
Dipterocarpaceae 64	simple, alternate, usually leathery with conspicuous parallel side veins, bending before margin, untoothed or wavy-toothed; stipules large, enclosing bud, falling early.	terminal or axillary, usually hanging face downwards, regular; 5 sepals, 5 petals, overlapping & twisted in bud, slightly fused at base.	bisexual; 5, 10 or many stamens, fused into tube, anthers with long tips (connectives); 1 style, simple or forked; ovary superior or ? inferior.	fruits with 2-5 wings (enlarged sepals), nuts often resinous.	bark with resin
Malvaceae 73	simple, alternate-spiral, circular or heart-shaped, often deeply lobed with several basal veins, usually toothed, with star-shaped hairs at least when young; with stipules.	showy, often large, regular, axillary, solitary or in short racemes/panicles, with 3 or more bracts at base; 5 sepals fused into cup, not overlap, often with an outer calyx(epicalyx); 5 petals, twisted in bud.	bisexual; many stamens fused into column attached to base of petals & falling together; 1 long style with 3-5 stigmas; ovary superior.	usually a dry capsule, splitting into 5 (10) parts, often with persistent epicalyx.	inner bark fibrous.
Bombacaceae 75	digitate, alternate-spiral, untoothed, smooth; stalk swollen at top, with stipules.	large & showy, flowering on leafless twigs; 5 sepals, fused, usually 5 free petals, twisted in bud.	many stamens, free or fused in bundles; ovary superior, 4-5 locules	dry capsules, splitting into 5 parts, many seeds packed with silky hairs	bark thorny
Sterculiaceae 77	simple or digitate, alternate, spiral or planar, sometimes lobed, often with several basal veins, smooth or with star-shaped hairs; stalks often long & swollen at top, mostly with stipules.	usually terminal, regular, (3)5 sepals not overlapping, free or fused into cup, sometimes colorful & petal-like, petals 5 or none, not overlapping.	bisexual or unisexual on same tree; stamens often joined in narrow tube; ovary superior, sometimes on a stalk fused with the stamen column.	mostly dry follicles or capsules, sometimes winged, often bright red.	

TABLE 1: All Families (continued)

Family	Leaf	Arrange, Calyx & Corolla	Sexual parts	Fruit	Note
Tiliaceae 87	simple, alternate, spiral or planar, often lobed, mostly with 3 basal veins; stalks often swollen at base with deciduous stipules.	rather small, regular, mostly in racemes or panicles; 4-5 sepals, usually fused at base, not overlapping in bud; 4-5 free petals, sometimes absent, ? with large glands at base.	bisexual; many slender stamens attached to small thickened ring around base of ovary, sometimes in 5-10 distinct bundles; usually 1 style; ovary superior.	dry & winged or thinly fleshy drupes, seeds not winged.	Bark ripping in fibrous strips
Elaeocarpaceae 94	simple, alternate, spiral, often toothed, usually leathery; old leaves often red; stalks mostly swollen at top	white, facing downwards in racemes, axillary or behind lvs; 4-5 free sepals; 4-5 free petals with fringed margin, not overlapping in bud.	10-many stamens, often with long tips (connectives); 1 style.	blue-green drupes with oily pulp & large 1-5 seeded stone; stone often pitted or warty.	
Malpighiaceae 98	simple, opposite-planar, untoothed, with marginal glands, stipules tiny.	short unbranched clusters behind leaves; calyx 5-lobed with large gland 5 unequal petals, fringed at top.	1 long & 9 short stamens; 1 slender style.	dry, splitting into 3 unequal sections, each with a single wing.	
Rutaceae 99	simple, trifoliate or odd-pinnate, alternate or opposite, spiral, usually smooth & dotted with translucent glands, often with citrus smell when crushed, no stipules (see note)	usually green or whitish, terminal or axillary, solitary or in cymes/panicles; regular; 4-5 sepals; 4-5 free petals.	mostly bisexual; 4-5 or 8-10 (rarely more) free stamens, attached to outside of disk; 1 style; ovary superior	capsule or berry, often with gland dots & smelling of citrus, sometimes with inner partitions (like an orange)	plants often thorny (modified stipules)
Simaroubaceae 106	simple or pinnate, alternate, spiral, often clustered; stalks sometimes jointed, stipules deciduous or none.	small, axillary (rarely terminal), in branched clusters, regular; 3-5 sepals, usually fused at base; 3-5 free petals.	often unisexual on same or different trees, 3-10 stamens, attached outside disc; 1-5 styles, fused at top; ovary seated on lobed disc.	thinly fleshy (rarely dry & winged), 1-seeded, 1-5 developing from each flower.	bark bitter, rarely with red sap.
Irvingiaceae 109	simple, alternate, spiral, untoothed, smooth, with narrow conical stipules.	inconspicuous, in short branched clusters hidden in leaf axils; 5 fused sepals, 5 overlapping petals.	10 free stamens attached outside disc; 1 style.	drupe with 1 large fibrous stone (like a mango)	twigs with ring-like scars
Ochnaceae 110	simple, alternate, planar, toothed, smooth, with stipules.	yellow, in short thyrses near end of twigs, regular; 5 free overlapping sepals, persisting; 5-6 free fragile petals, soon falling.	bisexual, >20 free stamens; single slender style attached to base of ovary; all parts on top of swollen convex receptacle.	thinly fleshy with large stone, 1-4 fts clustered together on convex receptacle, surrounded by red sepals.	
Burseraceae 111	odd-pinnate with opposite leaflets; alternate-spiral, mostly crowded near end of twigs; often toothed, with or without stipules	small, green or yellow, in axillary panicles, often crowded near end of twigs; 3-5 sepals, not overlapping, often small & fused at base; 3-5 free petals, not overlapping.	often unisexual on different trees; stamens short, 1-2x as many as petals, often fused at base, attached on or outside disc; 1 style; ovary superior.	fleshy or leathery drupe with a hard stone; small persistent calyx at base, rind often resinous, stone 3-celled.	bark often resinous

Meliaceae 114	pinnate or trifoliate, alternate, spiral, leaflets ?opposite & short-stalked, sometimes scaly, no stipules.	small, usually white or yellow, regular, in axillary cymose panicles; calyx small, cup-shaped with 4-5 lobes; 4-5 free petals.	8-10 stamens, usually fused into a tube with anthers around rim, rarely free; 1 style; ovary superior, usually surrounded by ring-like disc.	sometimes dry capsules with flat winged seeds, otherwise fleshy or leathery with large seeds, often with brightly colored aril.	
Olacaceae 123	simple, alternate, ?planar, untoothed, with widely spaced side veins, no stipules.	small, white or green, regular, in short axillary unbranched clusters; calyx small, cup-shaped with 5 teeth. 5 petals, free or fused in tube.	usually bisexual; 5 short stamens fused to petals; 1 style; ovary superior, fused to cup-shaped disc.	not splitting, fleshy or leathery, with hard 1-seeded stone.	
 Icacinaceae ◆ 125	simple, generally alternate, spiral or planar, with widely spaced side veins, no stipules.	mostly axillary, regular; 4-6 sepals, free or fused at base; 4-6 petals (rarely none), with pointed tips that curve inwards, usually not overlap.	unisexual or bisexual; 4-5 stamens alternating with petals; 1 style; ovary superior or half-inferior, with or without disc.	1-seeded drupe.	
Aquifoliaceae 127	simple, alternate, spiral or planar, smooth, often toothed, with short stalks, stipules absent or minute.	small, green or white, regular, in short axillary cymes; calyx 4-5 lobed; corolla with 4-5 overlapping lobes.	usually unisexual on different trees; males with 4-9 stamens attached to petals; females with 4-6 sessile stigmas; ovary superior, no disc.	small berry with many hard 1-seeded stones.	
Celastraceae 127	simple, alternate or opposite, with or without teeth, usually smooth, sometimes with black dots below; stipules absent or minute.	small, regular; calyx small, 4-5 lobes, usually overlapping; 4-5 free petals, usually twisted & overlapping in bud.	bisexual or unisexual on different trees; 4-5 stamens, attached on or inside disc; 1 short style, ovary partly or completely enclosed by large disc.	typically a capsule, sometimes fleshy & ? splitting, seeds mostly with aril.	
Rhamnaceae 130	simple, alternate-planar, finely toothed, 3-5 basal veins, usually hairy at least below.	small, regular, in axillary cymose clusters; calyx with 4-5 triangular lobes, not overlapping in bud, (0)4-5 small petals attached to calyx-tube.	4-5 stamens alternating with calyx lobes; 2 styles, fused at base; large disc lining or filling the calyx-tube.	small thinly fleshy drupes, stone with 1(2) seeds.	
Sapindaceae 131	usually even-pinnate with alternate leaflets & short point at top of rachis, alternate-spiral, no stipules.	small, often inconspicuous, in cymes or thyrses; 4-5 sepals; (0)4-5 free petals, often unequal, usually with 1-2 hairy scales at base.	mostly unisexual & bisexual on the same tree; 5-8 stamens, attached inside ring-like disc; ovary superior.	often 3-lobed & splitting into 3 parts, or splitting irregularly. Seeds sometimes with aril or sarcotesta.	
Aceraceae 138	simple, opposite (decussate), often deeply lobed, smooth, with long slender stalks, no stipules.	inconspicuous, regular, terminal or axillary; 4-5 sepals; 4-5 petals.	unisexual on same or different trees, 5-8 stamens, attached outside or upon (rarely inside) the disc; ovary superior, flattened.	dry & winged, fused in pairs.	
Hippocastanaceae 139	digitate, opposite, finely toothed, smooth, leaflets unstalked.	in narrow terminal thyrses; 4 unequal petals.	7 stamens, much longer than petals; 1 style.	leathery, splitting into 3 sections with 1-3 large seeds.	
Bretschneideraceae 139	odd-pinnate, alternate, untoothed, smooth or sparsely hairy.	terminal racemes; 5 pink petals with narrowed base.	8 stamens, close together in 1 group; 1 style.	leathery, splitting into 3 sections each with 1-2 seeds.	restricted to Doi Phu Kha

TABLE 1: All Families (continued)

Family	Leaf	Arrange, Calyx & Corolla	Sexual parts	Fruit	Note
Staphyleaceae 140	trifoliate or pinnate, opposite (decussate), toothed, smooth, with stipules.	green-white, regular, in branched clusters, terminal & upper leaf axils; 5 sepals & 5 overlapping petals.	bisexual; 5 stamens attached outside the disk; 3 styles, pressed together but not fused except at tips.	?lobed, fleshy with 1-5 pyrenes.	
Sabiaceae 141	simple or pinnate, alternate, spiral, no stipules.	white or cream, small, in branched clusters, terminal & upper leaf axils; calyx 4-5-lobed; 5 fleshy petals.	4-5 stamens, opposite to petals; 1 short style; thin 3-lobed disc.	thinly fleshy, eventually splitting open, with single hard stone.	
Anacardiaceae 142	simple or odd-pinnate, usually alternate-spiral, often clustered, untoothed, stalks swollen at base, no stipules. Young lvs often violet or red.	small, regular, usually in cymose panicles, terminal &/or axillary, pedicels often jointed; calyx cup-like with 3-5 lobes (spathe-like in <i>Gluta</i>); 3-5 free petals, often recurved.	bisexual or unisexual; 4-5 or 8-10 stamens (many in <i>Gluta</i>), alternating with petals, usually free & attached on margin of disc; 1-5 styles; ovary mostly superior; disc ring-like/knobly	drupes, mostly with one large seed or stone and a leathery or pulpy flesh, sometimes mango-like.	
Leguminosae (Mimosaceae) 157	mostly bipinnate (in NT).	small, regular, usually in heads; calyx tubular with 5 small lobes; 5 equal petals, often joined into tube.	many long stamens, usually more conspicuous than the petals.	dry pods, usually splitting lengthways into 2 sections; seeds often with groove on one side	
Leguminosae Caesalpinaceae 165	usually once-pinnate, rarely simple (bilobed).	sepals usually free; corolla asymmetric with 5(1) showy $\pm$ equal petals, upper one inside others in bud.	usually 10 free stamens but often several reduced & sterile, not hidden by petals.	dry pods, usually splitting lengthways into 2 sections	
Leguminosae (Papilionaceae) 176	usually once-pinnate.	sepals fused into cup or tube with 5 short teeth; corolla asymmetric, like a "sweet pea" (papilionaceous), upper petal larger, 2 lower petals fused.	usually with 10 stamens fused into a tube hidden by 2 lower petals, typically with 1 stamen $\pm$ free from the others.	dry pods, usually splitting lengthways into 2 sections	
Rosaceae 183	simple (pinnate in some shrubs), alternate, spiral or planar, often toothed, with stipules (?forked).	showy or small & inconspicuous, usually regular; calyx cup (hypanthium) with 5 sepals; 5(0) free petals attached on rim of calyx cup.	usually bisexual, many free stamens attached on rim of calyx cup; styles mostly free; ovary often attached to & enclosed by calyx cup, with thin disc.	not splitting, usually thinly fleshy or leathery with a large 1-3 seeded stone.	
Rhizophoraceae 186	simple, opposite-planar, usually untoothed, smooth; large conical stipules; twigs with ring-like scars.	green or whitish, regular, in axillary head-like cymes; calyx bell-shaped with 5-8 short teeth; 5-8 free petals attached to rim of calyx tube.	bisexual; 10-16 slender stamens, attached to rim of calyx tube around thin disc; 1 slender style; ovary sunk in base of calyx tube.	not splitting, fleshy with persistent calyx. 1(2) seeds with thin orange aril.	
Combretaceae 187	simple, alternate or opposite, often planar, untoothed, often with conspicuous glands; no stipules.	small, regular, in ? branched spike-like clusters; calyx-tube with 4-5(8) lobes, not overlapping; 4-5 free petals, often absent.	all bisexual or both bisexual & males in same cluster; 8-10 stamens surrounding disc; ovary inferior.	not splitting, drupe-like or with 2-5 wings. 1 seed.	

Myrtaceae 194	simple, opposite (rarely alternate), untoothed, usually smooth with minute translucent glands all over surface, often with faint side veins & 1-2 marginal veins; no stipules.	white or pink, regular; in short clusters; calyx cup-shaped with 4-5 lobes; 4-5 free petals, attached to rim of calyx cup, sometimes fused into hood in bud.	bisexual; many slender stamens with minute anthers, attached to rim of calyx cup, usually the most conspicuous part of the flower; single slender style; ovary inferior.	berry or small woody capsule, pulpy or leathery, with remains of calyx at top, 1-many seeds.	
Lecythidaceae 200	simple, alternate, spiral, usually bluntly toothed, smooth, usually short-stalked without stipules.	white or pink, in short terminal clusters; calyx bell-shaped with 4(5) lobes; 4-(5) fragile petals soon falling	bisexual; many large conspicuous stamens, fused into ring at base; 1 slender style; ovary ? inferior, with ring-like disc at top.	not splitting, with persistent calyx on top, thick-skinned with fleshy pulp & many seeds.	
Melastomataceae 201	simple, opposite-planar, untoothed or nearly so, smooth, no translucent glands, faint side veins, no stipules.	purple or reddish, regular, in head-like clusters, axillary or behind lvs; calyx 4-5 lobed; 4-5 free petals.	bisexual, 8-10 stamens with rather thick filaments & large anthers; 1 slender style; ovary inferior, with disc	thinly fleshy with 1 large seed; persistent calyx on top.	
Lythraceae 202	simple, opposite, usually more or less planar, untoothed, smooth or with star-shaped hairs. Buds narrow & pointed.	often large & showy, white, pink or purple, regular; calyx cup-or bell-shaped with 4-12 teeth, often ribbed. 6 free fragile petals with narrow base	bisexual; many free slender stamens attached to top of calyx tube; 1 style with small stigma; ovary usually half-inferior.	dry capsule, splitting into 6 sections with many small winged seeds; persistent calyx at base.	trunk often fluted
Crypteroniaceae 207	simple, opposite-planar, untoothed, short-stalked, stipules reduced to a raised ring between 2 leaf stalks.	tiny, white, in dense spike-like panicles; calyx cup-shaped with 5 lobes; no petals.	unisexual on different trees; 5 stamens attached to calyx cup between lobes; 1 style; ovary superior.	small, with persistent calyx & style, splitting longitudinally into 2 parts through the style, many seeds.	leaf buds very small.
Sonneratiaceae 208	simple, opposite-planar, untoothed, smooth, short-stalked, with tiny stipules.	large & showy, white, terminal; calyx cup-shaped with 4-7 lobes, fleshy, not ribbed; 6-7 white, fragile petals.	single row of slender stamens, longer than petals; 1 slender style.	dry capsule splitting into 6 (5-7) sections with persistent calyx at base, many tiny seeds.	young twigs squarish with ridges
Datiaceae (Tetrameleaceae) 209	simple, alternate, broadly ovate, usually bluntly toothed, with long slender stalks, no stipules.	females in catkins; males in panicles; calyx deeply 4-lobed, no petals.	unisexual; 4 stamens.	dry capsule with persistent calyx at top, valves ending in persistent styles.	deciduous tree, buttressed
Araliaceae 210	simple, digitate or 1-4x pinnate, sometimes huge (to 2m), alternate, spiral, often clustered near end of twigs, ?toothed or deeply lobed.	small, green or white, regular, in umbels or heads grouped into compound umbels or panicles, usually terminal; calyx minute; 5-11 petals, free or fused in cup & falling early.	5-11 or more free stamens, alternating with petals; styles free or fused into a column; ovary inferior with thin disc.	small berry with leathery or pulpy rind.	plants often spiny, sometimes epiphytic
Alangiaceae 213	simple, alternate, usually planar, mostly untoothed, 3-7 basal veins.	white or cream; in short cymes, axillary or behind lvs; calyx 4-10 lobed; 5-8 free strap-like petals, curled backwards.	4-18 stamens, filaments usually hairy; 1 style; ovary inferior with thin or well-developed disc.	drupe, often grooved, 1(2) seeds.	
Comaceae (Nyssaceae) 215	simple, alternate or opposite, untoothed, no stipules.	tiny, in heads or panicles, axillary or terminal; calyx bell-shaped with 4-5 unequal teeth; 4-5 free petals.	bisexual or unisexual on different trees; 8-10 stamens; 1 forked style; ovary inferior; large circular disc.	drupe with grooved stone.	

TABLE 1: All Families (continued)

Family	Leaf	Arrange, Calyx & Corolla	Sexual parts	Fruit	Note
Caprifoliaceae 216	simple or odd-pinnate, opposite (decussate), usually without stipules.	white, in terminal branched clusters; calyx (3)5-lobed; corolla often irregular, 5-lobed.	bisexual; 5 stamens attached to corolla-tube; short style with 3-5 stigmas; ovary inferior.	drupe with grooved stone or berry-like with 3-5 small seeds (pyrenes).	
Rubiaceae 217	simple, opposite, often decussate or clustered, untoothed, with distinct stipules between the 2 leaves of a pair, sometimes joined in a ring.	variously arranged, usually regular; calyx with 4-5 small lobes, often fused into tube at base; corolla with 4-6 or 12 spreading lobes, often fused into cylindrical tube at base.	usually bisexual; 4-6(12) stamens, attached to mouth of corolla tube between lobes, usually with short or no filaments; style slender, often forked; ovary inferior.	very diverse, drupes, berries or capsules, usually with persistent calyx or circular scar at top.	plants sometimes thorny
Compositae (Asteraceae) 231	simple, alternate, spiral, often toothed; no stipules.	minute, in dense heads ± grouped in panicles; sepals reduced to silky hairs (pappus); corolla tubular with 5 lobes	5 stamens fused into a tube; style forked with 2 stigmas; ovary inferior.	small, dry, 1-seeded achene, often crowned by a circle of hairs (pappus) wind-dispersed.	
Ericaceae 233	simple, alternate, spiral or planar, ? toothed, usually leathery & smooth, sometimes scaly; no stipules.	often showy, in axillary or terminal racemes/ head-like clusters; (4)5 small sepals ? fused into tube; corolla variously shaped, 5-lobed.	bisexual; stamens usually 10; single style.	berry or capsule with many minute seeds, calyx usually persistent.	sometimes epiphytic
Myrsinaceae 238	simple, alternate, often gland-dotted & sometimes with glandular-teeth, no stipules.	regular, usually white or pinkish, in cymose clusters or panicles, rarely solitary; calyx 5-lobed; 5 petals fused at base into very short tube.	bisexual; 4-5(6) stamens fused to corolla opposite lobes; 1 style; ovary superior or half-inferior.	small berry; often with persistent ? enlarged calyx at base; 1-many seeds.	
Sapotaceae (Sarcospermata ceae) 242	simple, alternate or rarely opposite, spiral, planar or clustered, not toothed, mostly smooth & leathery; stipules tiny or absent.	small, regular, in cymes or panicles, axillary or behind lvs; 4-8 ?free sepals in 1-2 whorls; 4-8 petals fused in short tube.	bisexual; stamens attached near top of corolla tube in 1-3 rows; inner row often sterile; ovary superior.	berry with slit-like cavities, usually with persistent calyx at base. 1-8 hard shiny seeds with oily endosperm & conspicuous pale scar.	white latex in bark, often also in lvs, fws & fts.
Ebenaceae 245	simple, alternate, spiral or planar, untoothed, usually with short stalks, no stipules.	inconspicuous, regular, males usually in cymes, females often solitary, axillary or behind lvs; 3-5(8) sepals, free or ? fused at base. 3-6 petals fused into tube at base.	unisexual, usually on different trees; 6-12 stamens, filaments mostly attached to corolla tube & shorter than it; 2-8 styles; ovary superior.	leathery or fleshy berry, often large, with persistent calyx at base, seeds in a ring, endosperm often ruminate.	
Symplocaceae 250	simple, alternate, spiral or planar, often toothed; no stipules. Leaves drying yellow-green.	white or yellow, regular, in short panicles or spikes, axillary or behind lvs; calyx 3-5 lobed; corolla with short tube & 5 overlapping lobes	bisexual; many slender stamens, attached to base of corolla & projecting beyond it; ovary inferior, 1 style, inconspicuous disc.	often bluish, thinly fleshy with large stone, persistent calyx at top, stone often ribbed lengthways (star-shaped in cross section).	
Styracaceae 253	simple, alternate, spiral, untoothed, dense minute star-shaped hairs below; no stipules.	regular, axillary & terminal; calyx bell-shaped with 5 short teeth; corolla with 5 narrow lobes.	bisexual; 10 stamens fused at base & attached to corolla; 1 long style with 3-lobed stigma; ovary superior.	leathery, splitting into 3 sections with persistent calyx at base, 3-6 seeds.	

Oleaceae 254	simple or odd-pinnate, mostly opposite, no stipules.	small, mostly white or cream, regular, in panicles; calyx tiny with 4 minute teeth or flat-topped; 4 petals, fused into short tube at base.	bisexual or unisexual; 2(4) stamens attached to corolla tube between lobes; ovary superior.	capsule with winged seeds or thinly fleshy drupe with single 1-seeded stone.	
Apocynaceae 257	simple, opposite or whorled, untoothed, with or without stipules.	often large & showy, regular, in cymes or panicles; 5 small free sepals; corolla funnel-shaped or salverform with 5 lobes, twisted in bud, curved & overlapping when mature.	bisexual; 5 short stamens attached to corolla-tube, sometimes pressed together in cone around style; ovary superior, 2 carpels sharing a single style, usually with large stigma.	typically a pair of narrow pods, joined at base; seeds sometimes with tuft of hairs at one or both ends.	white latex in all green parts
Buddlejaceae 261	simple, mostly opposite, spiral, usually finely toothed, dense minute star-shaped hairs below.	white, regular, in spike-like clusters, terminal & in upper leaf axils; calyx 4-lobed; corolla salverform, 4-5 lobed.	bisexual; 4 short stamens attached to corolla mouth.	capsule, 2-valved, many winged seeds.	
Loganiaceae 261	simple, opposite, untoothed, stipules fused into ring or absent.	in short cymes/corymbs, terminal or in upper leaf axils; calyx 5-lobed; corolla funnel-shaped, 4-5 lobed.	4-5 slender stamens attached to corolla tube; 1 style; ovary superior.	thick-shinned berry with pulpy flesh & many small seeds.	sometimes epiphytic
Boraginaceae 263	simple, alternate, spiral, finely toothed or untoothed, smooth; no stipules.	in dense cymes, terminal or in upper leaf axils; calyx 5-lobed; 5 petals fused into tube at base.	bisexual; 5 slender stamens attached to corolla tube; 1 long style with forked tip; ovary superior.	pulpy or dry, with a single hard stone or divided into 2-4 small stones each with 1 seed.	
Solanaceae 263	simple, spiral, often deeply lobed, often with star-shaped hairs & spines, usually alternate, no stipules.	in forked cymes, terminal or in upper leaf axils; 5 sepals; 5(6) petals, fused into short tube at base.	bisexual; 5(6) stamens with short filaments & large anthers, grouped in cone around style, ovary superior.	berry with many seeds, persistent calyx.	
Scrophulariaceae 264	simple, opposite, untoothed, smooth or sparsely hairy below, no stipules.	bisexual, narrow axillary thyrases; calyx 3-5lobed; corolla funnel-shaped with 2 unequal lips.	4 stamens attached to corolla mouth; 1 slender style with inconspicuous stigma.	capsule, 2 valves, many winged seeds.	sometimes epiphytic
Bignoniaceae 265	1-4x pinnate with opposite leaflets, opposite, often in 2 rows (decussate) rarely whorled, often with large glands on lower surface, no stipules.	often large & showy, usually terminal; calyx 4-5 lobed (rarely unlobed); corolla trumpet or funnel-shaped with 2 unequal lips.	bisexual; 4-5 stamens attached to corolla, 1 pair longer than other; 1 long style with 2-lobed stigma; ovary superior with ring-like nectary at base	long narrow pods splitting lengthways into 2-4 sections, filled with many flat winged seeds.	
Labiatae (Verbenaceae) 274	simple, trifoliate or digitate, opposite, often in 2 rows (decussate) with squarish stems; no stipules.	corymbs or panicles, axillary or terminal; calyx mostly tubular with 4-5 teeth; corolla usually funnel or trumpet-shaped with 2 unequal lips.	bisexual; (2)4-5 stamens, attached to corolla tube & often projecting; 1 style, ? forked; ovary superior.	small drupe or capsule with enlarged calyx at base; 1-4 small hard seeds, not winged.	

TABLE 1: All Families (continued)

Family	Leaf	Arrange, Calyx & Corolla	Sexual parts	Fruit	Note
Myristicaceae 282	simple, alternate in drooping sprays, untoothed, leathery, often long & narrow with many parallel side veins, short-stalked, no stipules.	tiny, in short thick clusters or slender panicles, axillary or behind lvs; calyx cup-shaped with 2-3 fleshy lobes, not overlapping in bud, no corolla.	unisexual on different trees; 6-30 anthers on a tiny globose or triangular column.	splitting open into 1-2 parts with leathery skin & single large seed, often with brightly colored aril.	bark usually with red sap, crown conical
Lauraceae 285	simple, usually alternate-spiral (rarely whorled), untoothed, typically smooth, often minutely gland-dotted, no stipules.	tiny & inconspicuous, regular, in axillary panicles or heads; calyx with 6 lobes in 2 rows, no petals.	6, 9 or 12 stamens in 2-4 rows of 3, anthers opening by 2-4 upturned flaps; 1 short style; ovary superior.	one-seeded berry with pulpy flesh, usually with persistent calyx at base.	bark aromatic, often resinous
Proteaceae 295	simple, alternate, spiral, often leathery with sharp teeth (esp. when young), sometimes deeply dissected when young, no stipules.	small, in spikes or racemes, axillary or behind lvs; 4 sepals pressed together into a tube with recurved tips, not overlap in bud; no petals.	bisexual or unisexual on different trees; 4 stamens opposite & attached to sepals; 1 style; ovary superior, surrounded by 4 glands.	nut or drupe-like	
Thymelaeaceae 296	simple, alternate, spiral, untoothed, smooth, many parallel side veins; shortly stalked, no stipules.	small, white or green, in fascicles at upper leaf axils, regular; calyx bell-shaped with 4-5 lobes; 8-10 tiny scale-like petals at mouth of corolla.	usually bisexual; 8-10 stamens attached to calyx tube; ovary superior.	capsules, splitting into 2 parts, persistent leathery calyx; 1-2 seeds with fleshy base.	
Euphorbiaceae 297	simple or rarely trifoliate, usually alternate, sometimes lobed and/or peltate, often toothed. Stalks often long & distinctly swollen at one or both ends, sometimes with glands at top, nearly always with tiny stipules.	usually minute, mostly green, yellow or white, regular, 3-5 sepals, petals often absent (3-5 & free if present).	unisexual on same or different trees; 1-many stamens, free or attached to common central stalk, 2-3 styles, often fused at base; ovary superior.	typically a 3-angled capsule splitting into 3-6 sections each with a single seeds; sometimes a small pulpy or leathery berry with 1-3 seeds.	
Ulmaceae 323	simple, alternate, spiral or planar, often toothed, 3 basal veins, smooth or with star-shaped hairs; stipules ? fused in pairs, usually falling early.	minute, green, in cymes/corymbs, axillary or behind lvs; 4-5 sepals, fused; no petals.	bisexual & unisexual on the same tree; 4-5 or 8-10 stamens opposite sepals; 2 equal styles; ovary superior.	dry with rounded wing or a small drupe.	
Moraceae 325	simple, usually alternate, sometimes palmately-lobed and/or toothed, often with 3(5) basal veins, stipules frequently large & sheathing buds.	minute, crowded on receptacles, which are globose, cylindric or hollow; 4 sepals; no petals.	unisexual on same or different trees; 1-3(40) stamens, opposite sepals; 1-2 styles, often unequally forked.	very varied, sometimes small with a single stone, in other case united into large fleshy compound fruits.	
Urticaceae 345	simple, alternate or opposite, usually toothed, with 3 basal veins, sometimes with stinging hairs; stipules free or fused in pairs.	sessile, usually tiny in compact heads or clusters; usually with 4-5 sepals ± joined at base; no corolla	unisexual; stamens 4 or 5, opposite to calyx lobes, filaments inflexed in bud.	dry, one-seeded, often enclosed by persistent calyx.	

Juglandaceae 347	odd- or even-pinnate with tiny point at end of rachis, alternate, spiral, often toothed, no stipules.	minute, in separate male & female catkins on the same or different trees, axillary or behind leaves; large 3-lobed bract; 4 sepals; no petals.	males with 4-12 stamens, seated on the sepals; females with inferior ovary & short, forked style.	small hard nut attached to base of large wing-like 3-lobed bract.	
Betulaceae (Corylaceae) 348	simple, alternate, spiral, long-tipped, doubly toothed; stipules falling early.	minute, in unisexual catkins on the same tree; 4 sepals; no petals.	4-6 stamens, each with 2 anthers; females with 2 long slender styles & a 3-lobed bract.	small nut with 2 papery wings.	
Myricaceae 350	simple, alternate, clustered near end of twigs, toothed, leathery, with tiny black dots below, stipules fall early	minute, in unisexual catkins on different trees; no sepals; no petals.	males with a tiny bract & 3-6 stamens; females in groups of 3, ovary with 2 styles.	warty drupe, thinly fleshy with large stone.	
Fagaceae 350	simple, alternate, spiral (rarely whorled), often toothed, usually leathery with short stout stalks, always with stipules but falling early	minute, unisexual on same tree, in upright spikes or drooping catkins; 6 (4-7) sepals, no petals.	males with 6 or 12 (18) free stamens; females with 3 styles & inferior ovary.	a large nut, partly or completely enclosed in a cupule (modified scaly bracts), usually spiny in <i>Castanopsis</i>	
Salicaceae 365	simple, alternate, spiral, linear, finely toothed, with stipules.	tiny, male & female on different trees, in drooping catkins similar in both sexes; no sepals or petals.	males with 2-10 free stamens; females with short style & 2-lobed stigma; ovary with 1-2 glands.	small capsule with silky-hairy seeds, wind-dispersed.	
Dracaenaceae (Agavaceae) 366	simple, crowded near top of stems, linear, untoothed, leathery, no stalks, grasping stems at base.	tiny, in panicles at top of stems; calyx tubular with 6 narrow sepals fused towards base; no petals.	6 stamens, attached to base of sepals; 1 style with 3-lobed stigma	thinly fleshy, 1-seeded.	
Pandanaceae 366	simple, crowded near top of stems, linear, sharply toothed, no stalks, grasping stems at base.	tiny, males & females on different trees, terminal panicles, no calyx or corolla but with 3-4-lobed "cup"	males with many stamens	in dense heads (syncarp), often spiny	
Palmae (Arecaeae) 367	large, simple (fan-shaped) or 1-2x pinnate, often with fringed margins, leathery, smooth. Stalks frequently enlarged & sheathing stems at base.	tiny, in branched clusters with large bract (spathe) in bud; calyx usually with 6 lobes in 2 rows; no corolla.	usually unisexual; males typically with 6 stamens.	fleshy or fibrous drupe, endosperm usually oily	often with single trunk
Cephalotaxaceae 374	simple, opposite-planar, linear, 2 white-stripes below.	male & female cones on different trees	males with 2-3 pollen sacs under each scale, females with 2 ovules.	seeds thinly fleshy with a stony core	
Podocarpaceae 375	simple, alternate or opposite, spiral or planar, ovate, lanceolate or linear.	male & female cones on different trees, both small.	males with 2 pollen sacs under each scale, females with a single ovule.	ripe seeds on a swollen ± fleshy base	
Pinaceae 376	needle-like, in clusters (fascicles) of 2-3 on short woody stumps.	male & female cones on the same tree, males smaller.	males with 2 pollen sacs under each scale, females with 2 ovules per scale.	woody cones, 2 winged seeds per scale	
Cycadaceae 377	once-pinnate, clustered near top of stems, rigid with sharp tips.	male & female cones on different trees, terminal, usually large.		masses of large dry seeds, each with a leaf-like "scale"	
Cyatheaceae 378	2-3x pinnate, clustered near top of stems, with brown dots (sori) below.				

TABLE 2 : ELAEOCARPUS (Elaeocarpaceae) adapted from FT2/4 (1981)

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	TREE	LEAF					FLOWER				FRUIT
			Size	Margin	Veins	Texture	Stalk	Cluster	Stalk	Petal	Anther	
<i>braceanus</i>	174	to 15m	8-16x3.5-5.5cm	entire/finely toothed	9-13 pairs, arched, ±slightly sunk	hairy on midvein above, smooth or short hairs below	1-3cm	5-15cm, behind lvs	0.1-0.5cm	6-8mm, fringe 1/3-1/2	not pointed, not hairy	2.3-3.5cm, hairy, round both ends
<i>floribundus</i>	167	to 30m	8-17x3-7cm	finely toothed	flat	slightly hairy, scabby	2-5cm, pink, with knee	8-20cm, behind lvs	0.4-0.8cm	5mm, fringe 1/2	not pointed, tuft of hairs	2.5-3.5cm, rounded, smooth with yellow dots
<i>hainanensis</i>	168	to 7m	5-16cm	finely toothed	8-17 pairs, arched	slightly hairy, with domatia	0.3-1.5cm	4-7cm, with lvs, persistent bracts 8mm	2-5cm	20-27mm, fringe 1/5	pointed, not hairy	4-4.5cm, smooth, pointed
<i>hygrophilus</i>	177	to 13m	5-12x2.5-5.5cm	shallowly toothed	5-7(9) pairs, slightly raised, arched	smooth&glossy, with domatia	0.5-2cm, pink, no knee	2-10cm, with lvs	2-7cm	5-8mm, fringe 1/2	not pointed, scattered hairs	(1.5)3-4cm, blunt / pointed both ends
<i>lanceifolius</i>	178	to 10m	13.5-18 x5-6.5cm	toothed	6-12 pairs	smooth, not shiny, ± with domatia	0.8-2.5cm, no knee	5-10cm, behind lvs	0.5-0.8cm	5mm, fringe>1/2	not pointed	2.5-3.5cm, smooth, blunt both ends
<i>petiolatus</i>	170	to 30m	9-25 x 4-11cm	slightly toothed	5-9 pairs, arched, joined, flat	smooth, with domatia. Buds resinous	3.5-10cm, bent, swollen both ends	5-10cm, with or just below lvs	0.8-1cm	6mm, fringe 2/5	pointed, not hairy	1.2-2cm, blunt tip, smooth
<i>prunifolius</i>	179	to 18m	10-17 x 3-6cm	entire/finely toothed	8-10 pairs, raised, not joined	smooth, twigs with resin	2.5-4cm, bent with knee	4-6cm, with lvs	0.8-1cm	5mm, fringe 1/4	pointed, hairy	1.4-2cm
<i>robustus</i>	175	to 25m	(8)15-25 x 4-13cm	rounded teeth	8-12 pairs, flat	smooth or hairy on midvein, with domatia	(1.5)3.5-7cm, with knee, often pink	6-21cm, behind lvs	0.4-1cm	7mm, fringe 1/2	not pointed, hairy	1.5-4cm, blunt/pointed, grey hairs
<i>rugosus</i>	169	to 20 (27)m	10-45 x 4-8(18)cm	sharply toothed	10-15 pairs, raised/sunken	slightly hairy / smooth, with glands	1.5-3cm, with knee	7-12cm, behind lvs	2-3cm	15-20mm, fringe 1/8	pointed, hairy	3-4cm, slightly hairy
<i>sphaericus</i>	176	to 25m	8-17 x 2.5-5.5cm	finely toothed	8-13 pairs, flat or sunk	slightly hairy or smooth, often with domatia	1-2 cm	6-10cm, mostly behind lvs	1cm	10-20mm, fringe 1/2	pointed, slightly hairy	2-3cm, metallic blue, slightly hairy
<i>stipularis</i>	173	to 30m	7-25 x 3-9cm	entire/finely toothed	8-14 pairs, flat	stiff hairs/velvety & domatia,	2-6cm, slender	8-10cm, behind or with lvs	0.5-1cm	5-6mm, fringe 1/3	not pointed, hairy	1.5-4cm, rounded, smooth or short stiff hairs

TABLE 3 : ALBIZIA & ARCHIDENDRON (Leguminosae) adapted from FT4/2

SPECIES	Sno	TREE habit	LEAF				FLOWER				FRUIT		NOTE
			Pinnae	Leaflets	Stipule		Arrange	Heads	Pedice	Central	Size	Colour	
<i>Albizia chinensis</i>	323	to 20m	(6) 10-16 pairs	15-30 pairs	0.6-1cm	leaf-like, 15-20mm	terminal & axillary	in panicles or clusters	none	different	7-15 x 2cm	yellow/pale brown	
<i>crassiramea</i>	318	to 20m	3-4 pairs	3-5 pairs	2.5-6cm	tiny	terminal	panicles	none	different	to 20x3 cm	rich red-brown	branches dark brown
<i>garrettii</i>	321	to 15m	5-8 pairs	10-22 pairs	0.6-1cm	tiny		in pairs	4-5 mm	different	14 x 3 cm	brownish	
<i>lebbeck</i>	317	to 25m	2-3(4) pairs	3-6(9) pairs	1.5-5.5cm	tiny	upper leaf axils	singly or in groups of up to 4	4mm	different	10-35 x 3-4cm	yellow/pale brown	
<i>lebbeckoides</i>	322	to 20m	3-4 pairs	15-25 pairs	0.7-2 cm	tiny	axillary	slender panicles	none	similar	15 x 1.5-2cm	dark brown	
<i>lucidior</i>	316	to 40m	1-2 pairs	1-4 pairs	3.5-10 cm	tiny	terminal	panicles 10-40 cm	0.5-2mm	different	10-30 x 2.5-3.5 cm	yellowish	
<i>odoratissima</i>	320	to 30m	3-8 pairs	8-16 pairs	1-3.5 cm	linear, 2.5mm	terminal	panicles up to 30 cm	none	different	7-22 x 3.5cm	brown/black	
<i>procera</i>	319	to 15m	2-5 pairs	5-11 pairs	3-4.5cm	tiny	terminal & upper lf axils	panicles	none	similar	7.5-17 x 1.2-2.5cm	brown/grey	branches pale grey
<i>Archidendron</i>													
<i>clypearia</i>	324	usually <10m	3-10 pairs	3-12 pairs	0.7-8.0 cm	none	terminal & upper lf axils	panicles	1-3 mm	similar	up to 20 x 1 cm	red- brown inside	twigs with ridges
<i>lucidum</i>	325	8-10m	1-2 pairs	4 pairs	7-19cm	none	terminal & upper lf axils	panicles	none	similar	up to 20 x 2-3 cm	red- brown inside	twigs not ridged, smooth / slightly hairy
<i>jiringa</i>	326	to 20m	1 pair	2-3 pairs	8-20 cm	none	in or below leaf axils	panicles	none	similar	20 - 25 x 4 cm	greyish inside	twigs not ridged, always smooth
<i>glomerulosum</i>	327	shrub to 3m	1-2 pairs	2-4 pairs	4-10(15) cm	none		panicles	none	similar	up to 12 x 2 cm	orange-red inside	twigs not ridged, densely hairy

TABLE 4 : CASSIA & SENNA (Leguminosae) adapted from FT4/1 (1984)

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	TREE	LEAFLETS				FLOWER				FRUIT	NOTE
			Pairs	Size / Shape	Texture	Stipules	Arrange	Stalk	Petals	Stamens		
<i>C. fistula</i>	341	to 20m, native	3-8	7-12(17)cm, ± pointed	smooth	small, deciduous	unbranched, drooping behind lvs	1.5-3.5cm	3-3.5cm, yellow	3 long, smooth	20-60x1.5-2 cm, tubular	
<i>C. garrettiana</i>	342	to 10m, native	6-9	5-9cm, long-pointed tip	smooth or nearly so	deciduous	branched, terminal	3cm	1.5-1.8cm, yellow	2 long	15-22x2-4cm, flat, ± twisted	
<i>S. siamea</i>	343	to 20m, introduced	6-12 (15)	3-7.5cm, blunt or rounded tips	smooth/finely hairy below	minute, linear, deciduous	large, branched, terminal	2-3cm	1.2-2cm, yellow	2 long	15-30x1-1.8cm, flat with ridges	
<i>S. timoriensis</i>	344	to 8(10)m, native	8-20 (24)	2-6 cm, blunt tip	yellow hairs when young	1.5-2cm, curve & ear-shaped	unbranched+axillary or branched+terminal	1-3cm	1.5-2cm, yellow	2 long	8-16x1-1.5cm, flat, no ridges	
<i>S. surattensis</i>	345	to 7m, introduced	6-9	2.5-4cm, round/blunt tip	smooth/slight hairy below	0.5-1.0cm, curve & narrow	unbranched, in upper leaf axils	1-2cm	1.5-2cm, yellow	1 long, 10 fertile	7-10x1-1.5cm, flattened	club-shaped glands
<i>S. sulfurea</i>	346	to 7m, introduced	4-6	5-10cm, pointed tip	grey below (glaucous)	0.5-1.0cm, curve & narrow	unbranched, in upper leaf axils	1-3cm	1.5-2cm, yellow	1 long, 10 fertile	12-17 x 1.5-1.8cm, flatten	club-shaped glands
<i>S. spectabilis</i>	347	to 7m, introduced	(6) 10-15	3-7cm, pointed tip	finely & softly hairy	1cm, narrow, curved, deciduous	large, branched, terminal	2-3cm	2-2.5cm, yellow	7 long	18-25x1cm, tubular	
<i>S. alata</i>	348	1-3m, introduced	8-20	5-15cm, oblong with round tip	smooth	0.6-0.8cm, ear-shaped	spike-like, upright, terminal	0.2-0.4 cm	2cm, bright yellow	2 long	10-20x1.5-2cm, flat with 4 ridges	
<i>C. bakeriana</i>	349	to 12m, native	5-7	6-8cm, rounded /short-pointed tip	silky when young	lanceolate, attach in middle	unbranched, upright, behind lvs	6cm	3.5-4.5cm, pink	3 long, smooth	30-40x1-1.5 cm, tubular	
<i>C. grandis</i>	350	to 20m, introduced	10-20	2.5-6cm, rounded lip	brown-woolly when young	tiny, deciduous	unbranched, upright, behind lvs	1-2cm	1.5cm, red / orange-pink	3 long, hairy	20-40(90)x3-4cm, tubular	
<i>C. agnes</i>	351	to 10m, native	6-7	3.5-5.5cm, short blunt lip	slightly hairy both sides	kidney-shaped, 1cm	branched corymbs, upright, terminal	3-3.5 cm	1.5-1.8cm, pink	3 long	tubular, smooth, lowest petal larger&curved	
<i>C. javanica</i> spp. <i>javanica</i>	352	to 15(20)m introduced	5-15	2.5-5cm	finely hairy or smooth	1.5cm, curved, attach in middle,	unbranched, upright, axillary	3-5cm	2.5-3.5cm, pink or red	3 long	20-60x1-1.5 cm, tubular	calyx dark red, ± thorny
<i>C. javanica</i> spp. <i>nodosa</i>	352	to 20m	5-12	2.5-6.5cm, pointed tip	finely hairy or smooth	tiny, curved, attach in middle	unbranched, upright, axillary	3-5cm?	2-3cm, pink or yellowish	3 long	30-60x1.2-1.8cm, tubular	calyx green, never thorny

TABLE 5 : DALBERGIA (Leguminosae)

SPECIES	Sno	LEAFLETS		FLOWER					FRUIT	NOTE
		pairs	Size	Arrange	Size	Colour	Standard Petal	Calyx		
<i>assamica</i> var. <i>assamica</i>	369	5-10	2.5-3.5 x 1-3cm	axillary	7-8mm		rounded, as long as wide	lower tooth 2x as long as others	5.5-8x2-2.5cm	stipule linear 5x1mm
<i>cana</i>	367	7-9	4.5-8 x 2.5-3.5 cm	terminal & upper leaf axils	8mm	purple or violet	longer than wide, with long claw	lower tooth slightly > than others, much < than tube	5-10x2-3cm	linear stipules, 1.5x0.5cm. pods hairy
<i>cultrata</i>	368	(3)4-6	2.5-5 x 1.5-2cm	axillary, often one-sided	5-6mm	white or pale pink	wider than long, claw much < than limb	lower tooth as long as side ones but much < than tube	(2.5)5-10 x1.5-2cm, curved	seeds off-centre; bark pale, usually smooth
<i>lanceolaria</i> (3 varieties)	363	3-6 (8)	2.5-5.5 x 2-3cm	axillary & terminal, one-sided	9-10 mm	white, pale pink or bluish	broadly obovate or circular, claw slightly shorter than limb, notched	lower tooth 1-2x as long as others	5-10x1.5-2cm	linear stipules
<i>nigrescens</i> var. <i>nigrescens</i>	362	(4)5-7	(1.2)2.5-4.5 x 1.2-2cm	compact, one-sided	8 mm	white	longer than wide, claw shorter than limb	lower tooth slightly > than others but much < than tube	5-8x1-2.5cm	bark dark greyish, fissured
<i>oliveri</i>	366	5-7 (10)	3-8 x 1-3 cm	terminal or on short side shoots	8-12 mm	purple in bud, fading lilac then white	circular, as wide as long, claw < limb	lower tooth much longer than others, as long as tube	9-14(17)x (1.2)2.5-4cm	
<i>ovata</i>	365	(2)3-4	(5)8-16 x 3-6.5 cm	terminal or upper leaf axils	5-6 mm	white	longer than wide	lower tooth slightly > than others, much < than tube	(4)8-12x2cm	± scandent; stipules small, deciduous
<i>rimosa</i>	364	2-3 (4)	5-7.5 (10)x2.5-4 cm	terminal & upper leaf axils	3-4 mm	white	broadly obovate, as wide as long, short claw, notched	lower tooth as long as others	(5)7-9x2-3.5cm	
<i>sericea</i>	370	6-10	3-5x2-3.5 cm	axillary, short & compact	6 mm	pale lilac or nearly white	oval or circular ± as long as wide	lower tooth 2x as long as others, ± as long as tube	(2.5)3-6x0.5-0.7cm	
<i>stipulacea</i>	371	7-10 (12)	2-5x1-1.5 cm	axillary, one-sided	8-10 mm	pink or bluish-violet	circular with short claw	lower tooth 2x as long as others, as long as tube	(5)7-12x (3)3.5-4.5cm	deciduous stipules 5-10x3-5mm. scandent

TABLE 6 : TERMINALIA (Combretaceae) adapted from TFB15

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	TREE height	LEAF				FLOWER		FRUIT			NOTE
			Size	Texture	Stalks	Glands	Arrange	Calyx	Size	Wings	Nut	
<i>alata</i>	396	to 30m	10-15cm	smooth or slightly hairy	1-2cm	stalked, on vein near base	axillary panicles	3-4mm diam. recurved	4-7cm	5(6) wings, 1-1.5cm wide		bark deep cracked
<i>bellinica</i>	389	to 40m	4-16cm	smooth	3-9cm	middle or top of stalk, ± obscure	spikes, upper fws male	4-5mm diam. recurved	2-3cm	0(drupe), ± slightly ridged	obovate or subglobose, velvety	
<i>calamansanai</i>	394	to 25m	8-13cm	smooth	2.5-4cm	middle or top of stalk	axillary spikes	1-1.5mm diam recurved	4-8cm	2 wings, much wider than long	1.2-1.8cm, triangular, not grooved/ridged	
<i>cambodiana</i>	397	6-10 m	5-7cm, often whorled	slightly hairy below	0.4-1.2cm	2 pairs, near leaf base & middle of stalk	axillary spikes	2-2.5mm diam	1.4-2 cm	5 wings, 2mm wide	1.2-1.7cm, smooth	
<i>catappa</i>	391	to 25m	12-25cm, slightly cordate	smooth or slightly hairy below	0.5-1.2cm, stout	leaf margin near base, obscure	axillary spikes upper fws male	3-5mm diam., triangular	3-5(7) cm	0(drupe)	smooth, flattened, strongly ridged	
<i>chebula</i> var. <i>chebula</i>	390	to 20m	8-15cm	brown-hairy at least on veins	(0.5)1-3cm	near base of leaf	terminal or axillary panicles	3-4mm diam. triangular, hairy inside	2.5-4 cm	0(drupe)	round, smooth, ± 5 shallow ribs	
<i>franchetii</i> var. <i>tomentosa</i>	399	to 10m	4-6cm	densely hairy both sides	0.4-1.5cm	leaf margin near base	terminal racemes	2-4mm diam.	0.7-0.9cm	3 wings 2-3mm wide	dense red-brown hairs, stalks 4-6mm	
<i>glaucofolia</i>	393	8-20m	10-21cm, clustered	smooth (glaucous)	3-5.5cm	middle or top of stalks	axillary spikes	3-3.5mm diam triangular	3.5-5 cm	2 wings, at least as wide as long	1.5-2.6cm, rounded, ridged/grooved	
<i>mucronata</i>	392	to 35m	8-15cm	smooth or sparsely hairy	1-2cm	near base of leaf	axillary spikes	4-5mm diam.	3-4cm	2 rounded wings, ± as wide as long	pale yellow-brown, finely hairy	
<i>myriocarpa</i> var. <i>hirsuta</i>	395	to 40m	10-20cm	smooth or slightly hairy on veins	0.4-0.7cm, stout	stalked, near base of leaf	terminal panicles	1mm diam. long hairs inside	1.1-1.6cm	2(3) wings, 0.4-0.6cm	0.3-0.4cm, silky	
<i>triptera</i>	398	to 18m	6-10cm	smooth	0.5-1.2cm	leaf margin near base	terminal or axillary panicles	1-2mm diam. toothed	1-1.4 cm	3 wings, 1.5-3.3cm	no stalks, smooth	

TABLE 7 : LAGERSTROEMIA (Lythraceae) adapted from BFB23 (1931) & GBS24 (1969)

SPECIES	Sno	TREE	BARK	LEAF			FLOWER				FRUIT	NOTE
				Size	Shape	Texture	Size	Color	Calyx	Ovary		
<i>balansae</i>	447	to 10m	cream, smooth & flaking	10-15cm	lanceolate taper tip	smooth or sparsely hairy below	3.5cm	pink-purple	no ridges	hairy	1.3-1.5cm	floral leaves pointed, fw bud nipple ≥ 1.5mm
<i>calyculata</i>	443	to 30m	cream, smooth & flaking	12-18cm	lanceolate	yellow hairs on young lvs	≤ 1.2cm	white	no ridges, dense hairs outside	hairy	≤ 1cm	fws sessile
<i>cochinchinensis</i>	446	to 43m	cream, smooth & flaking	4-8(11) cm	narrowly ovate, pointed tip	densely hairy on veins below	3.5-5cm	pink-purple	no ridges, densely hairy outside	dense silky hairs	1cm	floral leaves blunt, fw bud nipple ≤ 1mm
<i>floribunda</i>	445	to 20m	cream, smooth & flaking	12.5-20 cm	lanceolate blunt/slight pointed tip	brown hairs on young lvs	2.5-3.5 cm	pink, fading white	10-12 ridges brown hairs at tips inside	hairy	1.2-2cm	
<i>indica</i>	440	to 8m	cream, smooth & flaking	2.5-7.5 cm	elliptic	smooth	3.5-5cm	white, pink or mauve	no ridges, smooth	smooth	1.2cm, globose	
<i>loudonii</i>	441	to 20m	cream, smooth & flaking	up to 20cm	oblong, blunt/point both ends	yellow hairy below & vein above	±5cm	white, pink-purple, fringed	slightly ridged, hairy outside & tips inside	hairy	1.2-2cm, obovoid	
<i>macrocarpa</i>	449	to 8m	cream, smooth & flaking	12-18 (25)cm	oval/elliptic ± blunt tip	smooth	6-10cm	mauve or purple	10-12 narrow ridges	smooth	2.5-4cm, ovoid	fw clusters <15cm fw buds 1.5-2cm
<i>speciosa</i>	450	to 20m	cream, smooth & flaking	8-18 (24)cm	ovate/oblong, blunt/pointed tip	smooth	5-7.5cm	mauve or purple	10-12 rounded ridges	smooth	1.7-2.5 cm, globose	fw clusters up to 40cm, fw buds 0.9-1cm
<i>tomentosa</i>	444	to 30m	grey-brown, slightly fissured	10-18cm	lanceolate taper tip	young lvs yellow-hairy	2.7-3.5cm	white or pinkish	10-12 ridges, hairy outside, smooth inside	hairy	1-1.4cm	
<i>venusta</i>	448	to 17m	cream, smooth & flaking	10-15cm	elliptic		2.5-3.5 cm	purple	5-6 short ridges; "horns" between teeth	smooth	1.8-2cm, thin	calyx glaucous
<i>villosa</i>	442	to 30m	dark grey, fissured	5-10cm	ovate to lanceolate	soft grey hairs	small, < 1cm	white	5-6 narrow ridges	smooth	1.2-1.5cm	fw clusters spherical, petals

TABLE 8 : SYZYGIUM (Mytaceae) adapted from TFB21 (1994)

 Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	LEAF		FLOWER					FRUIT	NOTE
		SIZE	VEINS	ARRANGE	HYPANTHIUM	PETALS	STAMENS	STYLE		
<i>albiflorum</i>	428	9-14 x 3.5-6cm	1(0) marginal 7-13 pairs	0.3-0.6cm, terminal & upper axils, usually branched from base	cup 6-8.5mm, stalk 2.5-4.5mm	4-7.5mm, free, densely gland-dotted	7-12.5 mm	8.5-15 mm	?	central flower of 3 sessile
<i>angkae</i> ssp. <i>angkae</i>	416	7.5-14.5 x 2-6cm	2 marginal, 27-36 pairs	to 2cm, terminal & upper axils, branched	cup 5-7mm, stalk 2-5mm	4.5-6.5mm, free quite dense gland dots	6-7mm	7.5-8 mm	spherical/ovoid	twigs whitish
<i>balsameum</i>	419	6-14.5 x 3-7cm	no marginal 7-12 pairs	0.1-0.4cm, behind leaves, usually branched from base	cup 2.5-4mm, stalk 1.5-2mm	1-2mm, joined in hood, scatter glands	2-2.5 mm	1-1.5mm stout	0.4cm, spherical	
<i>cerasiforme</i>	410	7-15 x 2.5-5cm	2 marginal, 14-21 pairs	2-5cm, terminal & upper, branched, often clustered	cup 3.5-6mm, stalk 1.5-2mm	2-3mm, joined in hood, dense glands	4.5-7 mm	5-7.5mm stout	1.1-1.6cm	
<i>cinereum</i>	431	7-16(24) x 3-7.5cm	no marginal 6-12(18) pairs	8cm, terminal (+ axillary), ± branched	cup 2-3mm, stalk < 1mm	1.5-2mm, joined into hood in bud, scattered glands	1.5-2.5 mm	<1.5mm stout	(0.6) 1.3-1.5cm, bright red	bark whitish
<i>claviflorum</i>	430	5.5-18 x 2-7 cm	2 marginal, 13-26 pairs	to 3cm, terminal & axillary	cup 9-20mm, club-shaped, stalk 7-15mm	5(10) petals, (1.5) 2.5-4mm, joined into hood in bud, scatter glands	5-10 mm	(6) 8-18 mm	1.2-1.7(2.5)cm, cylindric/ellipsoid, purple,	calyx cup smooth inside
<i>cumini</i>	426	7-14 x 3-7cm	1 marginal, 19-30 pairs, parallel	(2.5) 4.5-10cm, mostly behind, branched, clustered	cup 2.5-5mm, stalk 1-2mm	1.5-3mm, joined in hood, scatter glands	4-6 mm	2-6.5 mm stout	(0.7) 1.5-2.5cm, ovoid-oblong, dark purple/black	
<i>diospyrifolium</i>	424	18-23.5 x 3.5-9cm	2 marginal, 9-14 pairs	4-5cm, terminal & axillary, corymbs	cup 14-20mm, stalk 1-2(7)mm	9-12mm, free, thick base, dense glands	16-21 mm	35-52 mm		calyx cup not ribbed. Tak southwards
<i>formosum</i>	422	23-46x10-14cm, base rounded or cordate	no marginal slightly loop-ed near top 13 pairs	behind leaves, short corymbs	cup 15-20mm, stalk 5-6mm	9-12mm, white or red, free, very dense glands	19-20 mm	35-38 mm	4cm, persistent spreading calyx lobes	sepals in 2 layers, outer larger, lvs sometimes whorled
<i>fruticosum</i>	427	7.5-11.5x 3.5-6.5cm tapering base	1 marginal, 12-16 pairs midvein sunk with 2 ridges	5to 6cm, mostly behind leaves, branched, stalks squarish	cup 2-3mm, stalk ≤0.5mm	1.5-2.5mm, joined into hood in bud, scatter glands	3-4.5 mm	2.5-3.5 mm	0.8-1.3cm, dark red-purple, ovoid	bark dark brown
<i>glaucum</i>	414	8-14.5 x 2.5-5cm	2 marginal, 11-20 pairs, midvein raised & grooved	to 11cm, terminal & upper, branched	cup 5.5-8mm, stalk 3-4mm	2.5-3.5mm, free, base thick, quite dense glands	4-9 mm	4-13 mm	?	calyx cup not ridged
<i>globiflorum</i>	415	9-15.5 x 3-5cm	2 marginal, 10-15 pairs, midvein sunk	8cm, terminal, branched from base	cup 6.5-10mm, stalk 2-5mm	7-10mm, free, concave, very dense glands	5-15 mm	7-16mm, stout	?	
<i>gratum</i> var. <i>gratum</i>	409	5-11.5 x 1.5-5cm	2 marginal, 10-15 pairs, midvein sunk	12cm, terminal & axillary, branched, stalks squarish	cup 4-9.5mm, longitudinally wrinkled, stalk 1-2mm	1.4-4.2mm, joined in hood in bud, scatter glands	5-10 mm	7-11 mm	0.6-0.8cm, spherical, white	calyx cup without thick ring inside, fts purple/black
<i>helferi</i>	411	5.5-13 x 2.2-4.5cm	1 marginal, 11-16 pairs	to 6cm, terminal & upper leaf axils	cup 5-7.5mm, stalk 1-1.5mm	5mm, free, dense glands when young	8-9 mm	11-12 mm	oval (immature)	midvein sunk/flat/raised
<i>jambos</i>	425	10-20 x 3-5cm, tapering base	(1) 2 marginal, 11-14 pairs, midvein sunk	to 6cm, terminal, unbranched	cup 12-14mm, stalk 4-6mm	15-17mm, free, thick base, very dense glands	33-37 mm	43 mm	3.5-6cm, dull yellow tinged pink, persist incurved calyx lobes	calyx cup funnel-shaped, with thickened ring inside, fw buds broad lobes
<i>megacarpum</i>	421	21.5-30 x 6.5-8.5cm	2 marginal, 14-20 pairs, midvein sunk	5cm, terminal & axillary, branched	cup 15-23mm, strongly ribbed, stalk 5mm	20-24mm, free, thick base, dense glands when young	24-33 mm	31-47 mm	4.2-6cm, spherical, green tinged red-purple	buds broad
<i>polyanthum</i>	417	6.5-13 x 2.2-5cm, pointed base	no marginal 7-10 pairs, midvein sunk (± raised near base)	2-4.5cm, behind leaves, branched near base, 1-3 clusters together, sessile	cup 2-2.5mm, stalk 1.5-2mm	1.4-2.2mm, free, quite dense glands	2.5-4.5 mm	1.5-2 mm	0.4-0.7cm, spherical	midvein generally sunken but slightly raised near base
<i>ripicola</i>	420	5-13x15 -2.5cm pointed base	1 marginal, 13-20(30) pairs, midvein sunk	9cm, terminal & axillary, sessile	cup 3.5-5.5mm, stalk 2-2.5mm	1.5-2.5mm	(3) 4.5-7 mm	(2.5) 4.5-6 mm	?	
<i>siamense</i>	423	9.5-27 x 2.7-8.3cm base round/heart-shape	1 marginal, 7-14 pairs, midvein sunk	to 5cm, terminal & upper, unbranched	cup 10-17mm, red, stalk 6mm	14-17mm, free, thick base, very dense glands	23-29 mm	37-42 mm	2.5-2.7cm, spherical or ovoid	calyx cup broad funnel-shaped, not ribbed
<i>thumra</i> ssp. <i>thumra</i>	412	13.5x4.5 -7.5cm, pointed base	2 marginal, 14-18 pairs, midvein sunk	9.5-12cm, terminal branched from base, sessile	cup 4.5-5.5mm, stalk 1.5-2mm (none)	2-3mm, free, ± narrow at base, scattered glands	4.5-7.5 mm	6-7.5 mm		tertiary veins faint
<i>winitii</i>	418	6.5-13.5 x 1.5-3cm	2 marginal, 15-20 pairs, midvein sunk	to 9cm, terminal & axillary, several together, stalks squarish	cup 3.5-5.5mm, stalk 1-1.5mm	2-3mm, joined in hood in bud, scatter glands	3.5-4 mm	4-6.5 mm		
<i>zimmermanii</i>	429	6.5-13 x 2.5-8cm, pointed/ taper base	1(0) marginal 6-9 pairs, midvein sunk	4-8cm, terminal & upper, branched from base	cup 7-8.5mm, stalk ±3mm	5-8.5mm, free, dense glands	9-13.5 mm	8.5-13 mm	?	

all spp. with 4 petals unless otherwise stated

TABLE 9: ARDISIA (Myrsinaceae) adapted from FT 6/2 (1996)

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	HABIT	LEAF				FLOWER			
			Size / Shape	Margin	Texture	Vein	Arrange	Stalks	Calyx	Corolla
<i>attenuata</i>	528	1.5-3m	8-24x2.5-6cm, narrow elliptic to obovate	no glands or teeth, rarely toothed near top	all parts smooth	10-14 pairs, tertiary veins distinct below	simple umbels in axils of reduced or fallen lvs	2.5-4.5 mm	deeply split, lobes 2-3mm	8-10mm, white/pink, with dark dots
<i>colorata</i>	532	2-5 m	13-26x3-8cm, lanceolate	no glands or teeth	scattered tiny scales below, no hairs	no submarginal, 15-20 pairs + short intermediates	10-18cm, terminal pyramidal panicles	2-3 mm, smooth or nearly so	split 2/3, lobes 1mm, spreading	3mm, pink, no dots
<i>corymbifera</i> var. <i>corymbifera</i>	526	1-3(5) m	8-15x2-3.8cm, oblong-lanceolate	large glands, untoothed or with shallow teeth	smooth or hairy below	15-20 arched pairs, ending in glands	terminal compound umbels, brown-hairy	0.5-1cm	split 2/3, lobes 3mm, dense black dots	6-8mm, white/pink, scattered dots
<i>Crenata</i> var. <i>crenata</i>	527	1-2(4) m	6-15(20)x2-4cm, lanceolate	rounded teeth & large glands	scattered tiny scales below, no hairs	12-18 pairs, with submarginal, tertiary veins usually faint	terminal, compound or simple umbels, smooth or slightly hairy	none or very short	split ± to base, lobes 1.5mm, scatter dots	4-6mm, white/pink, scattered dots
<i>kerrii</i>	529	to 7.5 m	4.5-13x2-5cm, narrowly obovate	no glands or teeth	scattered rusty scales below	many pairs, with submarginal, tertiary veins faint	pseudoterminal, simple/compound umbels/corymbs	0.5-0.8 cm	split 2/3, lobes 1-2mm spreading, not overlap	3mm, scattered brown dots
<i>nervosa</i>	533	to 8m	7-13x2-4.5cm, narrowly elliptic	no glands or teeth, ± wavy	dense minute scales & glands below	many parallel pairs, with submarginal, tertiary veins distinct		0.4-0.7cm	deeply split, lobes 1mm not overlap	3-4mm, white, scatter faint dots
<i>polycephala</i>	531	shrub, rarely to 8m	12-20x4-8cm, oblong to oblanceolate	no glands or teeth	all parts smooth, many black dots	12-20 pairs, arched, many short intermediates, no submarginal	simple short curved racemes, axillary or behind leaves	1-1.5cm	deeply split, lobes 4-5mm overlapping	pink
<i>quinquegona</i>	530	1.5-2m rarely to 6m	5-15x1.5-3cm, oblong-lanceolate	no glands or teeth	scaly or scurfy, no hairs	many parallel pairs, with submarginal, tertiary veins faint	axillary / pseudo-terminal, simple umbels / corymbs	0.4-0.8cm	split 3/4, lobes 1-1.5mm, not overlapping	3mm, white, many black dots
<i>virens</i>	534	shrub 1-3m	9-14(20)x3-6cm, oblong or lanceolate	round teeth large glands	dense tiny black dots below, ± scaly	15-20 pairs, with submarginal, tertiary distinct	terminal, compound umbels (corymbs) smooth	1-2cm, (to 3cm in ft) peduncle very short	split ± to base, lobes 2.5-3.5mm, dense black dots	white, lobes 6-8mm, scattered dots/lines

TABLE 10: MAESA (Myrsinaceae) adapted from FT 6/2 (1996)

SPECIES	Sno	HABIT	LEAF			FLOWER	NOTE
			Margin	Texture	Stalk	Arrange	
<i>M.glomerata</i>	540	small tree 4-5m	coarsely toothed except near base	short hairs on veins below	1-2cm, densely hairy	crowded axillary panicles, ≤2.5 cm, densely hairy	tube longer than lobes densely hairy
<i>M.indica</i>	542	shrub or treelet 1-5m	dentate with thick teeth, petiole 1-4cm	smooth, with dark stripes	1-4cm	axillary racemes or sparsely-branched panicles, 2-6cm, smooth	tube same length as lobes smooth
<i>M.montana</i>	541	shrub 2-3m	dentate with thick teeth	scattered hairs on veins below, ± with dark stripes	0.5-1cm	axillary racemes (or panicles?), smooth or hairy	tube same length as lobes slightly hairy
<i>M. paniculata</i>	538	climber or shrub to 4m	coarsely toothed	no hairs, with faint glandular stripes	1-1.8cm	terminal much-branched pyramidal panicles to 35cm	tube same length as lobes smooth
<i>M.perlarius</i>	536	shrub 1-3m	coarsely toothed except near base	rough hairs on midvein above & below.	0.7-1.1cm, rough hairs	axillary racemes or sparsely-branched panicles	tube same length as lobes hairy
<i>M. permollis</i>	539	shrub to 3 (6)m	thickened teeth	smooth above, long hairs on raised stumps below	2-3.5cm, red-brown hairs	racemes or sparsely-branched panicles, axillary, shorter than leaves	tube longer than lobes
<i>M. ramentacea</i>	537	shrub to 5m, rarely small tree to 10m	untoothed (rarely with scattered teeth)	smooth both sides	0.6-1cm	panicles to 12cm; axillary, behind lvs or sub-terminal	tube same length as lobes smooth or slightly hairy

TABLE 11: DIOSPYROS (Ebenaceae) adapted from FT 2/4 (1981)

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	LEAF		MALE FLOWER			FEMALE	FRUIT		
		Stalk	Size/Shape	Stalk	Calyx	Corolla		Stalks	Size / Shape	Calyx
<i>coetanea</i>	564	0.7-1cm smooth	to ± 20 cm, finely hairy below.	2-3 mm	divide ½, black-hairy both sides	tubular, divide to ⅓, hairy outside only	?	?	?	?
<i>dasyphylla</i>	565	0.3-0.5cm, hairy	7-20cm, densely hairy below.	0mm	2-3mm, divided ± to base, hairy outside only	6-7mm, tubular, divide to ½, hairy outside only	stalks 2-3mm	5mm	4-7cm, fleshy, smooth, globose, sunken or round both ends	divide to base, lobes reflexed, velvety outside only, no veins
<i>dictyoneura</i>	553	1-1.5cm smooth	16-22cm, smooth, leathery.	3-5 mm black -hairy	5-7mm, divide to base, lobes folded & wavy, black-hairy outside only	15-20mm, salverform, divide to ½, hairy outside only	stalks 3-5mm, calyx/corolla as males but larger	10-15 mm	2-3.5, skin crusty, black-hairy when young, round or sunk at top with cusp	divide to base, lobes upright & wavy (plicate), hairy both sides, obvious veins
<i>dumetorum</i>	560	0.2-0.3 cm, silky	1.5-5cm, silky when young.	3mm	1-3mm, divide ± to base, silky outside only	3-4mm, globose or ovoid, divide to ⅓, hairy along midline outside only		1-2 mm	1.1-1.3cm, ellipsoid/ovoid, 5-8 grooves, dry, silky when young, blunt + short nipple	divide to base, lobes reflexed, hairy both sides when young, faint veins
<i>ehretoides</i>	558	1-2cm, hairy or smooth	10-28cm, rounded/ heart-shaped base. hairy below when young	3mm	2-3mm, divide ⅓, sparsely hairy outside, smooth inside	3-5mm, ovoid or urceolate, divide to ⅓, slightly hairy outside, smooth inside	stalks ± 1cm, calyx divide to base, hairy outside only. corolla as males	10mm	1.5-2.5cm, dry, hairy when young, ovoid, blunt both ends	divide to ½ or more, lobes oblong, reflexed, hairy outside only, veins faint
<i>ferrea</i> var. <i>littorea</i>	550	0.2-0.5cm hairy or smooth	3-9cm, slightly hairy below when young	(sub) sessile	2-3mm, divided ½, silky outside, smooth inside	3-4 mm, ovoid, divide to ⅓, silky outside, smooth inside	(sub) sessile, calyx divide ⅓, hairy outside, silky inside, corolla tubular or globose, divide 1/6, silky outside only	1-2 mm	1-1.5cm, dry, black, globose, rounded + short nipple, woody, smooth	divide to ½, with 3 straight lobes , hairy when young, no veins
<i>glanulosa</i>	557	1cm, hairy.	rough hairs at least below 8-14cm	2mm	4-6mm, divide ± to base, long hairs both sides	6-8mm, globose, divide ¼-⅓, 6-8mm, hairy along midline only	stalks 2-5mm, calyx/corolla as males but larger	3-5 mm	2.5-4cm, fleshy, silky, globose, sunken both ends	divide ± to base, lobes spreading & wavy, densely hairy both sides, obvious veins

<i>malabarica</i> var. <i>siamensis</i>	555	1-1.5cm smooth	10-30cm, smooth.	2mm	2-3mm, divide ½, hairy both sides	7-15mm, ovoid or globose, divide to ¼, hairy along midline only,	stalks ± 2mm, calyx/corolla as males but larger	2-10 mm	2.5-5cm, globose, semi-fleshy, velvety when young, round/sunk both ends	divide to ½, lobes triangular & upright, ± wavy, hairy both sides, veins faint
<i>martabanica</i>	563	0.2-0.5cm rough hairy	7-17cm, smooth above, ± densely hairy below.	5-10 cm rough hairy	7-8mm, divide to base, linear lobes	20mm, salverform, divide 1/2 to 2/3, silky outside only		10-20 mm	1.5-2.5cm, dry, silky, ellipsoid / globose, rounded	divide to base, lobes reflexed, linear, silky outside, no veins
<i>mollis</i>	559		4-8cm, black when dry, slightly hairy when young	1mm	1-2mm, divide 1/2, smooth both sides	6-8mm, urceolate, divide to ½, smooth both sides		2-5mm	2cm, black, dry, smooth, rounded, not sunken	divide ½ (to base?), lobes reflexed
<i>montana</i>	561	0.2-1cm long-hairy	1.5-12cm, slightly hairy both sides when young. twigs thorny	2mm	1-2mm, divide ± to base, smooth or sparsely hairy both sides	8-10mm, urceolate, divide ½ to ⅓, smooth both sides	solitary, stalks ± 5mm, calyx & corolla as males	5-7mm	1-3cm, dry, hairy when young, rounded with short cusp	divide to base, lobes straight or reflexed, wavy, hairy both sides when young
<i>pilosanthera</i>	552	0.5-1cm hairy	8-20cm, ± smooth both sides, red-brown when dry	3-5 mm	3-4mm, divide ± to base, hairy both sides	7-12mm, salverform, divide to ½, hairy outside only	subsessile, calyx & corolla as males but larger	2-3mm	2-4cm, dry, silky when young, blunt or sunken, ovoid	divide to base, lobes straight, strongly wavy, hairy both sides
<i>rhodocalyx</i>	556	0.2-0.7cm, ± smooth	3-12cm, hairy below when young, midvein pinkish when dry.	1-2 mm	3-4mm, divide to 2/3, hairy outside, silky inside	8-12mm, ovoid or globose, divide to ¼, smooth both sides	stalks 2-3mm, calyx divide 3/4, hairy both sides, triangular lobes; corolla as males but larger	2- 5 mm	1.5-2.5cm, red, dry & brittle, skin <2mm thick, velvety when young	divide to at least ⅓, spreading tips, wavy, hairy both sides, obvious veins
<i>undulata</i> var. <i>cratericalyx</i>	562	1cm, smooth	12-18cm, smooth both sides	5-7 mm	Calyx 3-5mm, divide to ½, hairy outside, silky inside	Corolla 8-13mm salver-form, divide to ½, silky outside only	calyx divide to ⅓, wooly both sides; corolla as males but larger	sessile (var. <i>undulata</i> >10mm)	1.5-2cm, dry, globose, rounded tip, hairy when young	divide to ⅓, lobes reflexed, ± wavy, ± wooly both sides, no veins
<i>variegata</i>	551	0.5-1cm smooth.	15-30cm, smooth, leathery, mid-vein pinkish	2-4 mm	3-4mm, divide to ⅓, ± hairy outside, smooth inside	10-12mm, salverform, divide to ½, smooth both sides	stalks ± 5mm, calyx divide ± to base, lobes spreading, hairy both sides	5 mm	1.5cm, dry & brittle, skin ≤ 1mm thick, woolly when young, globose +	divide to ½ lobes reflexed & wavy, ± densely hairy, obvious veins

TABLE 12: SYMPLOCOS (Symplocaceae) adapted from FT 2/4 (1981)

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	TWIG	LEAF			FLOWER			FRUIT	NOTE
			Size	Texture	Vein	Arrange	Perianth	Structure		
<i>cochinchinensis</i> ssp. <i>cochinchinensis</i>	574	rusty-hairy or smooth, terminal buds hairy	(6)12-25 cm	smooth above, usually hairy below	8-16 pairs, parallel, prominent	spikes 3-15 cm, $\pm$ branched, rarely with very short pedicels	calyx hairy, lobes 1-2mm; bracts 2-10 mm, corolla 3-5mm	ovary smooth, hidden by persistent bracts; disc smooth; 30-70 stamens	globose or flask-shaped, 0.5-0.7cm, calyx enlarging	seed curved, stone smooth
<i>cochinchinensis</i> ssp. <i>laurina</i>	574	smooth, terminal buds hairy or smooth	4.5-21 cm	smooth	6-9 pairs (rarely 13), not parallel, often looped	spikes 1.5-4cm, $\pm$ branched, rarely with very short pedicels	calyx smooth, lobes 1-2mm, bracts 1mm	ovary smooth, bracts only near base	0.5-0.7cm, calyx not enlarging	petals white with yellow spots
<i>dryophylla</i>	569	smooth except base of young shoots, terminal buds large & scaly	9-23cm	smooth (except bud)	9-18 pairs, looped	racemes to 15cm, axes silky, pedicels 2-10mm	calyx smooth, lobes 1-1.5mm, bracts 5-9mm; corolla 5-6(10)mm	ovary smooth, inconspicuous disc; 40-75 stamens	ellipsoid, 0.5-1.2cm; stone smooth; seed straight or curved	only on Doi Intanon.
<i>henschelii</i> var. <i>magnifica</i>	573	terminal bud hairy	7-17cm	smooth or with scattered hairs on veins below	5-11 pairs	racemes to 10cm, pedicels 0-6mm	petals 2.5-5cm, fused to at least half way	stamens fused to tube attached to corolla tube	3-5cm	Doi Intanon & surrounding area
<i>hookeri</i>	570	smooth, also terminal buds	14-22 cm	smooth both sides	6-11 pairs, looped	racemes, pedicels 1-3mm	calyx smooth, lobes 1-3mm; bracts 5-8mm; corolla 6-9mm	ovary smooth, $\pm$ 80 stamens	1.3-2.4cm, stone smooth, seed straight	
<i>longifolia</i>	567	smooth, terminal buds hairy	11-24 x 3-6 cm	smooth both sides	6-11 pairs, looped	spikes, pedicels <1mm	calyx hairy, lobes 1.5-2mm; corolla 6mm	ovary smooth, $\pm$ 70 stamens	1.5-2.8cm, stone with low but distinct ridges	seed straight
<i>lucida</i>	566	smooth, angular when dry, terminal buds large & smooth	5-12cm	smooth both sides	5-15 pairs, midvein raised	spikes/racemes, branched from base, pedicels $\leq$ 5mm	calyx smooth, lobes 1-3mm; bracts 1-3mm; corolla 3-5mm	ovary smooth, densely hairy disc; 10-70 stamens	0.5-1.8cm, bracts persistent; seed U-shaped	
<i>macrophylla</i> ssp. <i>sulcata</i>	572	hairy or woolly (rarely smooth), terminal buds hairy	7.5-20 cm	smooth above, hairy below, margin glandular-toothed	6-17 pairs, looped	racemes, pedicels $\leq$ 2mm	calyx silky, lobes 1-2.5mm; corolla 2.5-6mm	ovary silky-hairy; 30-50 stamens	0.7-0.9cm, stone not flask-shaped, seed straight	
<i>racemosa</i>	571	smooth or rarely slightly hairy, terminal buds hairy	8-15cm	smooth both sides, upper surface very thick & wrinkled when dry	5-9 pairs	racemes to 10(17) cm, $\pm$ branched, axes hairy, pedicels 1-3mm	calyx smooth or minutely hairy, lobes <1mm; bracts >2mm; corolla 5-8mm	ovary smooth, disc hairy, $\pm$ 100 stamens	0.8-1.1cm, with persistent bracts; stone smooth; seed straight	
<i>sumuntia</i>	568	smooth (rarely hairy), terminal buds usually hairy	2-10cm	smooth both sides	5-8(10) pairs faintly looped	racemes 1-6cm, pedicels 1.5-13mm	calyx smooth or slightly hairy, lobes 0.4-1.5mm; corolla 4-11mm	ovary smooth or slightly hairy, disc smooth or hairy; 25-40 stamens	0.6-1cm, ovoid or flask-shaped; seed curved	

TABLE 13 : LAURACEAE adapted from CFRII57 (1957)

Sno = first species in genus. "Calyx" = perianth

GENUS	Sno	LEAF	FLOWER						FRUIT	NOTE
			Arrange	Calyx	Sex	Stamen	Anther	Stigma		
Actinodaphne	656	usually whorled	panicles; many overlapping bracts	6 subequal lobes	dioecious	males with 9 fertile, females with 9 sterile	4 cells	peltate	persistent enlarged calyx tube	If buds with large bracts
Beilschmiedia	681	spiral, often subopposite	panicles, no bracts	6 subequal lobes, short tube	bisexual	6 or 9 fertile, 3 large spear-shaped sterile, hairy filaments	2 cells	very inconspicuous	calyx lobes deciduous & not enlarging, stalks not or hardly swollen,	side veins few but obvious
Cinnamomum	668	spiral, usually opposite (1) 3 main veins	panicles, no bracts			9(6) fertile in 3 whorls, 4th whorl sterile, conspicuous	4 cells	discoid or peltate	usually woody, base embedded in enlarged calyx, limb persist but lobes deciduous	
Cryptocarya	679	spiral, alternate or opposite 1 main vein	panicles, no bracts	tube slender, conspicuous, 4 equal lobes	bisexual	9 (3 or 6) fertile, 4th whorl sterile, conspicuous	2 cells	small & not conspicuous rarely peltate	almost completely enclosed by enlarged calyx cup	
Lindera	666	spiral, 3 main veins	fasciated heads, large bracts		dioecious	9 or 12 fertile	2 cells	large, slightly 3-angled	calyx cup very shallow, untoothed	fw pedicels < 1mm
Litsea	657	spiral, 1 main vein	heads (compound umbels), large bracts	6 or 0 ± equal lobes, very short tube	dioecious	9 or 12 fertile, filaments slender	4 cells	obscurely lobed/ peltate	seated on + developed cup or disc, calyx usually deciduous	
Neolitsea	665	spiral, 3 main veins	heads, large bracts		dioecious	6 fertile in 3 whorls	4 cells	conspicuous, peltate	on disc-like cup, stalks often slightly thickened	individual fws sessile
Persea	676	spiral, 1 main vein	panicles, no bracts	6 lobes, outer whorl smaller, tube very shallow		6-9 fertile in 2 or 3 whorls, 4th whorl sterile, conspicuous	4 cells		calyx + persistent but not indurate & not clasping base of fruit, stalks thickened	
Alseodaphne	678	spiral, 1 main vein	panicles, no bracts	lobes spreading, outer 3 slightly smaller	bisexual	fertile with conspicuous filaments, 3 sterile	4 cells	slender style, small disc-like stigma	stalks thickened, calyx not persistent	
Machilus	655	spiral, 1 main vein	panicles, no bracts	lobes spreading, bent backwards			4 cells		calyx persistent, lobes spreading, no cup	
Nothaphoebe	677	alternate or subopposite, 1 main vein	panicles, no bracts	outer 3 smaller, pressed together, tube short		9 fertile, no filaments, 3 minute sterile	rounded 4 cells	slender style, small peltate stigma	stalks not or hardly thickened, calyx not persistent	
Phoebe	673	often clustered & sympodial, 1 main vein	panicles, no bracts	6 lobes, outer 3 slightly smaller, short tube		9 fertile, 3 sterile, heart-shaped with distinct stalks	4 cells	slender style, blunt stigma	calyx persistent & enlarged, erect, hard, clasping base of fruit, no cup	

TABLE 14: GLOCHIDION (Euphorbiaceae)

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	LEAF			MALE FLOWER		FEMALE FLOWER			FRUIT	
		Stalk	Size	Texture	Stalk	Sepals	Stalk	Sepals	Pistil	Stalk	Size / Shape
<i>dasystylum</i> var. <i>kerrii</i>	719	1-3mm, long hairs; stipules 0.5mm	4-12 x2-5 cm	rough hairs on midvein above & lower surface	8-12mm, smooth or sparsely hairy	1.5-2-4mm, narrow & pointed, smooth or sparsely hairy	<1mm, dense shaggy hairs	1-1.5mm, densely ochre- hairy outside	style column cylindrical, 3-4x as high as ovary densely hairy, 3-forked at tip; ovary hairy	7- 14mm, slender	0.6-0.7cm, flattened, 3-4 deep lobes, each lobe again 2-lobed, sparsely white-hairy
<i>sphaerogynum</i>	724	4-8mm, stipules short	9-19 x 3-6 cm	completely smooth	(stalked)	elliptic	none or v. short, densely clustered	circular	style column sub- globose, not forked; ovary smooth	short & stout	0.8-1.2cm, flattened, smooth, deeply 6,8 or 12 lobed, large globose style
<i>acuminatum</i> var. <i>siamense</i>	721	2-5mm, densely hairy; stipules 1mm	5-12 x1.5-4 cm	smooth or sparsely hairy on vein above glaucous & quite densely hairy below	5-8mm, sparsely hairy	very unequal, elliptic to oblong, 1.5-2mm, yellow outer 3 hairy & ridged outside, inner 3 smooth	1.5-2mm	1.5mm, narrowly ovate, ochre-hairy outside	style column funnel-/club- shaped, 3-4x as high as ovary; ovary smooth or sparsely yellow-hairy	5-10 mm	0.6-0.8cm, dark purple, deeply 4-6 lobed, very sunken, minute style on top. Seeds red-brown, 3- angled
<i>assamicum</i>	720	2-5mm; stipules 1- 2mm	9-15 x 3.5-5 cm	completely smooth	stalks 0.9- 1.2cm, fine hairy to smooth	narrow obovate, smooth	none or v. short, densely clustered	minute, linear- oblong, smooth or slightly hairy	style column very short, conical, smooth, as high as ovary, 3-4 forked; ovary smooth or sparsely hairy	none or very short	0.5-0.8cm, flattened, faintly 4(3-5)lobed, smooth/sparsely hairy, minute style. Seeds red
<i>eriocarpum</i>	723	3-4mm, stipules ±3mm, hairy	4-11 x 3-5cm	dense brown hairy when young, later smooth except veins & stalks	2-6mm, slender, finely hairy.	narrowly ovate, outer 3 hairy both sides, inner 3 hairy only on mid-ridge outside.	>1mm	slightly fused at base	style column obovoid, <2x as high as ovary, 4 deep grooves ± to base; ovary with long pale yellow hairs	5-8mm	0.8-1.5cm, depressed globose, hairy, 4-8 lobed, concave at top. Seeds red
<i>rubrum</i>	722	2-4mm, stipules 1mm.	3-14 x 1.5-5 cm	smooth except main veins	3-4mm & hairy at first; later 10-14mm & smooth	2mm, pointed- ovate, smooth or slightly hairy both sides	none	2mm, ovate- triangular, outer 3 hairy outside, inner 3 smooth	style column 1-4mm, conical, smooth, 3- forked, 2-5x as high as ovary, ovary hairy.	≤3mm	0.8-1.5cm, pink, flat/ concave both ends, 3-5 lobed, smooth/ minutely hairy. Seeds pale brown, 3-angled

TABLE 15: BOEHMERIA (Urticaceae) adapted from APG32 (1981)

SPECIES	Sno	HABIT	LEAF				FLOWER Arrange	NOTE
			Size	Arrange	Margin	Texture		
chiangraensis	795	2-4m	13-20 x 5-12cm	opposite	coarsely toothed	minutely hairy	axillary once- branched spikes	
cidemoides var. cidemoides	794	0.5- 1.5m	7-12 x 4-6.5cm	alternate or opposite with unequal-sized leaves	finely toothed	sharply hairy above, long soft hairs below	axillary clusters, also behind leaves, forming pseudospikes	lower fws male, upper female
cidemoides var. platyphyllodes		1-2m	10-20 x 7-12cm	opposite	finely toothed	sharply hairy above, soft hairs below	simple spikes or brached near base	
macrophylla	796	1.5-3m	13-25 x 2.5-5cm	opposite	minute shallow teeth	almost smooth above, softly hairy below	simple spikes	
malabariensis	797	2-4m	12-20 x 5-10cm	alternate	finely toothed	almost smooth above, sparsely or densely hairy below	axillary clusters, also behind leaves	male/female on different spikes
thailandica	798	2-3m	10-15 x 6-12cm	alternale	finely toothed	long hairs	axillary branched racemes(spikes?)	lower fws male, upper female
zollingeriana	799	1.5-3m	8-18 x 6-12cm	alternate or opposite with unequal-sized leaves	finely toothed	almost smooth above, often hairy below	males in axillary fascicles, female in terminal panicles	lower fws male, upper female
nirsa var. tenabossima		1-3m	9-20 x 5-15cm	alternale	coarsely toothed	scattered sharp hairs above, dense soft white hairs below	axillary paired panicles	

Sno = species number, **bold** if in main text, normal font if only in key

TABLE 16: FICUS (Moraceae)

SPECIES	Sno	HABIT	LEAF					FIG		
			Size	Shape	Margin	Stalk	Texture	Arrange	Stalk	Size
<i>altissima</i>	765	very large strangler with few or no aerial roots	7.5-17.5 x4-8cm	blunt both ends	no teeth	2.5-3.7 cm	smooth except young shoots	axillary, in pairs	sessile	1.8-2.5cm
<i>annulata</i>	767	usually strangling but rarely killing host	15-35x 6-12cm	tapering both ends		1.8-3.7 cm	smooth except young shoots	axillary, in pairs	0.6-1.8 cm	2.5-3.8cm
<i>auriculata</i>	768	small, spreading tree	up to 30x30cm	broad ovate, base usually heart-shaped	± scattered blunt teeth	3-20cm	scattered hairs below	short racemes on trunk/main branches	?	5-8.5cm
<i>benghalensis</i>	766	strangler to 23m with many aerial roots	12.5-20 cm	ovate, blunt both ends, base ± heart-shaped	no teeth	2.5-5 cm	minute soft hairs below	axillary, in pairs	sessile	1.2-1.8cm
<i>benjamina</i> var. <i>benjamina</i>	769	strangler to 20m with many aerial roots	5-11x1.5-8cm	narrow elliptic, narrow tip, blunt base	no teeth	0.6-1.8 cm	smooth	axillary, solitary or in pairs	sessile	0.8-1.2cm, orange-red
<i>callosa</i>	770	Independent tree to 20m (but fruiting when a shrub)	14-27x 5.5-15cm	broad/narrow elliptic, blunt both ends	no teeth	3-7.5 cm	smooth	axillary or behind lvs, solitary/paired	0.2-3 cm	1.8-2.5cm,
<i>capillipes</i>	771	?	9-12x3.5-5cm	narrow obovate, shortly caudate tip		1.5-2 cm	smooth	axillary, solitary	Sub-sessile	0.7-0.8cm
<i>curtipes</i>	772	scrambling	10-17.5x 5.5-7cm	narrow obovate, rounded tip		1.2cm	?	axillary, in pairs	sessile	0.7cm
<i>elastica</i>	764	large strangler to 20m with many aerial roots	7.5-20x 3.6-7.5cm	narrow elliptic, blunt or slightly tapered tip	no teeth	2.5-7.5 cm	smooth	axillary, usually in pairs	sessile	1.25-2.5cm
<i>fistulosa</i> var. <i>fistulosa</i>	773	small tree, rarely to 15m	7.5-30x 2.5-15cm	elliptic/obovate slightly taper tip, base +oblique	± with scatter teeth	1.2-6 cm	smooth	trunk/main branches on woody stumps	2.5-5 cm	2.5cm, ±with white dots
<i>geniculata</i>	775	deciduous strangler to 20m	10-17x5-10cm	narrow ovate/elliptic, abrupt tipped, base slightly cordate	no teeth	2.5-10 cm	smooth, glossy above	axillary, in pairs	sessile	0.6-0.8cm, often with white dots
<i>glaberrima</i>	776	large strangler, fruiting while still a shrub	12.5-17.5cm	oblong/lanceolate	slightly pointed tip	1.3-3.5 cm	smooth	axillary or behind leaves, in pairs	0.6-1 cm	0.6cm, orange
<i>heterophylla</i> b	777	small tree to 6m, often scandent	5-12.5x 4cm	broad elliptic, often lobed; pointed tip, round or cordate base		0.25-1.25cm	rough hairs	axillary, always solitary	0.4-2.5cm	1.5cm, orange with white spots
<i>hirta</i>	778	small evergreen tree to 9m	15-22.5 cm	narrow obovate, often lobed; pointed tip, round or cordate base		1.2-2 cm	long rough hairs	axillary or behind leaves, in pairs	sessile	1-3cm, orange
<i>hispida</i> var.	779	small evergreen tree to	15-35x	narrow ovate / oblong	no teeth or	1.2-	rough hairs	axillary or on trunk,	0.4-	2.5-3.5cm,

<i>hispidula</i>		12m	4-16cm	/obovate	finely toothed	3.6cm	± on long stems along the ground	1.8cm	yellow with grey hairs
<i>lactor</i>	780	large tree, sometimes epiphytic but with few aerial roots	7-20x4-8 cm, ovate or elliptic	apex narrowly pointed, base rounded or slightly cordate	no teeth	2-5cm smooth	axillary or behind leaves, clusters of 1-4 figs	sessile	0.7-1.7cm, whitish
<i>microcarpa</i> var. <i>microcarpa</i>	781	large strangler to 25m with many aerial roots	4-7x 2-4.5cm	narrowed at both ends, base often asymmetric	no teeth	0.5-1.2cm smooth	axillary, usually in pairs, sometimes solitary	sessile	0.5-0.6cm, dull pink or dark purple
<i>nervosa</i> var. <i>nervosa</i>	782	evergreen tree to 20m	7.5-20x3.5-5.5cm	narrow elliptic/ obovate, abrupt tip, blunt or tapering base		1.2-3.6cm smooth, glossy above, ± scatter short hairs below	axillary, usually in pairs, sometimes solitary	0.6-1.0cm	±1cm, abruptly narrow base
<i>pisocarpa</i>	783	epiphyte to 18m	7-13.5x 4.5-6cm	broad ovate/elliptic, abrupt tip, blunt or slightly tapering base		1.25-3cm smooth	axillary, usually in pairs, sometimes solitary	sessile	0.5-0.6cm, with thick ring at tip
<i>racemosa</i> var. <i>racemosa</i>	784	tree to 24m with widely spreading crown	6-15x1.8-7.5cm	elliptic, blunt tip, tapering base		1.2-6.2 cm glaucous below	trunk/main branches in big clusters on woody twigs	0.25-1.2cm	3-5cm, rose-red, often streaked
<i>religiosa</i>	785	deciduous strangler with few aerial roots, large limbs & dense spreading crown	12-18x 7.5-10cm	broad ovate or almost triangular	very long narrow tip, cordate base	5-12.5cm smooth, glossy	axillary or behind leaves, in pairs	sessile	1.2-1.5cm, blackish when ripe
<i>rumphii</i>	786	deciduous strangler to 20m, large spreading limbs & dense crown	7-18x 5-10cm	broad ovate or almost triangular	quite long narrow tip, blunt base	3.5-9 cm smooth, not shiny, with minute white dots above	axillary or behind leaves, in pairs	sessile	12cm, white turning black
<i>semicordata</i> var. <i>semicordata</i>	787	small evergreen independent tree to 12m		narrow elliptic or lanceolate, strongly asymmetric base		0.5-1.5cm slightly rough above, both rough & soft hairs below	trunk on long drooping stems, often running along the ground	0.2-1 cm	1.2-1.8cm, pale pink or brown
<i>superba</i>	788	large deciduous independent tree	7.5-25x 3.7-12cm	broad elliptic, ± pointed tip, base blunt or slightly tapering, ± heart-shaped		3.7-15 cm, dry yellow smooth	in bunches on small woody knobs on twigs & behind lvs	0.6-1.75cm	1.2-1.8cm
<i>variegata</i> var. <i>variegata</i>	789	deciduous independent tree to 33m, dense crown	9-25(33) x4.5-12.5 (15)cm	broad/narrow ovate, apex pointed, base rounded or slightly heart-shaped		2.5-18 cm smooth or very finely downy below	dense clusters on trunk & main branches	2.5-6.5cm	1.0-3.8cm, rose-red, ± streaked
<i>virens</i>	790	strangler	11-12.5x5.5-8.5cm	broad obovate, pointed tip, rounded/ slightly tapering base		5.5-7.5 cm ?	behind leaves, in pairs	sessile or stalked	0.8-1cm, ± orange or purple flush

Sno = species number, **bold** if in main text, normal font if only in key

<i>Texture</i>	<i>Arrange</i>	FRUIT Cup	Nut
<i>smooth above, minutely hairy below</i>	<i>stout spikes to 8cm indiv fls sessile, fused in 1-3s</i>	<i>±2.2cm, covering ½ of nuts, with irregular rings of scales, not overlap</i>	<i>±2.5cm, hemisph- erical; scar flat or slightly convex, ±2cm</i>
<i>smooth & shiny above, dense</i>	<i>fused in very short clusters</i>	<i>1.7-2.8 cm, covering ± all of nuts, with rather scattered</i>	<i>single ovoid nut, 1-1.3 cm</i>
			<i>small point at top & large convex scar (⅓ nut) hairy except on scar</i>
			<i>1.5-2.5 cm, globose- ovoid or quite flat, often slightly sunken at top; concave, 1.4-1.8cm</i>
			<i>1.4-1.9 cm, globose or slightly flattened; scar 5mm flat</i>
			<i>0.8-1.3 cm, globose to slightly oblong with short point; scar concave, slightly < nut</i>
			<i>(0.8) 1.5-2.5 cm, narrow ovoid or oblong with pointed tip, indistinctly angled; scar ±5 mm</i>
<i>minutely hairy, dense below.</i>	<i>on stout woody spikes, 7-17 cm</i>	<i>covering ¾ of nut, many stout curved scales, rigid, not sharp.</i>	<i>globose or flat-ovoid, lower half rough, very thick, fused to cups</i>
<i>thinly leathery, smooth or sparsely hairy, sometimes glaucous below.</i>	<i>fused in clusters of 2-3 on short common stalk.</i>	<i>0.8-1.2 cm, narrower than stout central stalks, cup-shaped, covering ⅓ of nut, dense overlapping scales</i>	<i>0.8-1.7 cm, globose or blunt ovoid smooth & shiny. Scar 7mm, ± flat</i>
<i>dark green & glossy above, minute dus- ky lines below.</i>	<i>dense spikes to 30cm, individual stalks, 0.6-1cm</i>	<i>to 0.7x1.6 cm, covering ¼-½ of nut, saucer-shaped with many indistinct rings of triangular scales</i>	<i>1.5-2.7 cm, ovoid or globose with short point at top; scar small, concave</i>

young shoots densely red-brown hairy, mature leaves + smooth	fts subsessile, fused in groups of 1-3 along spikes to 20 cm	woody, funnel-shaped with flat top, covering $\pm$ all of nut. Scales free near top, fused into uneven rings near base	1.1-1.8(2.5) cm, obovoid with flat top; large scar $\frac{3}{4}$ hgt. of nut.
glossy above, pale & smooth or sparsely hairy on veins only below	spikes amongst leaves, individual fts without stalks	0.5-0.6x1.2-1.3 cm, completely covering nuts when young, finally opening slightly to expose top of nut	1.4-1.8 cm, narrowly ovoid, pointed tip, flat at base with flat scar $\pm$ 6mm
leathery, completely smooth	spikes to 5 cm with only 1-2 fts	1.4-1.8 cm diam, scales quite distinct when young, closely pressed & indistinct when ripe	1.8-2 cm, ovoid, smooth
young lvs pinkish with brown-hairs, mature lvs smooth on both sides		0.8-2.2x0.8-1.5 cm, cup or saucer-shaped, covering $>\frac{1}{2}$ of nut, with 7-9 finely toothed rings, soft brown hairy outside	1.2-1.6 cm, oblong with short tip, not falling out of cups. Scar $\pm$ 1.2cm
young leaves densely soft brown hairy, mature lvs smooth	singly or in pairs amongst leaves	1-2x1.3-2.5 cm, deeply cup-shaped, $\frac{1}{2}$ covering nuts, softly hairy both sides, many layers of small overlapp scales not in rings	globose or flattened, sunken with nipple at top; scar covering basal $\frac{1}{3}$ of nut, convex
young lvs densely covered with rusty hairs, mature leaves hairy below	solitary or in pairs, no individual stalks.	1.7-2.3x1.4-1.8 cm, hemi-spherical or cup-shaped, woolly, covering $\frac{1}{3}$ - $\frac{1}{2}$ of nut	1.2-1.7x1.1-1.6 cm, subglobose or ovoid with short tip; scar $\pm$ 3mm, slight convex
smooth above, dense minute creamy hairs below		1.2-1.8 cm, deeply cup-shaped, covering $\frac{1}{2}$ of nut, with appressed scales, 1-2mm, in 5-8 faint rings	$\pm$ 1.2cm, oval with short nipple at top: large flat or convex scar 1.1-1.4 cm
smooth both sides or slightly scurfy-hairy below		3-3.5 cm, bowl or saucer shaped, covering $\frac{1}{4}$ or less of nut, with scales fused into 6-8 thin irregular rings	2-3 cm, ovate or flattened-globose, with blunt tip; large 2-ringed scar at base, 1-1.6 cm
young lvs pink & densely brown-velvety, mature lvs $\pm$ smooth	clustered amongst leaves	1.3-3cm, hemi-spherical or cup-shaped with tapering base, covering $\frac{1}{2}$ of nut, 6-10 irregularly toothed rings	1.3-1.6cm, hemispherical, deeply sunken into cup
young shoots dense soft hairs, mature lvs smooth, or slightly hairy	spikes very short & thick with only 1-3 fts	2-3.5cm, covering $\frac{1}{4}$ - $\frac{1}{3}$ of nut, scales fused into 5-8 concentric rings	1.7-4 cm, oblong-ovoid with short stout tip, falling out of cup when ripe, scar $\pm$ 1.1 cm
finy brown hairs at base of midveins above, whitish & dense hairs below	spikes 9-10 cm, indiv. fts without stalks, fused in clusters of 3	1.3-1.8x0.3-0.4 cm, saucer-shaped, covering $<\frac{1}{6}$ of nut, scales fused in 4-6 irregularly toothed rings	1.4-1.5 cm, globose or flattened with short point; scar concave, 0.7-1.2 cm

TABLE 17: LITHOCARPUS & QUERCUS (Fagaceae)

SPECIES	Sno	HABIT	BARK	Size / Shape	LEAF Teeth
<i>aggregatus</i>	821	to 20m		9- 24x3.5-9cm, pointed both ends	untoothed
<i>craibianus</i>	822	evg to 10m	red-brown, deeply fissured	12-16.5x3.5-5cm, long tapering tips	untoothed
<i>dealbatus</i>	811	evg to 20m	grey, cracked in small pieces	8-20x2-6cm, elliptic or lanceolate, tapering or pointed both ends	untoothed
<i>elegans</i>	823	evg to 25m	grey-brown, cracked in small pieces	7-30x3-12 cm, very variable shape, often slightly curved,	untoothed
<i>fenestratus</i>	824	evg to 20m	medium grey / dark brown, fairly smooth	12-22x3-8 cm, narrow with tapering tip & pointed base	untoothed
<i>garrettianus</i>	825			8-18(28)x2.5-8(12)cm, tapering both ends	untoothed
<i>lindleyanus</i>	826	evg to 10m	grey to pale brown, smooth or fissured	15-25(30)x6-15 cm, abrupt / blunt tip & narrowed to flat or heart-shaped base	untoothed or with shallow wavy teeth towards tip
<i>echinops</i>	828	large evg	dark brown, cracked	15-22 cm, narrowly elliptic	untoothed
<i>polystachyus</i>	827	to 15m,	greyish, quite smooth	10-20x5-8cm.	untoothed
<i>sootepensis</i>	829	medium evg	pale grey, smooth	9-18x4-8 cm, tapering or abrupt tip & blunt or slightly pointed base	untoothed

<i>truncatus</i>	830	to 17m	grey, nearly smooth or thinly cracked	12-22x2-8 cm, tapering tip & narrowed base	untoothed
<i>allena</i>	832	evg to 20m	dark grey, rough, wide vertical fissures	10-23x5-10 cm, clustered near end of twigs, tapering or pointed both ends	toothed except near base
<i>eumorpha</i>	834	small evg to 10m		7.5-10 cm, slightly tapering at both ends/ pointed base	slightly toothed near tip only
<i>kerri</i> var. <i>kerri</i>	835	dec, 6-15m	dark brown or grey, deeply cracked	8-24x3-8-10 cm, often in whorled, abruptly tapering tip, pointed or blunt base	quite sharply toothed in upper half
<i>kingiana</i>	836	dec to 15m	dark grey or blackish, deep cracks	(6)10-16x(2)4-6 cm, pointed or blunt at both ends	coarsely toothed in upper half
<i>lanata</i>	837 a	large evg		10-24x4-9 cm, void to lanceolate, pointed top & slightly pointed base	shallowly but often quite sharply toothed
<i>lenticellata</i>	837 b			6-13x2-4.5 cm elliptic, slightly pointed or blunt at both ends	toothed in upper $\frac{2}{3}$ or almost untoothed
<i>lineata</i>	838	evg, 10-20m	fairly smooth	8-25x3-8 cm, abruptly pointed top & broadly pointed base	toothed in upper $\frac{1}{3}$ - $\frac{1}{2}$ or only near tip
<i>mespilifolides</i>	839	briefly dec, to 20m		10-20x5-7 cm, broadly tapering or pointed tip & blunt base	coarsely toothed in upper $\frac{3}{4}$ with short teeth
<i>semiserrata</i>	840	dec or evg 13-17 (30)m	brown or dark grey, $\pm$ shallow fissures	8-23x3-8 cm, tapering or pointed tip & blunt or slight pointed base	toothed in upper half
<i>vestita</i>	841	large evg or dec		13-17x3-7 cm, tapering tip & pointed or blunt base	untoothed or with small black spines in upper $\frac{1}{2}$

TABLE18: CASTANOPSIS (Fagaceae)

Sno = species number, **bold** if in main text, normal font if only in key

SPECIES	Sno	HABIT BARK		Size / Shape	LEAF Teeth	Texture	FRUIT		
							Arrange	Cup	Nut
<i>acuminatissim</i> a	814	evg to 25m	dark brown deep fissured	5-15x2.5-5.5 cm, lanceolate with tapering tip & blunt or rounded or blunt base	untoothed or slightly toothed near top only	dark green & glossy above, silvery below, smooth or with minute scales		1-1.5 cm, with 4-5 widely spaced rows of short spines, 1.5-3 mm, not completely covering surface	0.8-1.2 cm, ovoid, smooth or slightly hairy. Scar $\leq$ 1/3 of nut
<i>argyrophylla</i>	815	semi- evg, 6-17m	grey-brown to dark brown, fairly smooth or + fissured	11-20x4.5-8 cm, ovate or elliptic- oblong, narrowed at both ends	not toothed	smooth or with minute dust-like hairs	in upright spikes	2-3.5 cm, with sharp (stout) simple spines 3-13 mm, close or widely spaced, drying black with pale tips	1.5-2.3cm, sub- globose, smooth except for scattered hairs near top. Scar $\frac{1}{4}$ height of nut
<i>armata</i>	816	evg, 15- 30m		8-22x3.5-8 cm, narrowly elliptic or lanceolate with tapering tip & blunt or slightly pointed base	not toothed	young shoots sparsely hairy, mature leaves completely smooth	short stout spikes, individual fls solitary or paired but not fused	(2)2.5-5 cm, sharp spines 3- 12 mm, in stalked star- shaped clusters arranged in concentric ridges, often dense but not completely covering surface	1-2.5 cm, solitary, ovoid or slightly flattened, partly fused to cupule, finely hairy with rounded scar.
<i>calathiformis</i>	817	evg to 20m	dark brown, deeply cracked	10-24x3-9 cm, elliptic- oblong, blunt or narrowed at both ends	widely spaced teeth except near base	$\pm$ hairy on midvein above, silvery with orange-brown hairs or +smooth below	spikes 9-15 cm, indiv fls without stalks but narrow- ed at base	1.8-3.2cm, covering $\frac{1}{2}$ - $\frac{3}{4}$ of nut, spines short & scale- like, in 4-6 concentric rings	1.2-2cm, dark brown & glossy, scar convex or slightly concave, 4-6mm
<i>diversifolia</i>	818	dec to 20m	moderately cracked	8-24x4-12 cm, ovate, oval or oblong, vari- able in size & shape even on same twig	not toothed or scattered teeth near top	smooth above, usually sparsely hairy at least on veins below	Indiv fls without stalks	3.5-5 cm, completely covered with sharp spines, 8-20 mm, radiating in dense clusters of 5-8	1.5-2 cm, softly hairy, slightly flattened with large scar 1/3-1/2 of nut
<i>indica</i>	819	evg 8-20m	brown or silvery-grey, + deeply cracked	10-25x3.5-9 cm, elliptic or oblong with pointed tip & blunt or slightly pointed base	distinctly & quite sharply toothed except near base	dark green & shiny above, silvery with minute creamy- orange "dust" below	densely clustered	2.5-4 cm, completely covered by long slender straight sharp spines of differing lengths, 8-12 mm	0.6-1.3 cm, ovoid, slightly hairy esp. near top. usually solitary
<i>tribuloides</i>	820	evg to 30m.	tan-brown to dark grey- brown, rather thin, fissured	8-15x3-5 cm, narrowly ovate to lanceolate with tapering tip & blunt or slightly pointed base	untoothed or with shallow teeth near tip only	dark green & shiny above, grey-green with creamy-brown "dust" below	spikes to 25cm, individual fls solitary or in pairs but not fused,	1.3-2.5cm, with sharp spines, 3-7 mm, usually on short ridges in $\pm$ 4 indistinct rows, often branched or in star-shaped clusters	0.7-1.2 cm, smooth, subglobose or ovoid with convex scar, 0.8-1.2 cm

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ตัวอย่างแสดงอยู่ในตอนที่ 2 bold type refers to the shorthand code used in part 2

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grewiaefolia	69	<i>sureni</i>	236	baccifera	218
<i>kerrii</i>	69	Ceiba		<i>fruticosa</i>	218
<i>oblonga</i>	69	pentandra	117	Clausena	
<i>odorata</i>	71	<i>robustus</i>	250	excavata	196
<i>pallida</i>	71	Celtis		<i>javanensis</i>	196
<i>yunnanensis</i>	70	<i>cinnamomea</i>	750	<i>lunulata</i>	196
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agnes	351	<i>napalensis</i>	749	<i>javanicum</i>	709
<i>alata</i>	348	<i>orientalis</i>	748	spiciflorum	709
bakeriana	349	<i>serotina</i>	749	<i>Cleistanthus</i>	690
fistula	341	tetrandra	749	<i>eburneus</i>	690
<i>floribunda</i>	347	<i>timorensis</i>	750	<i>hirsutulus</i>	690
garrettiana	342	Cephalotaxus		<i>tomentosus</i>	690
<i>glauca</i> var. <i>fruticosa</i>	345	griffithii	865	Cleistocalyx	
<i>glauca</i> var. <i>glauca</i>	346	<i>mannii</i>	865	nervosum	432
grandis	350	<i>oliveri</i>	865	<i>operculatus</i>	432
javanica	352	Ceriscoides	497	<i>Clerodendrum</i>	629
<i>javanica</i> var. <i>agnes</i>	351	sessilifolia	507	<i>colebrookianum</i>	629
<i>javanica</i> var. <i>indochinensis</i>	351			<i>disparifolium</i>	629
<i>nodosa</i>	352			<i>fragrans</i>	629
<i>pachycarpa</i>	350			<i>garrettianum</i>	629
<i>pectabilis</i>	347			<i>glandulosum</i>	629
				<i>infortunatum</i>	629

<i>paniculatum</i>	629	<i>polyanthum</i>	48	Dacrycarpus	
<i>villosum</i>	629	<i>pruniflorum</i>	47	imbricatus	867
<i>Cleyera</i>		<i>subglaucum</i>	49	Dacrydium	
<i>gymnanthera</i>	81	sumatranum	50	elatum	869
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<i>winitii</i>	149	kerrii	713	<i>discolor</i>	364
<i>Columbia</i>		kongensis	718	<i>dongnaiensis</i>	366
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<i>auriculata</i>	151	<i>pierrei</i>	717	<i>floribunda</i>	365
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<i>ligustrinum</i>	48	<i>lineata</i>	838	<i>armata</i>	313b
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<i>neriifolium</i>	50	<i>semiserrata</i>	840	<i>muricata</i>	263b

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<i>elata</i>	2	<i>alatus</i>	98	<i>sign</i>	172
<i>hookeri</i>	1	<i>artocarpifolius</i>	96	<i>tomentosus</i>	171
<i>indica</i>	6	<i>cordatus</i>	100	Ehretia	
<i>kerrii</i>	2	costatus	96	<i>acuminata</i>	609
<i>meliosmifolia</i>	5	<i>grandifolius</i>	100	<i>laevis</i>	610
<i>ornata</i>	4	<i>incanus</i>	98	<i>ovalifolia</i>	609
<i>ovata</i>	5	<i>laevis</i>	97	<i>polyantha</i>	609
<i>parviflora</i>	2	<i>macrocarpus</i>	101	<i>serrata</i>	609
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<i>harmandii</i>	558	<i>laoticum</i>	210	<i>siamensis</i>	173
<i>helferi</i>	552	<i>mangiferum</i>	310	sphaericus	176
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<i>peregrina</i>	555	<i>sonneratioides</i>	452	<i>Engelhardia</i> see Engelhardtia	
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<i>putii</i>	558	andamanicum	225	<i>colebrookiana</i>	805
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<i>permicophylla</i>	806	<i>montana</i>	413	<i>oblonga</i>	605
<i>serrata</i>	806	<i>operculata</i>	432a	<i>obovata</i>	605
<i>spicata</i>	805	<i>paniala</i>	432b	Falconeria	
<i>Epicycas</i>		<i>polyantha</i>	417	<i>insigne</i>	744
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Eriobotrya		<i>resinosa</i>	417	<i>adenophylla</i>	616
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Eriolaena		<i>zeylanica</i>	408	<i>annulata</i>	767
<i>candollei</i>	144	<i>zimmermannii</i>	429	<i>auriculata</i>	768
Erythrina		<i>gracilis</i>	190	<i>avium</i>	780
<i>lithosperma</i>	358	Euodia		<i>banyana</i>	766
<i>microcarpa</i>	357	<i>glomerata</i>	192	<i>benghalensis</i>	766
<i>monosperma</i>	355	<i>meliaefolia</i>	189	<i>benjamina</i>	769
<i>stipitata</i>	357	<i>triphylla</i>	190	<i>blinii</i>	782
<i>stricta</i>	357	<i>viticina</i>	191	<i>callosa</i>	770
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<i>suberosa</i>	359	<i>mitratus</i>	254	<i>cordatifolia</i>	770
<i>sublobata</i>	359	<i>sclerocarpus</i>	255	<i>cuneato-nervosa</i>	782
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<i>bracteata</i>	407	<i>fragifera</i>	270	<i>fistulosa</i>	773
<i>cerasiformis</i>	410	<i>longan</i>	270	<i>flavescens</i>	767
<i>cinerea</i>	431	<i>longana</i>	270	<i>fulva</i>	774
<i>claviflora</i>	430	<i>noronhiana</i>	264	<i>geniculata</i>	775
<i>cochinchinensis</i>	420	<i>obtusa</i>	270	<i>geniculata</i> var. <i>abnormalis</i>	
<i>collinsae</i>	409	<i>pallens</i>	270		788
<i>cumini</i>	426	Eurya		<i>glaberrima</i>	776
<i>diospyrifolia</i>	424	<i>acuminata</i>	87	<i>glomerata</i>	784
<i>expansa</i>	410	<i>monticola</i>	87	<i>grandidens</i>	773
<i>formosa</i>	422	<i>nitida</i>	88	<i>hapalophylla</i>	787
<i>fruticosa</i>	427	Eurycoma		<i>harlandii</i>	773
<i>glauca</i>	414	<i>longifolia</i>	204	<i>heterophylla</i>	777b
<i>globiflora</i>	415	<i>merguensis</i>	204	<i>heteropleura</i>	777a
<i>grandis</i>	413	<i>Excoecaria</i>		<i>hirta</i>	778
<i>grata</i>	409	<i>baccata</i>	742	<i>hispidula</i>	779
<i>helferi</i>	411	<i>Fagara</i>		<i>indica</i>	766
<i>jambolana</i>	426	<i>nitida</i>	199	<i>indica</i>	781
<i>jambos</i>	425	<i>rhetsa</i>	197	<i>infectoria</i>	790
<i>laosensis</i>	413	<i>Fagerlindia</i>	498	<i>insignis</i>	780
<i>leptalea</i>	430	<i>plumbea</i>	498	<i>laccifera</i>	765
<i>leptantha</i>	430	Fagraea		<i>laccor</i>	780
<i>macrocarpum</i>	421	<i>ceilanica</i>	605	<i>laevigata</i>	789

<i>littoralis</i>	781	<i>jangomas</i>	67	<i>leiostylum</i>	722
<i>longspathulata</i>	770	<i>latifolia</i>	66	<i>penangense</i>	722
<i>macrocarpa</i>	768	<i>lenis</i>	66	rubrum	722
<i>macrophylla</i>	768	<i>ramontchi</i>	66	sphaerogynum	724
microcarpa	781	rukam	68	<i>velutinum</i>	723
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<i>mollis</i>	779	<i>thorelii</i>	66	obovata	300
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<i>poilanei</i>	779	<i>kydia</i>	56	<i>subsessilis</i>	181
<i>polysyce</i>	789	<i>lanceolata</i>	55	<i>winitii</i>	181
<i>quangtrienensis</i>	778	<i>lobulosa</i>	56	Glyptopetalum	
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<i>roxburghii</i>	768	<i>tinctoria</i>	54	tetrandra	242
<i>roxburghii</i>	778	<i>umbellifera</i>	56	Goniothalamus	
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<i>semicostata</i>	784	sootepensis	505	<i>siamense</i>	240
<i>suberosa</i>	776	<i>spinosa</i>	496	<i>subrostratum</i>	240
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<i>subracemosa</i>	789	Garuga		dalglieshiana	79
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<i>valida</i>	767	<i>multiflorum</i>	741	abutifolia	157
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<i>kerrii</i>	131	<i>cyrtostylum</i>	722	hirsuta	160
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Cycadaceae	377	462	431
Datisceae	209	424	Myrtaceae
Dilleniaceae	31	381	193
Dipterocarpaceae	64	389	Nyssaceae
Dracaenaceae	366	460	215
Ebenaceae	245	432	426
Elaeocarpaceae	94	397	Ochnaceae
Ericaceae	233	430	110
Euphorbiaceae	297	445	123
Fabaceae	155	412	404
Fagaceae	350	457	Oleaceae
Flacourtiaceae	53	386	254
Gentianaceae	261	437	435
Guttiferae	49	385	Palmae
Hippocastanaceae	139	409	367
Hypericaceae	48	385	460
Icacinaeae	124	405	Pandanaceae
Irvingiaceae	109	401	366
Juglandaceae	347	456	Papilionaceae
Labiatae	274	440	175
Lauraceae	285	442	Pinaceae
			376
			462
			Pittosporaceae
			46
			384
			Podocarpaceae
			375
			462
			Polygalaceae
			47
			384
			Proteaceae
			295
			444
			Rhamnaceae
			130
			406
			Rhizophoraceae
			186
			419
			Rosaceae
			183
			418
			Rubiaceae
			217
			427
			Rutaceae
			99
			398
			Sabiaceae
			141
			409
			Salicaceae
			365
			460
			Sapindaceae
			131
			406
			Sapotaceae
			242
			432
			Sarcospermataceae
			242
			432
			Saurauaceae
			63
			389
			Scrophulariaceae
			264
			438
			Simaroubaceae
			106
			400
			Solanaceae
			263
			438
			Sonneratiaceae
			208
			425
			Staphyleaceae
			140
			409
			Sterculiaceae
			77
			392
			Strychnaceae
			262
			437
			Styracaceae
			253
			435
			Symplocaceae
			250
			434
			Tetrameliaceae
			209
			425
			Theaceae
			56
			387
			Thymelaeaceae
			296
			444
			Tiliaceae
			87
			395
			Ulmaceae
			323
			450
			Urticaceae
			345
			455
			Vacciniaceae
			233
			430
			Verbenaceae
			274
			440

Field Guide to Forest Trees of Northern Thailand

- ♦ 430 species in detail, plus notes for a further 450 species
- ♦ covering over 75% of the total native tree flora
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- ♦ local names & uses
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- ♦ synonyms & cross-references in regional floras

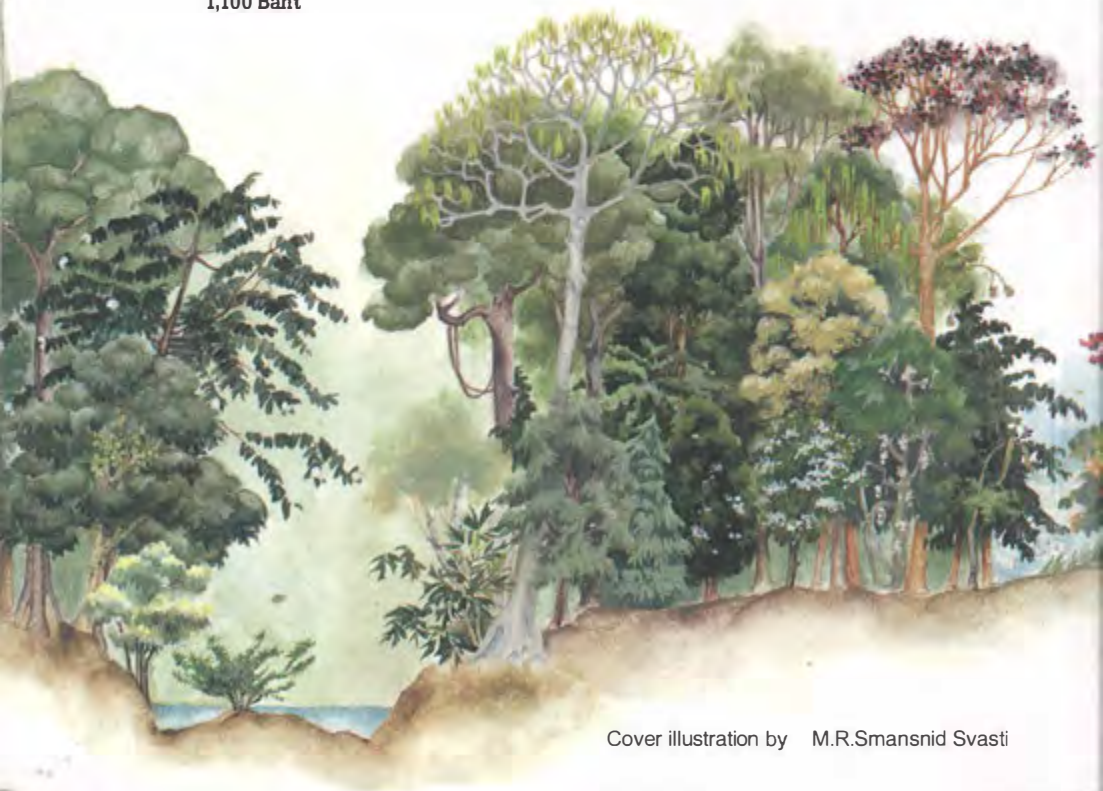
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