

# **A Field Guide to the Common Trees and Shrubs of Sri Lanka**

**Mark S. Ashton, Savitri Gunatilleke, Neela de Zoysa,  
M.D. Dassanayake, Nimal Gunatilleke and Siril Wijesundera**

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*To all our teachers  
for inspiring us  
to appreciate and enjoy nature*

A Field Guide to the Common Trees and Shrubs of Sri Lanka  
(including an introduction to the flora, plant uses, and index).

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## Preface

The stimulus for *The Field Guide to the common trees and shrubs of Sri Lanka* was the success of a similar guide for Puerto Rico compiled by one of us (MA). Begun as a modest effort in 1985, it was boosted in 1988 with grants from the WWF-US and from the Environmental Program of the MacArthur Foundation. The collective inertia made this comprehensive end-product possible.

This Guide is organized into three parts. The first part is a general introduction that deals with the geography, climate, geology, soils, natural vegetation and the history of landuse on the island. This section intends placing the tree and shrub species described in context with the biological and cultural history of the island.

The second part is the main body of the *Guide* which includes 95 families and 704 species of trees and shrubs, each with its own illustration. It is preceded by a key to identification and with an explanation on how to refer to the descriptions. All of the technical terms used are listed in a glossary. The information is organized in a form accessible to the practical user as well as the more advanced botanical reader.

The third part of the book is a reference to plant uses. It includes sections on timber, medicinal, as well as food and other uses of the trees and shrubs described. This section gives an overview to the general reader of the extent of traditional and contemporary uses of plants in this country and provides more precise information to the forester.

It is hoped that this book will serve a long-felt need by making available information on the fascinating plant life of Sri Lanka to a wide range of people. It is a pioneer effort, and the authors would welcome suggestions and criticisms from those who use the book. We also hope that in the coming few years we can compile a sequel to this book on the less common and rare trees and shrubs of Sri Lanka.

## Acknowledgements

This work has been carried out over a period of eleven years somewhat intermittently by the authors in their spare time. It made it no less easy that they were scattered in several different places. We would like to thank the School of Forestry and Environmental Studies, Yale University for the use of computer printing facilities. We also thank Magdon Jayasuriya, Curator, National Herbarium, Peradeniya and D. B. Sumithraarachchi, Director of the Royal Botanic Gardens, Peradeniya for use of the herbarium and the helpful co-operation of the herbarium staff. We thank K. Vivekanandan, Chief Research Officer of the Forest Department, Sri Lanka, for use of the Department herbarium. We appreciate the important contributions made by Nishanta Rajakaruna by supervising and co-ordinating the guide during an important period and Jayantha Samarasinghe and Sunil Gamage by collating the plant-uses section. We also thank A. M. Gunapala for collection of plant specimens, and Milton Liyanage for the maps in the introduction.

We especially thank those who contributed the most to the illustrations: Malini Goonatilleke, L. S. B. Wadigamangawa, Chaminda Nagahapitiya, Sumedha Madawala, A.S.T.B. Wijetunga, Dharshini Goonatilleke and Jagath Kodituwakku. We also recognize the many others who helped with illustrations: Ruchindra Abeytunga, Maitri Jansz, Indula Silva, Shanta Jayaweera; and the numerous students of the Botany Department at Peradeniya: N. Ekanayake, C. de Silva, N. de Silva, K.D. Ratnayake, D. Welagedara (Botany Special Part III, 1989); Nilanthi Herath, Nilmini Kanthi, Champa Nalinie, Niranjala Perera, Hasantha Priyadharshani, Sunil Sarath Kumara, Asanga Uduwela, Malkanthi Wijepala (Botany Special Part I, 1990); Kamani Dambawinna, Deepthi Dissanayake, Priyani Kulatunga, Rohini Padmalatha, Renuka Premaratna, Mohamud Rizvi, Yojitha Seneviratne, Kushan Tennakoon, Dayani Tilakaratne, Thusitha Weerasekara (Botany Special Part II, 1990); Anoma Basnayake, D. Ekanayake, Anoma Perera, Udeni Pushpalatha, Geethani Rathnayake, Deepika Somaratne, Priyanka Weerasinghe, Hemanthi Wijeratne, Kapila Yakandawala (Botany Special Part III, 1990).

Our appreciation is also extended to Mr Rohan Pethiyagoda for the encouragement given to us during preparation of the manuscript, to Ruwan Herath and Miss Elita Atapattu for the long hours spent and their tireless efforts in typesetting the manuscript.



**Part I:**  
**Introduction to the Flora**

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## INTRODUCTION

Since ancient times Sri Lanka has been well known for its great natural beauty. A rich and diverse flora is one of the country's important assets. This small island of 65,500 square kilometres has over 3,500 flowering plant species native to it. Over a quarter of these species are considered unique to the country. Today Sri Lanka is considered one of the most biodiverse areas in South Asia. Recent scientific evidence indicates that many of the plant species in the southwest of the country have a Deccan-Gondwana and ancestry.

The island's natural flora has been enriched by the age-old Lankan tradition of cultivating spice, food, ornamental, and medicinal plants. Many of these were introduced from places as far off as China, the Mediterranean, Ethiopia, and Arabia, by travellers who visited the country during a period of at least two thousand years. The introduction of plantation crops such as tea and rubber during the 19th century has not only altered the landscape but the nation's economy as well.

This rich plant heritage is better appreciated if seen in the natural and historical context of the country. We therefore briefly describe factors such as geology, soils, climate and land form, and landuse trends that have influenced and shaped the plant life of Sri Lanka.

### Geography

Sri Lanka is situated close to the southeastern tip of India, north of the equator (Fig. 1). The two countries, although separated by the shallow Palk Strait, share the same continental plate and are linked by coral reefs and islets, popularly known as Adam's Bridge. Both the evolutionary history and the cultural traditions associated with the flora of this country have a strong Indian influence (see Box 1). The nearest land masses, other than India, are the Malayan region towards the east and the African continent to the west.

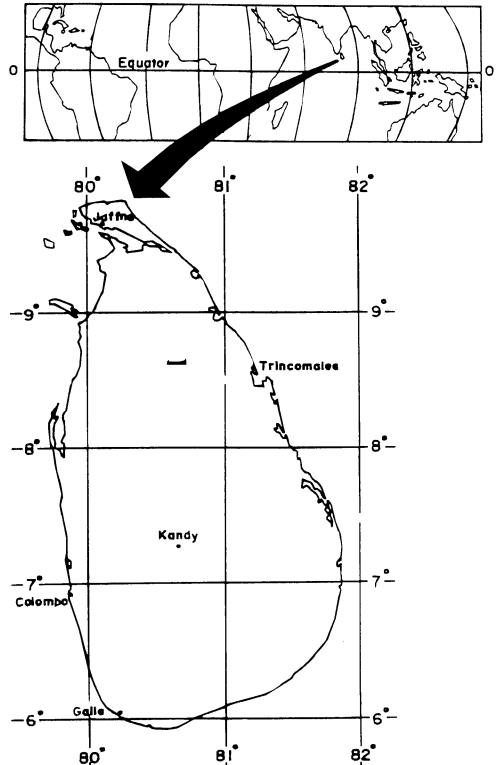
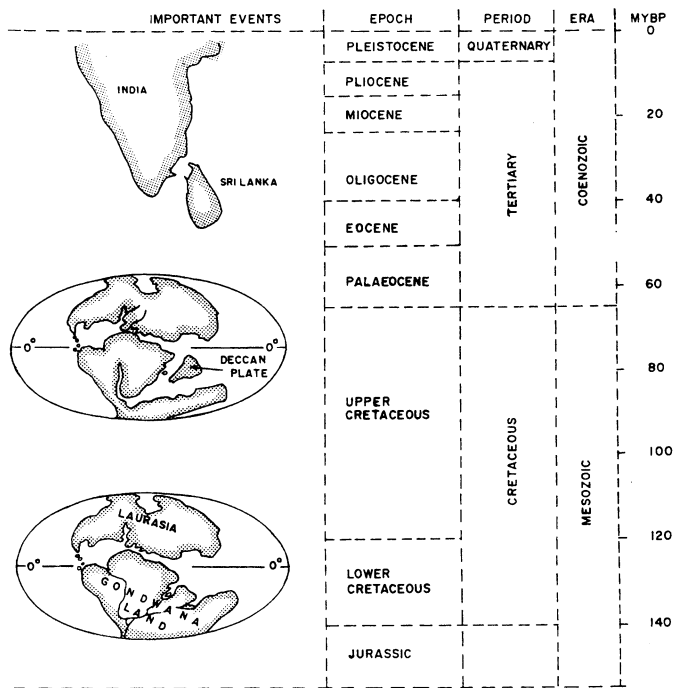


Figure 1. Geographical location of Sri Lanka with respect to the tropical and subtropical regions of the world.

**BOX 1.** The origin of Sri Lanka’s natural plant communities has become clearer with recent evidence on the geological past of the Asian region. It has been traced back a hundred million years to the early Cretaceous period when the ancient southern continent Gondwana began breaking up. The Deccan plate, a fragment consisting of India and Sri Lanka, drifted north and collided with mainland Asia nearly 55 million years later. After a lapse of another 20 million years, in the late Miocene, Sri Lanka was separated with the submersion of the land area between the two countries. The maps below show the geological past of Sri Lanka and the time scale indicating the different epochs, periods and eras with time of their initiation in millions of years before present (MYBP). Map stages show the Deccan plate, wedged between Africa and Australia, as part of Gondwana (I); as the Deccan plate separates from remaining Gondwana (II); and the isolation of Sri Lanka from India with rising sea levels (III).



**Land form**

The present landform of Sri Lanka is the result of millions of years of weathering by rain and wind, as well as movements of the earth’s crust. The topography of Sri Lanka is remarkably varied for its small area, with coastal plains, lowland hills and a mountainous interior (Fig. 2). This variation is reflected in the complexity of the island’s diversity of natural plant communities and crops.

The coastal plains hardly exceed 100 m in elevation. The lowlands cover nearly three quarters of the country and are extensive in the north and east. Towards the south-central part, the land rises gently to about 600 m in elevation with low, rounded hills and crests of hard rock. Two large basins, the Kelani and Uva, characterize this area.

The central mountain area consists of a complex of plateaux, mountain chains and basins, much of it reaching elevations greater than 1800 m. Along the southern margin of the highlands are numerous waterfalls which have led to the speculation that the mountains were formed by upliftment during relatively recent geological times. The central mountains are steeply dissected particularly on the south and south-western faces. The highest part takes the shape of an anchor, marked by Adams Peak, Kirigalpoththa, Pidurutalagala and Namunukula, all major peaks reaching between 2000 m and 2524 m. These are interspersed with the plateaux of Horton Plains, Ambawela and Nuwara Eliya. To the northeast and southwest of the central mountains are two small massifs, the Knuckles mountains and the Rakwana hills respectively (Fig. 2).

The drainage pattern of the country is almost entirely governed by the central highlands, with all the perennial water courses originating in the mountains and winding their way down to the plains below (Fig. 3).

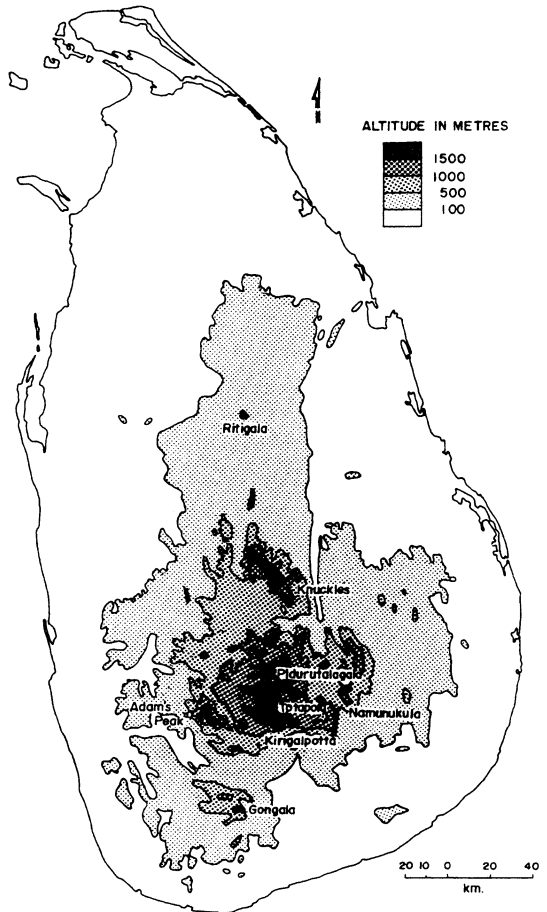


Figure 2. Altitudinal variation within the island and its highest peaks.

## Climate

Sri Lanka's equatorial position gives its lowlands a tropical climate, with year round temperatures of 27-28°C and a relatively constant day length. Rainfall is largely governed by monsoonal winds which occur during two seasons of the year. From mid-May to September, the monsoon blows from the southwest direction and brings in a greater amount of moisture than during December to February when the wind blows from the northeast.

The distinct inter-monsoonal periods receive convectonal rains and at times cyclones. During the southwest monsoon, the position and dramatic relief of the southwestern side of the central highlands forces the moisture-laden air upwards. The rapidly cooled air condenses, causing precipitation mostly on the windward slopes of the island's southwest. During this time the northeastern and southeastern parts of the land hardly receive any rain. On the other hand, the northeast monsoon winds rise over the central highlands more gradually, and the rain shadow effect is not nearly so distinct, allowing precipitation to fall on the entire island. This has resulted in the division of the country into two major climatic regions; the **wet zone** which receives rain from both monsoons, and the **dry zone** which receives rain from only one. The gradual change from the wet to dry zone allows an **intermediate zone** to exist. In addition, two small areas at the extreme northwest and southeast of the country have a very dry climate and are known as **arid zones** (Fig. 4).

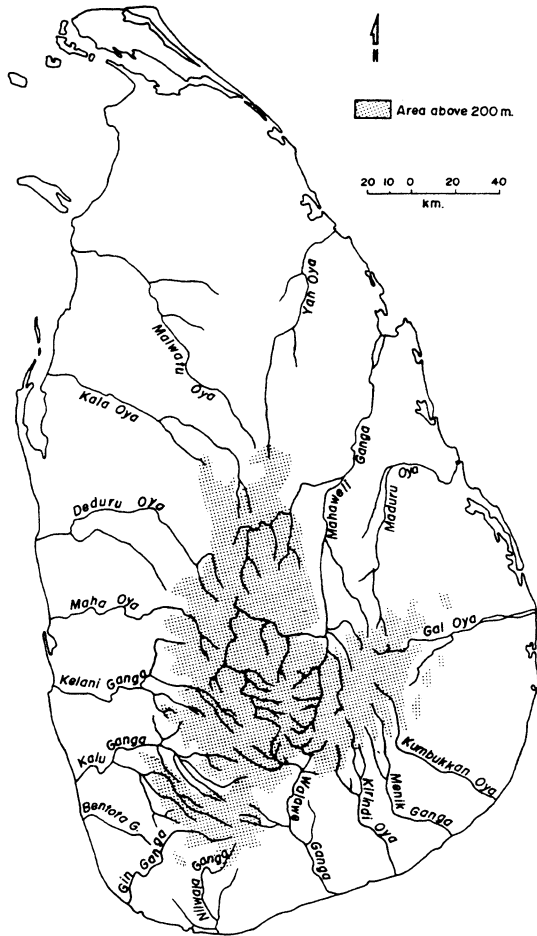


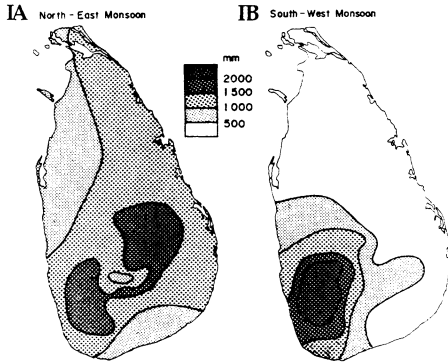
Figure 3. The main rivers showing their origin in the mountains and direction of flow to the sea.

Furthermore, owing to the small size of the island and its 'open' position in the Indian ocean, an oceanic climate dominates the coastal lowlands. This area

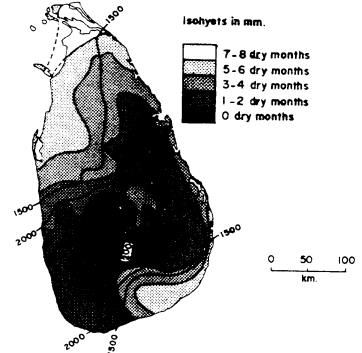
is strongly influenced by local convectional winds and their associated thunderstorms. These local sea winds sometimes influence the interior of the country, often interacting with monsoonal winds.

Besides rainfall, temperature plays an important role in highland regions. For every 100 m increase in elevation, the mean temperature falls by 0.5°C. On the plateaux there is often ground frost in the lower lying areas between December and March.

Rainfall by Season



II Wet and Dry Months



III

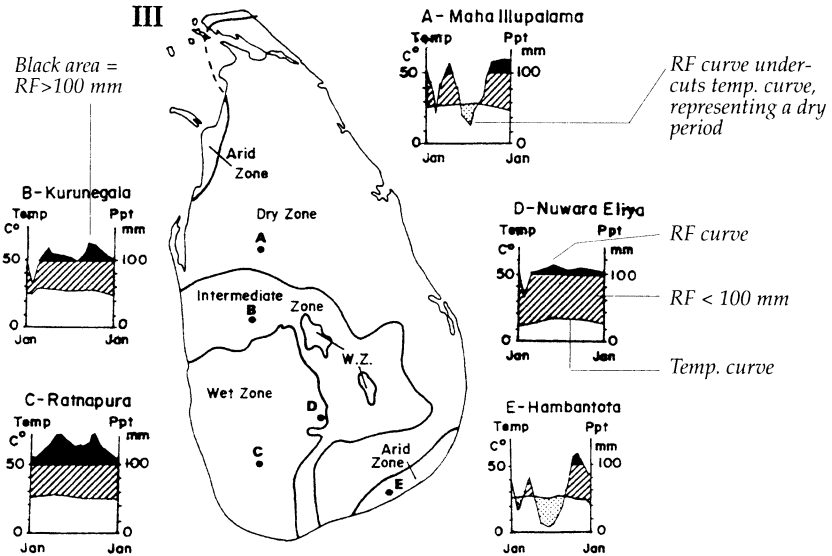


Figure 4. Rainfall (RF) distribution during the northeast (IA) and southwest (IB) monsoons; duration of dry period and rainfall distribution in millimetres (II); climatic zones with representative climatic graphs for each zone in the country (III).

## Geology

Most of Sri Lanka is underlain by **Precambrian rocks** which are metamorphic. Two major groups of Precambrian rocks are recognized: i) the **Highland series** and ii) the **Vijayan complex**. The more recent rock types are of sedimentary origin, found mostly in the northwest of the country including the entire Jaffna peninsula. These are predominantly Miocene **limestone**. Small extents of **Jurassic sandstone, shale and grit** are found among the Vijayan rocks in the basins of Tabbowa and Andigama. **Alluvium, beach and dune sands, red earth and mottled gravel** of quaternary origin are found all over the island but predominantly near the coast (Fig. 5).

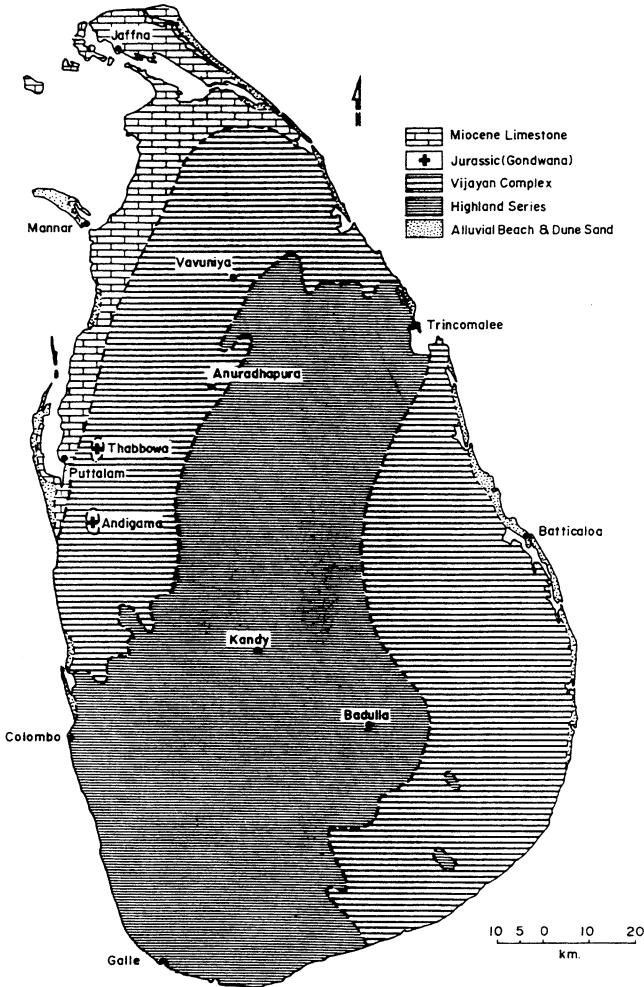


Figure 5. Major rock formations

## Soils

Soil is formed by the weathering of parent rock material. Depending on the parent rock type, the weathering process, and climate, a variety of soils can form. In Sri Lanka fourteen major soil groups are recognized, but only two of them are found extensively (Fig. 6). Since the parent material of the Precambrian rocks is relatively uniform over the island mass, weathering by climate appears to be the main determinant of soil type. Soil groups therefore closely coincide with the climatic zones of the country.

**Reddish brown earths** occupy most of the dry and intermediate zones, overlying the Vijayan rocks, and also on the Highland rocks between Polonnaruwa and Trincomalee. These soils are found on ridge crests, upper slopes and mid-slopes. In the valleys there are poorly-drained gleyed soils that are low in humus. The northern dry zone has two other main soil types found to smaller extents. These overlie sedimentary rock. **Red-yellow latosols**, considered to be the most ancient in the country, occur in a band from Puttalam and Mannar to Mullaitivu and parts of Jaffna. Southern Jaffna and Mannar districts have in addition soils known as **grumusols**. These are poorly drained, grey-black clay soils, which are sticky when wet and harden and crack when dry.

In association with reddish brown earths are **non-calcic brown soils**. They are most common in Kurunegala, Puttalam, Ampara, Batticaloa and Moneragala areas. These soils occur wherever the parent rock is deficient in iron and magnesium, and are particularly vulnerable to erosion. On the Kandy plateau and the montane regions of the intermediate and wet zones are **reddish brown latosols** (little developed). Also in this area are small areas of very young brown soils known as **immature brown loams**.

The soils in the lowland wet zone are predominantly **latosols**. These are underlain by the Highland series rocks. Two major groups are recognized here; those rich in alumina (well developed) and those near the coast which are mostly lateritic (very well developed). The lateritic soils harden on exposure, and severely restrict root penetration and infiltration.

The coastal and freshwater wetlands are characterised by young and unstable soils. In the northern and southern dry zones, Hambantota, Jaffna, Mannar and Puttalam areas, are found **solodized solonetz** and **solonchanks** (saline soils). These soils, found along the coast, tidal flats and flood plains in association with other soil types, are rather brownish or yellowish, saline and alkaline.

**Acid swamp and bog soils** are more characteristic of the wet zone. These poorly drained soils rich in organic matter overlie alluvial deposits. They are found on the flood plains, tidal marshes and filled-up lagoons of the Colombo, Kalutara, Galle, and Matara areas.

**Regosols** found all over the country are recent deposits of deep, whitish, excessively drained sands. They are characteristic of coastlines with beaches and dunes. **Alluvial soils** are found adjacent to fresh water streams, rivers and flood plains. They are continually formed during frequent inundations with new deposits of sand, silt and clay brought down by water from the uplands.

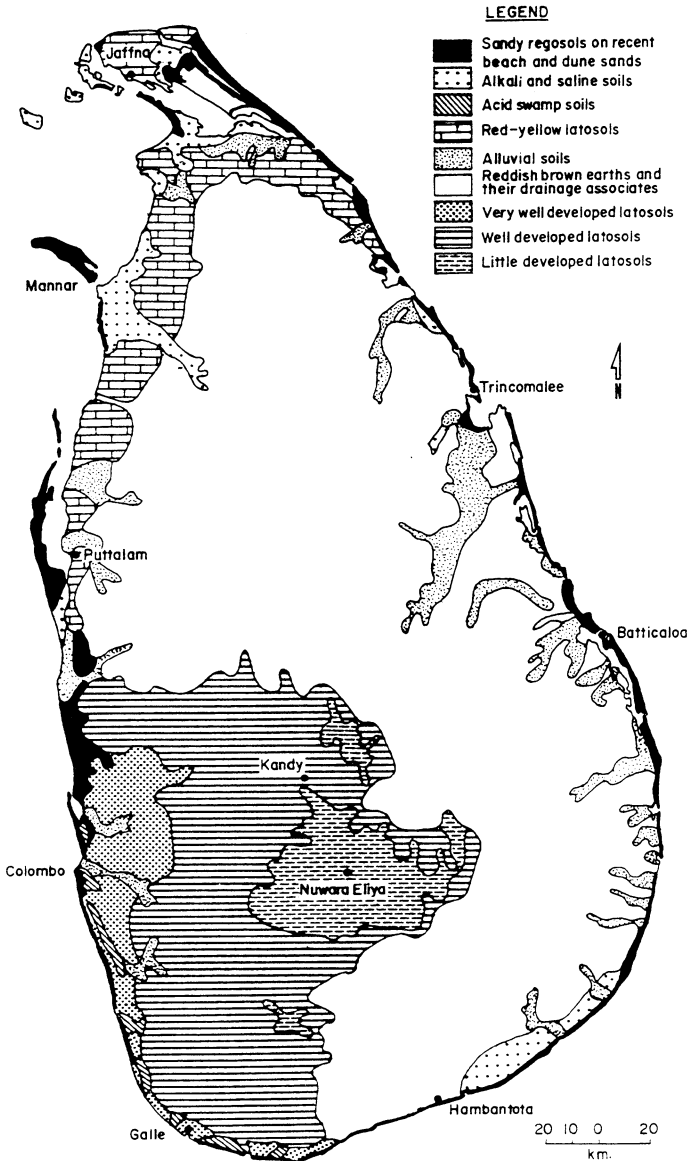


Figure 6. The major soil types



## Vegetation types

Vegetation reflects the combined effect of topography, climate and soils. In Sri Lanka the natural vegetation is predominated by a diversity of forest types (Fig. 7). Only a small fraction of land is under non-tree-dominated vegetation. This is mainly grassland, and coastal and fresh water wetlands.

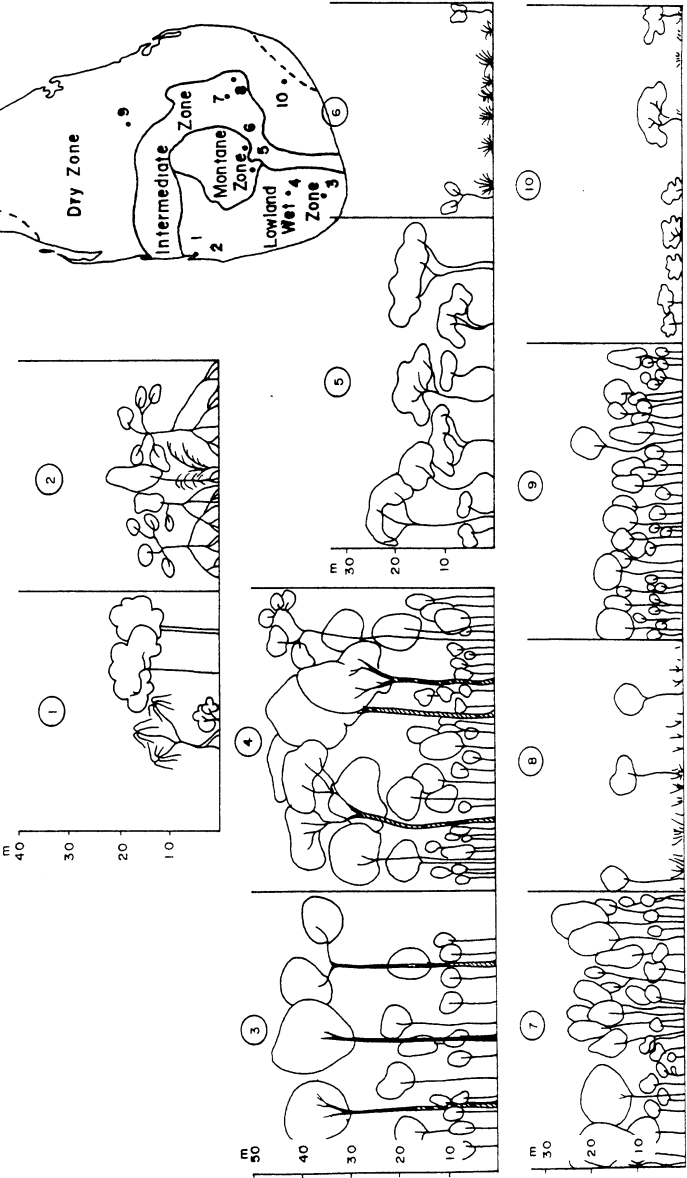
The most extensive type of forest in the island is the **dry mixed evergreen forest** found in the dry zone. Although deciduous species exist in these forests, their evergreen character is maintained by a few widespread species. Consequently these forests are also referred to as semi-evergreen forests. They receive rains only from the northeast monsoon. The strong seasonality in rainfall has prompted us to categorize them in this guide as **monsoonal forest**. In the arid zones of the northwest and southeast extremities of the country, **thorn scrub** predominates. This comprises small trees and thorny shrubs. Along the rivers, in both dry and arid zones, where there is no acute shortage of moisture, are impressive **riverine forests** (gallery forests). The tall, buttressed, spreading trees arch over waterways, and the cool, shady environment beneath them is in sharp contrast to the heat and dust away from the water.

In the intermediate zone, the vegetation gradually changes to **moist semi-evergreen forests**. Although these forests have a fair proportion of deciduous species, they are essentially evergreen. However, within the southeastern intermediate zone (Moneragala), mostly deciduous species constitute the forest canopy. Hence, these forests are more deciduous or semi-evergreen in character than those of the northern block in the Kurunegala area. In this guide, these forests have been lumped together as intermediate forests.

In the wet zone vegetation has been largely categorized by elevation with **wet-evergreen forests** or **rain forests** in the lowlands and hills, **lower montane forests** on the lower slopes of mountains between 1000 m and 1500 m, and **montane forests** above 1500 m. Although the wet zone is only a small area of 15,000 square km in extent, the combination of climate, topography and geological history has resulted in a diversity of species-rich associations in this zone, as compared to the vegetation types in the rest of the country. Consequently, at least nine floristic zones, based on species more or less restricted to each zone, have been recognized in this area (Fig. 8). The high proportion of endemic plant species (species found only in Sri Lanka), is another characteristic of these forests. These features of the Sri Lankan lowland rain forests and montane forests make them of critical importance in understanding the biogeography and floristic wealth of south and southeast Asia.

The non-forest vegetation types are mostly grasslands, found in small pockets in all climatic zones of the country. Most of these grasslands are secondary in origin and appear to be fire-maintained by humans. The dry zone also has **villu grasslands** which are associated with river flood plain systems such as those in the lower reaches of the Mahaveli. These seasonal marshes are inundated during rainy seasons. As the water recedes with the onset of the dry

Figure 7. The climatic zones of Sri Lanka and the major natural vegetation types, indicated by numbers and vegetation profiles within each of these zones. 1 = coastal dune and beach scrub; 2 = mangroves; 3 = rain forests below 300 m elevation; 4 = hill rain forests between 300 and 1000 m elevation; 5 = montane forests; 6 = montane grasslands (wet pataunas); 7 = moist semi-evergreen forests (intermediate); 8 = savannas; 9 = dry mixed evergreen forest (monsoonal); 10 = thorn scrub.



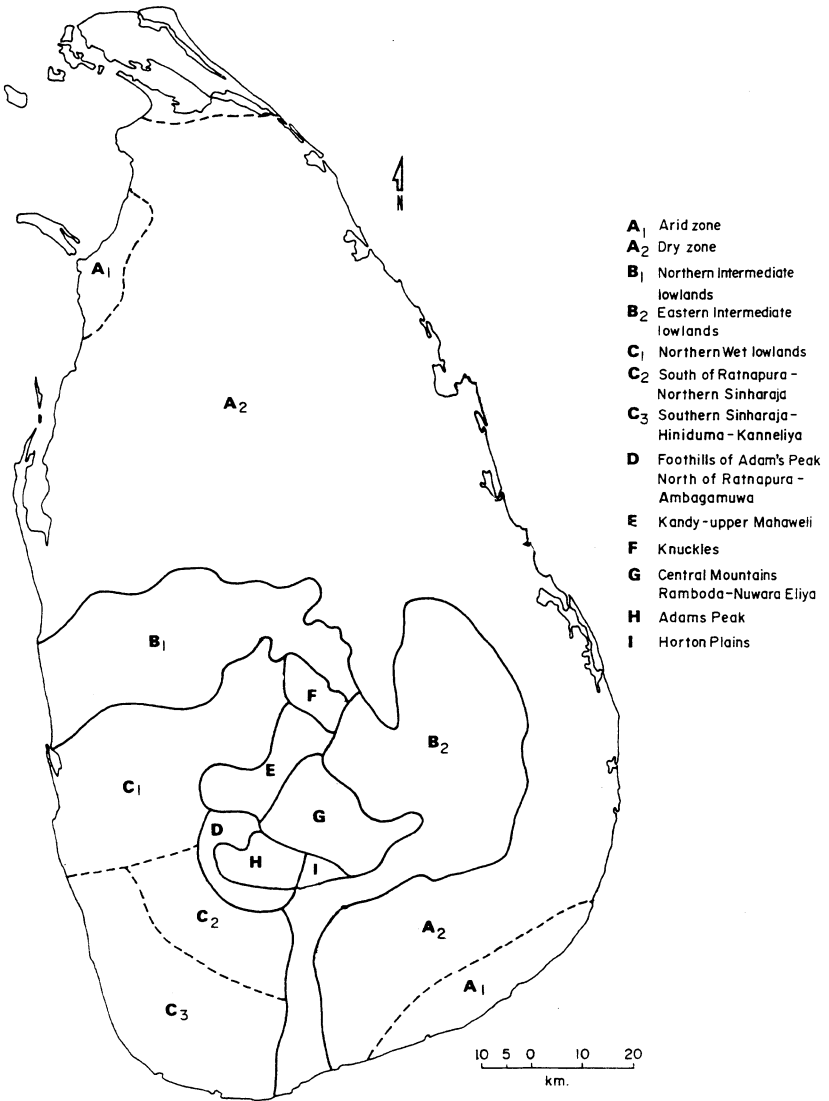


Figure 8. The floristic zones

season, the land reverts to succulent grassland. On the eastern and southeastern side of the mountains in the Uva basin are the **savannas**. These are grasslands with a conspicuous tree component; the trees in them are scattered and often fire-tolerant. These savannas are thought to be maintained by fire following destruction of dry semi-evergreen forest.

There are fairly large tracts of grasslands in the Kandy, upper Mahaveli, and Ratnapura-Rakwana areas known as the **dry patanas**. These grasslands are of secondary origin and are maintained by annual burning which prevents their reversion to forest. In the wetter areas of the lowland wet zone are **fern or kekillia lands** which are of secondary origin as well. Here too, burning retains them in this state, preventing their being taken over by scrub. Perhaps the best known grasslands in the country are those of the highland plateaux: the Horton plains, Moon plains, Ambawela, and Nuwara Eliya. These picturesque montane grasslands are known as **wet patanas** and are interspersed with montane forest.

In the coastal areas **mangroves** and **salt marshes** colonize inundated bays, inlets and river estuaries with **scrub** vegetation invading sandy shores and dunes. Inland areas inundated by fresh water have **swamp** and **floodplain forests**. Most of these have been converted to paddy land.

### Trends in landuse

Sri Lanka has been populated and cultivated for a long time. Although there is evidence of several prehistoric settlements, large scale settlements began after the 5th or 6th century BC. For 17 centuries thereafter, the dry zone was the major centre for economic activity (Fig. 9). The complex irrigation systems built during this time still continue to dominate life in these areas. The 3rd century AD saw the wet zone gradually colonised; especially Kegalle, the Kandy plateau, and the Kelani Ganga basin. By the 10th century a greater part of the lowland wet zone was inhabited. However, the hills above 600 m retained their forested landscape. With the decline of the dry zone civilization in the 13th century, the centre of activity shifted to the wet zone, where the last kingdoms of Gampola and Kandy were located. The early phase of Sri Lanka's history therefore suggests that nearly all the forests now in the dry zone are of secondary origin, having re-established over the last 7-8 centuries.

By the 16th century, Europeans had arrived in this country. The Portuguese occupied the maritime provinces and traded in spices and prize timbers. Later the Dutch replaced the Portuguese. In the early 19th century the British colonized the whole country. Much of the wet zone forest was cleared, initially for coffee, and then for tea and rubber.

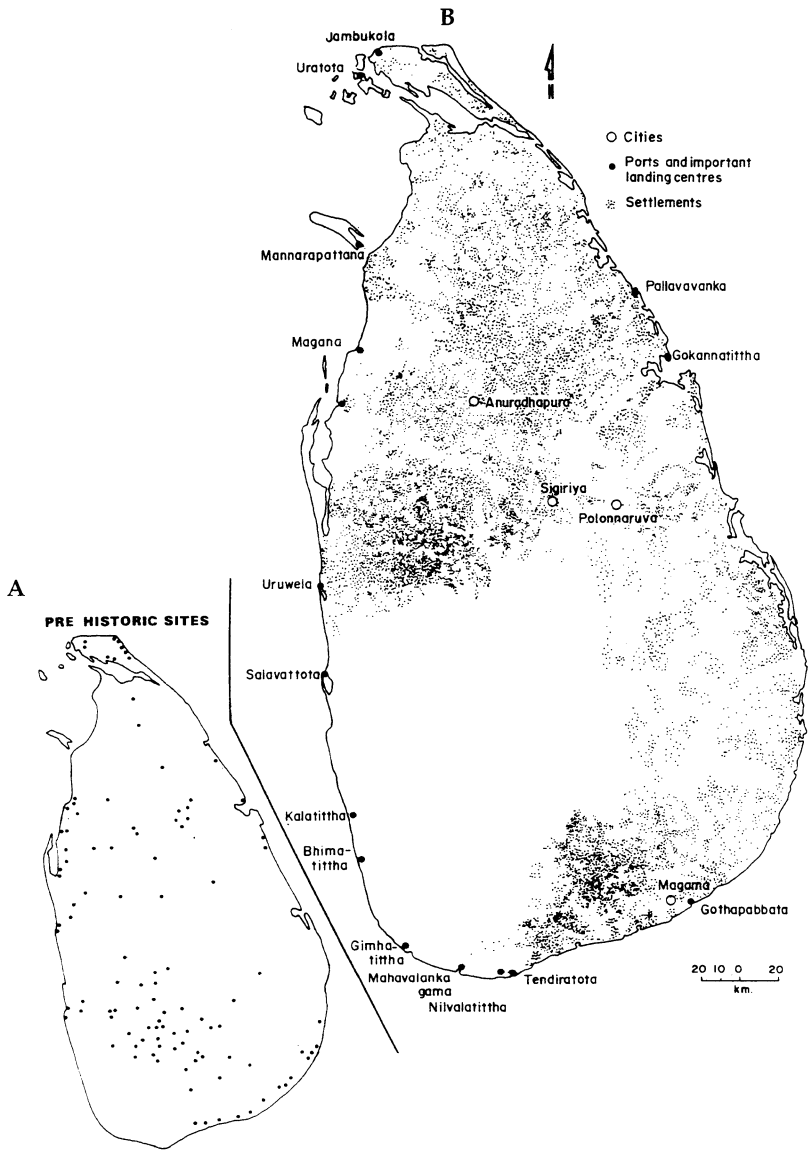
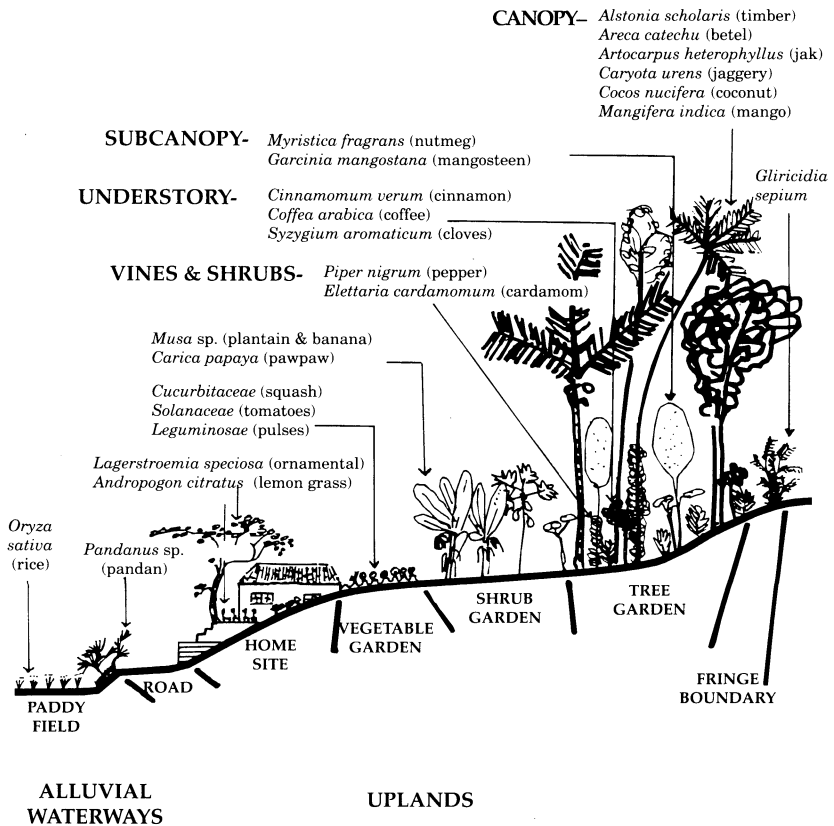


Figure 9. Distribution of prehistoric sites (A) and the cities, ports and settlements before the 3rd century AD (B).

**BOX 2.** The early landuse pattern usually included a small village settlement with paddy cultivation along the waterways. On higher ground tree and shrub crops were grown in home gardens. In the dry zone small reservoirs irrigated paddy fields. The catchment above the reservoirs and the area around the village was forest land subject to shifting cultivation and for gathering forest products not usually obtainable from the home gardens. Kandyan home-gardens are good examples of mixed-species tree cultivation. The plants in these gardens can comprise a spatial arrangement of vegetation that is complex. The paddy field and vegetable garden are single layered with fast growing arable crops. Vertical structure plays a more important role in the tree and shrub areas. The tallest trees of a garden form the framework within which are a heterogeneous mix of other subcanopy and groundstory plant species. Plant species can occupy a particular niche in both vertical and horizontal space. Plant species diversity is therefore high. In two gardens visited by Mendis *et al.* (1985) 105 tree species, 68 shrub species and 79 herb species were identified.



Before the colonial period, the King was the traditional proprietor of land. The British followed this tradition with laws concerning 'crown land' and 'waste land'. All land without formal title was made the property of the government. The main reason for the British statutes was to obtain land for plantations. Food production took a secondary place and the importance of fallow for the rehabilitation of land was not appreciated.

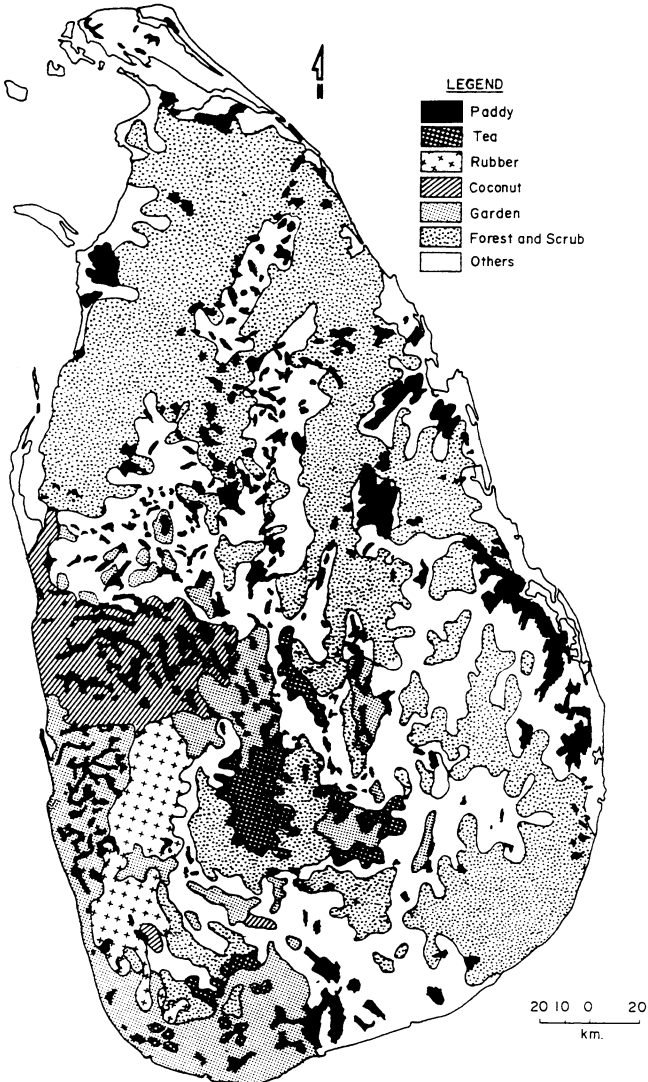
From the beginning of the 20th century, and particularly since independence in 1948, the dry zone has been recolonized to augment food production. Ancient irrigation systems were restored and new ones established. By far the most important of these has been the Mahaveli development programme which was initially begun in 1970 and accelerated in 1977. It has provided irrigation for an additional 130,000 ha of dry zone land.

From a population that was 2 million in early colonial times, in the last fifty years it has burgeoned to 18 million. The wet zone and the Jaffna peninsula are the most densely populated areas with over 500 people per square kilometre. Since ancient times rice had been and continues to be the staple food crop, occupying 8% of the land area. Plantation crops, mostly introduced by the British, remain the basis of the island's economy and occupy 14% of the land. In the dry zone shifting cultivation is still practiced to a limited extent, while the wet zone provides most of the vegetables and fruits. Overall, about a quarter of the island's land is under cultivation (Fig. 10). Most cultivation is characterised by the coexistence of both traditional and modern agriculture. The latter involves improved varieties, especially of rice, and high inputs of fertilizer, pesticides and herbicides.

Many of the early food and medicinal plants were introduced from India - rice cultivars, medicinal plants of the ancient 'ayurvedic system', and temple trees such as the 'Bo tree'. During the British period many species of commercial importance as well as horticultural value were introduced. The three botanic gardens in the country, all of them over a hundred years old, have played a central role in these later introductions.

Since the end of the 19th century natural forests have dwindled to less than 25% of the total land area, due in large part to an array of encroachments (agricultural expansion, logging, urbanization, and shifting cultivation). Not more than 10% of this can now be classified as undisturbed. Fortunately though, at least half of the remaining natural forests in the country is now under some form of legal protection. Even so, a closer look reveals that the species-rich lowlands and mountains of the wet zone contain the least area in some form of natural forest. The proportions calculated in relation to each zone are about 8% in the lowland wet, 17% in the montane, and 47% in the dry (Fig. 11).

Since the extent of natural forest is very small, it is every person's responsibility to conserve it for future use. Current legislation concerning the protection of natural areas must be strengthened. Research should be accelerated to find out more about the status of plant species important to rural economies. Such species should be propagated and cultivated. Ancient rice cultivars and other valuable crop material should be conserved. Perhaps most importantly, cultivation practices should aim at innovative multi-species systems which are sustainable.



*Figure 10. Distribution of existing plantations, paddy, home gardens and remaining natural forest and scrub.*





*Figure 11. Distribution of remaining natural forests and their administrative boundaries.*



## Part II:

# The field guide

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Descriptions of dicotyledonous angiosperms .....	75



## An explanation of species and family descriptions

Family descriptions have been arranged within four groups of higher plants. In progressive order of the book they are: tree ferns and their allies, Gymnosperms, and Angiosperms (flowering plants) which have been further divided into monocotyledons and dicotyledons. Families belonging to each group have been arranged alphabetically. Family number codes are associated with the key. Species within each family have also been organized alphabetically at the generic level and numbered.

Families have been described to cater to individuals who have different levels of experience and interest. For those who are not interested in the details of floral parts, brief descriptions of each family are given immediately following the family name and code number that minimizes the use of technical language. For the more advanced user details of the flower parts, and in some cases fruit parts, that make different families taxonomically distinct from each other, are described and illustrated. This book has been designed in such a way that though floral information is useful, it is not necessary to understand it in order to fully utilize the guide and to identify tree and shrub species.

Species descriptions of trees and shrubs have been given and vegetative parts illustrated by simple black and white line drawings. Again an attempt has been made to minimize technical language. The description of each species has been organized with its scientific name and an associated **Headline**, below which further information is categorized under **Leaves, Trunk, Flowers, Fruits, Site, and Uses**. For the explanation of the technical terms within the species descriptions, the information has been arranged within each category as a series of questions that the user should become familiar with when trying to identify a particular species under inspection. Definitions of technical terms have been listed separately in the **glossary** at the end.

### The headline: AN EXAMPLE

*Cryptocarya wightiana*, gulumora (S), (T III:438), N, 30, tree

A B C D E F

A - **Scientific name** (always given in Latin).

B - **Common names** (E) = English; (S) = Sinhala; (T) = Tamil.

C - **Reference** (detailed description of a species by: author, volume, page no.).

T = Trimen, H. (1893-1900) **HANDBOOK TO THE FLORA OF CEYLON**; Volumes I to V, and its updated Volume VI.

DF = Dassanayake, M.D. and F.R. Fosberg. (1980 - ongoing). **A REVISED HANDBOOK TO THE FLORA OF CEYLON**; Volumes I to VIII. Amerind Publ., New Delhi.

D - **Origin** Endemic (E); Native (N); Introduced (I - country/region of origin) In certain cases where a species has recently been introduced into Sri Lanka a reference description has not been given.

E - **Tallest height** (in meters).

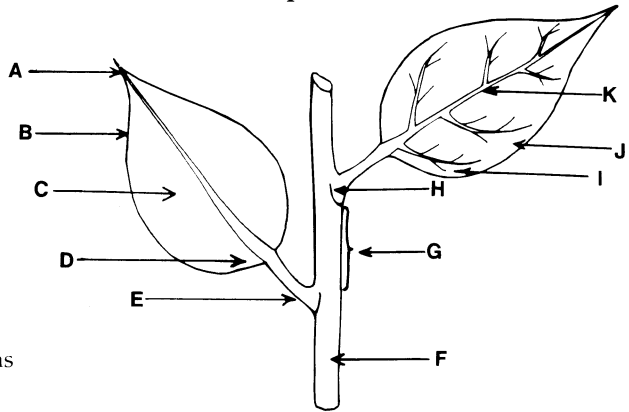
F - **Habit**: shrub (multi-stemmed, short woody plant), small tree (tree less than 5 m in height), tree.

### Leaves: what is a leaf ?

Leaves are the organs of the plant which absorb atmospheric carbon dioxide and combine it with water taken in via the roots to produce sugars using light energy. This process is called photosynthesis. Sugars are simple carbohydrates that can be readily converted to other more complex substances. They can be thought of as the building blocks of plants. Different forms of carbohydrate are used for growth, reproduction, energy storage and physiological processes. The petioles (leaf stalks) support the leaf blade (lamina), uniting it with the main plant stem, and are responsible for leaf orientation. Veins facilitate leaf form, transport nutrients and water from the petiole to all areas of the leaf blade, and convey sugar synthesized in the leaf to other parts of the plant.

#### Leaf and stem parts

- A - leaf tip
- B - leaf margin
- C - lamina
- D - leaf base
- E - petiole
- F - stem
- G - internode
- H - node
- I - tertiary veins
- J - secondary veins
- K - midrib

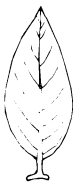


#### Questions about the leaf that you should ask yourself

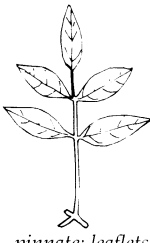
1. Is the leaf simple or compound? Compound leaves have several leaflets borne on an axis.

#### LEAF TYPES

*simple*



*pinnate; leaflets opposite without terminal*



*pinnate; leaflets opposite with terminal*



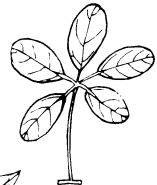
*pinnate; leaflets alternate*

*bipinnate*



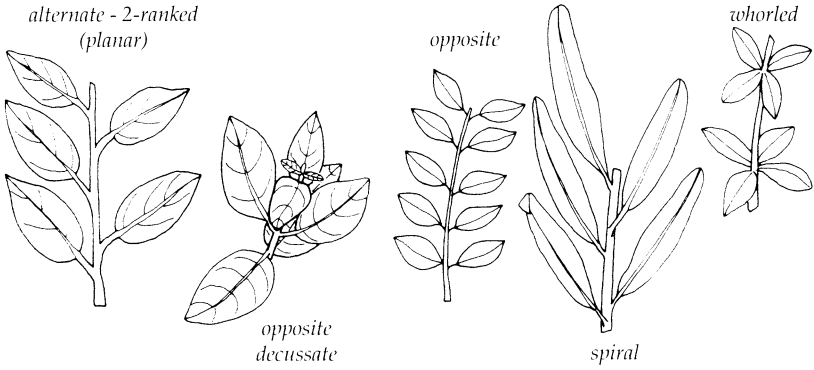
*trifoliolate*

*palmate*



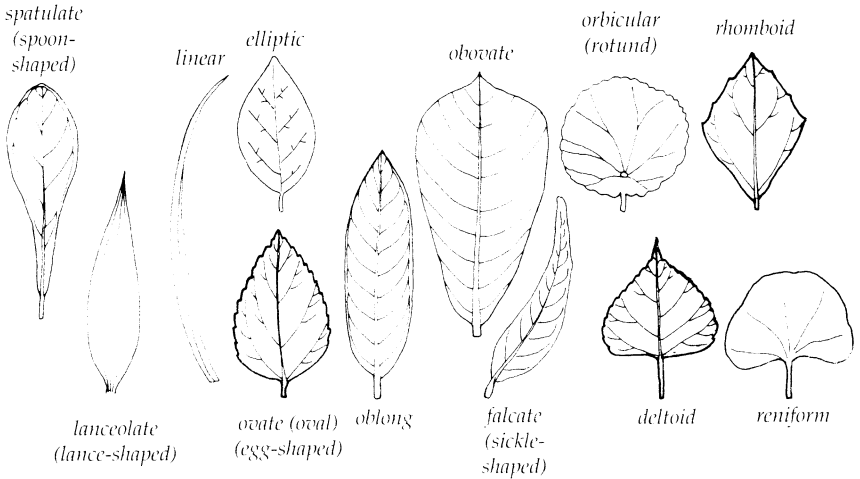
2. How are the leaves arranged on the stem ?

LEAF ARRANGEMENT



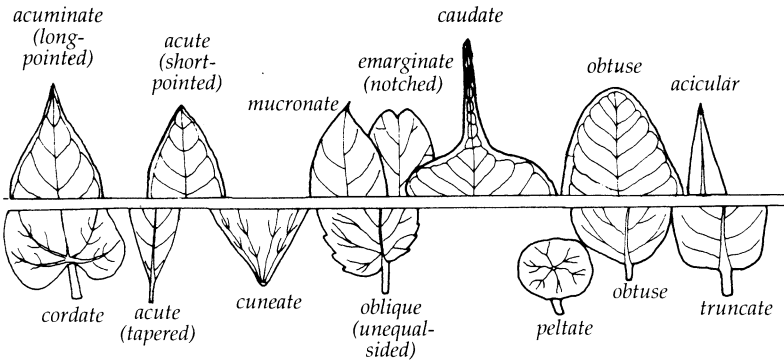
3. What shape is the leaf ?

LEAF SHAPE



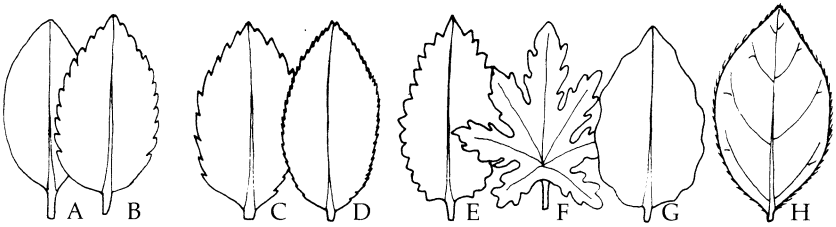
4. What shape are the leaf apex and leaf base ?

LEAF ENDS



5. What kind of margin does the leaf have ?

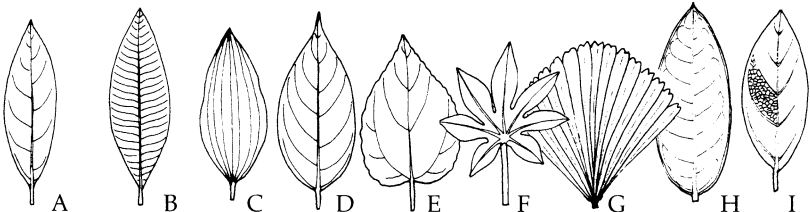
LEAF MARGINS



A-entire; B-crenate; C-serrate; D-serrulate; E-dentate; F-palmately lobed; G-undulate; H-ciliate

6. What is the venation pattern on the leaf ? Veins are best seen on the leaf underside.

LEAF VENATION



A,B - pinnate; C - parallel; D - strongly arched; E - basally 3-veined; F - palmate; G - flabellate; H - intramarginal; I - reticulate.



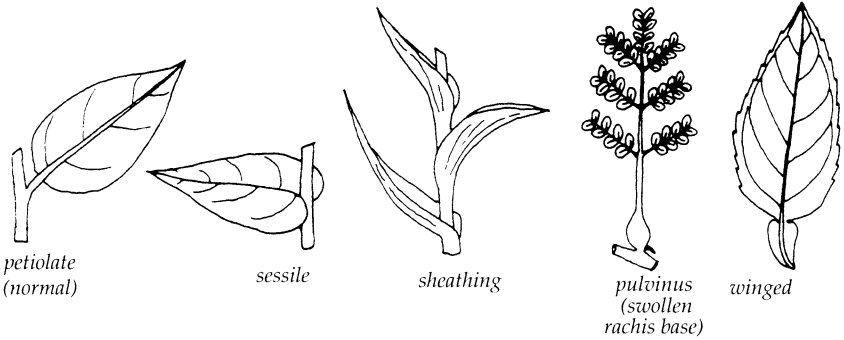
7. What is the leaf surface like ?

LEAF SURFACE

**Coriaceous** - leather-like; **gland dotted** - with minute to clearly visible yellow dotted glands; **fulvous** - with reddish-yellow tawny hairs; **glabrous** - smooth, without hairs; **glaucous** - with waxy, whitish bloom; **hirsute** - with stiff, bristly hairs; **pubescent** - with soft, downy hairs; **puberulous** - very finely pubescent; **rugose** - wrinkled, with sunken veins; **scabrous** - with short, bristly hairs rough to the touch; **scaly** - covered with small plates, scurfy; **stellate** - star-shaped; **strigose** - with short, stiff hairs or scales; **tomentose** - with dense, matted pubescence; **villous** - with long, silky, straight hairs.

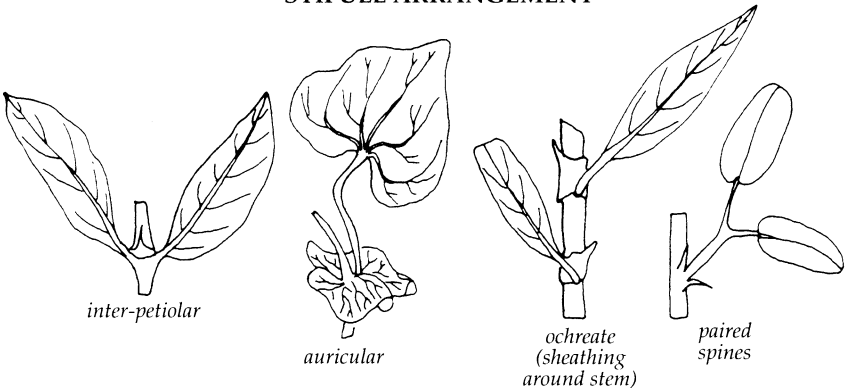
8. What is the petiole or rachis like ?

PETIOLE/RACHIS TYPES



9. Are stipules present ? If so, what are they like ? Are they deciduous leaving only a scar ? Stipules are small leaf-like structures near the base of the petiole.

STIPULE ARRANGEMENT



**Trunk: stem - bark - branches - twigs - roots**

The trunk and branches of a tree or shrub serve three functions, i) support the crown, ii) transport sugars, nutrients and water between roots and leaves and iii) store sugars for future use. The **bark (B)** is the outer dead skin of corky tissue that protects the tree from the elements. The texture, thickness and colour of the bark differ between species. The **inner bark (IB)** is the living portion that lies immediately beneath the dead bark.

The **wood (W)** is composed of **xylem** - tubular structures that conduct water and nutrients. The girth increase in a stem of a growing tree is largely due to new xylem formed from the cambium - a thin layer of actively dividing cells that exists as a sheath around the stem from which new tissues develop.

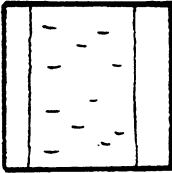
**Sapwood (s)** is the outer portion of the stem wood that has living xylem cells. **Heartwood (h)** is the central portion of the stem wood that has dead xylem. Heartwood is lignified and the xylem tubes are occluded with gums, resins and minerals. With age sapwood turns to heartwood. Heartwood is usually more resistant to rot than sapwood, it has a higher density and is also a stronger, more resilient structural timber.

**Questions you should ask yourself**

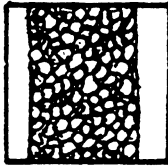
1. What is the colour and texture of the bark ?

**BARK TEXTURES**

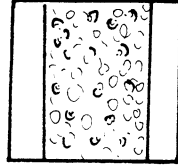
*smooth*



*scaly*



*scroll-marked*



*shaggy*



*fissured*



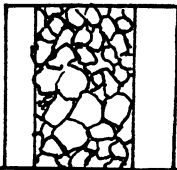
*furrowed*



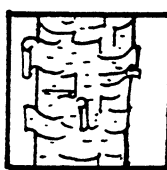
*rough*



*platy*



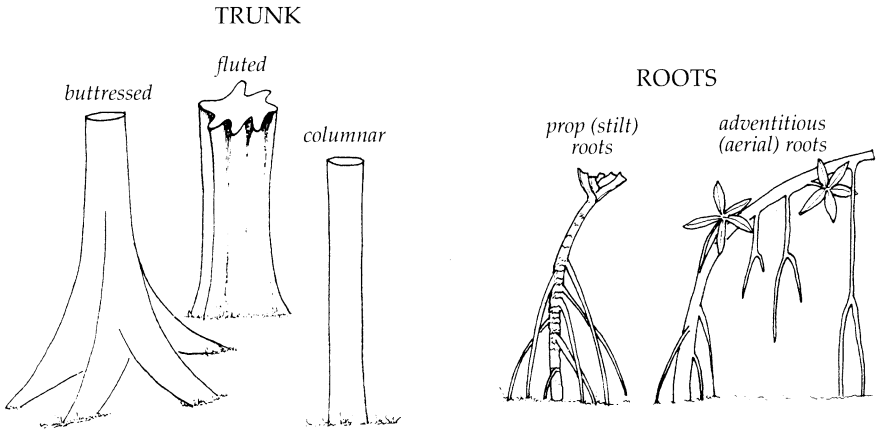
*papery*



*fibrous*



## 2. How does the tree support itself ?



3. **What is the sap like ?** Sap is best observed by making a slash in the trunk of the tree and/or examining the freshly broken end of a twig or leaf. Is it a milky, yellow, or pink latex, or a clear sap that darkens on exposure ? Is it a mucilaginous, clear and watery, coloured and watery, or resinous sap ?

### Flowers: what is a flower ?

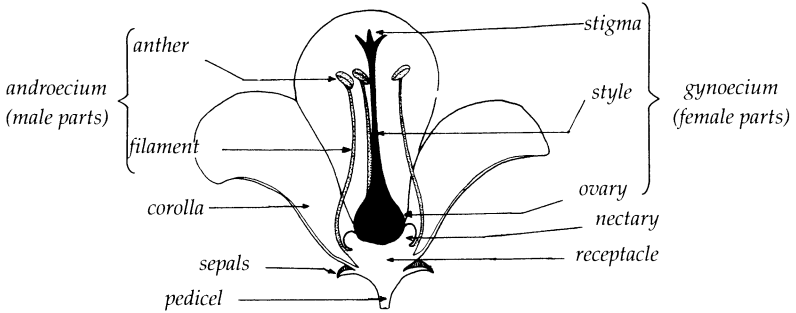
The flower is the sexual reproductive structure of a plant. It comprises male parts - **androecium**; female parts - **gynoecium**; the flower base; and outer parts that protect the flower core from the elements and that attract animal visitation.

The androecium consists of a number of **stamens** that show a particular arrangement. They usually arise from the flower base, or are attached to the petals, and surround the gynoecium. The filament is the supporting stalk to which the pollen (male spore) producing **anther** is attached.

The gynoecium consists of a receptive end called the **stigma**, a stalk called the **style** which exposes the stigma to receiving pollen from other flowers, and a basal swelling called the **ovary**. The ovary is made of leaf-like structures called **carpels** which are usually joined together. The carpels enclose one or more chambers called **loculi** in which the **ovules** are found. The ovules are arranged in different ways within the loculi. For details refer to the figure illustrating **placentation**.

The floral base consists of the **receptacle**, upon which the androecium, gynoecium, and outer floral parts rest, and the stalk (**pedicel**), from which the flower obtains support and sustenance from the plant. Often plants that are pollinated by animals have sugar secretory glands (**nectaries**) at the base. Animals attracted to flowers unknowingly pollinate the stigma (s) with pollen carried on their bodies from previously visited flowers. Other forms of pollination can occur via wind and water.

The outermost protective portions of the flower are called the **sepals**. Collectively they make up a whorl called the **calyx** and enclose the inner parts of the flower during development and before bloom. The next whorl of the flower comprises the **petals** that collectively form the **corolla**. They are usually large and showy to act as visual cues to animal visitors. Flowers that are wind and water pollinated have petals that are small and inconspicuous, or absent.

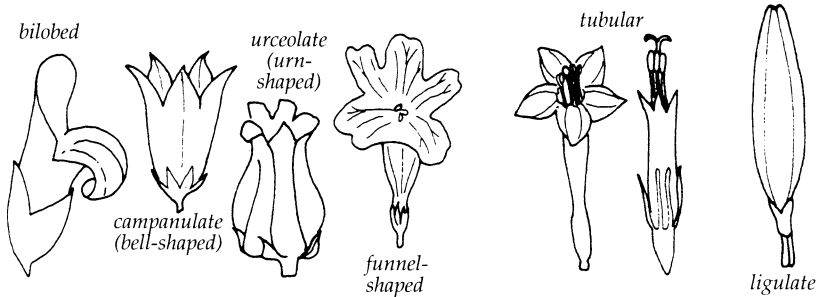


A diagram of the flower parts from a perfect flower.

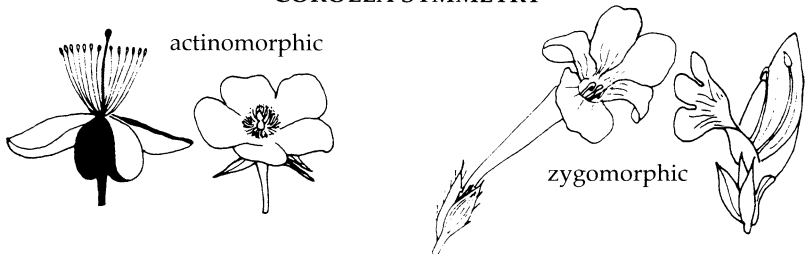
**Questions you should ask yourself**

1. What colour and shape is the corolla? Is it conspicuous? Is it actinomorphic (radially symmetrical) or zygomorphic (asymmetrical)?

**COROLLA FORMS**

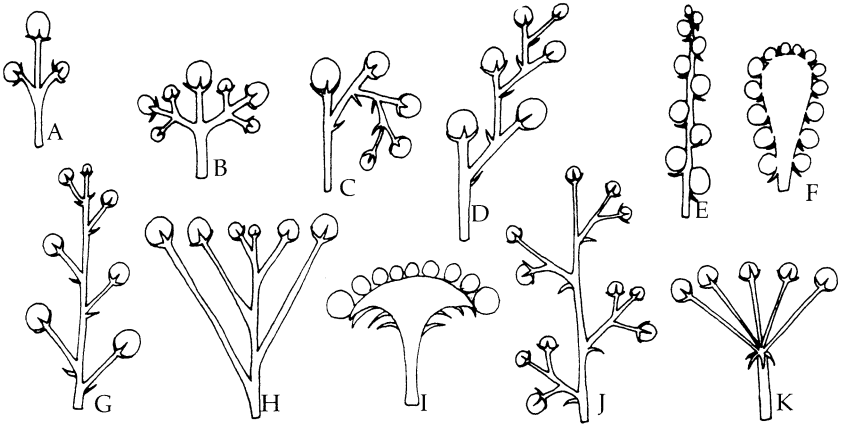


**COROLLA SYMMETRY**



2. **How are the flowers arranged on the axis of the inflorescence ?** (An inflorescence is a flowering branch. Under **Flowers** in the species description I denotes inflorescence type)

**INFLORESCENCE TYPES**

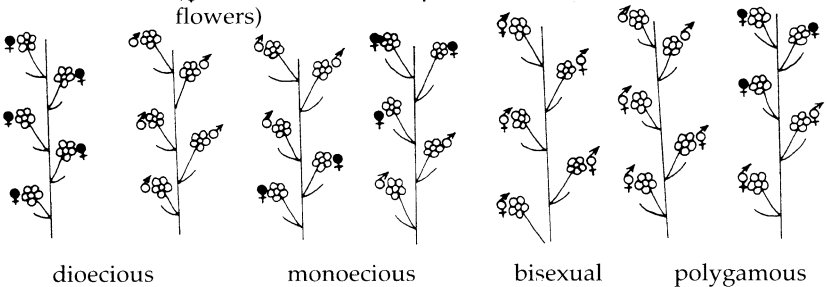


A - simple cyme; B - compound dichasial cyme; C - helicoid monochasial cyme; D - scorpioid monochasial cyme; E,F - spike; G - raceme; H - corymb; I - head or capitulum; J - compound raceme or panicle; K - umbel.

3. Many plants have evolved flowers that have only one functionally working sex, perhaps to avoid self-pollination. Flowers of different sex can occur on the same or different individuals. Some species have both, one sex and two-sex flowers on the same individual. The nature of the different flower sex combinations differs between families and genera and defines the breeding system of a plant. **What does the flower combination of the tree or shrub appear to be?**

**BREEDING SYSTEMS**

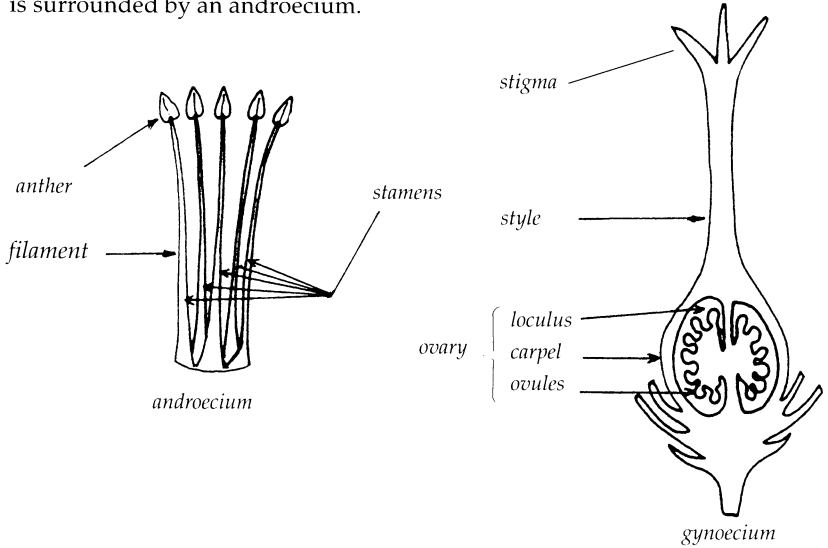
(♀=female, ♂=male, ♀♂=bisexual flowers)



**Dioecious** - Unisexual. Male and female flowers borne on separate plants. **Monoecious** - Unisexual. Separate male and female flowers borne on the same plant. **Bisexual** - Male and female parts borne on the same flower. **Polygamous** - Unisexual and bisexual flowers borne on the same plant.

## AN EXPLANATION OF THE FLORAL PARTS FOR THE ADVANCED USER

The gynoecium and androecium comprise female and male parts of the flower respectively. In general the gynoecium is found at the centre of a flower and is surrounded by an androecium.



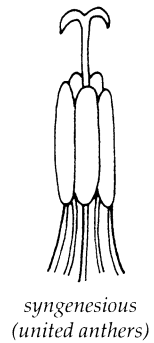
### ANDROECIUM TYPES

#### 1. The nature of stamen attachment and arrangement.

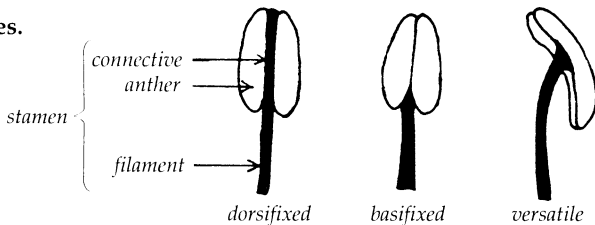
*monadelphous (all filaments united into one group)*



*diadelphous (filaments united into two groups)*

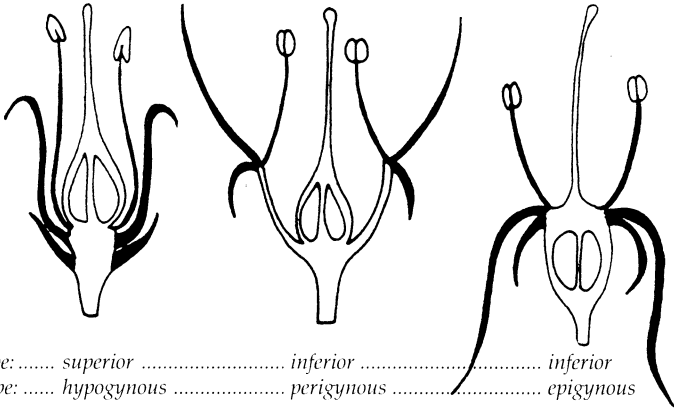


#### 2. Anther types.



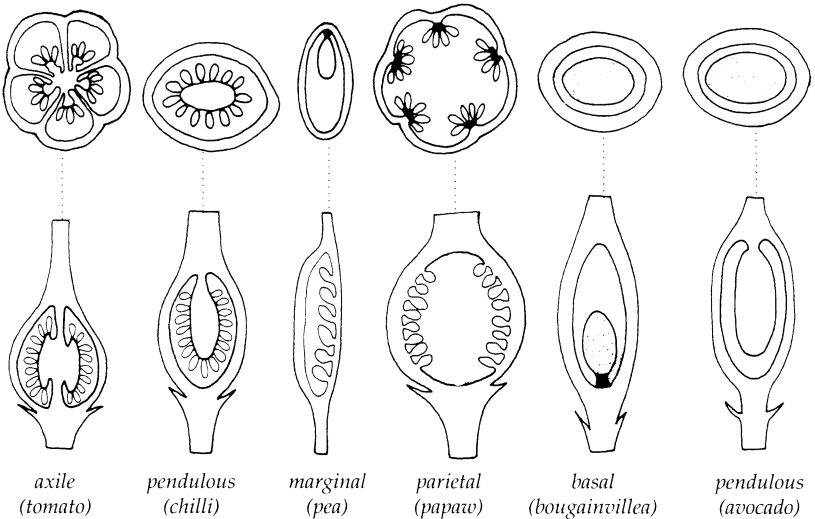
### GYNOECIUM TYPES

1. **Calyx, corolla and androecium arrangement** in relation to the ovary, gives rise to different ovary types and flower types as shown below.



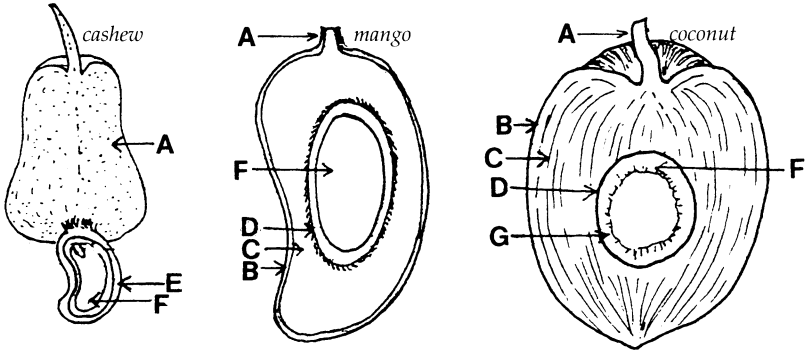
### 2. Placentation (arrangement of ovules within the ovary).

Transverse (upper row) and longitudinal (lower row) sections of ovaries, showing different placentation types.



**Fruit: what is a fruit ?**

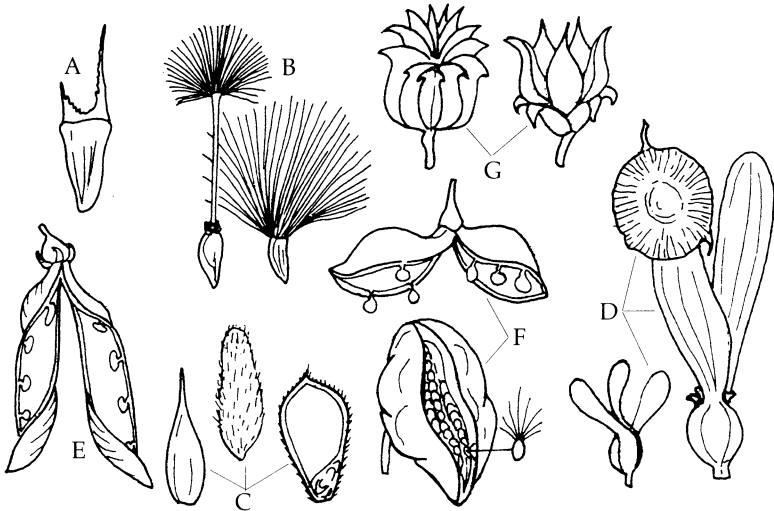
After fertilisation the ovary develops into the fruit and the ovule forms the seed. The seed consists of an embryo and a food store (cotyledons or endosperm). The fruit has a protective coat that can remain undifferentiated as a pericarp, or differentiate into a pericarp of several distinct layers (exocarp, mesocarp, and endocarp).



Parts of a simple fruit (one seeded): pedicel (A), fleshy in the cashew nut and normal in the mango and coconut. Pericarp or fruit wall uniform (E) or differentiated into an outer exocarp (B), middle mesocarp (C), and inner endocarp (D), in mango and coconut; embryo (F) and endosperm (G).

1. What kind of fruit does it have ? Is it dry or fleshy ? Is it simple or composed of many together (composite) ?

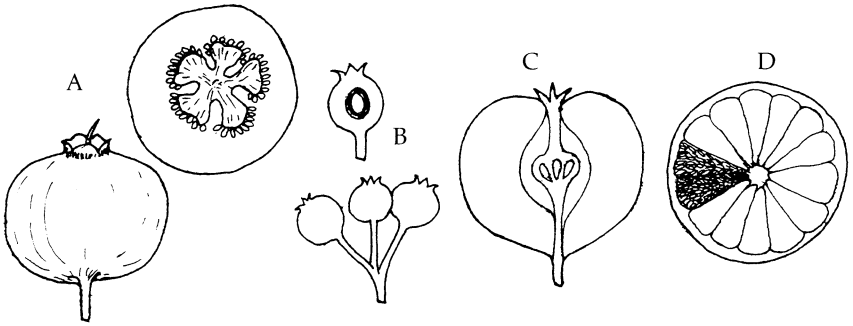
**DRY FRUITS**



**Indehiscent types:** achene (A), cypselas (B), caryopses (C), samaras (D).  
**Dehiscent types:** legume (E), follicles (F), and capsules (G).

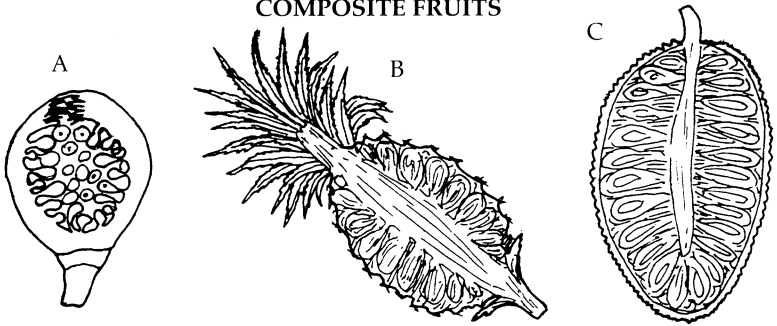


**FLESHY FRUITS**



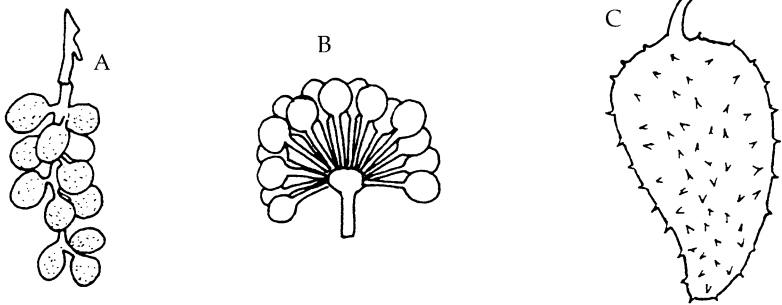
Different types of fleshy fruits where the pericarp is soft. Many seeded berry (A), single seeded berries (drupes) (B), pome (C) and hesperidium (D).

**COMPOSITE FRUITS**



Different types of composite fruits: fig (A); pineapple (B); and jak (C), all developed from an inflorescence.

**AGGREGATE FRUITS**



Different types of aggregate fruits that develop from a cluster of fruitlets formed from a single flower with an apocarpous ovary (ovary with free carpels). Each fruitlet develops from a single carpel. The fruitlets may be achenes, follicles (A), drupes (B) or berries (C); they may be separate from each other (A,B) or fused together (C).

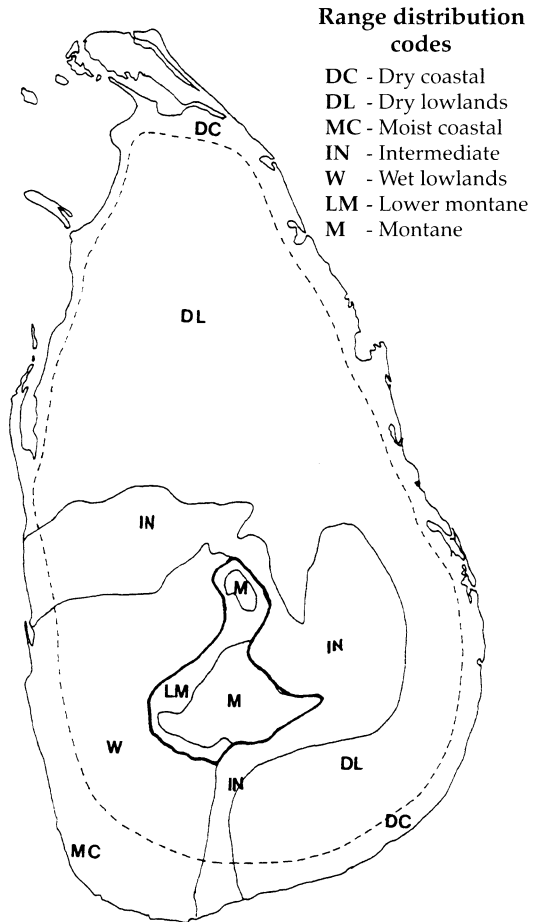
### Site: where is the tree or shrub growing ?

A **site** is a particular type of place where a plant lives. Each plant thrives under a set of climatic, soil and water conditions. This results in the establishment of a **plant community** composed of several species that are characteristic of that site. **Indicator** species are tree and shrub species that characterize a particular site and are not found elsewhere. **Generalists** are tree and shrub species that can grow on a wide range of different sites. A species that has a large population of individuals occupying a site is a **dominant** species.

Forest development is very slow because the life time of a tree is long. A forest may appear stable to the observer but in actual fact its species composition, growth and structure are changing. The term which describes these changes is called **succession**. It is a phenomenon where plant communities and the soils that they occupy pass through succeeding stages (**seral**) of composition and structure. The term **old growth** refers to the late seral stages of a forest's development.

Careful observation of the forest environment will inform you about where each tree or shrub species is found. Some questions that you should ask yourself include: what is the stature of the tree or shrub you are observing? Is it a large forest canopy tree or is it found in the forest understory? Can it be found in forest openings or is it on roadsides? Is the tree restricted to ridgetops, or swamps, or is it found along streams?

Answering some of these questions by observing where a plant grows will aid in its identification and provide you with an understanding of its site requirements.



## GLOSSARY OF TERMS USED IN THIS GUIDE

- Achene:** a one-seeded dry indehiscent fruit from one carpel. Usually the seed is not fused to the fruit wall.
- Acicular:** needle-pointed.
- Actinomorphic:** a flower having radial symmetry; regular, more-or-less star-shaped.
- Acumen:** pointed end of a leaf.
- Acuminate:** leaf apex tapering gradually to a point (long-pointed).
- Acute:** sharply-pointed leaf apex (short-pointed).
- Adnate:** fusion of unlike parts, e.g. stamens with petals, or calyx with ovary.
- Adpressed:** flattened.
- Adventitious roots:** those arising from an unusual place other than at the base of the stem.
- Aerial roots:** those growing above ground, as in root climbers, trees with prop roots and strangling roots.
- Aggregate fruit:** fruit which is formed from an apocarpous ovary. Refers to an ovary of a single flower where the pistils are separate, each pistil gives rise to a fruit and they are attached to a single axis.
- Alternate:** leaves arranged singly at different heights on opposite sides of the stem in one plane.
- Ampuliform:** bladder-like.
- Anatropous:** inverted ovule in which opening (micropyle) is close to the funiculus (ovule stalk).
- Androecium:** collective term for male parts of the flower - each stamen is made up of filament, anther and connective.
- Androgynophore:** axis or stalk bearing androecium and gynoecium above the point of perianth (sepals and petals) attachment.
- Annular:** ring-like.
- Anthesis:** opening time of a flower or time when petals are unfolded.
- Anterior:** side of plant organ away from the central axis of the plant.
- Apex:** tip or free end of any plant part.
- Apiculate:** leaf apex abruptly and shortly pointed; or fruit terminated by a short sharp, flexible point.
- Appendage:** part of or expansion attached to the main organ.
- Aril:** appendage or outer covering of seed (growing out of the hilum or funiculus); sometimes appears as a pulpy covering.
- Arillate:** having an aril.
- Aromatic:** strong sweet or fragrant.
- Asymmetrical:** not divisible into equal halves.
- Attenuate:** gradually tapering to a point.
- Auricle:** an ear-shaped appendage, as in the top of a leaf-sheath in grasses.
- Auriculate:** with auricles.
- Awn:** a bristle-like part or appendage.
- Axil:** upper angle between twig or leaf and the stem, or between two veins.
- Axile:** placentation (arrangement of ovules within the ovary) where ovules are attached to the central axis formed by fusion of septa.
- Axillary:** floral buds (or branches) arising at the upper angle of the stem and leaf.
- Bark:** outer protective covering of stem consisting of inner live tissue (inner bark) and outer dead tissues (outer bark).
- Basal:** part of the flower where it is attached; or placentation (arrangement of ovules within the ovary) where the ovules are attached to the stalk side of the ovary.
- Basifixed:** attachment of anthers by their base to the filament.

**Beaked:** with long prominent point.

**Berry:** several seeded indehiscent fruit with a fleshy pericarp and without a hard layer surrounding the seeds. Usually formed from an ovary with axile placentation.

**Bifarious:** arranged in two rows in a single plane (two-rowed).

**Bifid:** divided in two or forked.

**Bifurcate:** forked.

**Bilabiate:** two lobed, often used to describe corolla and calyx.

**Bilobed:** two lobed.

**Bipinnate:** leaflets borne on secondary axes and not directly on the primary leaf axis.

**Bisexual:** both sexes represented in the same flower.

**Blade:** flattened or expanded part of the leaf (see lamina).

**Bracteolate:** bearing secondary bracts or bracteoles at the base of individual flowers. Each flower has two bracteoles.

**Bracts:** a much reduced or modified leaf in whose axil an inflorescence or flower arises.

**Bristle:** stiff, strong hair.

**Bulbous:** bulb-like.

**Buttress:** expanded base of stem, which provides additional support.

**Caducous:** falling off early or prematurely.

**Callosity:** leathery or hard thickening.

**Calyptra:** a hood or lid of an *Eucalyptus* fruit.

**Calyx:** outer whorl of floral parts (sepals) of a flower.

**Cambium:** the zone of cells that is responsible for forming the phloem and the xylem.

**Campanulate:** bell-shaped.

**Capitate:** in a head or aggregation of flowers into a very dense cluster.

**Capitulum:** dense inflorescence comprising an aggregate of usually sessile flowers.

**Capsule:** dry fruit formed from a syncarpous ovary, usually opening at maturity by one or more lines of dehiscence. The line of dehiscence may be along the septa (septicidal) or locules (loculicidal) or an apical pore (poricidal).

**Carpellary:** having a carpel or many carpels.

**Caruncle:** fleshy outgrowth of a seed.

**Caryopsis:** achene with testa (outer wall of seed) and pericarp (fruit wall) fused.

**Caudate:** with leaf apex drawn out into a long point (long-pointed).

**Cauliflorous:** condition where flowers are borne on the main stem.

**Centrifugal:** from the centre towards the periphery.

**Ciliate:** fringed with hairs.

**Cinereous:** ash-coloured; light grey.

**Clavate:** thickened towards free end or club-shaped.

**Columnar:** column-shaped stem, trunk, flower, or fruit, with little or no flaring at base.

**Compound:** made up of two or more similar units.

**Connate:** fusion or union of similar parts: sepal with sepal, petal with petal.

**Connective:** tissue between the two anther lobes in a stamen.

**Cone:** a coniferous fruit that consists of a series of overlapping bracts.

**Conical:** cone-like.

**Contorted:** mis-shaped, twisted.

**Coppice shoot:** a sprout from the stem base arising from dormant buds.

**Cordate:** leaf base heart-shaped.

**Coriaceous:** having a leathery texture.

**Cork:** soft, dead protective tissue.

- Corm:** short, solid, enlarged underground stem in which food is stored.
- Corolla:** inner whorl of floral segments (petals).
- Corymb:** a flat-topped racemose inflorescence, the main axis of which is elongated, but the pedicels of the older flowers are longer than those of the younger flowers.
- Cotyledons:** first leaf or leaves of a seed plant found in the seed. They may form the first photosynthetic leaves or remain below ground.
- Crenate:** scalloped leaf margin.
- Crenulate:** minutely scalloped leaf margin.
- Culm:** the stem of grasses and sedges, usually hollow except at the swollen nodes.
- Cuneate:** leaf base wedge-shaped or triangular with narrow end at point of attachment to petiole.
- Cupular:** having a cup-like structure.
- Cupule:** cup-like structure at the base of fruits, as in some palms, formed by the dry and enlarged floral envelopes.
- Cyme:** broad, more or less flat-topped, determinate flower cluster with central flowers opening first.
- Cymose:** sympodially (growth of axillary shoots after terminal has ceased growing) branched inflorescence.
- Cypsela:** inferior bicarpellary achene as in Compositae.
- Deciduous:** leaves, stipules or a plant part falling after a period of time; shedding.
- Decurrent:** a branching pattern that is not dominated by the main axis. Lateral branching is nearly or equally dominant to the main apical axis (see sympodial).
- Decussate:** opposite leaf arrangement where successive pairs of leaves are at right angles to each other, resulting in four rows of leaves along the stem.
- Deflexed:** to bend or turn downwards or aside.
- Dehiscent:** opening or splitting of a seed or fruit (or anther).
- Deltoid:** triangle-shaped.
- Dentate:** large saw-like toothed leaf margins.
- Denticulate:** finely dentate.
- Dichasial:** cymose inflorescence represented by a false dichotomy with the first flower to open situated between two lateral flowers.
- Dichotomous:** divided into two.
- Diadelphous:** stamens united into two sets.
- Didynamous:** four stamens, 2 long, 2 short.
- Dilated:** expanded or flattened.
- Dimorphic:** having two different forms.
- Dioecious:** having separate male and female flowers on different plants.
- Disciform:** disc-shaped or flat and circular.
- Disc florets:** tubular flowers in the centre of heads of most composites, as distinguished from the peripherally placed ray florets.
- Distichous:** leaves arranged singly at different heights on opposite sides of the stem in one plane (alternate 2-ranked).
- Divaricate:** spreading very far apart; forked.
- Dorsifixed:** stamen where the filament is attached to the back of the anther.
- Dot glands:** circular markings on the under surface indicating an internal secretory structure.
- Drupe:** a fleshy one-seeded indehiscent fruit with the seed enclosed in a stony endocarp.
- Drupaceous:** bearing drupes.
- Elliptic:** oval-shaped where the broadest part is equidistant from both ends.
- Emarginate:** the apex of a leaf that is indented (see notched).

- Embryo:** young plant in the early stages of development still within the seed.
- Endocarp:** inner-most layer of the pericarp, or fruit wall.
- Endosperm:** the tissue with stored food of a seed.
- Entire:** leaf margin continuous, without teeth or scallops.
- Epigynous:** having floral parts positioned above or on the ovary. Refers to floral parts when ovary is inferior.
- Epipetalous:** borne on or arising from the petals or the corolla.
- Excurrent:** the branching pattern of a tree that is dominated by a central apical axis. Often as in the case of palms this axis is unbranched (see monopodial).
- Exocarp:** outer-most layer of the pericarp, or fruit wall.
- Extrorse:** facing outward. Refers to dehiscence of anther when it opens on its outer length.
- Exudate:** mucus, gum or resinous substance that is exuded by the plant.
- Falcate:** sickle-shaped.
- Fibrous:** bark that is very finely fissured and stringy.
- Filament:** the stalk of the stamen.
- Filiform:** thread-like, long and slender.
- Fissured:** grooved or furrowed.
- Flabellate:** fan-shaped venation.
- Flaccid:** limp, floppy.
- Flaky:** broad parts of the bark shedding or coming off.
- Fluted:** fan-shaped base of a trunk, flower or fruit.
- Follicle:** dry dehiscent fruit formed of one carpel opening along one side (the dorsal side or that away from the axis).
- Forked:** divided.
- Foveolate:** having pits or shallow cavities.
- Free central:** refers to placentation where ovules are borne on a central axis that is free from the ovary wall.
- Froned:** leaf of a fern or palm.
- Fruitlet:** small fruit.
- Funicular:** of the stalk or funicle by which an ovule or seed is attached to the placenta of the ovary.
- Fulvous:** with deep yellow-coloured tawny hairs.
- Furrowed:** with narrow to wide parallel cracks, often describing a bark texture.
- Fused:** united.
- Geniculate:** bent like a knee.
- Geocarpic:** having fruits mature underground.
- Geotropic:** growth downwards towards the earth's centre.
- Glabrous:** having a smooth surface without hairs.
- Gland:** secretory structure.
- Gland dotted:** see dot gland.
- Globose:** globular or spherical.
- Glomerate:** in a dense compact cluster or clusters.
- Glume:** a membranous bract at the base of most grass inflorescences or spikelets.
- Gum:** various colloidal materials resulting from the breakdown of plant cells and exuding from the wounds of dicotyledonous angiosperms.
- Gynoeceium:** collective term for the female part of the flower i.e., ovary, style and stigma.
- Gynophore:** stalk supporting the ovary. Elongation of the thalamus or receptacle between stamens and ovary.
- Gynostegium:** column formed by the fusion of stamens, styles and stigma.
- Heartwood:** dead tissue in the central portion of the stem, which does not conduct water.
- Helicoid:** in the shape of a helix, twisted.

- Hesperidium:** the fruit of an orange and other citrus plants.
- Hilum:** the scar or mark on the seed indicating its point of attachment to the placenta.
- Hirsute:** covered with rather rough or coarse hairs.
- Hispid:** covered with stiff bristle-like hairs.
- Hypanthium:** cup-like expansion of the receptacle formed from fusion of floral parts and androecium, on which the calyx, corolla and stamens are borne.
- Hypogynous:** borne beneath or below the gynoecium or ovary, referring to stamens, petals, sepals, and disk.
- Imbricate:** overlapping arrangement of sepals and petals like roof tiles.
- Imparipinnate:** pinnate with an odd terminal leaflet.
- Indehiscent:** fruits that do not release the seeds, instead the whole fruit is shed from the plant.
- Indusium:** an epidermal (outermost layer) outgrowth covering and protecting a sorus (collection of small stalked sporangia) as in ferns.
- Inferior:** position of ovary below the calyx, corolla and stamens.
- Inflorescence:** a flower cluster such as a spike, panicle or raceme.
- Infructescence:** a fruit cluster (originating as above).
- Intercostals:** tertiary veins set parallel to each other between two laterals.
- Internode:** part of the stem between successive nodes.
- Intramarginal:** vein running along the margin of a leaf.
- Involucre:** one or more whorls of small leaves or bracts arising close underneath a flower cluster.
- Keel:** boat-shaped structure formed by union of the two front petals in some Leguminosae; or ridge on the lower side of a leaf as in some Pandanaceae.
- Lacerate:** torn or cut into irregular lobes.
- Laciniate:** cut into narrow pointed lobes.
- Lactiferous:** plants that have laticifers - cells that contain latex that are usually located in the phloem region.
- Lamina:** expanded portion of the leaf (see blade).
- Lanceolate:** lance-shaped or much longer than broad, wide at base and tapering to apex.
- Laterals:** main veins that arise from the midrib, or main secondary veins (see secondaries).
- Latex:** a milky, or clear, sometimes coloured juice or emulsion of diverse composition found in plants that have laticifers - cells that contain latex that are usually located in the phloem region.
- Leaflet:** one small leaf-like part of a compound leaf.
- Leaf scar:** petiole scar or mark left on stem after a leaf has fallen.
- Leaf sheath:** lower part of leaf enveloping a stem or culm.
- Leathery:** (see coriaceous).
- Legume:** the pod of members of the Leguminosae. A fruit dehiscent along both sutures.
- Lemma:** lower of two membranous bracts enclosing a flower of grass. Upper is the palea.
- Lenticel:** ventilating pore on dead bark of stem which appears as a characteristic marking.
- Ligule:** a membranous outgrowth at the junction of blade and leaf sheath or petiole; or small scale on upper surface of leaf base; or a tongue-shaped corolla.
- Ligulate:** with a small expansion or outgrowth at the junction between the leaf blade and the leaf sheath.
- Linear:** long and narrow, the sides nearly parallel (see striate).
- Lineolate:** marked by fine lines or striate.
- Lobe:** any rounded projection of a floral part or leaf.

- Loculicidal:** dehiscing more or less midway between the partitions or septa of the ovary.
- Lodicules:** scales at base of ovary in grasses, representing rudiments of the perianth.
- Marginal:** at or near the edge or border; placentation where ovules are borne on the side of an ovary made up of a single carpel e.g. beans.
- Medullary rays:** parenchyma arranged in ray form and that goes from the pith to the cortex.
- Membranous:** thin tissue, membrane-like.
- Mesocarp:** middle layer of the pericarp or fruit wall.
- Midrib:** main vein of the leaf that is continuous with the petiole.
- Microsporophylls:** leaves bearing the male reproductive structures in ferns and some gymnosperms.
- Monadelphous:** having stamens united by their filaments into one body.
- Monochasial:** cyme reduced to a single flower on each axis.
- Monoeious:** having separate male and female flowers on the same plant.
- Monopodial:** the branching pattern of a tree that is dominated by a central apical axis. Often as in the case of palms the axis is unbranched (see excurrent).
- Mucilaginous:** containing, or composed of mucilage. Widely occurring in plants, hard when dry but capable of absorbing water, swelling and becoming slimy.
- Mucronate:** with short, sharp pointed leaf apex.
- Multiple:** when applied to fruits, an aggregation or collection of fruits formed from the entire inflorescence. Fruits formed from each flower are attached to the swollen, fleshy inflorescence axis.
- Nectariferous:** producing nectar or having nectar secreting structures.
- Nectary:** nectar secreting gland, often appearing as a protuberance, scale or cap.
- Node:** part of the stem, usually thickened, where one or more leaves are attached.
- Notched:** a leaf apex that is indented (see emarginate).
- Nut:** an indehiscent, one-celled (locule or cavity), one-seeded fruit with a hard, woody pericarp.
- Oblique:** unequal-sided.
- Oblong:** longer than broad with nearly parallel sides.
- Obovate:** reverse of ovate. Leaf where basal part is narrower and broadest part is towards the apex.
- Obtuse:** blunt or rounded apex.
- Ochrea:** fused stipules sheathing around the stem at the node.
- Operculum:** lid, cap or covering flap; lid that protects the bud in *Eucalyptus* formed of sepals and/ or petals.
- Opposite:** when referring to leaves - two leaves per node, one on each side of stem.
- Orbicular:** circular or disc-shaped.
- Ovary:** part of a carpel or gynoecium containing the ovules.
- Ovate:** leaf where basal part is broader and narrower part is towards the apex.
- Ovule:** part of the ovary containing the egg. After fertilization ovule matures into seed.
- Palea:** the upper or inner of the bracts of the floret in grasses, often partly inclosed by the lemma.
- Palmate:** lobed, divided or ribbed as in the fingers of an out-stretched hand.
- Panicle:** a compound racemose inflorescence.
- Papery:** paper-like bark, peeling, thin and membranous.
- Pappus:** a circle or tuft of bristles, hairs or feathery processes modified from the calyx or corolla and persistent in the fruit.
- Papilla:** small fleshy projection.



- Parietal:** arrangement of ovules within the ovary where the ovules are borne on the walls of the uni-locular, one-to many-carpellary ovary.
- Pedicel:** stalk of a flower.
- Peduncle:** stalk of an inflorescence.
- Peeling:** narrow, long parts of the bark shedding or coming off.
- Peltate:** petiole attached to blade of leaf at its centre inside the margin (attached to the centre like the inside of an umbrella).
- Pendant:** drooping, hanging.
- Pendulous:** drooping, hanging downwards.
- Perianth:** corolla and calyx.
- Pericarp:** wall of ripened ovary or fruit wall.
- Perigynous:** borne or arising from around the ovary and not beneath or above it.
- Persistent:** remaining attached until mature or for an unusually long period.
- Petal:** one unit of the inner floral whorl or corolla.
- Petiole:** leaf stalk (petiolate - with a petiole).
- Pilose:** covered with soft hairs.
- Pinna:** single leaflet of compound leaf (plural, pinnae).
- Pinnate:** having leaflets on either side of a leaf axis.
- Pisiform:** pea-shaped.
- Pistil:** unit of gynoecium, comprising the ovary, style and stigma. When comprising only one carpel it is a simple pistil.
- Pistillate:** flowers with functional pistils and no functional stamens.
- Placentation:** arrangement of ovules within ovary (axile, marginal, parietal, free central, basal).
- Planar:** leaves arranged such that they are on either side of the stem and at one level.
- Platy:** a bark surface that comes off in small relatively circular pieces.
- Plicate:** folded like a fan.
- Pneumatophores:** roots that protrude vertically above the soil surface. Common in some mangroves.
- Pod:** a one-celled, one-to many-seeded fruit formed from a superior ovary with a single carpel and splitting into two valves at maturity.
- Pollen:** spores or grains borne by the anther, containing the male gamete.
- Pollinia:** mass of pollen organized as in orchids and asclepiads (milk weeds).
- Polygamodioecious:** species that are functionally dioecious, but have a few flowers of the opposite sex or a few bisexual flowers on all plants at flowering time.
- Polygamous:** bearing unisexual and bisexual flowers at the same time.
- Pome:** a fruit like an apple or pear, in which most of the edible part is the enlarged axis of the flower, rather than the ovary.
- Pomiform:** apple-shaped.
- Prickles:** rigid, stiff hairs.
- Prop-roots:** roots arising from the basal part of the stem providing additional support (see stilt roots).
- Pseudostem:** false stem made of sheathing bases.
- Pubescent:** covered with short soft hairs.
- Puberulous:** covered with fine hair, scarcely visible to the unaided eye.
- Pulvinus:** swollen petiole or rachis base which is responsive to vibrations and heat.
- Punctate:** with coloured or translucent dots or depressions or pits.
- Pustular:** blistery, usually minutely so.
- Pyrene:** a small stone of a drupe or similar fruit.
- Pyriiform:** pear-shaped.
- Quadrangular:** four-sided.

- Raceme:** flower cluster with the separate flowers attached by short equal stalks at equal distances along the central stem.
- Rachis:** axis bearing leaflets (or flowers). Petiole of a fern frond.
- Rachilla:** secondary axis bearing leaflets (or flowers) off of a rachis.
- Ray florets:** outer modified florets of some composites with an extended or strap-like part to the corolla.
- Receptacle:** the more or less elongated or enlarged end of flower axis or stalk on which the flower parts are borne.
- Reduced:** become smaller or degenerated.
- Reflexed:** bent over, directed back upon itself, recurved.
- Reniform:** kidney-shaped.
- Resin:** any of various substances with high molecular weight, including turpenes, which are found in mixture in plants. Often exuded from wounds and cuts (callus tissue), and by cells lining resin canals in the xylem, where it protects the plant from insects and fungi as it hardens to an amorphous vitreous solid.
- Reticulate:** patterned like a network.
- Retuse:** leaf apex rounded with a notch at the centre (see emarginate).
- Revolute:** margin rolled back towards under surface.
- Rhizome:** an elongated subterranean stem or branch; usually horizontal.
- Rhomboid:** diamond-shaped.
- Rosette:** a cluster of closely crowded radiating leaves arising from a very short stem near the surface of the ground.
- Rotundate:** round or circular.
- Rough:** uneven bark surface.
- Rugose:** wrinkled.
- Sagittate:** like an arrow head - triangular with basal lobes pointed downwards.
- Salverform:** flower shape when the fused corolla or petals form a slender tube basally and an abruptly expanded flat lip at the upper end.
- Samara:** a winged indehiscent fruit.
- Sap:** watery fluid in plants.
- Sapwood:** living outer part of the stem that conducts water and nutrients.
- Sarcotesta:** softer, fleshy outer portion of a testa.
- Scabrid:** somewhat rough.
- Scabrous:** rough or gritty to the touch with a covering of stiff hairs, scales, or points.
- Scales:** flat, small, plate-like structures usually found on the leaf under surface or on the bark.
- Scalariform:** ladder-shaped.
- Scalloped:** (see crenulate).
- Scandent:** climbing by stem, roots or tendrils.
- Schizocarp:** a dry fruit that is formed from an ovary with fused carpels which dehisces by splitting into two or more one seeded parts or mericarps.
- Scorpioid:** curled up at the end like a scorpion tail.
- Scroll-marked:** hammer marked-like shallow depressions on the bark surface.
- Scurfy:** scaly skin; dried outer skin peeling off in scales. Scaly epidermal covering of some leaves.
- Secondary:** lateral veins off of the main midrib.
- Sepals:** separate part of the calyx, usually green and foliaceous (leaf-like).
- Septa:** a partition; referring especially to the partitions in a compound ovary.
- Septicidal:** dehiscent along the septa of the fruit.
- Serrate:** leaf margin toothed with teeth pointing forward.
- Serrulate:** minutely serrate.
- Sessile:** not stalked. Base of plant part directly resting on main axis (unpetiolate).

- Shaggy:** long, irregular pieces of bark that peel off.
- Sheath:** a protective covering. Lower part of leaf enveloping stem or culm.
- Simple:** not branched referring to stems; not compound, referring to leaves.
- Sinuate:** wavy margin.
- Sori:** clusters of sporangia on the back of fern fronds.
- Spadix:** racemose inflorescence with an elongated axis, sessile flowers, and an enveloping spathe.
- Spathe:** large, enveloping leaf-like structure, green or petaloid, protecting a flower cluster or spadix (spathaceous).
- Spatulate:** spoon-shaped, broad and rounded above the middle and tapering gradually to a narrow base.
- Spicate:** having the form of a spike.
- Spike:** an elongated inflorescence bearing sessile flowers.
- Spikelet:** a small spike; the unit of an inflorescence of grasses and sedges.
- Spiny:** thorny or prickly or with stiff, pointed projections.
- Spiral:** consecutive leaves arranged around the stem in all directions.
- Sporangia:** case, capsule, or cell in which spores are produced (e.g. megasporangia).
- Spur:** short, stubby branch with densely crowded leaves and leaf scars.
- Spurred:** having a tubular or sac-like projection from a petal or sepal, containing a nectar-secreting gland.
- Stalk:** a supporting structure as the peduncle (inflorescence stalk), pedicel (flower stalk), or petiole.
- Stamen:** unit of the androecium comprising a filament, anther lobes, and connective.
- Staminate:** flowers having stamens and no pistils - a male flower.
- Staminode:** sterile stamen, which may be reduced or expanded and petal-like.
- Standard:** upper and broad, more or less erect petal of some of the Leguminosae.
- Stellate:** star-like with radiating branches, or in star-like clusters.
- Stem sheath:** enveloping leaf base around the stem.
- Sterile:** lacks functional sex organs.
- Stigma:** receptive part of the pistil or gynoecium where pollen is received or trapped.
- Stilt roots:** (see prop roots) roots arising from basal part of stem and providing additional support.
- Stipitate:** borne on a stalk.
- Stipule:** appendage or leafy outgrowth at base of petiole.
- Stoloniferous:** capable of bearing many creeping stems or runners that develop rootlets and stem and ultimately a new individual.
- Striated:** (see linear) With fine longitudinal lines with channels or ridges.
- Strigose:** with sharp, adpressed straight hairs, stiff and often swollen at base.
- Strobilus:** synonymous with cone and best restricted to conifers.
- Style:** more or less elongated part between the ovary and stigma.
- Subacute:** nearly pointed leaf apex.
- Subclavate:** somewhat club-shaped.
- Subtend:** to be opposite or under.
- Succulent:** fleshy.
- Superior:** ovary free and separate from the calyx, usually lying above the attachment of the calyx to the receptacle.
- Supra-axillary:** above axils.
- Sympodial:** (see decurrent) A branching pattern that is not dominated by the main axis. Lateral branching is nearly or equally dominant to the main axis.
- Syncarp:** multiple or fleshy aggregate fruit.
- Syngenesious:** with united anthers.

- Tertiaries:** small veins arising from the laterals.
- Thryse:** mixed inflorescence with main axis racemose, later axis cymose.
- Tomentose:** densely woolly or pubescent.
- Transverse:** lying across or between.
- Trifoliolate:** three-leaved.
- Trifoliolate:** with three leaflets.
- Tri-pinnate:** compound leaf where leaflets are borne on the tertiary axes; divided pinnately three times.
- Truncate:** appearing as if cut off at the end; leaf base or apex nearly or quite straight across.
- Tuber:** a much thickened, usually short, subterranean stem, as in the potato, or root.
- Tubercle:** small rounded or knob-like extension from the stem or bark.
- Tuberous:** of the nature of a tuber.
- Tubular:** having the form of a tube.
- Two-ranked:** (see alternate, distichous, or planar).
- Umbel:** an umbrella-shaped inflorescence, in which the pedicels radiate from a common point at the summit of the peduncle.
- Undulate:** (see sinuate) leaf margins wavy.
- Unifoliolate:** with one leaf.
- Unisexual:** bearing only one sex, either male or female.
- Urceolate:** urn-shaped.
- Utricle:** a small bladder-like structure; one seeded, usually indehiscent fruit.
- Valvate:** arrangement of petals and sepals where they meet without overlapping.
- Variiegated:** marked with irregular patches of different colours.
- Venation:** arrangement of veins.
- Verrucose:** with minute warts or blunt projections.
- Verticillate:** with flowers arranged in whorls.
- Versatile:** attachment of filament to anthers near the middle, anther moving freely from side to side like a see-saw.
- Vestigial:** imperfectly developed or degenerate.
- Villous:** with long, silky, straight hairs.
- Virgate:** long, straight, slender, and rod-like.
- Viviparous:** germinating while still attached to the parent plant, like in some mangrove species.
- Wart:** firm or hard protuberance.
- Whorled:** with three or more leaves arising at a single node.
- Wing:** a flat expansion of petiole, fruit, or stem.
- Woolly:** having long, soft, more or less matted hairs.
- Xylem:** structures that conduct water and nutrients.
- Zygomorphic:** corollas which can be divided into equal halves in one plane only (see symmetrical).

**Key to the identification of families  
(based on vegetative characters)**

**Note.** Numbers in parentheses denote family code number for species descriptions in the guide.

- 1 Plant a tree fern ..... Cyatheaceae (1)  
Plant not a tree fern ..... 2
- 2 Reproductive structures are strobili,  
not flowers ..... Gymnosperms (cycads & conifers)  
Reproductive structures are flowers ..... Angiosperms (flowering plants)

**Key to gymnosperms (cycads & conifers)**

- 1 Leaves large, pinnately compound, plants not resinous ..... Cycadaceae (2)  
Leaves not pinnately compound, plants resinous ..... 2
- 2 Mature leaves needle-like and in bundles ..... Pinaceae (5)  
Mature leaves not needle-like ..... 3
- 3 Branches whorled, growth strongly monopodial, leaves  
relatively large, often sharp-pointed, not scale-like ..... Araucariaceae (3)  
Branches not whorled, growth not strongly monopodial,  
leaves small, flat, scale-like ..... Cupressaceae (4)

**Key to angiosperms (flowering plants)**

- 1 Leaves usually parallel-veined ..... Monocotyledons  
Leaves with tertiaries forming a network ..... Dicotyledons

**Key to monocotyledons**

- 1 Leaf bases sheathing, forming a pseudostem ..... Musaceae (8)  
Pseudostem absent ..... 2
- 2 Leaves large and compound, inflorescences large,  
enclosed in one or more large spathaceous bracts  
in bud, stems unbranched ..... Palmae (Arecaceae<sup>1</sup>) (9)  
Leaves not compound, inflorescences not enclosed  
in such spathaceous bracts, stems usually branched ..... 3
- 3 Leaves arranged in 3 rows, margins spinous,  
stilt roots present ..... Pandanaceae (10)  
Leaf arrangement and margins not so, stilt roots absent ..... 4
- 4 Plants with many stems, conspicuous  
internodes and swollen nodes ..... Gramineae (Poaceae<sup>1</sup>) (7)  
Internodes and nodes not so ..... Agavaceae (6)

<sup>1</sup>New family names.

**Key to dicotyledons**

- Leaves reduced to scales, twigs green, slender,  
 jointed and finely ribbed or striate ..... Casuarinaceae (28)  
 Leaves normal, twigs not so—see Table 1: select appropriate group to continue

**TABLE 1 - Key to dicotyledon groups**

Leaf arrangement	Leaves simple		Leaves compound	
	Stipules Present	Stipules Absent	Stipules Present	Stipules Absent
Alternate or spiral	Group A	Group B	Group G	Group H
Opposite or Subopposite	Group C	Group D	Group I	Group J
Whorled	Group E	Group F	—	—

**Key to Group A**

Leaves simple, alternate or spiral, stipules present

- 1 Milky white sap present ..... Moraceae, Euphorbiaceae  
 (*Euphorbia*, *Excoecaria*, *Hevea*, *Manihot*) (61; 46)  
 Milky white sap absent ..... 2
- 2 Reddish, orange or yellow sap present  
 when stem is slashed ..... Bixaceae (21)  
 Cochlospermaceae (32)  
 Reddish, orange or yellow sap not present when stem is slashed ..... 3
- 3 Stipules fused with petiole, enclosing young parts ..... Dilleniaceae (40)  
 Stipules not fused with petiole ..... 4
- 4 Leaves with distinct intramarginal veins ..... Ochnaceae (68)  
 Leaves without intramarginal veins ..... 5
- 5 Glandular pits at vein axils on leaf undersurface ..... Elaeocarpaceae (43)  
 Glandular pits absent ..... 6
- 6 Leaf margin serrate, dentate or crenate, not entire ..... 7  
 Leaf margin entire ..... 16
- 7 Leaves 3-5 veined at base ..... 8  
 Leaves not 3-5 veined at base ..... 9
- 8 Prickles present ..... Rhamnaceae (*Zizyphus*) (74)  
 Prickles absent ..... Rhamnaceae (*Colubrina*), Tiliaceae (92)  
 (*Grewia*, *Muntingia*), Ulmaceae (*Celtis*, *Trema*), (93)  
 Urticaceae (*Boehmeria*, *Debregeasia*) (94)

- 9 Trunk and branchlets bearing spines ..... Flacourtiaceae (*Flacourtia*, (47)  
*Scolopia*), Rhamnaceae (*Scutia*) (74)  
 Trunk and branchlets unarmed ..... 10 (see key to cluster 1)

### Cluster 1—flower description

- 10 Stamens more than ten ..... 11  
 Stamens ten or less ..... 14
- 11 Filaments free ..... Flacourtiaceae (*Homalium*, *Hydnocarpus*) (47)  
 Rosaceae (*Prunus*, *Pyrus*) (76)  
 Filaments united at base or along their length ..... 12
- 12 Filaments united forming a tube ..... Malvaceae (*Hibiscus*) (57)  
 Filaments united not forming a tube ..... 13
- 13 Ovary inferior ..... Lecythidaceae (*Careya*) (52)  
 Ovary superior ..... Euphorbiaceae, Flacourtiaceae (46; 47)
- 14 Stamens ten ..... Sterculiaceae (*Helicteres*, *Pterospermum*) (88)  
 Stamens less than ten ..... 15
- 15 Filaments free ..... Urticaceae (*Villebrunea*) (94)  
 Filaments basally united ... Euphorbiaceae, Rhamnaceae (*Rhamnus*) (46; 74)
- 16 Twigs with stipular thorns ..... Capparidaceae (*Capparis*) (26)  
 Twigs without stipular thorns ..... 17
- 17 Leaves heart-shaped ..... Malvaceae (*Hibiscus*, *Malvaviscus*), (57)  
 ..... Tiliaceae (*Berrya*) (92)  
 Leaves not heart-shaped ..... 18
- 18 Leaves with golden yellow scales beneath .. Bombacaceae (*Cullenia*) (22)  
 Leaves without golden yellow scales ..... 19
- 19 Lamina base or upper end of petiole with  
 2 glandular dots ..... Rosaceae (*Prunus*) (76)  
 Lamina and petiole without glandular dots ..... 20
- 20 Bark resinous ..... Dipterocarpaceae (41)  
 Bark not resinous ..... 21 (see key to cluster 2)

### Cluster 2—flower description

- 21 Stamens more than 15 ..... 22  
 Stamens upto 15 ..... 25
- 22 Filaments free ..... 23  
 Filaments united basally ..... 24
- 23 Carpels free ..... Magnoliaceae (56)  
 Carpels united ..... Flacourtiaceae (*Hydnocarpus*), (47)  
 ..... Rosaceae (*Photinia*) (76)

continued..

24	Ovary superior .....	Euphorbiaceae, Flacourtiaceae ( <i>Hydnocarpus</i> )	(46; 47)
	Ovary inferior .....	Lecythidaceae ( <i>Couroupita, Barringtonia</i> )	(52)
25	Filaments free .....	Ulmaceae ( <i>Gironniera, Holoptelia</i> )	(93)
	Filaments united at least partly .....	26	
26	Filaments united into a tube .....	Erythroxylaceae	(45)
	.....	Sterculiaceae ( <i>Heritiera, Sterculia</i> )	(88)
	Filaments united only basally into bundles .....	Celastraceae ( <i>Bhesa</i> ),	(29)
		Euphorbiaceae, Leguminosae ( <i>Bauhinia, Crotalaria</i> )	(46; 53)

### Key to Group B

Leaves simple, alternate or spiral, stipules absent

- 1 Milky or reddish orange watery sap present in stem ..... 2  
Such sap absent in stem ..... 3
- 2 Sap milky white ..... Apocynaceae (*Cerbera, Plumeria, Thevetia*), Caricaceae, Sapotaceae (14; 83)  
Sap reddish orange ..... Myristicaceae (63)
- 3 Leaf undersurface gland dotted (seen against the light or with a hand lens), and when crushed smells citrus-like ..... Rutaceae (78)  
Leaf without gland dots and no citrus-like smell ..... 4
- 4 Young twigs with leaves of 2 sizes; large normal leaves alternating with smaller deciduous leaves ..... Rhizophoraceae (*Anisophyllea*) (75)  
Leaves of one size only ..... 5
- 5 Leaves 3 veined at base ..... 6  
Leaves not 3 veined at base ..... 7
- 6 Leaves equal-sided at base ..... Boraginaceae (*Cordia*) (23)  
Buxaceae (*Sarcococca*), Hernandiaceae (*Gyrocarpus*) (25; 49)  
Leaves not equal-sided at base ..... Aristolochiaceae (*Apama*) (17)
- 7 Leaves without petiole ..... Goodeniaceae (48)  
Leaves with petiole ..... 8
- 8 Leaf base distinctly cordate ..... Datisceaceae (*Tetrameles*) (38)  
Leaf base not cordate ..... 9
- 9 Leaf under surface white or densely hairy ..... Compositae (*Vernonia*) (34)  
Ericaceae (*Rhododendron*), Lauraceae (*Cryptocarya*) (44; 51)  
Leaf under surface not white nor densely hairy ..... 10
- 10 Leaf when crushed smells of wintergreen ..... Ericaceae (*Gaultheria*) (44)  
Leaf without a wintergreen smell ..... 11
- 11 Leaf arrangement on stem planar ..... Annonaceae (13)  
Leaf arrangement not planar ..... 12



- 12 Leaf lamina with gland dots, dashes or glandular hairs ..... Myrsinaceae (64)  
 Leaf lamina without gland dots, dashes or glandular hairs ..... 13
- 13 Irritant exudate present ..... Anacardiaceae (12)  
 Irritant exudate absent ..... 14
- 14 Leaf less than 3 cm long ..... Aquifoliaceae (*Ilex*), Ebenaceae (15; 42)  
 Leaf more than 3 cm long ..... 15 (see key to cluster 3)

### Cluster 3—flower description

- 15 Ovary superior ..... Combretaceae, Cornaceae, Symplocaceae (33; 36; 89)  
 Ovary inferior ..... 16
- 16 Corolla absent ..... Daphniphyllaceae (37)  
 Corolla present ..... 17
- 17 Corolla zygomorphic ..... Sabiaceae, Sapindaceae (79; 82)  
 Corolla actinomorphic ..... 18
- 18 Hypanthium present ..... Thymelaeaceae (91)  
 Hypanthium absent ..... 19
- 19 Stamens epipetalous ..... Ebenaceae, Solanaceae (42; 85)  
 Stamens not epipetalous ..... 20
- 20 Stamens more than 15 ..... Theaceae (90)  
 Stamens less than 15 ..... 21
- 21 Anthers opening by valves ..... Lauraceae (51)  
 Anthers not opening by valves ..... 22
- 22 Disk or nectaries present ... Olacaceae, Sapindaceae, Simaroubaceae (70; 82; 84)  
 Disk or nectaries absent ..... Icacinaceae, Pittosporaceae (50; 71)

### Key to Group C

Leaves simple, opposite or subopposite, stipules present

- 1 Plants growing only in mangrove habitats and showing vivipary ..... Rhizophoraceae (75)  
 Plants showing no vivipary ..... 2
- 2 Leaves with serrated margin ..... Celastraceae (*Elaeodendron*, *Kokoona*), (29)  
 Chloranthaceae (30)  
 Leaves with entire margin ..... Loganiaceae, Rubiaceae (*Gaertnera*) (54; 77)

### Key to Group D

Leaves simple, opposite or subopposite, stipules absent

- 1 Leaf margins serrate, dentate, crenate or ciliate, not entire ..... Apocynaceae (14)  
 Verbenaceae (some species) (95)  
 Leaf margin entire ..... 2

- 2 Milky, creamy, yellowish or pinkish sap present ..... 3  
 Milky, creamy, yellowish or pinkish sap absent ..... 5
- 3 Depression at petiole base protecting  
 young buds ..... Clusiaceae (*Clusia, Garcinia*) (31)  
 Depression at petiole base absent ..... 4
- 4 Secondary veins closely parallel  
 to each other ..... Clusiaceae (*Calophyllum, Mesua*) (31)  
 Secondary veins not parallel to each other ..... Apocynaceae (*Carissa,*  
*Ervatamia, Pagiantha, Walidda, Wrightia*), (14)  
 Asclepiadaceae (*Calotropis*) (18)
- 5 Leaves with intramarginal vein ..... 6  
 Leaves without intramarginal vein ..... 7
- 6 Undersurface of leaves gland-dotted  
 (seen against the light or with a hand lens) ..... Myrtaceae (65)  
 Undersurface of leaves not gland-dotted ..... Melastomataceae (58)
- 7 Stem spiny or leaves with prickly hairs ..... Acanthaceae (*Barleria*), (11)  
 Nyctaginaceae, Punicaceae (66; 73)  
 Stem not spiny and leaves without prickly hairs ..... 8
- 8 Young twigs quadrangular ..... Lythraceae (*Lagerstroemia*), (55)  
 Melastomataceae (*Memecylon*), Sonneratiaceae, Verbenaceae (58; 86; 95)  
 Young twigs not quadrangular ..... 9
- 9 Negatively geotropic roots present ..... Avicenniaceae (19)  
 Negatively geotropic roots absent ..... 10
- 10 Leaf arrangement planar ..... Monimiaceae (60)  
 Leaf arrangement not planar ..... Lauraceae (*Bielschmidia,*  
 ..... *Cinnamomum*), Loganiaceae (*Fagraea, Strychnos*), Oleaceae, (54; 70)  
 ..... Salvadoraceae, Thymelaeaceae (80; 91)

**Key to Group E**

- Leaves simple, whorled, stipules present ..... see Rubiaceae (77)

**Key to Group F**

- Leaves simple, whorled, stipules absent ..... see Apocynaceae (*Nerium*), (14)  
 Lauraceae (*Actinodaphne, Alseodaphne, Neolitsea*) (51)

**Key to Group G**

Leaves compound, alternate, stipules present

- 1 Leaflets deciduous, rachis and petiole  
 modified to thorns ..... Leguminosae (*Parkinsonia*) (53)  
 Leaflets not deciduous, thorns absent ..... 2
- 2 Leaves trifoliolate ..... Leguminosae (*Butea, Desmodium,*  
*Flemingia, Crotalaria*) (53)

Leaves not trifoliolate but bipinnate, once pinnate or palmate .....	3	
3 Leaves palmate with 4-9 leaflets .....	4	
Leaves not palmate .....	5	
4 Stipule adnate to petiole .....		Araliaceae ( <i>Schefflera</i> ) (16)
Stipule not adnate to petiole .....		Bombacaceae ( <i>Adansonia</i> , <i>Bombax</i> , <i>Ceiba</i> ), Sterculiaceae ( <i>Sterculia</i> ) (88)
5 Leaves bipinnate .....		Leguminosae ( <i>Caesalpinia</i> , <i>Cassia</i> , <i>Delonix</i> , <i>Peltophorum</i> ) (53)
Leaves once pinnate .....	6	
6 Leaflets alternate .....		Leguminosae ( <i>Pericopsis</i> , <i>Pterocarpus</i> , <i>Sophora</i> ) (53)
Leaflets paired .....	7	
7 Leaves with a terminal leaflet .....		Leguminosae ( <i>Gliricidia</i> , <i>Pericopsis</i> , <i>Pongamia</i> ), Burseraceae ( <i>Canarium</i> ) (24)
Leaves without a terminal leaflet .....		Leguminosae ( <i>Cassia</i> , <i>Humboldtia</i> , <i>Saraca</i> , <i>Sesbania</i> , <i>Tamarindus</i> ) (53)

**Key to Group H**

Leaves compound, alternate, stipules absent

1 Leaves tripinnate .....		Moringaceae (62)
Leaves not tripinnate .....	2	
2 Leaves bipinnate .....		Meliaceae ( <i>Melia</i> ) (59)
Leaves not bipinnate .....	3	
3 Leaves trifoliolate .....		Capparidaceae ( <i>Crateva</i> ), Meliaceae ( <i>Walsura</i> ), Sapindaceae ( <i>Allophylus</i> ) (26; 59)
Leaves not trifoliolate .....	4	(82)
4 Leaves pinnate, leaflets alternate .....		Meliaceae ( <i>Dysoxylum</i> ), Proteaceae ( <i>Grevillea</i> ), Sapindaceae ( <i>Harpullia</i> ) (59)
Leaves pinnate, leaflets paired .....	5	(72; 82)
5 Leaves without a terminal leaflet .....		Meliaceae ( <i>Cedrela</i> , <i>Chukrasia</i> , <i>Swietenia</i> ), Sapindaceae ( <i>Nephelium</i> , <i>Pometia</i> , <i>Sapindus</i> , <i>Schleichera</i> ), Simaroubaceae (84)
Leaves with a terminal leaflet .....	6	
6 Leaflet margin serrate .....		Anacardiaceae ( <i>Spondias</i> ), Meliaceae ( <i>Aglaia</i> , <i>Azadirachta</i> , <i>Cipadessa</i> ) (12; 59)
Leaflet margin entire .....		Anacardiaceae ( <i>Lankea</i> ), Connaraceae (12; 35)

**Key to Group I**

Leaves compound, opposite or subopposite, stipules present

Leaves pinnate with terminal leaflet .....	Staphyleaceae ( <i>Turpinia</i> ) (87)
Leaves palmately compound; 3-7 leaflets .....	Verbenaceae ( <i>Vitex</i> ) (95)

**Key to Group J**

Leaves compound, opposite or subopposite, stipules absent

- |   |  |  |      |
|---|--|--|------|
| 1 | Leaf undersurface gland dotted (seen against the light or with a hand lens), and when crushed smells citrus-like ..... | Rutaceae   | (78) |
|   | Leaf without gland dots and no citrus-like smell .....   | 2  |      |
| 2 | Leaves palmately compound .....  | Bignoniaceae ( <i>Tabebuia</i> )   | (20) |
|   | Leaves not palmately compound .....  | 3  |      |
| 3 | Leaves bipinnate or tripinnate .....   | Bignoniaceae ( <i>Jacaranda</i> , <i>Oroxylum</i> )                                | (20) |
|   | Leaves not bipinnate nor tripinnate .....  | Bignoniaceae ( <i>Dolichandrone</i> ,<br><i>Spathodea</i> , <i>Stereospermum</i> ) | (20) |

## 1. CYATHEACEAE

**FAMILY DESCRIPTION - Habit:** tree ferns. Trunks mostly unbranched, covered with hairs or scales. **Leaves:** spiral, generally large, bi-, tri-, quadri-pinnate, rarely simple. Stalk densely covered with hairs or scales or spiny at the base. **Sori** (groups of sporangia): on the under surface of leaflets. Indisium present or absent.

1. *Cyathea crinita*, tree fern (E)/ ginihota (S), N, 5, small tree.

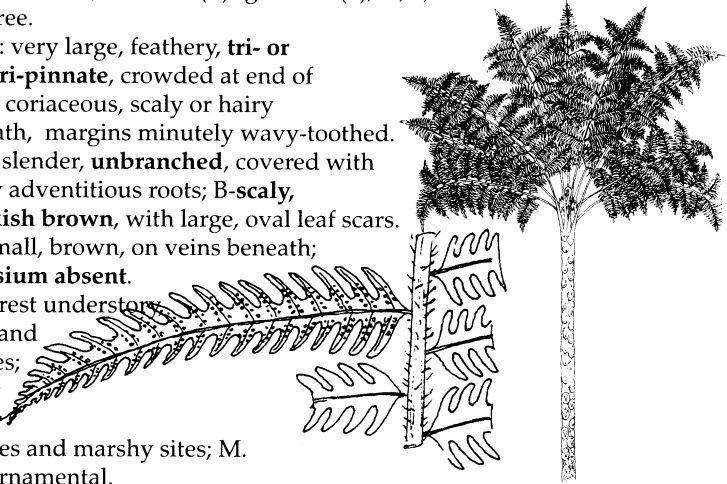
**Leaves:** very large, feathery, **tri- or quadri-pinnate**, crowded at end of stem, coriaceous, scaly or hairy beneath, margins minutely wavy-toothed.

**Trunk:** slender, **unbranched**, covered with many adventitious roots; B-**scaly, blackish brown**, with large, oval leaf scars.

**Sori:** small, brown, on veins beneath; **indisium absent**.

**Site:** forest understory, gaps and fringes; along water courses and marshy sites; M.

**Uses:** ornamental.



2. *Cyathea gigantea*, tree fern (E)/ ginihota (S), N, 5, small tree.

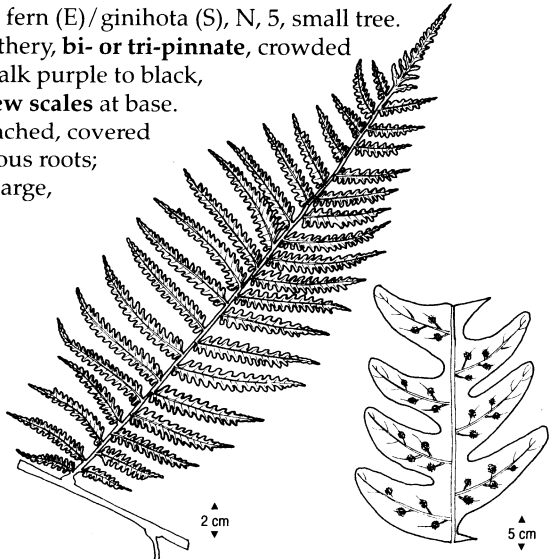
**Leaves:** very large, feathery, **bi- or tri-pinnate**, crowded at the end of stem; stalk purple to black, **glabrous** or with a few scales at base.

**Trunk:** slender, unbranched, covered with many adventitious roots; B-**scaly, brown** with large, oval leaf scars.

**Sori:** small, brown, on veins beneath; **indisium absent**.

**Site:** forest understory, gaps and fringes; along water courses; M.

**Uses:** ornamental.



3. *Cyathea hookeri*, tree fern (E)/  
ginihota (S), E, 2, small tree.

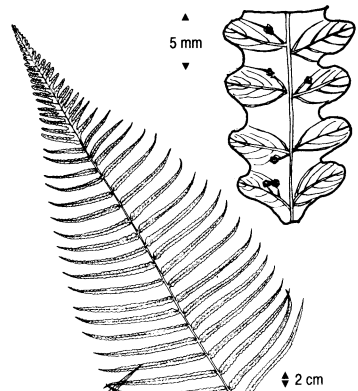
**Leaves:** feathery, **pinnate**, crowded at the end of stem, margins minutely wavy-toothed.

**Trunk:** slender, **unbranched**; B-scaly, **brown**, large oval leaf scars.

**Sori:** small, brown, on veins beneath; **indusium present**.

**Site:** forest understory, gaps and fringes; along water courses; hybridises with *C. sinuata*; M, W.

**Uses:** ornamental.



4. *Cyathea sinuata*, tree fern (E)/  
ginihota (S), E, 2, small tree.

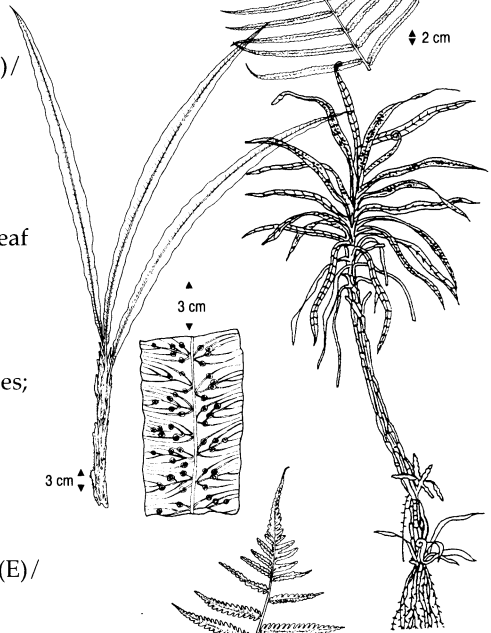
**Leaves:** **simple**, crowded at end of stem, margins minutely wavy-toothed.

**Trunk:** slender, unbranched; B-scaly, brown, large oval leaf scars.

**Sori:** small, brown, on veins beneath.

**Site:** forest understory; in colonies along water courses; hybridises with *C. hookeri*; M, W.

**Uses:** ornamental.



5. *Cyathea walkerae*, tree fern (E)/  
ginihota (S), N, 5, small tree.

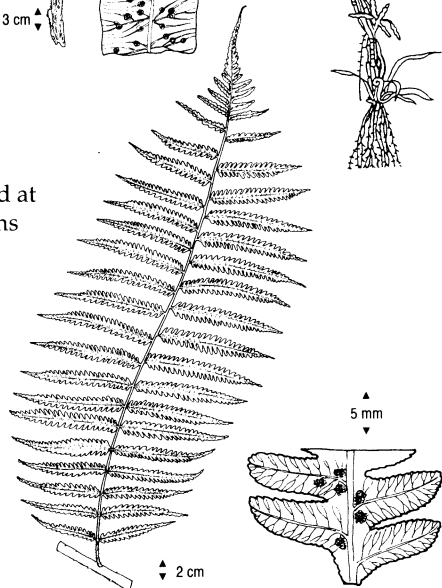
**Leaves:** very large, feathery, **tri- or quadri-pinnate**, crowded at end of stem, coriaceous, margins minutely wavy-toothed.

**Trunk:** slender, **unbranched**; B-scaly, brown, large oval leaf scars.

**Sori:** small, brown, on veins beneath; **indusium present**.

**Site:** forest understory, gaps and fringes; along water courses and in marshy sites; W.

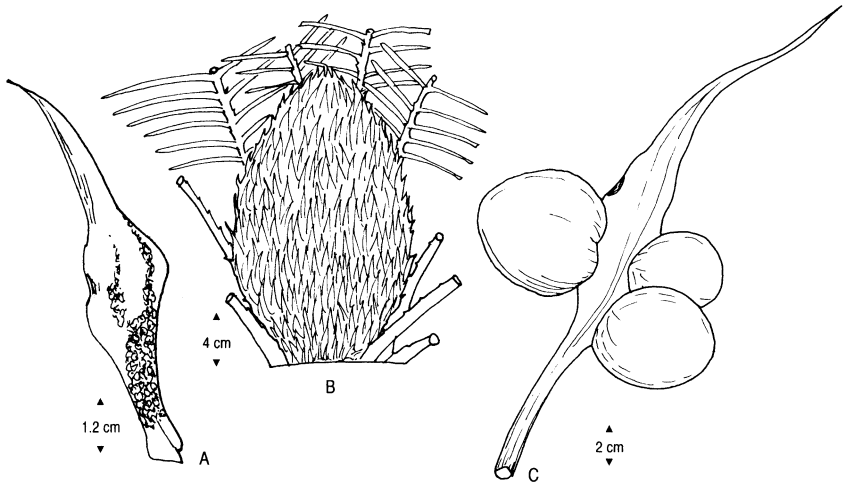
**Uses:** ornamental.



## 2. CYCADACEAE

**FAMILY DESCRIPTION - Habit:** small, palm-like trees or shrubs. Stem thick, tuberous and partly underground, columnar and rarely branched. **Leaves:** pinnate, spiral, crowded at the stem apices. Leaf bases persist on trunk. **Cones:** unisexual, variable in size, plants dioecious. **Fruits:** drupe-like, sometimes brightly coloured.

**REPRODUCTIVE PARTS - MALE CONES:** microsporophylls spirally arranged, with abundant microsporangia. **FEMALE CONES:** megasporophylls usually in a cone (not in *Cycas*), and leaf-like, toothed or lobed. Megasporangia or ovules are large, marginal, naked.



Key: a single microsporophyll (A), male cone (B) and megasporophyll (C) of *Cycas circinalis*.

1. *Cycas circinalis*, madu (S), (T IV:121), N, 3, small tree.

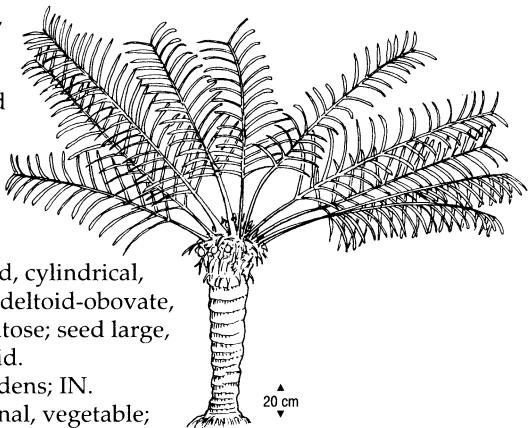
**Leaves:** pinnate; leaflets linear-lanceolate, pointed to sickle-shaped apex; stalk with short deflexed spines at base.

**Trunk:** single or forked; B-glabrous, brown.

**Cones:** male shortly stalked, cylindrical, ovoid; megasporophylls deltoid-ovovate, spiny-tipped, buff tomentose; seed large, pale reddish yellow, ovoid.

**Site:** savannahs, home gardens; IN.

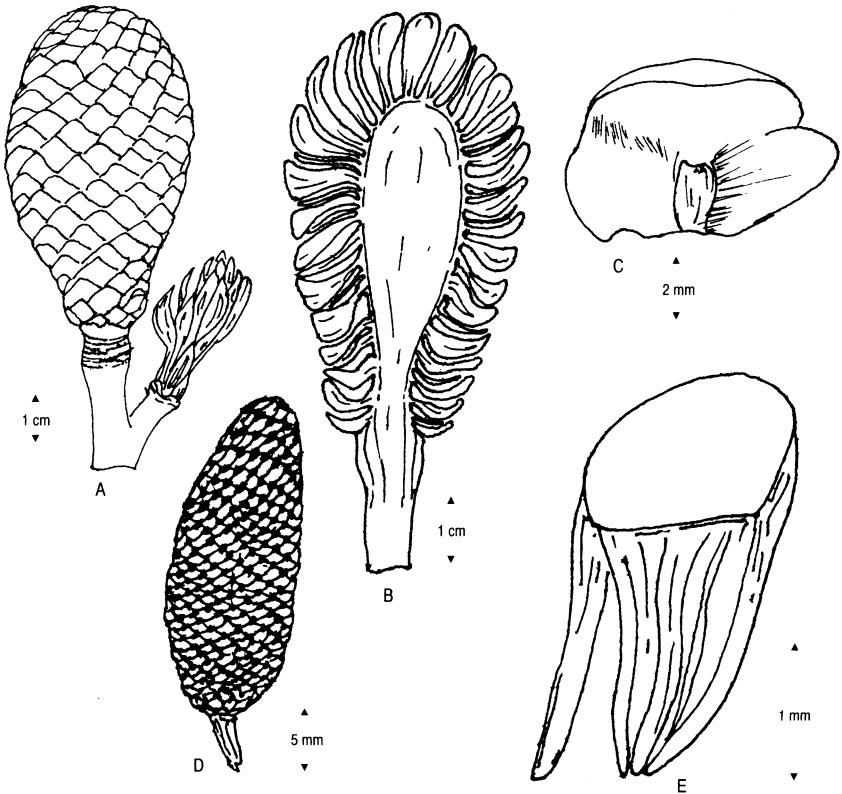
**Uses:** leaves, seeds-medicinal, vegetable; ornamental.



### 3. ARAUCARIACEAE

**FAMILY DESCRIPTION** - **Habit:** large trees, more or less symmetrical branches, often whorled. **Leaves:** alternate, often two ranked, broad to needle-like, sometimes sharply pointed. **Cones:** unisexual; plants dioecious or monoecious. Seeds large, winged or wingless.

**REPRODUCTIVE PARTS** - **MALE CONES:** large, cylindrical, axillary or terminal. Microsporophylls many, spiral. Microsporangia linear, many. **FEMALE CONES:** large, globose, woody, each megasporophyll with 1 ovule, cone disintegrating when seeds mature. Scale adnate to seed (*Araucaria*) or not (*Agathis*).



Key: female cone in full (A), and in longitudinal section (B), a single megasporophyll with seed (C), male cone (D) and a microsporophyll from the male cone showing the microsporangia (E) of *Araucaria* sp.





