



Guide to
MANGROVES
of Sri Lanka



Biodiversity Secretariat
Ministry of Environment & Renewable Energy



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Foreword

Mangrove ecosystem is one of the most important ecosystems in the coastal zone. In Sri Lanka mangrove ecosystems occupy approximately 15,668 ha of coastal lagoons, bays and estuaries. These ecosystems are vital to the biological productivity of Sri Lanka's coastal areas.

In recent years mangroves around the world have declined due to various unplanned development activities such as building of tourist hotels, houses, prawn farms etc. Only few published information is available on mangrove species in Sri Lanka. Therefore the Biodiversity Secretariat of the Ministry of Environment and Renewable Energy published a Field Guide to the Mangroves of Sri Lanka which consist of description and pictures of 20 commonly occurring true mangrove species and few mangrove associate species in 2008. The list of true mangroves species and their status were updated in the National Red List, 2012.

Guide to the Mangroves of Sri Lanka consists of 21 true mangrove species with description and pictures according to the updated list of 2012. This book is prepared by Mr. M.G. Manoj Prasanna (Programme Assistant (Environment) Biodiversity Secretariat, Ministry of Environment and Renewable Energy) and Prof. K.B. Ranawana (Professor in Zoology, of the Department of Zoology, University of Peradeniya) with the Instruction of Mr. N.K.G.K. Nammewaththa, Additional Secretary (Natural Resources), Ministry of Environment and Renewable Energy and Mr. Gamini Gamage, Additional Secretary (Environment and Policy Planning), Ministry of Environment and Renewable Energy.

With the knowledge and experience of working with the mangrove ecosystems, I hope the reader will gain a greater understanding of the significance of mangrove ecosystems and identification of mangrove species.

R.H.M.P. Abeykoon,

Director,

Biodiversity Secretariat,

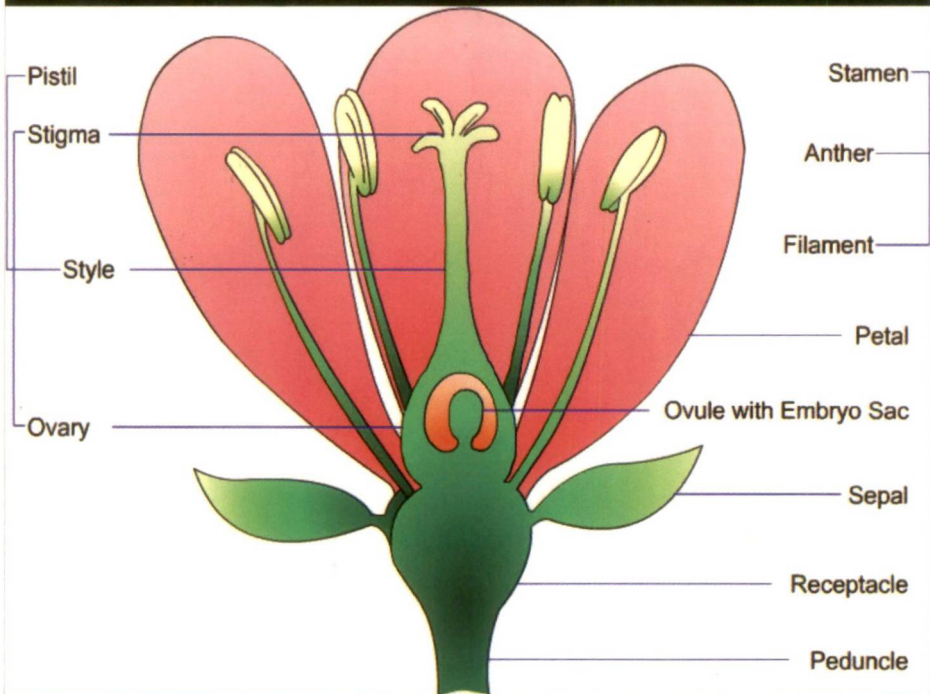
Ministry of Environment and Renewable Energy.



A Seedling of *Cecriops tagal*

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Major parts of typical flower

Introduction

Mangrove Ecosystems and it's Status

The word “Mangrove” is derived from the Portuguese word “Mangue” and a English word “Grove” The corresponding French words are “Manguler” and “Paletuvier” (Macnae, 1968 ; Kethiresan & Bingham, 2001). It is believed that all these words originated from the Malaysian word “manggi manggi” meaning “above the soil”. This word is no longer used in Malaysia but is used in eastern Indonesia to refer to *Avicennia* species (Kethiresan & Bingham, 2001).

Mangrove ecosystem is referred to as Mangrove Tidal Forests (Mephram & Mephram, 1985; Jayasooriya, *et. al*, 2006), Inter-tidal Forests (Saenger, *et. al.*, 1983; Jayasooriya, *et. al*, 2006) or Coastal woodlands (Saenger, 1983; Jayasooriya, *et. al*, 2006).

The term mangrove is simply used to describe a wide variety of taxonomically unrelated tropical trees and shrubs which share common characteristics. It is an assemblage of halophytic, evergreen, woody plants and shrubs which live between the sea and the land that are regularly flooded by tides (Miththapala, 2008). The mangrove environment exists in conditions of high salinity, extreme tides, strong winds, high temperature and muddy, anaerobic soils. Mangroves are the only group of plants which have highly developed morphological and physiological adaptations for those extreme environmental conditions (Kathiresan & Bingham, 2001).

Mangroves perform a vital ecological role, providing habitats for a wide variety of species and mangrove forests together with their adjacent intertidal environments are among the most productive ecosystems on earth and play a vital role as the major primary producer in estuarine

ecosystem (Zara, *et al*, 1996, Bhatt & Kathiresan, 2012). It also supports to increase secondary and detritivorous production within the ecosystem. The muddy and sandy sediments of the mangrove ecosystems are home to a variety of epibenthic, infaunal and meiofaunal invertebrates as well it provides breeding and feeding grounds for a large variety of fish species with good protection (Kathiresan & Bingham, 2001). Mangrove ecosystem have also been considered as low cost and high efficiency wetland system for the treatment of municipal waste water (Liu, *et al*., 2009). The mangrove ecosystem limits the impacts of storm surges and protects coastal areas from storm impacts (Das & Crepin, 2013).

Destruction of mangrove will accelerate release of the large quantities of stored carbon and increase global warming and other climate issues (Ramsar Secretariat, 2001; Kristensen *et al*., 2008; Gilman, *et al*, 2008). According to the products and services provided by the mangrove ecosystem, the value of it has been estimated to be USD 200,000 - 900,000 ha⁻¹(Wells, *et al*.; 2006, Gilman, *et al*, 2008).

Mangrove forests are found in very hostile environments with wide fluctuations of temperature and salinity. The plants found in mangals are generally categorized as true mangroves or core/exclusive mangrove species and mangrove associates. True mangroves can be found only in mangrove areas or the areas containing high salinity and the associates can be found in mangrove areas as well as other freshwater marshes (De Silva & De Silva, 2006).

Mangroves are strictly restricted to the tropical and few warm temperate countries between latitude 30° north and 30° south, with the largest proportion found between latitude 5° north and 5° south (Bhatt &

Kathiresan, 2012). The estimated spatial extent of the mangroves in the world is about 18 million hectares spreading across 123 countries and territories (FAO, 2007). Nearly 75% of world's mangrove ecosystems occur in just 15 countries. About 90% of mangroves are found in developing countries, though they are nearing extinction in 26 countries. Their long term survival is threatened by fragmentation of the remaining ecosystems. Due to this ecosystem services of mangroves will be lost entirely within the next 100 years (Duke, 2007). Globally, mangrove habitats continue to disappear, the annual rate of loss was 0.66% between 2000-2005 (FAO, 2007).

Adaptations of Mangroves

The mangrove environment has some special physicochemical characteristics of salinity, tidal current, winds, high temperature, and muddy anoxic soils. Plants of the environment are able to adapt themselves to particularly all types of adverse conditions (Kathiresan & Bingham, 2001). Mangrove species have developed many morphological and physiological adaptations to survive in the intertidal habitat. In general mangrove species share four important traits that allow them to live successfully in adverse environmental conditions. The most obvious adaptation is the development of aerial roots such as pencil roots (*Avicinnia* sp.), peg roots or pneumatophores (*Sonneratia* sp.), knee roots (*Bruguiera* sp.), plank roots (*Xylocarpus* sp.) and prop roots (*Rhizophora* sp.) (Plate 1) associated with gas exchange in this anaerobic soil conditions of the mangrove environment (de Silva, 2006).

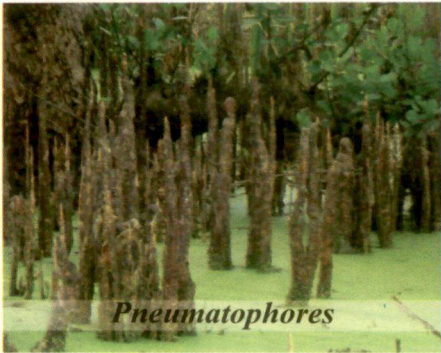
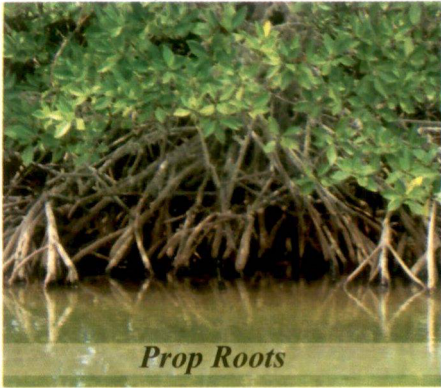


Plate 1. Different root types in mangroves

The fruits or propagules of many mangrove species are viviparous, which means that young individuals start growing leaves and a root while attached to the parental trees. It is a critical morphological adaptation to survive in the muddy habitats. Propagules when dropping at low tide, will be planted by themselves under the parental tree or when dropping at high tide they can move away from the parental trees. This mechanism is an important strategy to maintain the vegetation structure and the composition or the vegetation structure dynamics of the mangrove ecosystem (Plate 2).



Plate 2. Propagules of mangroves

Salt

Salinity plays a vital role on the distribution of species, their productivity and growths of mangrove (Twitlley & Chen, 1998). Changes in salinity are controlled by climate, hydrology, rainfall, topography and tidal flooding. Mangroves generally tolerate higher salinity range when compared to terrestrial plants but tolerance capacity also vary among the different mangrove species. In general, mangrove vegetation is luxuriant in low salinity levels. Experimental evidence indicates that in high salinity, mangroves spend more energy to maintain water balance and iron concentration rather than primary production and growth (Clough, 1984, Kathiresan, 2000). Therefore, mangrove show some adaptations to regulate excess irons. Some mangrove species exclude salt by having significantly impermeable roots which act as an ultrafiltration mechanism to exclude sodium salts from the rest of the plant. Another strategy for coping with high concentrations of salt is the secretion of salt through special salt-excreting glands on leaves (Plate 3).

Some mangroves uptake salt water and store excess salt in old leaves and the bark (Tomlinson, 1994).

Adaptations of Leaves



Leaves of mangroves show many adaptations to survive in harsh conditions. One of the prominent adaptation is thick leaves. It helps to increase the photosynthesis efficiency as well as to store more water. This fleshy structure of leaves is a result of special modification of cells and tissues to store water.

Thick cutinized outer epidermal wall is also present in many mangrove leaves to reduce water loss by evaporation. The stomatal structure of mangroves shows special features to minimize water loss by transpiration. They have a highly developed thick guard cells on both sides of stomatal cells to reduce the size of the stomatal pore when needed.



Plate 4 : Thick Leaves of Mangroves

Distribution in Sri Lanka

Sri Lanka is a continental island of 65,610 km² which is situated in the Indian ocean between latitude 5°.55'- 9°.51' N and longitudes 79°.41.' - 81°.53'. close to south eastern India and share the same continental plate. Mangals are found along the sheltered lagoons and estuaries in Sri Lanka (Kariyawasam, 1998) (Figure 1.2).

The extent of mangals in Sri Lanka was estimated to be between 10,000 ha to 12,000 ha. This is less than 0.1% of the total land area of Sri Lanka (CCD, 1985; Amarasinghe, 2003). In many parts of Sri Lanka mangrove ecosystems are being destroyed at an alarming rate due to construction of

saoltrens, shrimp farming and urban and village expansions. there fore the current extent of mangroves of Sri Lanka could be well below 12,000 ha. (Amarasinghe, 2003). But according to unpublished data of Department of Forest, it was approximately 15,668 ha in 2010. The current annual global rate of loss of mangals vary from 1- 20 % (Guebus, *et. al*, 2005 there fore it is a great challenge to protect the world mangrove community for the future.

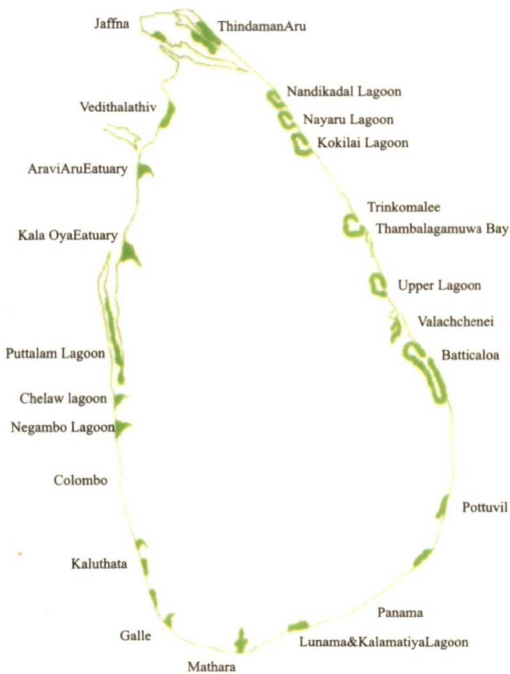


Figure 1.2 Distribution of Mangroves in Sri Lanka (CCD, 1984.)

Vegetation Types of Mangrove Ecosystems

The development of mangrove swamps is a result of substrate, topography and freshwater hydrology as well as tidal action. One can expect several different types of mangroves developing under different sets of these conditions. Five types of mangals are generally recognized in the world: they are; (1) Fringing Mangroves, (2) Over wash Mangroves, (3) Riverrine Mangroves, (4) Basin Mangroves, (5) Dwarf Mangroves (De Silva, & De Silva, 2006).

Fringing Mangroves

Fringing mangroves are common along protected shorelines adjacent to land higher than mean high tide but are exposed to daily tides. It can be seen as relatively thin fringe along the waterways. Because of more prop roots and low energy tides the fringing mangrove can collect more organic matters as they face open wind directly (De Silva & De Silva, 2006).

Overwash Mangroves

Overwash mangroves exist as islands frequently washed by tides every day during the high tides. They are dominated by *Rhizophora* species because of their strong stilt root system that withstands the daily tidal flow and strong waves during periods of heavy seas (De Silva & De Silva, 2006).

Riverine Mangroves

These mangroves are found in estuaries and estuarine creeks, sometime it may extend several miles inland from the river mouth. In riverine mangroves the nutrient status is very high because it can accumulate organic matters from both upland and estuary. Trees grow tall and broad in the riverine mangroves.

They annually add a large amount of organic matter to the environment because of their high productivity. In the riverine mangals the salinity always varies because of the freshwater from rains and seasonal flooding during the wet season (De Silva & De Silva, 2006).

Basin Mangroves

Basin mangroves develop in inland depressions, or basins, often behind fringe mangroves. They are often isolated from all but the highest tides. Flooded water can remain for a long period of time due to the topography of the area. The salinity of the soil is comparatively high and the dominant mangrove species in the basin mangroves are *Avicennia* sp. (De Silva, & De Silva, 2006).

Dwarf Mangroves

These are found in comparatively higher elevations of the coastal fringe. The plant species which constitute the dwarf mangroves are relatively small. The reason being lack of nutrients in the soil so the productivity of the plants also is very low (De Silva & De Silva, 2006). See figure 1.3

Information on mangrove species has been obtained from "Hand book of mangroves in Indonesia" (Ministry of Forestry in Indonesia, JICA, ISME, 1997) and the Botany of mangroves (Tomlinson, 1994)

Description of true mangrove species are in page 14 to 55. Photographs of mangrove associates from page 57 to 63 and beach plants from 65 to 69.

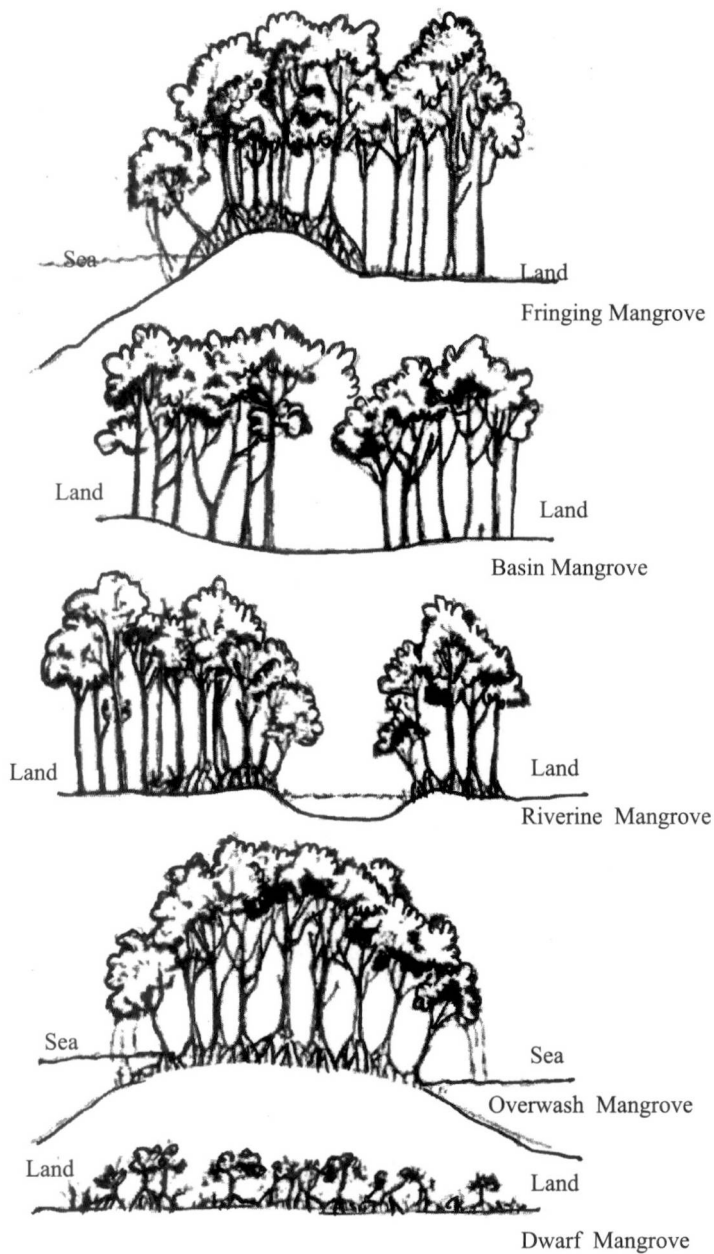


Figure 1.3 : Vegetation Types of Mangrove Ecosystems

Source: Snedaker and Getter (1985)

Key to Identify Mangroves of Sri Lanka

1. A) Two seed leaves present 2
 B) Two seed leaves absent *Nypa fruticans*

2. A) Stilt roots present 3
 B) Stilt roots absent 4

3. A) Peduncle long *Rhizophora mucronata*
 B) Flowers sessile (peduncle very short) ... *Rhizophora apiculata*

4. A) Pneumatophores present 5
 B) Pneumatophores absent 8

5. A) Pneumatophores pencil like 6
 B) Pneumatophores tall and thick 7

6. A) Leaf tips rounded *Avicennia officinalis*
 B) Leaves not rounded *Avicennia marina*

7. A) White flowers *Sonneratia alba*
 B) White flowers with pink stamens *Sonneratia caseolaris*

8. A) Lenticells prominent in the lower parts of stem 9
 B) Lenti cells not prominent in the lower parts of stem 10

9. A) Red flowers *Bruguiera gymnorhiza*
 B) Yellow flowers *Bruguiera sexangula*

10. A) Ribbon roots present 11
 B) Ribbon roots absent 12

11. A) Keel present on the fruit *Heritiera littoralis*
 B) Keel absent on the fruit *Xylocarpus granatum*
12. A) Propagules prominent 13
 B) Propagules absent 16
13. A) Propagules long and straight 14
 B) Propagules thing and short 15
14. A) Calyx present in the middle of the receptacles. *Ceriops decandra*
 B) Calyx in the top of the receptacles *Ceriops tagal*
15. A) Leaf tips pointed *Bruguiera cylindrica*
 B) Leaf tips not pointed *Aegiceras corniculatum*
16. A) Latex present in the leaf and bark 17
 B) Latex absent in the leaf and bark 18
17. A) Thorny trunk present *Excoecaria indica*
 B) Thorny trunk absent *Excoecaria agallocha*
18. A) Leaves larger than 3cm 19
 B) Leaves not larger than 3cm *Pemphis acidula*
19. A) White flowers present 20
 B) White flowers absent *Lumnitzera littorea*
20. A) Flowers with long stalk *Lumnitzera racemosa*
 B) Flowers without long stalk *Scyphiphora hydrophyllacea*



Aegiceras corniculatum

Family: Myrsinaceae
Aegiceras corniculatum

Local name : Hinkadol / AvaryKadol (S), Vitlikanna (T)

General : **shape** : shrub or small tree, height up to 5m, **Root** : Tap root well developed. **Leaf, Arrangement** : Simple alternate to spiral, Blade: Obovate-obolong to obovate, **Apex** : Rounded to emarginated **Size** : 5-10cm long.

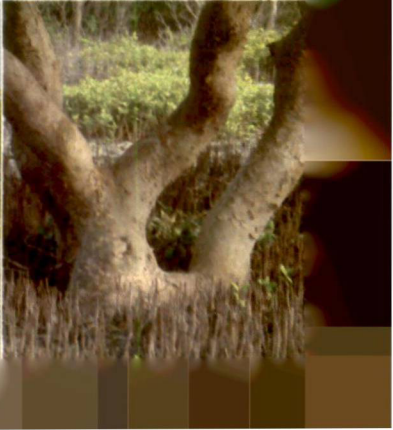
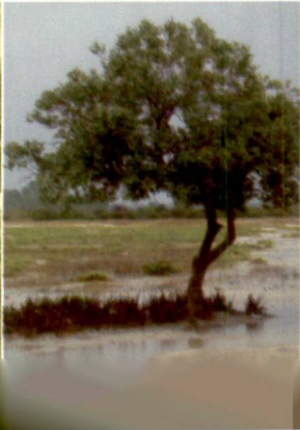
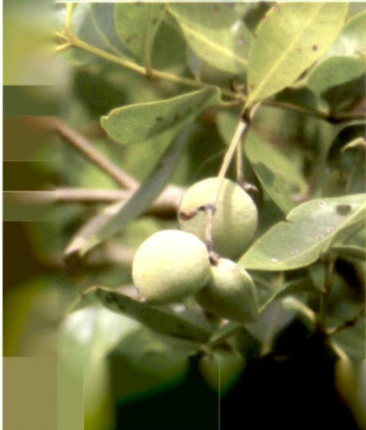
Flower : **Inflorescence**, Simple umbel in the shoot apex or on the axillary branches. **Petal** : 5, white, calyx: 5-lobed, green **Size** : Diameter 0.4-0.5cm, length 0.5-0.6cm, **Other**: 5 stamens opposite to petal, **Colour** : white

Fruit : **Size** : Diameter 0.7cm, length 4-5cm, **Colour** : Green to reddish in maturation, **Surface** : Smooth, Cylindrical, curved hanging fruit, **Calyx** persistent, Crypto Viviparous.

Noticeable characters : Trunk base much thick, with growth of basal roots.

Bark : Smooth, reddish brown or dark gray, salt glands presents on the leaves.

Distribution : Common mangrove species. Found in lagoon fringing as well as riverine mangrove in most of the mangals.



Family: Avicenniaceae

Avicennia marina

Local name : Manda, Mada gas (S), Kannamaram, Venkandal(T)

General : Shape : Low growing or large tree or shrub, height upto 10m,

Roots : Pencil-like pneumatophores. **Leaf, Arrangement :** Simple, opposite decussate. **Blade :** Obovate , **Apex :** Acute, size:3-6cm long

Flower : Inflorescence : Terminal, **Petals :** 4, **Calyx :** 5 lobed, **Colour :** Yellow

Fruit : Size : 12-15mm long, **Colour :** Grey, **Surface :** fine hairy **Seed type:** Crypto viviparous.

Noticeable characters : Tree-well branched. Bark- smooth, yellowish brown. **Leaves :** green above and whitish- yellow beneath and posses salt glands.

Distribution : Could tolerate wide range of salinity. Mainly found in lagoon fringing mangals all around Sri Lanka



Avicennia officinalis

Family: Avicenniaceae

Avicennia officinalis

Local name : Manda (S), Kanna, Upatha (T)

General : Shape : Shrub or tree, height up to 25m, Pencil-like pneumatophores. **Leaf, Arrangement :** Simple, opposite, **Blade :** Obovate or broadly oblong, **Apex :** Rounded, **Size :** 4-12cm long. **Seed Type :** Cryptoviviparous, **Bark :** smooth, Brownish gray

Flower : Inflorescence : Umbel or a panicle, terminal and in the axils of the uppermost leaves, **petal :** 4, Yellow, **Calyx :** 5 lobed. **Size :** Diameter 6-8mm, **Other :** Zygomorphic, sessile flowers in compact heads, 4 stamens.

Fruit : Size : Width 2-2.5cm, Length 2.5-3cm, **Colour:** Pericarp greenish yellow, **Surface :** Densely hairy, wrinkled, **Broadly ovoid,** beaked or heart shape

Noticeable characters : Tree : Well branched. **Bark :** Smooth, yellowish brown. **Leaves :** Dark green and shiny above, slightly hairy beneath, edges slightly curved down, possess salt gland. **Flower larger than the *Avicennia marina***

Distribution : Prefer low salinities. Mainly found in lagoon fringing mangals away from the lagoon mouth



Family : Rhizophoraceae
Bruguiera cylindrica

Local name : Malkadol (S)

General : Shape : Bush or small tree, height up to 6m. **Roots :** Knee roots and buttresses. **Leaf, Arrangement :** Simple, opposite decussate. **Blade :** Lance-ovate. **Apex :** Acuminate. **Size:** 8-10cm. **Seed Type:** Viviparous. **Bark :** Gray, relatively smooth.

Flower : Inflorescence : Axillary, 3-flowered cyme. **Petal :** 8, white, hairy outside. **Calyx :** 8 lobed, yellowish green, smooth. **Size :** Small flower, length 0.8-1.2cm.

Fruit : Size: diameter 0.5-1.0cm, length 10-15cm. **Colour:** Green to purplish green. **Surface:** Smooth, slightly ridged.

Noticeable characters : Smaller tree than other two *Bruguiera* species. Not heavily branched.

Distribution : Restricted distribution. Found in lagoon fringing mangals in the west coast.



Brucea gymnorhiza

Family: Rhizophoraceae

Bruguiera gymnorhiza

Local name : Malkadol (S), Srikanda (T)

General : Shape : Tree, height up to 20m. **Roots** : Knee roots and small buttresses. **Leaf, Arrangement** : Simple, opposite, **Blade** : Ovate, **Apex** : Acuminate, **Size** : 10-15cm, above dark green, lower surface yellowish green, smooth, and thick, no black dots on the surface. **Seed Type**: Viviparous. **Bark** : Dark gray or almost black, rough, lenticled.

Flower : **Inflorescence** : Axillary, single flower **Petal** : White to brown. **Calyx** : 10-14 lobed, red. **Size** : 3-5cm long.

Fruit : **Size** : Diameter 1.7-2.0cm, length 20-30cm. **Colour** : dark green to purple tinted brown. **Surface** : Smooth, Cylindrical.

Noticeable characters : Densely spreading branches, pedicels and flowers reddish colour.

Distribution : Found in most of the mangroves.



Family: Rhizophoraceae

Bruguiera sexangula

Local name : Malkadol (S)

General : **Shape :** Tree, height up to 33m. **Leaf, Arrangement :** Simple, opposite decussate, **Blade :** Elliptic-ablong, **Apex :** Acute, **Size :** 8-10cm. **Seed type:** Viviparous. **Bark :** Dark gray, rough.

Flower : **Inflorescence :** **Petal :** Yellowish brown, densely fringed with hairs, **Calyx :** 10-12lobed, yellow, **Size :** 2cm long, **Other :** Mature calyx tube distinctly ribbed, each petal lobe with 0-2 apical bristles not exceeding the lobe apices.

Fruit : **Size :** Diameter 1.5-2.0cm, length 10cm, **Colour:** Dark green
Surface : Glabrous to slight rough, slightly ridged, **Other :** Capsule or berry with yellowish persistent calyx.

Noticeable characters : Much branched, spreading or diffused, petioles, midribs, pedicels and flowers yellow, knee roots and small buttresses present, prefer water of low salinity and well-drained soil.

Distribution : Occur in most of the mangals.



Family: Rhizophoraceae

Ceriops tagal

Local name : Punkanda, Rathugas (S), Chirukandal (T)

General : Shape : Shrub or small tree, height between 3-5m, **Roots :** thin stilt roots. **Leaf, Arrangement :** Simple, opposite, **Blade :** Ovate-oblong. **Apex :** Rounded, **Size:** 4-8cm long, **Seed type :** Viviparous, **Bark :** Reddish brown.

Flower : Inflorescence : Branched umbel with 3-4 flowers, **Petal :** 5-6, white, emarginated, **Calyx :** 5 lobed, greenish yellow, **Size :** 1cm diameter.

Fruit : Size : Diameter 2-3cm, length 25-30cm, **Colour :** Brownish green **Surface :** Rough, ridged, cotyledonary body reddish when ripe and ready to fall.

Noticeable characters : Tree conical in shape, cylindrical long hanging fruit.

Distribution : Prefer well drained sandy substratum. Mainly found in lagoon fringing mangals. In some mangals *Ceriops* form a very thick single species stand (eg. Rekawa mangal in the south coast).



Ceriops decandra

Family: Rhizophoraceae

Ceriops decandra

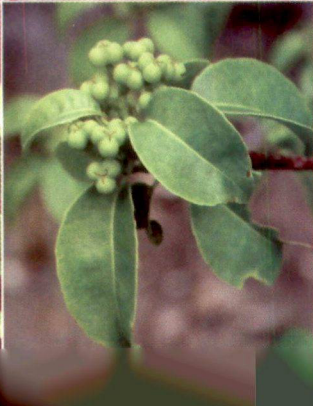
Local name : Punkanda (S), Chirukandal (T)

General : Shape: tree, **Leaves:** large, **Branching:** syllepsis, lateral axes developing in pairs. terminal buds short. No basal sprouting. Buttress, aerial roots and pneumatophores present.

Flower : Stamens not enclosed at anthesis, short filament, Antepetalous stamens are appressed to the subtending petals.

Noticeable character : Have a marked dorsal thickening on the terminal buds Buds are flattened. Hypocotyl sharply ridged.

Distribution : In the tidal zone mixed with other Rhizophoraceae. Very rare species in Sri Lanka presently restricted to a few location in Trincomalee District



Family: Euphorbiaceae

Excoecaria agallocha

Local name : Telakiriya (S), Tilai (T)

General : Shape : Shrub or tree, height up to 20m, dioecious **Root :** Roots generally without any aerial growth, but very often superficial spreading horizontal roots are exposed due to water erosion during tidal flashing. **Leaf, Arrangement:** Simple, alternate, spirally arranged, somewhat cluster to the end of the erect shoot **Blade:** Ovate-elliptic **Apex:** Sub-acuminate with poisonous milky latex.

Flower : Inflorescence : Male Inflorescence; catkin, up 7cm long
Female Inflorescence; mixed cyme **Petal :** Green and white **Calyx :** Yellowish green **Size:** Diameter 0.2-0.3cm.

Fruit : Size : 3 lobed, schizocarp (Fruit like combined 3 balls), Diameter 0.6cm **Colour:** Green **Surface :** Leathery.

Noticeable characters : Woody tree, perennial, partially deciduous, much branched, very dense with dark leaves and spreading branches, bark lenticellate, lenticel prominent on young twigs and also present in mature trunk base; mature trunk base with gall like tumorous growth.

Distribution : All around Sri Lanka in lagoon fringing and riverine mangals.



Family: Euphorbiaceae

Excoecaria indica

Local Name : Muhudu Kaju

General : Shape : Deciduous tree, uniux, high up to 10 -15 meter,

Roots : No above-ground roots, **Leaves :** Simple **Leaves,**

Arrangement : opposite, obovate to broad-elliptic, **Apex:** rounded or shortly pointed, 4cm cm long, 2.5 cm wide,

Flower : Flowers terminal, spike, 5cm long,

Fruits : Spherical, Woody capsule, green to black in color, 3 seeds presence

Noticeable Characters : Occur along river mouth, limited distributed mangrove species in Sri Lanka. Thorns are present in the lower parts of the trunk. Evergreen to semi-deciduous, tree with milky juice

Distribution : Limited distribution in the country. Recorded in only few places in North west coast.



Heritiera littoralis

Family: Sterculiaceae

Heritiera littoralis

Local name : Attona, Etuna, Homediriya (S), Choomuntiri (T)

General : **Shape** : Tree, height up to 16m, **Roots** : Buttresses. , **Leaf, Arrangement, Blade** : Elliptic to obovate, **Apex** : Acute or sub-obtuse **Size** : 15-30cm long **Seed Type** : Normal seed **Bark** : Grayish, scaly, vertically fissured.

Flower : **Inflorescence** : Axillary or terminal, loose panicle, **Petal** : Purple and brown, **Calyx** : 5 lobes, reddish, **Size** : Female 3-7mm long, male flower 5-6mm long, Unisexual flowers, both densely hairy.

Fruit : **Size** : Length 5-7cm, **Colour** : Green to Brown, Surface: Smooth.

Other : Ridge on outer edge resembles a chicken's comb, contains brown, shining, strongly keeled seeds winged on the side.

Noticeable characters : Leaf under surface greyish white, bole up to 1mm in girth, broad buttresses and well developed plank roots. Prefer well drained soil. Occur in dryer parts of riverine and lagoon fringing mangals.

Distribution : Found in both south and west coast mangals. Individual trees show scattered distribution within a mangal.



Lumnitzera littorea

Family: Combretaceae

Lumnitzera littorea

Local name : Rathamilla (S), Tipparuthin (T)

General : **Shape :** tree, height up to 15m. **Leaf, Arrangement :** Simple, alternate, **Blade :** Obovate, **Apex :** Obtuse, rounded or emarginated, **Size :** 4-8cm, **Seed Type :** Normal seed, **Bark :** gray to dark brown, grooved, fissured along the long axis of the trunk

Flower : **Inflorescence :** terminal, spike/racemose, flowers pedicellate **petal :** 4, red, **Calyx :** 5 lobed, green, **Size :** 10-12mm long Less than 10 stamens much longer than the petal

Fruit : **Size :** 9-12mm, ellipsoid-oblong, **Colour :** yellowish green, **Surface :** longitudinally ribbed, Vase-shaped

Noticeable characters : Red flowers, Knee roots

Distribution : Restricted to Madu Ganga mangal in the southern wet zone



Family: Combretaceae

Lumnitzera racemosa

Local name : Beriya (S), Tipparuthin (T)

General : **Shape** : Shrub or small tree, height up to 3m. **Leaf, Arrangement** : Simple, spiral, **Blade** : Obovate, fleshy, **Apex**: Rounded or notched, **Size**: up to 8cm long, **Other**: Leaf base pointed, very short petiole, leaf have salt glands. **Seed type**: Normal seed. **Bark** smooth, **Purplish**.

Flower : **Inflorescence** : terminal or axillary spike/racemose, 2-3cm long, flowers sessile, **petal** : 5 white, **Calyx** : 5 green sepals forming the base of the calyx tube, **Size** : 1cm long. **Other** : 10 stamens, free, arranged in 2 whorls 5 at the base of the petal, five at the base of the sepal teeth, stamens and petal-lobes equal in length.

Fruit : **Size** : Width 3-5mm, length 10-12mm, oblong, narrow at both ends, **Colour** : yellowish green, **Surface** : Glossy, **Vase-shaped**

Noticeable characters : Much branched tree, pneumatophores occasionally developed as looping lateral roots, white flowers

Distribution : Occur in most of the mangals in Sri Lanka



Nypa fruticans

Family :Palmae
Nypa fruticans

Local name : Gin pol (S), Water coconut (E)

General : Shape : Plant with a creeping horizontal stem, **Root :** Roots borne along the lower side of the stem, no prominent aerial roots, **Leaf, Arrangements:** Palm leaf **Blade:** Leaflets linear-lanceolate, **Apex:** Acute, **Size :** Leaf 4-10m long, dull green in colour, mid rib yellowish green. Seed type: Oviparous.

Flower : Inflorescence, Spike with a head-like part at the tip bearing female flowers, and bears the male flowers below staminate flower. Peduncular and rachis bracts, bright yellow when fresh with light green stripes on both sides, 4-6mm long, similar petals Pistillate flower: Lemon yellow **Size:** 25cm (female flower)

Fruit : Size : Diameter 15-20 cm, flattened sideways, **Colour:** Chestnut-brown **surface:** Smooth, shiny

Noticeable characters : The only palm species found in the mangroves. Grow close together. Often form pure stands. Freshwater loving species.

Distribution : Found in riverine manglas, away from river mouths where water salinity is well below the salinity level of estuaries. Occur in south and west coast mangals.



Pemphis acidula

Family :Lythraceae
Pemphis acidula

Local name : Muhudu Wara (S), Kiri-maram (T)

General : **Shape**: shrub or small tree, height: 7-10m, **Bark**: light grey to brown / **Leaves**: decussate, sometimes fleshy, shortly petiolate, narrowly ovate to obvate, densely covered with stiff white hair, **Apex**: bluntly pointed to rounded

Flowers : Hexamerous, perfect, perigynous, distylous, pedicel: 5-10mm, **Calyx** : 5-8mm, **Petals** : 6, Campanulate: greenish red, 12 angled, 6 pointed triangular lobes

Fruit : **Diameter** : 4-5mm, **Shape** : spherical, enclosed in enlarged calyx, with persistent style

Noticeable character : Young twigs angular, densely hairy twigs, irregular branched by syllepsis. Each node supporting an axillary bud, the bud with a lateral series of minute, ephemeral linear colleteres.

Distribution : Found on well organized sandy foreshores, near lagoon mouth and more exposed mangrove associations. Rares species



Rhizophora apiculata

Family : Rhizophoraceae
Rhizophora apiculata

Local name : Kadol (S), Kandal (T)

General : Shape : Tree/shrub, height up to 10m. Maximum height is achieved in riverine mangroves. **Roots :** Stilt roots/Prop roots / **Leaf, Arrangement:** Simple, opposite, **Blade :** elliptical to obvate, **Apex** Acute. **Size :** 10-12cm long, **Seed type:** Viviparous. **Bark:** grayish brown, longitudinally fissured.

Flower : Inflorescence : Axillary, 2-flowered cyme on stout peduncle
Petal : 4, **Calyx :** 4 lobed, greenish yellow, outside reddish, **Size :** 2-3cm.

Fruit : Size : Diameter 1.3-1.7cm length 20-50cm, capsule, **Colour :** Green to Brown, cotyledonary collar when mature, **Surface :** Warty (relatively smooth)

Noticeable Characters : Stem differentiated into nodes and internodes, much branched, leaves comparatively smaller but longer than *Rhizophora mucronata*. Fleshy leaves dark green above, paler and scattered black dots beneath. Common where freshwater influence is strong.

Distribution : Mainly found in riverine mangroves are around the country



Family : Rhizophoraceae

Rhizophora mucronata

Local name : Maha Kadol / Kadol(S), Kandal(T)

General : Shape: Tree, Height up to 10m. **Roots :** Prop roots, Stilt roots.

Leaf, Arrangement : Simple, opposite, **Blade :** Elliptical, **Apex :** Aristate or bluntly, acute, abrupt tooth-like tip **Size :** 10-12cm long Yellowish green leaves. **Seed Type:** Viviparous. **Bark :** Rough, gray to black.

Flower : Inflorescence : Axillary, dichotomous cyme, 4-8 flowers, **Petals :** 4, white, hairy, **Calyx :** 4 lobed, cream yellow to yellowish green, **Size :** Diameter 3-4cm, Length 1.5-2.0cm,

Fruit : Size : Diameter 2-2.3cm, length 50-70cm, **Colour:** Green to yellowish green, **Surface :** Warty, **Other :** Cotyledonary collar yellow when mature when mature hanging hypocotyls.

Noticeable characters : Prop roots descending from all levels of the trunk and branches small black dots scattered on the lower surface of the leaves. Prominent species in lagoon fringing mangroves, always border waters edge . Prefer muddy substratum.

Distribution : Common species found in most of the mangals.



Sonneratia alba

Family: Sonneratiaceae

Sonneratia alba

Local name : Kirala, Yak Kirila(S), Kinnai(T)

General : **Shape** : tree height up to 18m, **Roots** : Pneumatophores, **Leaf, arrangement** : Simple, opposite, **Blade** : Oval-rotundate, **Apex** : Rounded, **Size** : 3-10cm long, **Seed type** : Normal seed **Bark**: Smooth, gray, finely fissured longitudinally.

Flower : **Inflorescence** : 1 to few flowered cymes, terminal or branchlet **Petal** : 6, white, linear, **Calyx** : Tube 6 prominent ridges, **Size** : 2-4cm long, **Other** : Large flowers on very thick pedicel, **Colour** : white

Fruit : **Size** : Diameter 5cm, globous, depressed and flat on top. **Colour** : Green, **Surface**: Smooth, Other supported on the much-enlarged calyx, which forms a cup round the Base, calyx lobes spreading or reflexed in the fruit.

Noticeable characters : Prefer high saline water and soil. Conical pneumatophores are much shorter than *S.caseolaris*. Flowers open during the night and are pollinated by bats.

Distribution : Mostly found in the west coast mangals from Chilaw to Puttalam lagoon and Kalpitiya peninsula. Rare elsewhere.



Sonneratia caseolaris

Family: Sonneratiaceae

Sonneratia caseolaris

Local name : Kirilla, Honda Kiriala (S), Kinnai (T)

General : Shape : Tree, height up to 15m, **Roots** : pneumatophores, **Leaf Arrangement**: Simple, opposite **Blade**: Oblong-oval or roundish, **Apex**: Obtuse or apiculate, **Size**: 6-7cm long, **Seed type**: Normal seed, **Bark**: Pale brown bark, smooth or furrows at maturity.

Flower : Inflorescence: Terminal cyme solitary or few flowered on the outer pendulous twig, **Petal** : 6, red linear, **Calyx** : Tube green with 6 valvate lobes, **Size** : Diameter 8-10cm, **Other** : Petals alternated with calyx teeth, numerous red stamens, **Colour** : pink

Fruit : **Size** : Diameter 6cm, broadly ovoid or subglobose, slightly depressed on top, **Colour** : Green, **Surface** : Smooth, have numerous seeds.

Noticeable characters : Conial shaped pneumatophores arising from horizontal roots, Pneumatophores well developed (up to 1m). Freshwater loving species. Flowers open during the night and bat pollinated. Ripe fruits are used to make a delicious drink.

Distribution : Common in the riverine mangals in the southern and western coasts extending upstream along the river banks.



Scyphiphora hydrophyllacea

Family: Rubiaceae
Scyphiphora hydrophyllacea

Local Name : Kalu Kadol

General : Shape : Shrub or small tree, much branched, high up to 3m
Roots : Not prominent prop roots. **Leaves :** Simple leaves, **Leaf, Arrangement :** opposite, leathery, glossy and obovate, **Size:** 4-9 x 2-5 cm.

Flower : Flowers in clusters, axillary, bisexual, flowers stemless, white; **calyx :** tube 5 mm long, cup shaped at the end of tube, crowned by 4 minute teeth; corolla tube is cylindrical, tinged with red, 2-4mm long, with a rough-hairy mouth; petals are broadly elliptic, 2 x 2.5 mm, **Colour :** white

Fruits : Cylindrical fruits, green, ribbed along its length 8 mm long, tipped remnants of the **calyx** ; fruit contain 4 cylindrical seeds

Noticeable Characters : Occur on mud, sand, and rocky substrates on the landward margin of mangroves or on the banks of tidal waterways. Flowering throughout the year.

Distribution : Limited distribution in the country. Recorded only in Puttalam and Kilinochchi Districts.



Xylocarpus grantum

Family: Meliaceae
Xylocarpus grantum

Local name : Mutti-kadol (S), Kotalai (T)

General : Shape: Tree to 10m, **Leaf, Arrangement:** Compound, alternate, pinnate, leaflets in 1 or 2 pairs, **Blade:** Obovate or elliptic, **Apex:** Obtuse, rounded or emarginated, **Size:** Up to 12cm long, **Other:** Leaves usually with 4 leaflets, leaflets light green, rachis brown, **Seed type :** Normal seed.

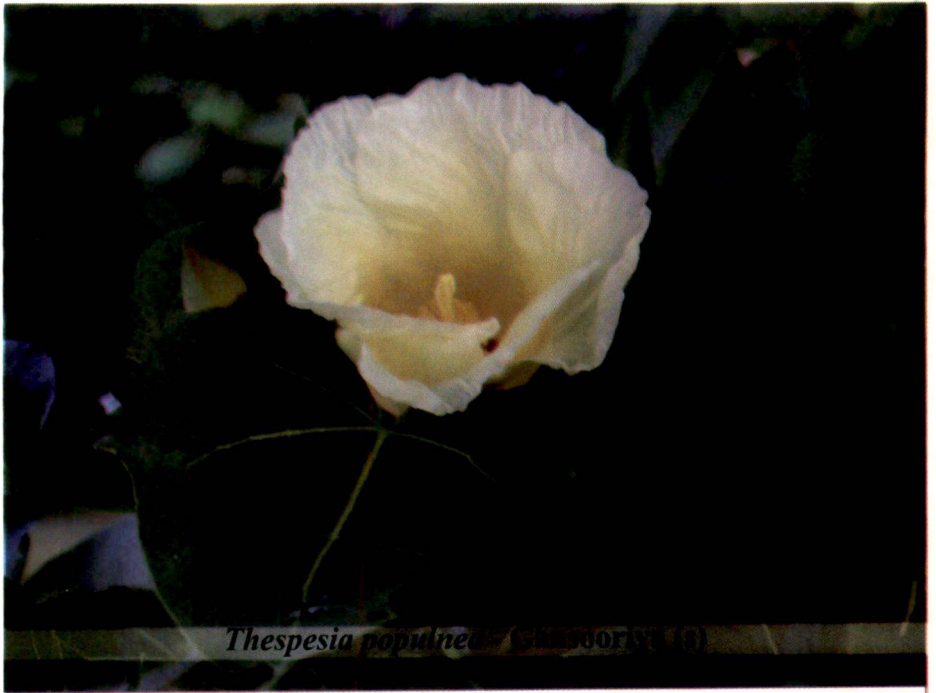
Flower : Inflorescence, Mixed, irregularly branched, without any well developed main axis, three flowers. **Color :** white

Fruit : Size: Diameter 10-12cm, globose, capsule, **Colour:** Brown, **Surface:** Leathery.

Noticeable Characters : Much branched, dark green tree, Bark-reddish brown, thin, smooth and irregularly scaling. Root: Buttresses with above ground, ribbon-like roots (plank roots).

Distribution : Restricted to a few locations in the south and west coasts. Highest number of trees are found in Pambala area of the Chilaw lagoon.

Mangrove Associates
and
Beach Plants



Thespesia populnea - Chasooru (S)



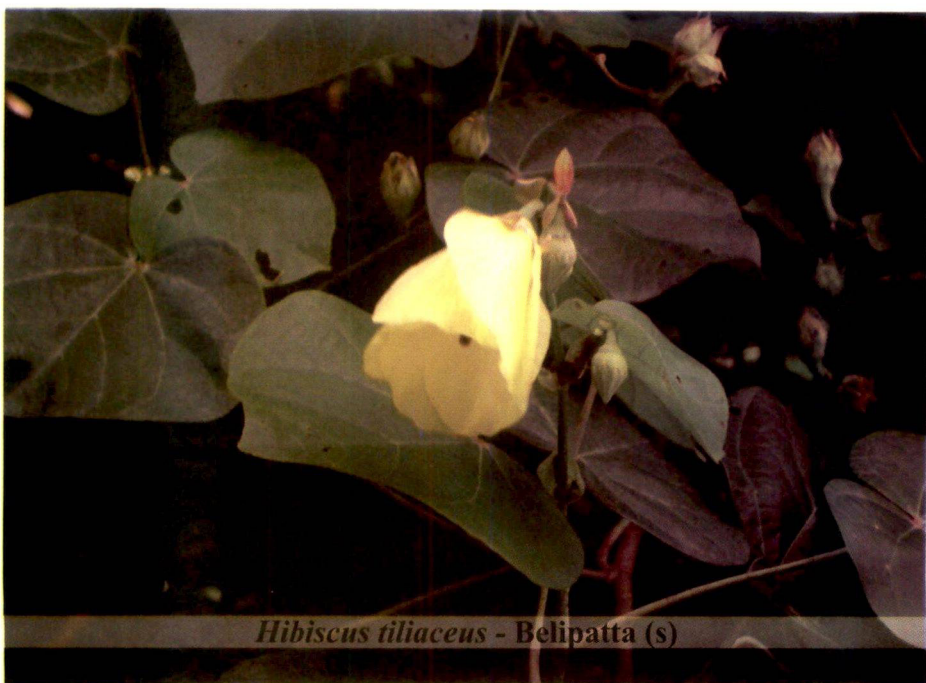
Premna serratifolia - Walmidi (S)



Phoenix zeylanica - Walindi (s)



Cerbera odollam - Gonkaduru (s)







Dolichandrone spathacea - Daga / Diyadagna (s)



Barringtonia asiatica - Mudila (s)



Clerodendrum inerme - Walgurunda (s)



Cynometra iripa - Muhudu naminan (s)

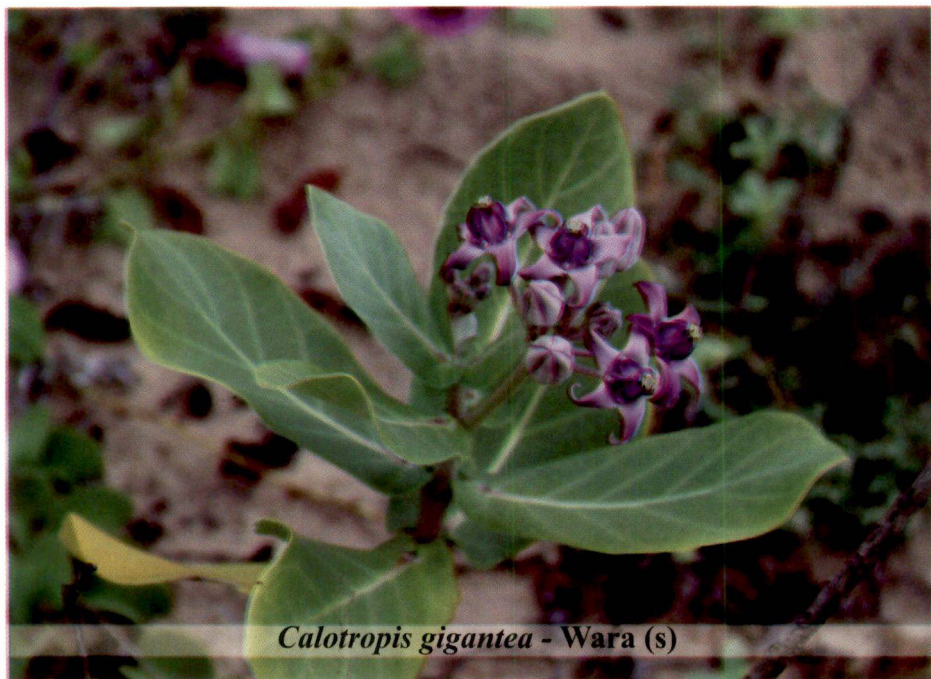
Pic. By K.B. Ranawan



Memecylon umbellatum - Korakaha (s)



Azima tetraacantha



Calotropis gigantea - Wara (s)



Calotropis gigantea - Ela wara (s)



Scaevola taccada - Thakkada (s)



Ipomoea pes-caprae - Binhm (s)





Spurfex littoreus - Maharawana ravla (s)



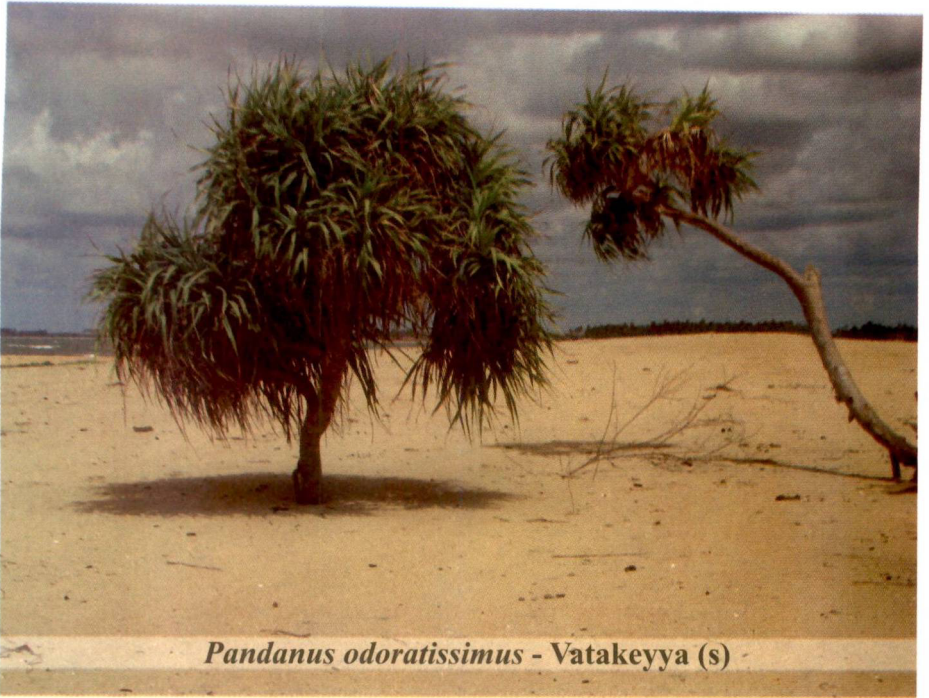
Salicornia brachiata



Suaeda monoica



Sesuvium portulacastrum



Pandanus odoratissimus - Vatakeyya (s)



Hydrophylax maritima

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