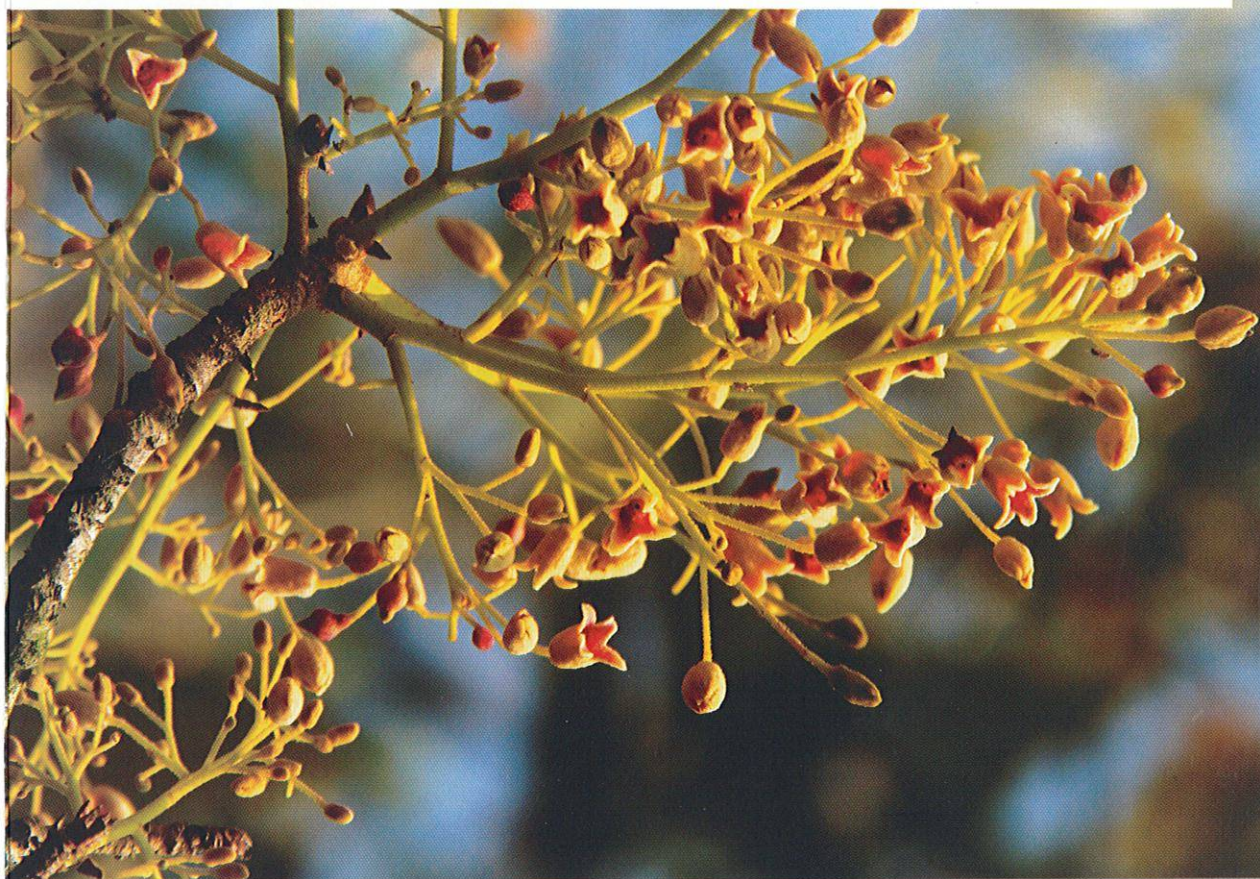




Handbook of selected plant species of the Sundarbans and the embankment ecosystem

Sustainable Development and Biodiversity Conservation in Coastal
Protection Forests, Bangladesh (SDBC - Sundarbans)

Implemented by:
giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



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Mahmood Hossain



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FOREWORD

I consider it a privilege to write the foreword for the volume on the Handbook of selected plant species of the Sundarbans and the embankment ecosystem.

The sustainable management of the Sundarbans has been the crucially important question for the planners, policy makers, naturalists and biologists in the face of predicted climate change to occur. Sundarbans' role in protecting the human settlements and the wider resources in the upper periphery of the coastal districts from sea cyclones and tidal surges is enormous. The humans have inherent curiosity to know the unknown around them; the awe wilderness of Sundarbans is attributed by all of its biota and identification of its biota to whatever extent possible could be regarded as the starting key to the sources of all relevant information. The author of the book Prof. Dr. Mahmood Hossain is one of the few serious and sincere teachers of Khulna University whom, I observed as the former Vice-chancellor of the University to grow in success in winning important international project funding and excellence in research in areas of his expertise.

The aim of this book is to assist those who have stakes in the Sundarbans mangrove to help identify some mangrove plant species. Apparently, though the book does not contain as exhaustive list of the plant species of the forest, a total of 39 mangrove and 11 mainland plant species with quality photographs have been included in the book together with descriptions on adaptations and uses of the plant species; the important thing is that 11 main land species that are planted in the embankment proper and other mangrove species generating on the outer sides of the embankment have been particularly included. Sustainability of the embankment has been an increasingly important question because of lack of plants leading to erosion of the embankment; the identity of the floral species in the embankment would add value to the management efforts of the embankment.

There has been no pictorial publication on Sundarbans plant species as such so as to provide people to identify and know the plant species of the forest whereas the need of such a book is great from the point of view of management of the ecosystem alike. This is an output of the SDBC-Sundarbans project commissioned by German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by German Development Cooperation (GIZ) and Bangladesh Forest Department. To my knowledge this is the first ever attempt to bring out such an important digest on mangrove and mainland plant species with photographs and description on important variables for which the author deserves special thanks.

I believe the book would largely meet its aim in fulfilling the need of people who have stakes in the Sundarbans. I congratulate the author for bringing out such a useful volume.



Dr. Md. Saifuddin Shah

Professor

Fisheries and Marine Resource Technology Discipline
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PREFACE AND ACKNOWLEDGMENT

The Sundarbans is the most important natural mangrove forest of Bangladesh and rich in flora diversity compared to other mangrove forests in the world. This forest ecosystem is dynamic and complex in nature. The goods and services from this forest have been used by the vicinity population from generations. A buffer area of 10 km width from the boundary of the Sundarbans has been identified as Ecological Critical Areas (ECA). These areas have been protected with embankment from saline water intrusion and tidal surges. Plantation of mainland species has been established on the embankment for its stabilization and protection as well. Species composition in the mangroves, embankments and the natural recruitment of mangrove species at the outer side of the embankment is an interesting topic of biodiversity study.

The aim of this book is to assist laypersons, students, researchers, experts and those involved with the management and conservation of the Sundarbans and the nearby embankments with a convenient guidebook for identifying the common plant species in the field on the basis of appearance and habitat type. This book provides high quality photographs along with description, distribution, adaptation, flowering and fruiting period and common uses of trees, shrubs and climbers of the Sundarbans mangrove forest as well as commonly planted tree species on the embankments. It is not possible to include all plants (mainly herbs, grass and climbers) in this small guide and therefore, for plants that are not found in this guide, is recommended to contact with Bangladesh National Herbarium. I hope that this small volume will contribute to identify species and their habitats. Thus it will play a vital role in the conservation and sustainable management of the Sundarbans and nearby embankment ecosystem.

I acknowledge with great thanks the support from Sustainable Development and Biodiversity Conservation in Coastal Protection Forests (SDBC-Sundarbans) project of German Development Cooperation (GIZ). This funding provides extensive field trips and photography. Special thank goes to Centre for Integrated Studies on the Sundarbans (CISS), Khulna University for their logistic support during the field trip by providing the water vessel (ML Otter). I also acknowledge the cooperation of Conservator of Forest, Khulna Circle, Khulna; and Divisional Forest Officer (DFO), of Sundarbans West Forest Division and Sundarbans East Forest Division in all aspects of the project.

I am very much grateful to Dr. Md. Khairul Alam for his meticulous comments on the manuscript. I would like to especially thank Dr. Karsten Schroeder, Md. Abdullah Abraham Hossain and Dr. Uwe Scholz for their cordial support during the planning of this work. I also acknowledge the cooperation of Ms. Ottilie Mooshofer, Mr. Eric Lacroix, Mr. Panchanon Kumar Dhali. I would like to thank Dr. Sheikh Julfikar Hossain, Dr. Md. Golam Rakkibu, Dr. Abdus Subhan Mollick, Mr. Md. Sharif Hasan Limon, Mr. Md. Rabiul Alam, Mr. Mohammad Raqibul Hasan Siddique and Mr. S.M. Rubaiot Abdullah for their continuous inspiration. Thanks also go to Mr. Sanjoy Saha and Mr. Uzzwal Kundu for their enduring support during the field work.

Mahmood Hossain

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INTRODUCTION

The term “mangrove” refers to an ecological group of evergreen plant species belonging to several families, that shows similarity in their physiological characteristics (succulent leaves, lenticels, coping with excess salt: salt gland and secretion, salt balance, selective ion transport) and structural adaptations (buttress, pneumatophore, knee roots, prop roots, aerial roots and viviparous seeds) to a similar habitat influenced by the tidal inundation in the tropical and subtropical sheltered coastline (Saenger et al., 1983; Ball, 1988; Ricklefs and Latham, 1993; FAO, 1994; Field, 1995).

There are about 114 mangrove plants species that belong to 66 genera and 43 families (Tomlinson, 1986). Mangroves are widely distributed to the regions between 30° north and south of the equator and some extend to the north in Bermuda (32°20' N) and Japan (31°22' N) and to the south in Australia (38°45' S), New Zealand (38°03' S) and the east coast of South Africa (32°59' S) (Spalding et al., 1997). Distribution of world mangrove forest can be divided into two regions. The Indo-Pacific region includes East Africa, Red sea, India, Southeast Asia, Southern Japan, Philippines, Australia, New Zealand and Southern Pacific Archipelago. The west Africa-America region includes Atlantic coast of Africa, The Americas, Pacific coast of tropical America and Galapagos Island. Indo-Pacific region is much higher in floral diversity than the West Africa-America region (Walsh, 1974; Spalding et al., 1997).

Mangroves are economically and ecologically important as a natural renewable resource (Field, 1995). They are the sources of wood and non-wood forest products, including timber, fuelwood, charcoal, pulp, fodder, thatch, honey, wax and medicine (Aksornkoae, 1993; Field, 1995; FAO, 2003). Several commercially important fish, shellfish species and marine animals are known to spend at least part of their life cycle such as feeding, breeding and nursery grounds in mangroves (Heald and Odum, 1970; MacNae, 1974; Mattes and Kapetsky, 1988). Moreover, mangroves provide shelter and habitat for diverse wildlife particularly, avifauna and mammals but relatively few ones live there permanently and even few ones are restricted (Liem and Haines, 1977; FAO, 1994). It helps to stabilize shorelines in coastal streams and estuaries by protecting them against tidal bores and soil erosion due to wind, waves and water currents. Mangroves entrap the upland runoff sediments thus protecting nearshore reefs and reducing water turbidity (Aksornkoae, 1993; Hegazy, 1998; FAO, 2003; Mahmood et al., 2005). Mangrove forest also acts as windbreaker against the storms, especially in countries, which are frequently attacked by strong winds and cyclones, such as the Philippines, Vietnam, Bangladesh, India and Australia (FAO, 2003). Nutrients and heavy metals are found to sink in the mangrove forest and result in reduction of excessive amounts of pollutants (Lacerda, 1998; Mahmood et al., 2001; MacFarlane and Burchett, 2002).

The total area of world mangroves is about 15 million hectares that are distributed in 100 countries (FAO, 2003). Bangladesh contributes about 4% of the world mangrove forest and placed at the sixth position in terms of area coverage. Total mangrove area in Bangladesh is about 635,586 hectares, of which 618,586 hectares is naturally growing (Sundarbans, Chakaria Sundarbans and scattered mangroves) and 17,000 ha is manmade mangrove (coastal afforestation) (Hoque and Datta, 2005). The Sundarbans is the largest single continuous mangrove forest in the world spreading over the southwestern part of Bangladesh and West Bengal state of India on the delta of the Ganges, Brahmaputra and Meghna Rivers. Presently, Sundarbans covers proximately one million hectares that extending from the Hooghly River in India to the Baleswar River in Bangladesh. In Bangladesh, it is located between 21°30' and 22°30' North and 89°00' and 89°55' East that covers 600,386 hectares, of which 4,11,230 hectares is forest area and 1,89,156 hectares of water bodies (rivers, channels and creeks) (Iftekhar and Saenger, 2008). This forest has been administratively classified as reserved forest and has been managed systematically for more than 130 years by the Forest Department. The Sundarbans was declared as Ramsar site no. 560 in 1992 and the area includes three wildlife sanctuaries encompassing approximately 140,000 hectares and these wildlife sanctuaries were declared a “World Heritage site” by UNESCO in 1997 (Siddiqi, 2001).

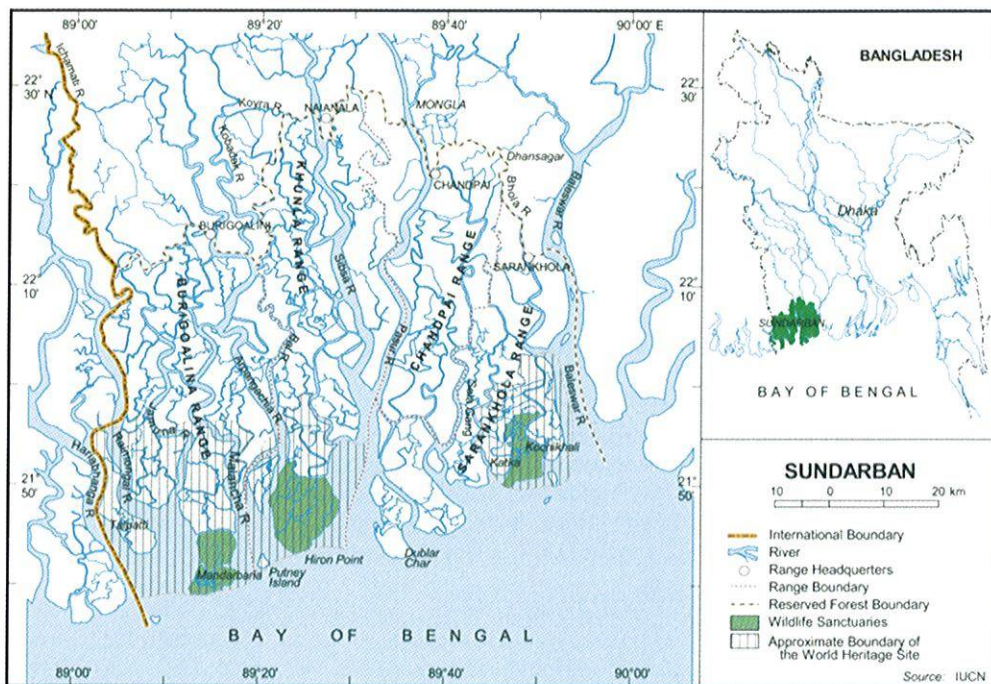


Figure: Sundarbans mangrove forest of Bangladesh

The Sundarbans is almost flat and maximum ground elevation is about 3 m above the mean sea level. This forest is cross crossed by a complex network of rivers, canals and creeks. The width of rivers varies from hundred meters to few kilometer; depth of the rivers varies from place to place. Major contributory rivers of Bangladesh Sundarbans are Madhumati-Balashwar, Gorai-Rupsha-Pussur, Kobadak-Sibsha and Jamuna-Ichamati systems, most of which are distributaries of the river Ganges. The hydrology of the Sundarbans is dominated by the freshwater flows which exhibit very high seasonal variation in their discharge and tides ranging in height from 2 m to 5.94 m. Tidal influence extends to more than 50 km inland from the shoreline and surges increase considerably during the cyclonic storms. The freshwater flow from the rivers and the tidal ingress result in a gradient of salinity that varies both spatially and temporally. In general, the salinity is higher nearer the coast and the water is nearly fresh on the inland side limit of the Sundarbans. Furthermore, salinity found to decrease from west to east of this forest. Based on the degree of salinity, the Sundarbans has been divided into three salinity zones, less saline (salinity <2 dS m^{-1}), moderately saline (2-4 dS m^{-1}) and strongly saline (>4 dS m^{-1}) (Siddiqi, 2001).

This mangrove forest is home to an estimated about 505 species of wildlife, including 355 species of birds, 49 species of mammals, 87 species of reptiles, 14 species of amphibians as well as emblematic species such as the Bengal Tiger. Additionally, there are more than 300 species fish, which includes 237 species of finfish, 38 species of shellfish and 34 species of molluscs; and about 234 species of flora (Siddiqi, 2001). Globally, angiosperm diversity is low in mangroves as well as in the Sundarbans, but this picture changes drastically when associated species are included. Prain (1903) identified a total of 334 species of plants from the Sundarbans and adjoining areas while, Chaffey and Sandom (1985), and Hussain and Acharya (1994) recorded about 66 and 123 species of flora respectively for the Bangladesh Sundarbans. However, at least 53 mangrove species found to exist in the indo-pacific region and 28 species in the Bangladesh Sundarbans (Tomlinson, 1986). Species of Rhizophoraceae and Avicenniaceae generally dominate most of the mangrove forest in the world, but the Sundarbans has the greatest abundance

of Sterculiaceae and Euphorbiaceae. Species composition, distribution of plant species and vegetation dynamics in the Sundarbans is heterogeneous that seems to be controlled by various environmental factors such as coastal physiography, elevation, climate, current and wave, salinity, dissolved oxygen, soil and nutrients (Iftekhhar and seanger, 2008). The floristic elements of the Sundarbans can be divided into exclusive mangrove species and mangrove associates. *Aegiceras corniculatum*, *Avicennia officinalis*, *Bruguiera sexangula*, *Ceriops decandra*, *Excoecaria agallocha*, *Heritiera fomes*, *Kandelia candel*, *Lumnitzera racemosa*, *Nypa fruticans*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Sonneratia apetala*, *Sonneratia caseolaris*, *Xylocarpus moluccensis*, *Xylocarpus granatum* are the major species of the Sundarbans. But, *H. fomes*, *E. agallocha*, *C. decandra* and *S. apetala* dominate this forest (Siddiqi, 2001; Hoque and Datta, 2005). Embankments were constructed along the river and canal banks of the Ecological Critical Areas (10 km width from the boundary of the Sundarbans) for the protection of main land from tidal inundation and surges. Different government and non-government organizations and the local people planted non-mangrove tree species on the embankments for its stabilization. The common tree species are *Albizia lebbeck*, *Albizia procera*, *Albizia richardiana*, *Azadirachta indica*, *Limonia acidissima*, *Moringa oleifera*, *Pithecellobium dulce*, *Samanea saman*, *Swietenia macrophylla*, *Terminalia arjuna* and *Vachellia nilotica*.

This book will help to identify the common plant species of the Sundarbans and its nearby embankments. It has arranged plant species alphabetically under category of mangrove and non-mangrove types. Each species has been described with scientific, local, english and family name, ecology, distribution, form, common uses, adaptation and flowering and fruiting periods; and provided with high quality photographs of leaves, flowers, fruits, bark and special features for quick identification.

MANGROVE SPECIES

Acanthus ilicifolius L.

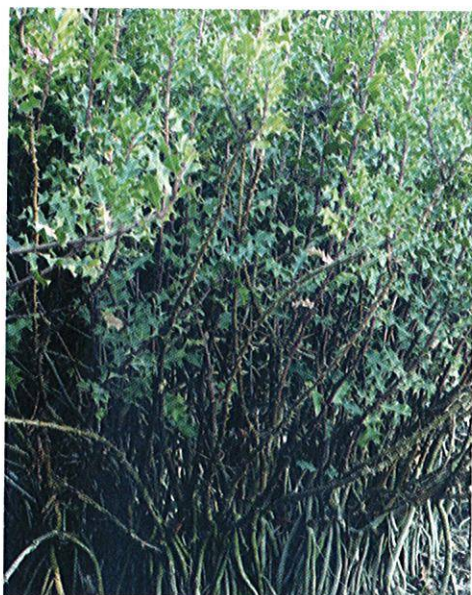
Local name: Hargoza

English name: Holy mangrove, Holly-leaved acanthus, Sea holly

Family: Acanthaceae

Description

This is an exclusive mangrove species. It is a pioneer, evergreen, semi-wood spiny shrub, less branched and grows up to 2 m in height. Bark is smooth and reddish brown to greenish grey in colour. Smaller sized sporadic lenticels, aerial and stilt roots are observed at the stem base. Leaves are simple, short petiolate, shiny, waxy and rigid with sharp spinous teeth on the margin; leaves growing under deep shade can be spineless. Sometimes, salt crystals can be seen on the leaf surface. Flowers are light blue to purple and contain one large petal. The fruits are capsule and slightly flattened and four seeded. This species shows hypogeal type of germination. It shows vegetative propagation through stem cuttings and rooting from horizontal stems. This species can tolerate strong saline condition and grows well at shade to full sunlight with freshwater flow. It commonly occurs along the coast of tidal swamp, banks of river and tidal creeks, protected sea shore or low swampy areas in the mangrove forest and its vicinity. In the Sundarbans, it occurs with *Avicennia officinalis*, *Avicennia alba*, *Sonneratia apetala*, *Excoecaria agallocha* and *Ceriops decandra*.



Distribution

This species is native to Bangladesh, India, Pakistan, Sri Lanka, Thailand, Cambodia, Vietnam, Indonesia, Malaysia, Singapore, China, Papua New Guinea, Taiwan, the Philippines, northern Australia and Pacific island. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans; and coastal areas of Chittagong, Cox's Bazar, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

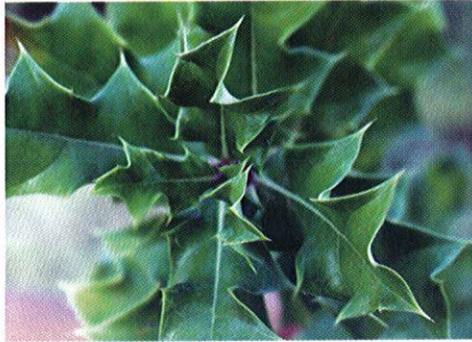
- Habit: Shrub
- Height: 0.5-2 m
- Diameter: 1-1.5 cm
- Bark: Smooth, reddish brown to greenish grey

Common use

- It is used as hedge plant for fencing
- Entire plant is placed in rice sacks to keep the rice dry
- Soil stabilization for slope, embankment and riverbank
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Oblong to elliptical
- Margin: Serrate with sharp spines
- Apex: Acute
- Base: Acute
- Upper surface: Green
- Lower surface: Green
- Venation: Pinnate/net
- Size: 5-15 cm long

Flowers

- Inflorescence: Spike, terminal
- Petals: 1
- Sepals: 4
- Stamens: 4
- Size: 2-3 cm long
- Others: Bisexual



Fruits

- Type: Capsule
- Colour: Green
- Texture: Glossy
- Size: 2-2.5 cm long



Adaptation

- Aerial root
- Lenticels
- Stilt root



Acrostichum aureum L.

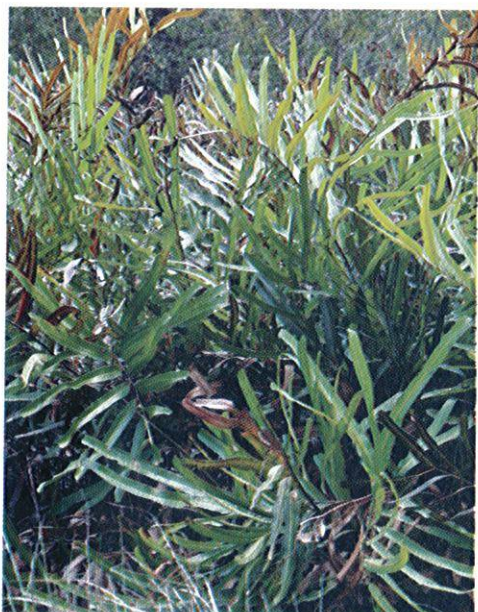
Local name: Hudu, Tiger fern

English name: Golden leather fern, Mangrove fern

Family: Pteridaceae

Description

This is a mangrove associate species. It is an evergreen, fast growing, robust, opportunistic fern that grows up to 3 m in height. Stem is fibrous rhizome, stout, erect and covered with relatively large scales. Fronds (leaves of fern) are pinnate, alternate and widely spaced, leaflets 8-20. Fronds are usually arching around the edge of the plant, but tend to be more erect near the centre. Sori are found to aggregate along the under-surface of the upper five to eight pairs of pinnae and it gives brick red or rust red appearance. Spores are 37-72 µm in diameter. This species shows good natural regeneration from spores. It also shows vegetative propagation through rhizomes. It can tolerate strong saline condition and form pure patch at the open areas of the mangrove forests, salt marshes, banks of river and tidal creeks. In the Sundarbans, it grows on the slightly elevated areas with infrequent tidal inundation in association with *Excoecaria agallocha*, *Phoenix paludosa* and *Ceriops decandra*.



Distribution

This species is distributed in the tropical, sub-tropical areas around the world and throughout the Southeast Asia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans, and coastal areas of Chittagong, Cox's Bazar, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

- Habit: Rhizomatous fern
- Height: 1-3 m

Common use

- The young shoots can be cooked and eaten as salad
- Leaves are used as fodder
- Leaves are used as thatching materials
- Fibers of old leaves are used to make cord
- Rhizomes and old leaves have medicinal uses



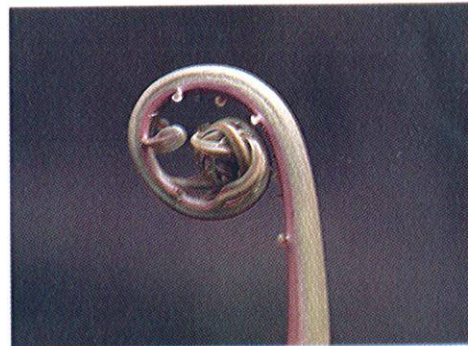


Fronds

- Arrangement: Compound, alternate
- Blade shape: Linear-oblong (Leaflet)
- Margin: Entire-little wavy
- Apex: Rounded mucronate
- Base: Cunate
- Upper surface: Green
- Lower surface: Green
- Venation: Reticulate
- Size: 10-34 cm long (Leaflet)

Adaptation

- Salt tolerant mechanism



Aegialitis rotundifolia Roxb.

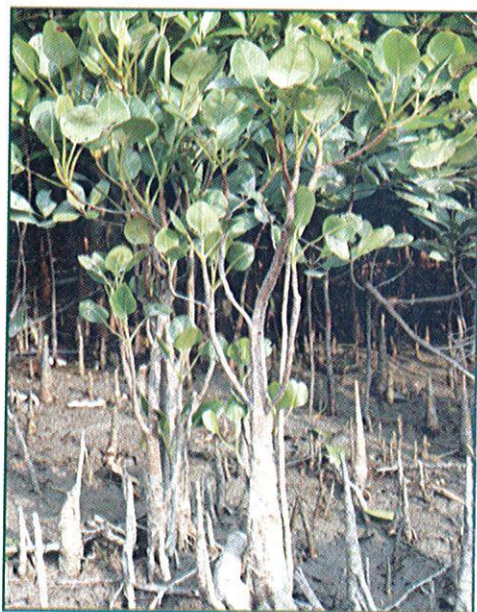
Local name: Nuniya, Nuniagach

English name: Not known

Family: Plumbaginaceae

Description

This is an exclusive mangrove species. It is an evergreen, perennial small shrub that grows up to 3 m in height. Bark is smooth, reddish brown in colour and about 2-3 mm thick; inner bark is pinkish white in colour. Wood is light, corky and light brown in colour. Stem base is swollen with spongy tissue. Leaves are simple, alternate, long petiolate; salt crystals are found on the leaf surface. Midrib is prominent and yellowish green in color. Water colour sticky latex is observed after injuring the leaf petiole. Flowers are bisexual, white, rich in nectar, fragrant, and arranged in leafy-panicles. The fruits are capsule, 5-dibbed, slightly curved and one seeded. This species can tolerate strong saline condition and can form pure patch on the raised areas with infrequent tidal inundation. In the Sundarbans, this species is associated with *Sonneratia apetala*, *Aegiceras corniculatum*, *Excoecaria agallocha*, *Ceriops decandra*, *Kandelia candel* and *Acanthus ilicifolius*.



Distribution

This species is restricted distribution in Bangladesh, India, Myanmar, Andaman and Nicobar Island, Cambodia and Thailand. In Bangladesh, it occurs in the Sundarbans and coastal areas of Cox's Bazar.

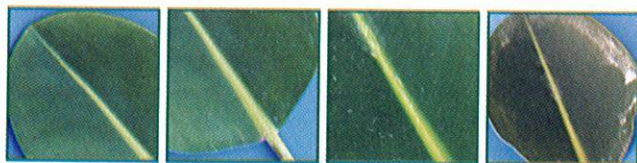
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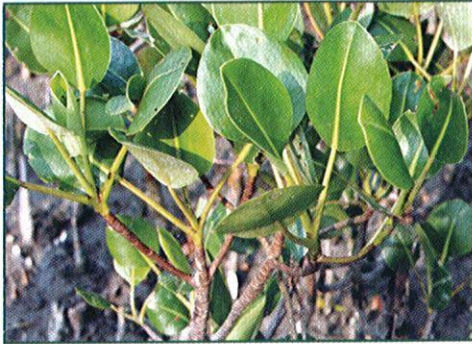
- Habit: Shrub
- Height: 2-3 m
- Collar diameter: 1-6 cm
- Bark: Smooth, reddish brown

Common use

- Used as fuel wood

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Broad ovate
- Margin: Entire-smooth
- Apex: Obtuse to shortly apiculate
- Base: Round
- Upper surface: Green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 3-10 cm long

Flowers

- Inflorescence: Raceme
- Petals: 5
- Sepals: 5
- Stamens: 5
- Size: 1.5-2 cm long
- Others: Bisexual

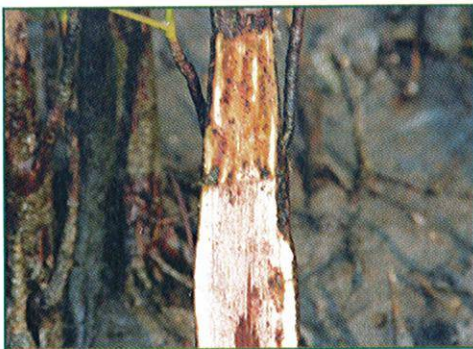


Fruits

- Type: Capsule
- Colour: Pale brown
- Texture: Ribbed
- Size: To 6 cm long

Adaptation

- Swollen stem base



Aegiceras corniculatum (L.) Blanco

Local name: Khulshi

English name: Black mangrove, River mangrove

Family: Myrsinaceae

Description

This is an exclusive mangrove species. It is an evergreen, pioneer, single or multi-stemmed shrub or small tree. It grows up to 7 m in height with narrow crown. Bark is smooth, surface is brown and inner bark is green with light yellowish horizontal short lines and about 2-3 mm thick. Lenticels are corky and horizontally arranged on stem. Heartwood is moderately hard and reddish brown in colour. Leaves are simple, spirally arranged and non-stipulate. Salt crystals are observed on the leaf surface. Midrib is prominent and often light reddish at the back side. Flowers are bisexual, rich in nectar, fragrant, subsessile, 1-2 cm long, and clusters of 10 to 30 flowers at the leaf axils. The fruit is capsule, curved horn-shaped, pointed apex, light green to pink in colour and 1 seeded. This species shows cryptoviviparous germination with modified epigeal type. It can tolerate strong saline condition and form pure patch along the banks of rivers and creeks with open sunlight. In the Sundarbans, it occurs with *Sonneratia apetala*, *Avicennia officinalis*, *Excoecaria agallocha*, *Xylocarpus moluccensis*, *Ceriops decandra*, *Kandelia candel* and *Acanthus ilicifolius*.



Distribution

This species is restricted in the Indo-Pacific region and occurs in Australia, Bangladesh, Brunei, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Singapore, Solomon Islands, Sri Lanka, Taiwan, Province of China, Thailand and Vietnam. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans.

Form

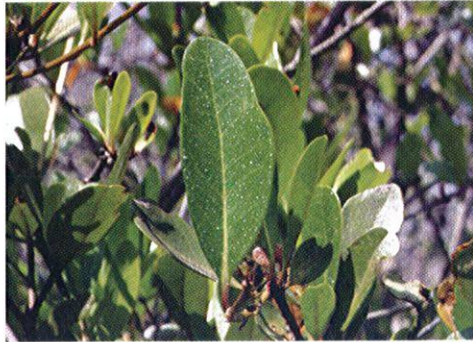
- Habit: Shrub or tree
- Height: 2-7 m
- DBH: 2-20 cm
- Bark: Smooth, brown

Common use

- Stems are used for fuel wood and charcoal production
- Young leaves are edible
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Obovate
- Margin: Entire-smooth
- Apex: Obtuse to emarginate
- Base: Acute
- Upper surface: Dark green
- Lower surface: Pale green
- Venation: Pinnate/net
- Size: 4-8 cm long

Flowers

- Inflorescence: Umbellate, axillary/terminal
- Petals: 5
- Sepals: 5
- Stamens: 5
- Size: 1-2 cm long
- Others: Bisexual

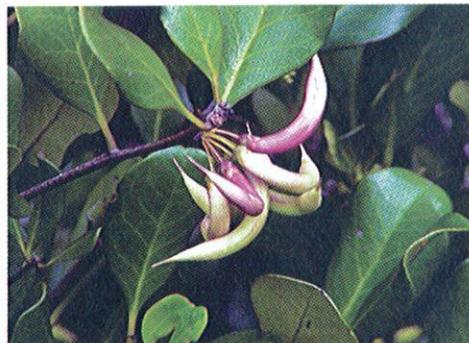


Fruits

- Type: Capsule

Propagules

- Shape: Cylindrical
- Colour: Light green to purple
- Texture: Smooth
- Size: 5-8 cm long



Adaptation

- Cryptoviviparous germination
- Swollen stem base
- Lenticels



Aglaia cucullata (Roxb.) Pellegr.

Synonym: *Amoora cucullata* Roxb.

Local name: Amoor

English name: Pacific maple

Family: Meliaceae

Description

This is a mangrove associate species. A small to medium-sized evergreen tree, grows up to 15 m in height with dense spreading crown. Bark is smooth, brown to pinkish-grey or pale orange brown and about 6-8 mm thick; inner bark is reddish. Heartwood is reddish brown. It is the only species of this genus that has pneumatophores. Lenticels are present on pneumatophores, stem base of seedlings and saplings and younger branches of mature tree. Sometimes aerial roots can be seen at the base of sapling. Leaves are imparipinnate and the terminal leaflets are smaller in size. Flowers are small, yellowish and arranged in clusters at leaf and branch axils. Fruits are round, covered with a leathery skin and 3 seeded. It splits into three parts, seeds are surrounded by a shiny red aril. Natural regeneration is plentiful under and around the parent trees. It shows coppicing ability. This species is less salt tolerant and grows well with shade condition. In the Sundarbans, it occurs with *Heritiera fomes* and *Excoecaria agallocha*.



Distribution

It is distributed in Bangladesh, India, Indonesia, Malaysia, Myanmar, Nepal, Papua New Guinea, the Philippines, Singapore, Thailand and Vietnam. In Bangladesh, it occurs in the Sundarbans, Teknaf and other coastal areas.

Form

- Habit: Tree
- Height: 10-15 m
- DBH: 10-40 cm
- Bark: Smooth, brown, pinkish-grey, pale orange brown

Common use

- Wood is used for fuel wood, timber, house and boat building, flooring, furniture, household and agricultural implements
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



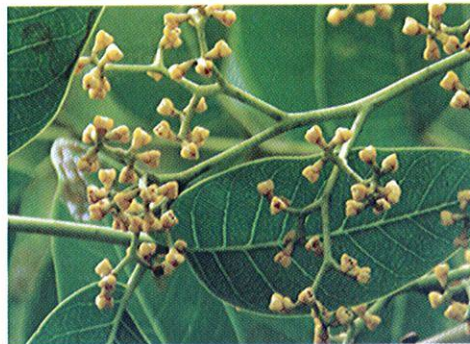


Leaves

- Arrangement: Compound, leaflets opposite with an odd terminal one
- Blade shape: Elliptic-oblong (Leaflet)
- Margin: Entire-smooth
- Apex: Acute or acuminate
- Base: Oblique
- Upper surface: Green
- Lower surface: Green
- Venation: Pinnate
- Size: 20-40 cm long (Leaflet)

Flowers

- Inflorescence: Panicle, axillary
- Petals: 3
- Sepals: 3
- Stamens: 6
- Size: 2-3.5 mm long
- Others: Unisexual



Fruits

- Type: Slightly dehiscent capsule
- Colour: Yellowish-green to reddish at mature stage
- Texture: Leathery
- Size: 8-12 cm diameter



Adaptation

- Aerial roots at the sapling stage
- Lenticels
- Pneumatophores
- Occasionally buttress



Avicennia alba Blume

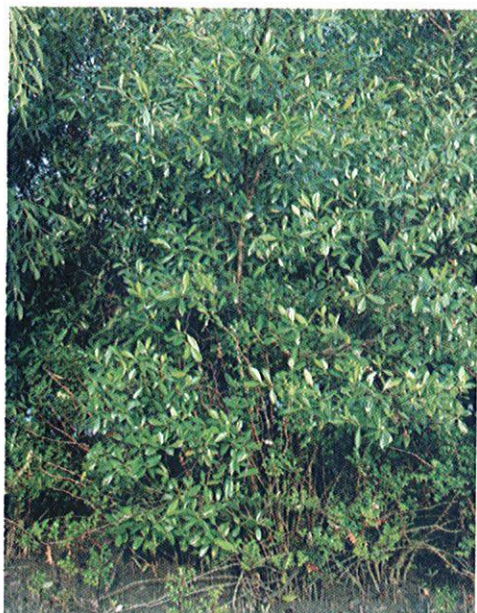
Local name: Maricha bean, Sada-bean

English name: White avicennia, White mangrove

Family: Avicenniaceae

Description

This is an exclusive mangrove species. A small to medium-sized, evergreen and pioneer tree. It grows up to 10 m in height with dense bushy crown that often starts branching near the base of the trunk. Bark is smooth and about 2 mm thick; green colour is observed after removing the upper bark surface. Lenticels are sporadically present at the stem. Sometimes aerial roots can be found at the stem base. Pneumatophores are finger or pencil like and contain numerous lenticels. Leaves are simple and opposite. Salt crystals are observed at the upper surface of leaf. Flowers are yellowish-orange, fragrant and arranged in clusters of 6-10 flowers. Fruits are conical, curved and elongated, capsule, leathery and arranged on branched axis and 1 seeded. This species shows epigeal or modified epigeal type of germination. It can tolerate strong saline condition; and colonized at the silt deposited muddy banks of rivers and tidal flats with full sunlight. In the Sundarbans, it occurs with *Avicennia officinalis*, *Avicennia marina*, *Sonneratia apetala* and *Acanthus ilicifolius*.



Distribution

It occurs from India to Southeast Asia, the Philippines, Papua New Guinea and tropical Australia. In Bangladesh, it occurs in the Sundarbans, Chakaria Sundarbans, Teknaf and other coastal areas at moderate to high saline areas.

Form

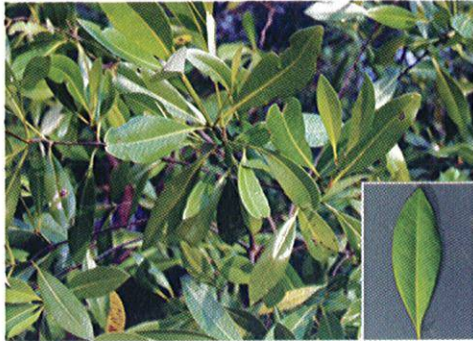
- Habit: Tree
- Height: 8-10 m
- DBH: 10-30 cm
- Bark: Smooth, brownish-black
- Root: Cable root system

Common use

- Wood is used as firewood, timber, house building and rice stumpers
- Leaves are used for fodder and fish food
- The seeds and seedlings are used as vegetables
- Sapwood and seeds have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Elliptic-lanceolate
- Margin: Entire-smooth
- Apex: Acute
- Base: Acute
- Upper surface: Glossy green
- Lower surface: Silvery white
- Venation: Pinnate to arcuate
- Size: 6-15 cm long

Flowers

- Inflorescence: Penicled spike, terminal/axillary
- Petals: 4
- Sepals: 4
- Stamens: 4
- Size: 5-6 mm long
- Others: Bisexual



Fruits

- Type: Capsule
- Shape: Conical curved and elongated
- Colour: Greyish-green
- Texture: Leathery
- Size: 4 cm long



Adaptation

- Aerial roots
- Cryptoviviparous germination
- Lenticels
- Pneumatophores



Avicennia marina (Forssk.) Vierh.

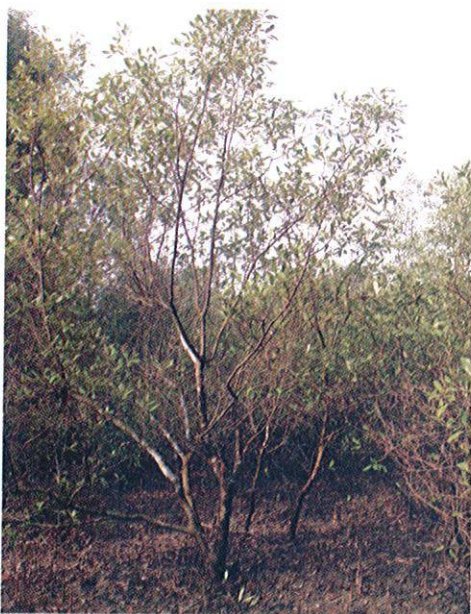
Local name: Kanak bean, Sada bean

English name: Grey mangrove, White mangrove

Family: Avicenniaceae

Description

This is an exclusive mangrove species. It is a small to medium-sized, evergreen, pioneer tree or much branched shrub that grows up to 10 m in height. Bark is smooth, about 2 mm thick, grey-green in colour; dark green colour is observed after removing the upper surface of bark. Pneumatophores are finger or pencil like and contain numerous lenticels. Leaves are simple; salt crystals are found at the upper surface of leaf. Inflorescence is spike, terminal/axillary and 3-4.5 cm long. Flowers are small, orange to dark orange in colour, fragrant and arranged in clusters of 2-12 flowers. Fruits are heart-shaped, capsule, leathery skin, arranged on branched axis and 1 seeded. This species shows epigeal or modified epigeal type of germination. It can tolerate strong saline condition, and colonized at the silt deposited muddy banks of rivers and tidal flats with full sunlight. In the Sundarbans, it occurs with *Avicennia officinalis*, *Avicennia alba*, *Sonneratia apetala* and *Acanthus ilicifolius*.



Distribution

It occurs in mangroves of Africa, Asia, South America, Australia and Polynesia. In Bangladesh, it occurs in the Sundarbans, Chakaria Sundarbans, Teknaf and other coastal areas.

Form

- Habit: Tree
- Height: 2-10 m
- DBH: 10-30 cm
- Bark: Smooth, grey-green

Common use

- Wood is used for fuel wood, toothpicks, boat building and pulp production
- Leaves are used as fodder
- Fruits are edible
- Leaves have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



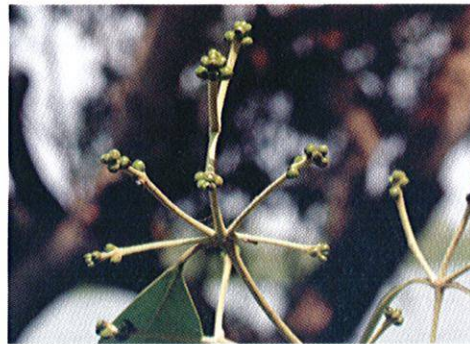


Leaves

- Arrangement: Simple, opposite
- Blade shape: Lanceolate to elliptical
- Margin: Entire-smooth
- Apex: Acute
- Base: Acute
- Upper surface: Yellowish-green
- Lower surface: Silvery grey
- Venation: Pinnate to arcuate
- Size: 4-11 cm long

Flowers

- Inflorescence: Spike, terminal/axillary
- Petals: 4
- Sepals: 4
- Stamens: 4
- Size: 5-7 mm diameter
- Others: Bisexual



Fruits

- Type: Capsule
- Shape: Heart-shaped
- Colour: Light-green
- Texture: Leathery
- Size: 2-3 cm long



Adaptation

- Aerial roots
- Cryptoviviparous germination
- Lenticels
- Pneumatophores

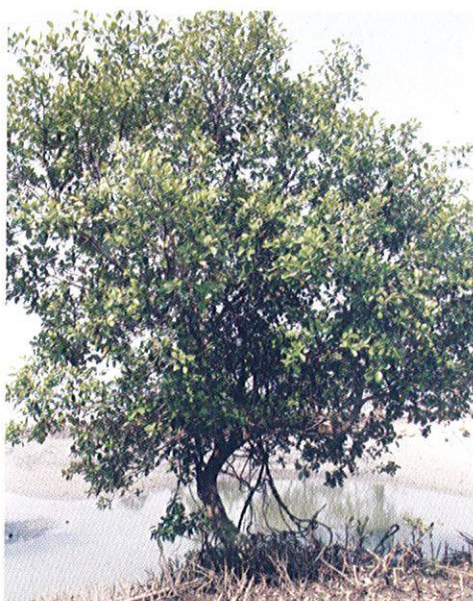


Avicennia officinalis L.

Local name: Bara bean, Kala bean
 English name: Indian Mangrove, White Mangrove
 Family: Avicenniaceae

Description

This is an exclusive mangrove species. It is a small to medium-sized evergreen pioneer tree that grows up to 25 m in height. Bark is smooth, about 3 mm thick and brownish-grey in colour. Numerous small sized lenticels are observed at the stem and younger branches. Pneumatophores are finger or pencil like and contain lenticels. Leaves are simple and opposite; salt crystals are found at the upper surface of leaf. Inflorescence is spike, terminal/axillary. Flowers are small and orange-yellow in colour. Fruits are heart-shaped, capsule, leathery skin and 1 seeded. This species shows epigeal or modified epigeal type of germination. It can tolerate strong saline condition; and colonized on the silt deposited muddybanks of rivers and tidal flats at the moderate saline areas with full sunlight. In the Sundarbans, it occurs with *Avicennia alba*, *Sonneratia apetala*, *Excoecaria agallocha* and *Acanthus ilicifolius*.



Distribution

This species occurs in mangroves of Pakistan, India, Sri Lanka, Bangladesh, Myanmar, Andaman Island, Thailand, Malaysia, Indonesia, the Philippines, New Guinea and north-eastern Australia. In Bangladesh, it occurs in the Sundarbans, Chakaria Sundarbans, Teknaf and other coastal areas.

Form

- Habit: Tree
- Height: 10-25 m
- DBH: 50-100 cm
- Bark: Smooth, grey to brown
- Root: Cable root system

Common use

- Wood is used as fuel wood and posts
- Fruit is edible after roasting
- Leaves are used as fodder
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



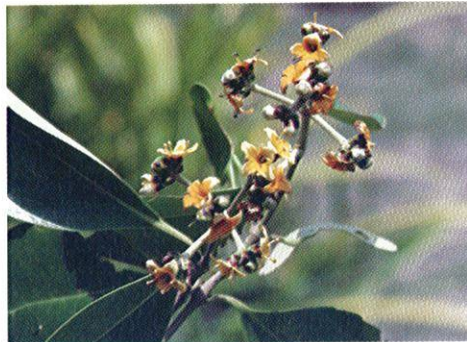


Leaves

- Arrangement: Simple, opposite
- Blade shape: Obovate
- Margin: Entire-smooth
- Apex: Round
- Base: Acute
- Upper surface: Glossy green
- Lower surface: Silvery white
- Venation: Pinnate
- Size: 6-14 cm long

Flowers

- Inflorescence: Spike, terminal/axillary
- Petals: 4
- Sepals: 5
- Stamens: 4
- Size: 9-15 mm diameter
- Others: Bisexual



Fruits

- Type: Capsule
- Shape: Heart-shaped
- Colour: Yellowish green
- Texture: Leathery
- Size: 2-4 cm long



Adaptation

- Aerial roots
- Cryptoviviparous germination
- Lenticels
- Pneumatophores



Brownlowia tersa (L.) Kosterm.

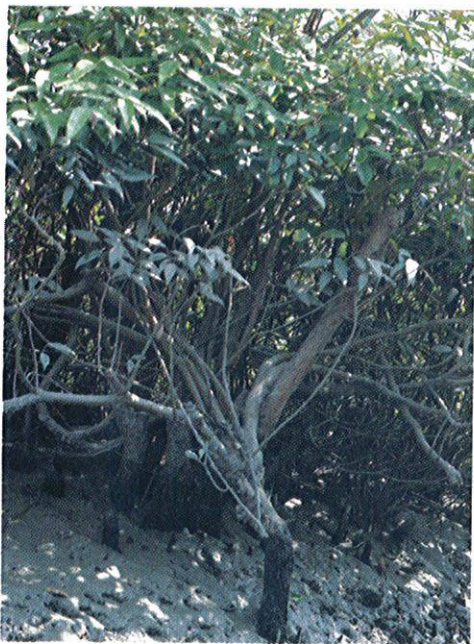
Local name: Lata sundri

English name: Dungun air

Family: Malvaceae

Description

This is an exclusive mangrove species. It is a perennial non-climbing, much branched, fast growing evergreen shrub that grows up to 2 m in height. Bark surface is smooth and dark brown to blackish in colour; inner bark is light pink in colour. Numerous lenticels are observed at the stem and younger branches. Leaves are simple, alternate and spirally arranged; lower surface is covered with a dense layer of tiny hairy scale. Flowers are small, emerging at the axis or end of branches in cluster on stalks up to 4 cm long. It contains pink petals with fluffy yellow stamens. Fruits are tiny woody capsule. This species shows good natural regeneration and can form pure patch. It can tolerate moderate saline condition and grows well on variety of soil types along the banks of tidal creeks, canals and rivers of the mangrove habitat with full sunlight to semi shade condition. In the Sundarbans, this species is associated with *Excoecaria agallocha*, *Ceriops decandra* and *Nypa fruticans*.



Distribution

This species is native to Bangladesh, India, the Andaman and Nicobar Islands, Myanmar, Thailand, Malaysia, Indonesia, Cambodia, Singapore, the Philippines and Brunei. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans, and coastal areas of Chittagong, Cox's Bazar, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

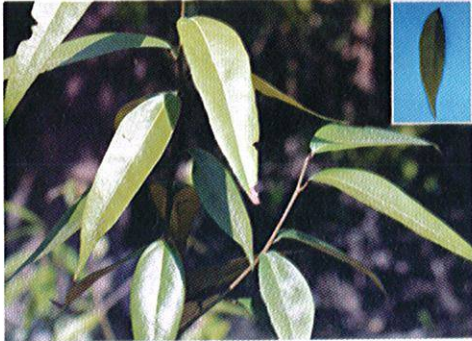
- Habit: Shrub
- Height: 0.5-2 m
- Bark: Smooth, dark brown to blackish

Common use

- Stems are used for fencing and fuel wood
- Used for landscaping in saline areas

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Lanceolate to elliptic-lanceolate
- Margin: Entire-smooth
- Apex: Acute
- Base: Rounded
- Upper surface: Yellowish green
- Lower surface: Golden brown
- Venation: Pinnate/net
- Size: 10-15 cm long

Flowers

- Inflorescence: Cyme, axillary/terminal
- Petals: 6
- Sepals: 4
- Stamens: Numerous
- Size: 1 cm long
- Others: Bisexual



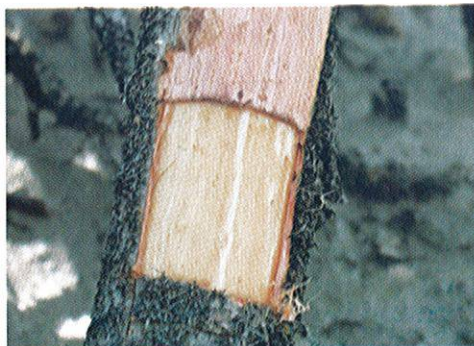
Fruits

- Type: Capsule
- Shape: Heart-shaped
- Colour: Greyish green
- Texture: Woody
- Size: 1-1.5 cm long



Adaptation

- Lenticels



Bruguiera gymnorhiza (L.) Lam.

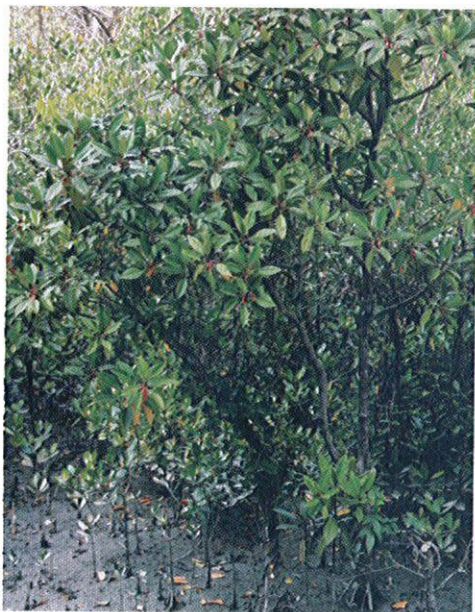
Local name: Lal kakra

English name: Large-leafed orange mangrove

Family: Rhizophoraceae

Description

This is an exclusive mangrove species. An evergreen, small to medium sized tree that grows up to 15 m in height with round crown. Bark is rough, dark grey to brown in colour and about 4 mm thick. Greenish colour is observed after removing the bark surface and inner bark is pale brownish. Heartwood is reddish, very hard and heavy. It develops knee-like breathing roots that shade bark and contain larger lenticels. Leaves are simple, opposite and pointed tip. Seedling leaves are often reddish beneath. The pendulous red flowers are borne singly on short stalks at leaf axils. The fruit develops within the calyx and becomes enlarged when ripened. This species shows viviparous germination with modified epigeal type. It has short buttress and occasional stilt roots. Sometimes, short aerial roots are found on those that grown at permanently waterlogged areas. It can tolerate strong saline condition, but grows well at the moderate saline areas with full sunlight. In the Sundarbans, it occurs with *Avicennia officinalis*, *Heritiera fomes*, *Excoecaria agallocha*, *Rhizophora apiculata*, *Ceriops decandra* and *Bruguiera sexangula*.



Distribution

This species is distributed in east coast of Africa, Madagascar, Maldives, and India to Southeast Asia, China, Japan, Taiwan, Papua New Guinea to Solomon Islands and north east coast of Australia. In Bangladesh, it occurs in the Sundarbans.

Form

- Habit: Tree
- Height: 10-15 m
- DBH: 10-30 cm
- Bark: Rough, dark brown
- Root: Cable root system

Common use

- Wood is used for fuel wood, charcoal, pulp, rayon, furniture, construction purpose, post, stakes and piling
- Bark is used for tannin and dye
- Leaves have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Elliptic
- Margin: Entire-smooth
- Apex: Acute to acuminate
- Base: Acute
- Upper surface: Glossy green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 10-20 cm long

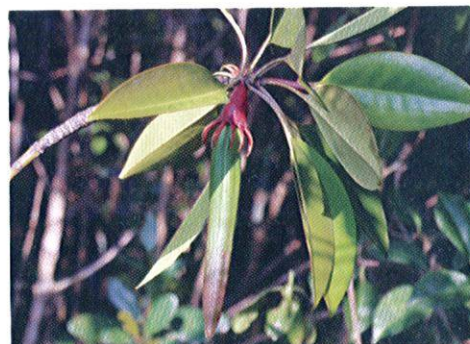
Flowers

- Inflorescence: Solitary, axillary
- Petals: 11-14
- Sepals: 11-14
- Stamens: 11-14 pairs
- Size: 3-4 cm long
- Others: Bisexual



Propagules

- Shape: Cigar-shaped
- Colour: Dark green to purple when mature
- Texture: Distinct larger ridged
- Size: 20-25 cm long



Adaptation

- Buttresses
- Knee-like air-breathing roots
- Lenticels
- Stilt roots and aerial roots
- Viviparous germination



Bruguiera sexangula (Lour.) Poir.

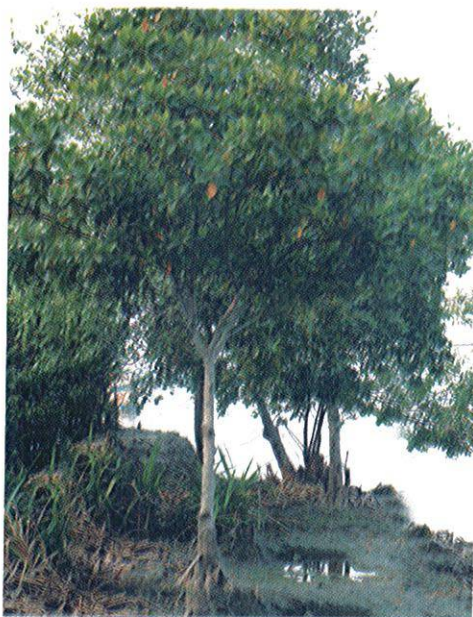
Local name: Kakra

English name: Upriver orange mangrove

Family: Rhizophoraceae

Description

This is an exclusive mangrove species. An evergreen tree that grows up to 30 m in height. It may grow as a single-stemmed tree or multi-stemmed shrub. Bark is rough, dark grey to brown in colour and about 4 mm thick. Brick red colour is observed after removing the bark surface. Profuse pale pinkish corky lenticels are present at the stem. Heartwood is very hard, heavy and reddish brown in colour. Leaves are simple and opposite. The pendulous yellowish green flowers are borne singly on short stalks at axils. The fruit develops within the calyx and becomes enlarged when ripened. This species shows viviparous germination with modified epigeal type. It has short buttress and occasional stilt roots at the base of trunk. It can tolerate strong saline condition, but grows well at the moderate saline areas with full sunlight. In the Sundarbans, it occurs with *Avicennia officinalis*, *Heritiera fomes*, *Excoecaria agallocha*, *Rhizophora mucronata* and *Bruguiera gymnorrhiza*.



Distribution

This species occurs India, Bangladesh, Sri Lanka, to Myanmar, Thailand, Vietnam, Cambodia, the Philippines, Malaysia, Singapore, Indonesia to Papua New Guinea, Solomon Islands and south to northern Australia and New Caledonia. In Bangladesh, it occurs in the Sundarbans.

Form

- Habit: Tree
- Height: 15-30 m
- DBH: 10-40 cm
- Bark: Rough, grey to brown
- Root: Cable root system

Common use

- Wood is used for fuel wood, charcoal, construction purpose and poles
- Bark is used for tannin
- Roots and leaves have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Elliptic
- Margin: Entire-smooth
- Apex: Acuminate
- Base: Acute
- Upper surface: Glossy green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 6-15 cm long

Flowers

- Inflorescence: Solitary, axillary
- Petals: 10-11
- Sepals: 10-12
- Stamens: 10-11 pairs
- Size: 3-3.5 cm long
- Others: Bisexual



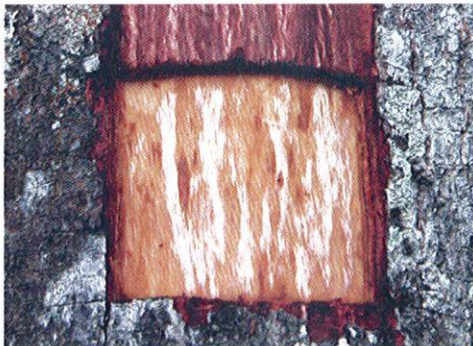
Propagules

- Shape: Cigar-shaped
- Colour: Green to purple when mature
- Texture: Finely ridged
- Size: 5-10 cm long



Adaptation

- Knee-like air-breathing roots
- Lenticels
- Stilt roots
- Short buttress
- Viviparous germination



Cerbera manghas L.

Synonym: *Cerbera odollum* Gaertn.

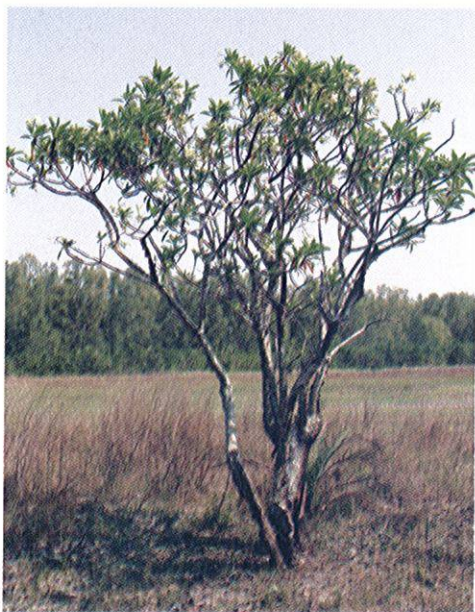
Local name: Dakur

English name: Sea mango, Suicide tree, Pong-pong

Family: Apocynaceae

Description

This is a mangrove associate species. A small to medium-sized evergreen to semi-evergreen, fast growing tree that grows up to 15 m in height with round to oval crown. This plant as a whole yields a milky white latex. Bark is rough and grey to brown in colour and about 7-10 mm thick; inner bark is whitish. Green colour is observed after removing the bark surface. Sapwood is whitish; heartwood is soft and white to pale yellowish-brown in colour. Large greyish lenticels are present at the stem base. Leaves are simple, whorled and clustered at the ends of the branches. Flowers are white to cream coloured, fragrant, bisexual, 20-30 flowers per cluster and corolla with a yellow eye. Fruits are egged shaped drupe, fleshy, fibrous endocarp and 1 seeded. This species shows hypogeal germination of seeds and can be propagated by stem cutting. This species shows coppicing ability. It is less salt tolerant and preferably grown at full sunlight. In the Sundarbans, it occurs with *Heritiera fomes* and *Excoecaria agallocha*.



Distribution

It is widely distributed from the islands of the Indian Ocean to tropical Asia, tropical Africa, tropical Australia and the islands of the Pacific Ocean. In Bangladesh, it occurs in the Sundarbans; and coastal areas of Bagerhat, Khulna, Sathkhira, Pirojpur, Barisal, Chittagong, Cox's Bazar and Noakhali district.

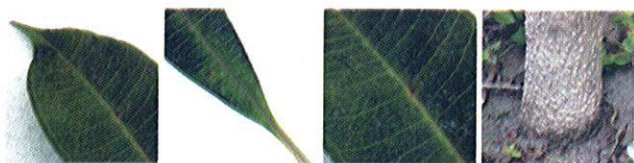
Form

- Habit: Tree
- Height: 6-15 m
- DBH: 30-70 cm
- Bark: Rough, grey

Common use

- Wood is used for mouldings, veneer, matchsticks, shuttering and carving
- Seed oil is used as fish poison and can be burnt in lamps
- Avenue plantation and ornamental purpose in the parks, gardens and coastal areas
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Oblong-lanceolate or narrowly lanceolate
- Margin: Entire-smooth
- Apex: Apiculate
- Base: Cuneate
- Upper surface: Dark green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 15-30 cm long

Flowers

- Inflorescence: Cyme, terminal
- Petals: 5
- Sepals: 5
- Stamens: 5
- Size: 3-5 cm diameter
- Others: Bisexual



Fruits

- Type: Drupe
- Shape: Egg-shaped
- Colour: Green
- Texture: Fleshy
- Size: 5-10 cm long



Adaptation

- Lenticels



Ceriops decandra (Griff.) Ding Hou

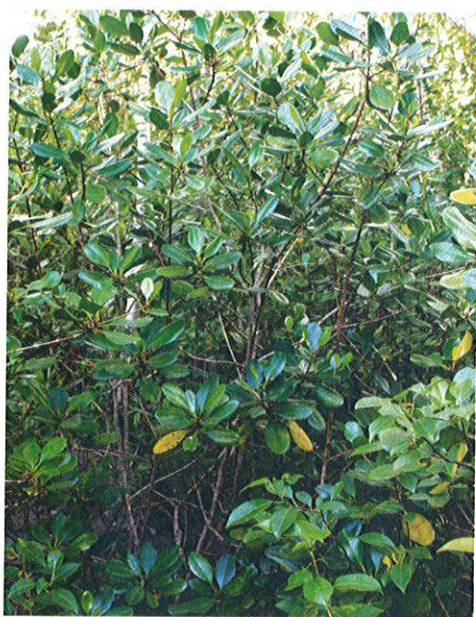
Local name: Goran

English name: Groran, Cuttia, Kabaing, Tengar, Palun, Bido-bido, Landing-landing

Family: Rhizophoraceae

Description

This is an exclusive mangrove species. It is an evergreen, medium-sized, slow growing perennial shrub that grows up to 4 m in height. Bark is smooth, grey to brownish in colour and about 2-4 mm thick. Light green colour is observed after removing the upper surface of bark and inner bark is brown in colour. Stem base contains numerous stilt roots and sporadic lenticels. Leaves are simple, opposite, spirally arrange and clustered towards the end of branches. Leaf petioles are yellowish in colour. Inflorescence is stalked axillary condensed cymes. Flowers are small, white, rich in nectar and fragrant. The fruits are ovoid-conical berries, 1seeded, 1-2 cm long and brown in colour. Hypocotyl clearly ribbed from top to bottom, green to yellowish green in colour and erect. This species shows viviparous germination with epigeal type. It shows good coppicing ability. This species found to tolerate moderate to strong saline condition; grows well on the raised areas with infrequent tidal inundation and can form pure stand with full sunlight to semi-shade condition. In the Sundarbans, this species is associated with *Sonneratia apetala*, *Excoecaria agallocha*, *Heritiera fomes*, *Kandelia candel* and *Acanthus ilicifolius*.



Distribution

This species has restricted distribution in Bangladesh, India, Myanmar, Andaman and Nicobar Island and Thailand. In Bangladesh, it occurs in the Sundarbans; and coastal areas of Cox's Bazar, Barisal, Barguna and Chittagong.

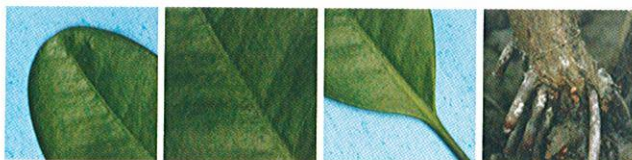
Form

- Habit: Shrub
- Height: 1.5-4 m
- Collar diameter: 1-8 cm
- Bark: Grey to brownish

Common use

- Stems are used for posts, poles, tools, fuel wood and charcoal production
- Bark is used for dye and tannin
- Different parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Mostly obovate
- Margin: Entire-smooth
- Apex: Round to emarginate
- Base: Acute
- Upper surface: Green
- Lower surface: Pale green
- Size: 4-10 cm long

Flowers

- Inflorescence: Cymes, axillary
- Petals: 5-6
- Sepals: 5-6
- Stamens: 10-12
- Size: 0.5 cm long
- Others: Bisexual

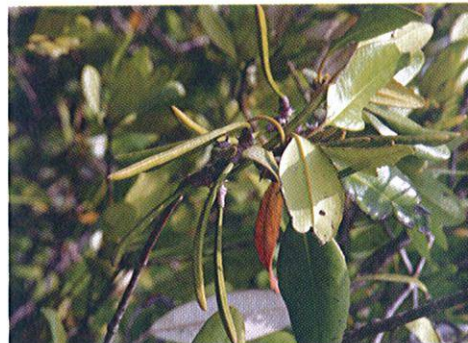


Fruits

- Type: Berry

Propagules

- Shape: Cylindrical, pencil shape
- Colour: Green to yellowish green
- Texture: Smooth, slender, slightly ribbed
- Size: 10-16 cm long



Adaptation

- Aerial roots
- Lenticels
- Stilt roots
- Viviparous germination



Clerodendrum inerme (L.) Gaertn.

Local name: Gang jhapa, Bon jui

English name: Indian privet, Seaside clerodendrum, Wild jasmine, Glory Bower, Chhoti-ari

Family: Verbenaceae

Description

This is a mangrove associate species. A perennial, much branched, fast growing, evergreen shrub that grows up to 6 m in height. Bark is smooth and light brown; inner bark is greyish in colour. Profuse lenticels are present at the stem and younger branches. Leaves are simple and opposite. Flowers are small, pinkish white and fragrant. Group of 3 flowers are joined at a common base point. The fruits are drupe, green turning black upon ripening and splited into four single-seed nutlets. This species shows good natural regeneration; and also propagated by stem cuttings. It shows aggressive growth characteristics. It can tolerate high saline condition and salty water spray; grows well on variety of soil types along the banks of river and tidal creeks, edges of mangrove habitat, coasts and saline marshes with full sunlight to semi-shade condition. In the Sundarbans, this species is associated with *Heritiera fomes*, *Excoecaria agallocha*, *Pongamia pinnata*, *Hibiscus tiliaceus*, *Dalbergia spinosa* and *Cynometra ramiflora*.



Distribution

This species is native to Bangladesh, India, Sri Lanka, China, Myanmar, Vietnam, Malaysia, Singapore, the Philippines, Indonesia, Cambodia and Australia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans, and coastal areas of Chittagong, Cox's Bazar, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

- Habit: Shrub
- Height: 3-4 m
- Bark: Smooth, light brown

Common use

- Stems are used as fishing poles and fish trap
- Commonly planted as hedge or ornamental plant
- The flowers are used to perfume the coconut oil
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



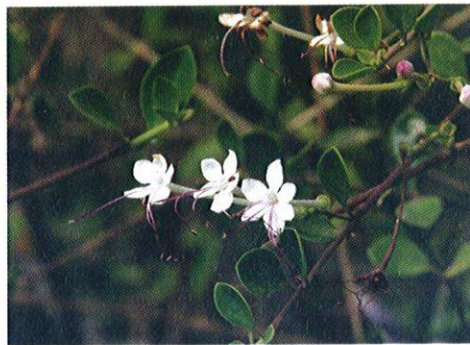


Leaves

- Arrangement: Simple, opposite
- Blade shape: Elliptical to ovate
- Margin: Entire-smooth
- Apex: Obtuse
- Base: Acute
- Upper surface: Shiny green
- Lower surface: Green
- Venation: Pinnate/net
- Size: 2-5 cm long

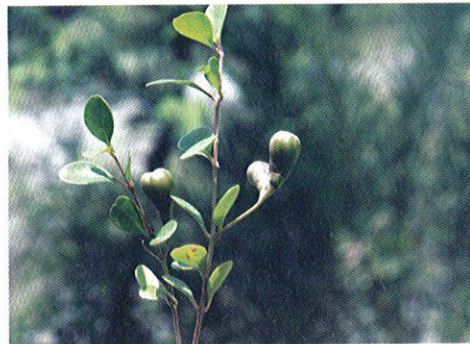
Flowers

- Inflorescence: Cymes, axillary
- Petals: 5
- Sepals: 5
- Stamens: 4
- Size: 3-5 cm long
- Others: Bisexual



Fruits

- Type: Drupe
- Shape: Oval-shaped
- Colour: Green
- Texture: Woody
- Size: 1-2 cm long
- Others: 4 seeded



Adaptation

- Lenticels



Crinum viviparum (Lam.) R. Ansari & V. J. Nair

Synonym: *Crinum defixum* Kar-Gawl.

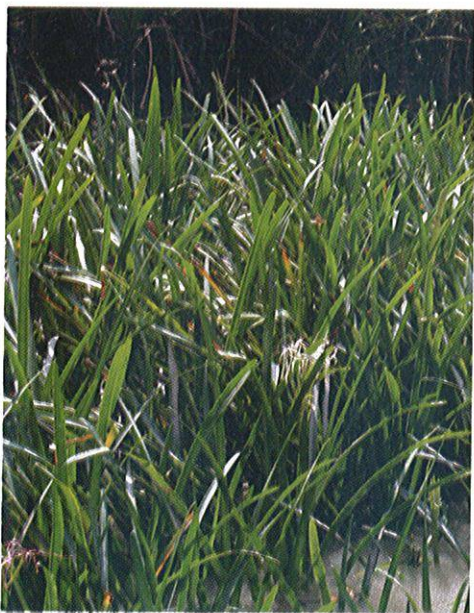
Local name: Bonpiaz, Sukh-darshan

English name: Ceylon swamplily, Milk and wine lily, Pink striped trumpet lily, Sudarshan

Family: Amaryllidaceae

Description

This is a mangrove associate species. It is a bulbous robust herb that grows up to 1.5 m in height. Leaves are simple, linear, concave or channeled, waxy, thick, 2-3 cm width and slightly sheathing at the base. Root system is fibrous and numerous. Rhizome is bulb and globose. Inflorescence is umbel; it contains 6-15 white flowers on 45 to 75 cm long cylindrical stalk. Flowers are fragrant; filament base is white and mid to upper portion is red in colour. Fruit is capsule, smooth and 1-2 seeded. This species can tolerate moderate saline condition; grows well on frequently inundated banks of rivers and canals with semi-shade to full sunlight. In the Sundarbans, this species is associated with *Cryptocoryne ciliata* and different species of grass.



Distribution

This species is distributed in Bangladesh, India and Sri Lanka. In Bangladesh, it occurs in the Sundarbans; and coastal areas at the southern part and damped fellow land of Chittagong and Sylhet districts.

Form

- Habit: Herb
- Height: 1-1.5 m

Common use

- Ornamental plants in gardens
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

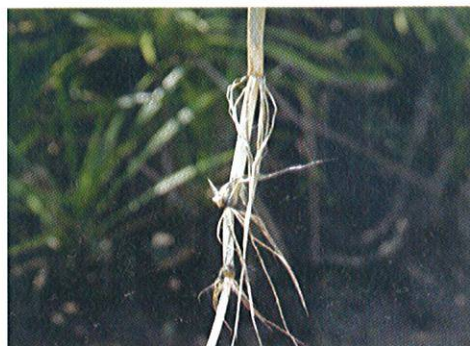
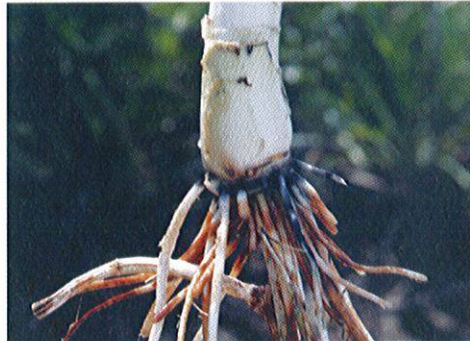
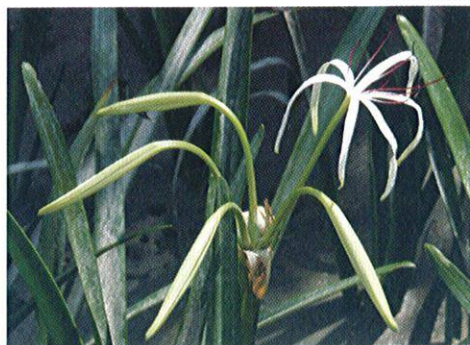
- Arrangement: Simple
- Blade shape: Linear or linear-lanceolate
- Margin: Entire-smooth
- Apex: Acute to obtuse
- Upper surface: Dark green
- Lower surface: Dark green
- Venation: Parallel
- Size: 50-90 cm long

Flowers

- Inflorescence: Umbel
- Petals: 6
- Stamens: 6
- Size: 5.5 cm long
- Others: Bisexual

Fruits

- Type: Capsule
- Texture: Smooth
- Size: 2.5 cm long



Cryptocoryne ciliata (Roxb.) Fisch. ex Wydler

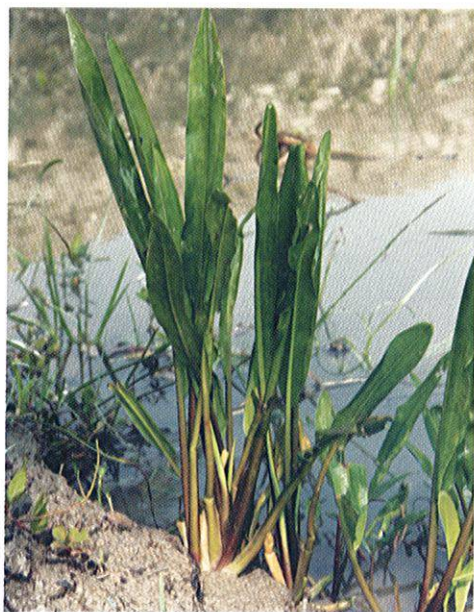
Local Name: Char kachu, Kerali

English name: Water trumpet

Family: Araceae

Description

This is a mangrove associate species. It is an aquatic, slow growing perennial herb that grows up to 50 cm in height. Roots are numerous; rhizome runners are 30-40 cm long. Leaves are simple, waxy, thick, 3-5 cm width and long stalked. Flowers are solitary and have short stalk. The spathe takes the form of a tube with a pointed opening at the top. The opening bears purplish-red coloured hairs and outer margin, while the inner margin is greenish-yellow. Flowering shoot bears both the male and female flowers. Four to eight female flowers are borne at the base of the spadix and numerous male flowers on the apical end. Flowers have no petals. The fruit is round and black in colour, fleshy and break open into six to eight parts. Seeds are smooth and whitish. This species shows good natural regeneration and also propagated from runners of mother plant. It can tolerate moderate saline condition; and grows well on frequently inundated nutrient-rich muddy shores of the tidal rivers and canals with full sunlight. In the Sundarbans, this species is associated with *Nypa fruticans* and grasses.



Distribution

This species is distributed in Bangladesh, India, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Singapore, Thailand and Vietnam. In Bangladesh, it occurs in the Sundarbans; and coastal areas at the southern districts.

Form

- Habit: Herb
- Height: 40-50 cm

Common use

- Used as aquarium plants

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple
- Blade shape: Lanceolate to broad lanceolate
- Margin: Entire-smooth to slightly wavy
- Apex: Acute or acuminate
- Upper surface: Green
- Lower surface: Green
- Venation: Parallel
- Size: 40-50 cm long



Flowers

- Inflorescence: Spathe and spadix, terminal
- Others: Unisexual

Fruits

- Type: Berry
- Shape: Round
- Colour: Black
- Texture: Smooth
- Size: 2.5-3 cm long



Cynometra ramiflora L.

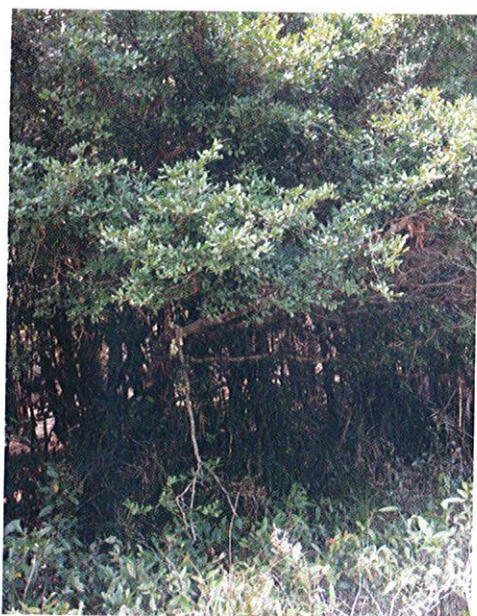
Local name: Singra

English name: Cynometra, Katong laut

Family: Fabaceae

Description

This is a mangrove associate species. It is a small to medium-sized evergreen tree or shrub that grows up to 12 m in height with spreading crown. Bark is smooth and about 2 to 4 mm thick; surface is patched with dark grey, brown and black colour; and inner bark is brown. Stem and branches contain numerous lenticels. Sapwood is whitish; heartwood is closed grain and red to dark brown in colour. Leaves are compound; two pairs of leaflets and the front pair is larger, leaflets are opposite, minute notch at the apex and short petiolate. Young leaflets are pinkish in colour and turned dark green with maturity. Inflorescence is short raceme or umbel like cluster of 2-6 flowers. Flowers are bisexual and yellowish white in colour. The fruit is pod, hardy, grooved, rounded ridges; dark green at early stage and brown at the mature stage and 1 seeded. This species shows epigeal type of germination. It found to grow at the landward edge of less saline areas as understory in association with *Heritiera fomes* and *Excoecaria agallocha* in the Sundarbans.



Distribution

This species is distributed in India, Sri Lanka, Bangladesh, Myanmar, Thailand, Malaysia, Indonesia, Vietnam, Papua New Guinea, the Philippines and Cambodia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans.

Form

- Habit: Tree or shrub
- Height: 4-12 m
- DBH: 5-30 cm
- Bark: Smooth with grey, brown and blackish patch

Common use

- Wood is used for fuel wood, charcoal production, posts, light construction and craft making
- Purple dye is extracted from wood chips
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, opposite
- Blade shape: Obovate-oblong (Leaflet)
- Margin: Entire-smooth
- Apex: Acute to emarginate
- Base: Oblique
- Upper surface: Dark green
- Lower surface: Green
- Venation: Pinnate/net
- Size: 5-12 cm long (Leaflet)

Flowers

- Inflorescence: Racemes, axillary
- Petals: 5
- Sepals: 4
- Stamens: 10
- Size: 1.2-2.0 cm long
- Others: Bisexual



Fruits

- Type: Pod, one seeded
- Shape: Kidney shaped
- Colour: Dark green
- Texture: Woody
- Size: 2-3 cm long



Adaptation

- Lenticels



Dalbergia spinosa Roxb.

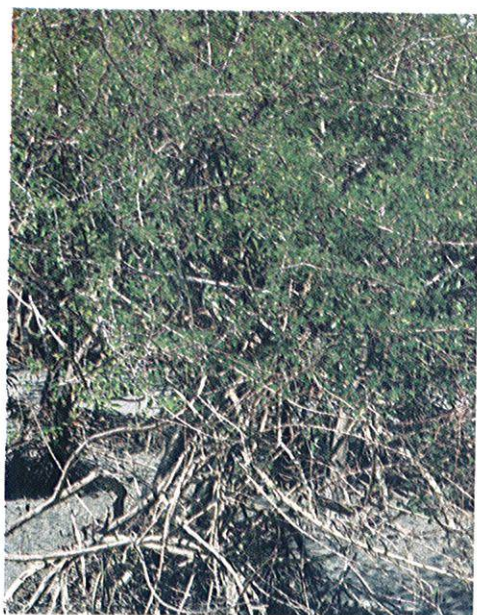
Local name: Chanda katta, Anantakanta

English name: Spiny-dalbergia, Chillanki, Chillingi

Family: Fabaceae

Description

This is a mangrove associate species. It is a perennial, non-climbing evergreen large shrub that grows up to 6 m in height. Bark is smooth and greenish brown, while inner bark is reddish and about 4-6 mm thick; sapwood and heartwood are whitish in colour. Profuse lenticels are observed at the stem base, but sporadically observed at younger branches. The branches are armed with long and straight spine; 1 to 3 woody spines at each node. Leaves are compound, imparipinnate, arises from nodes of spinous branchlets, 7-11 leaflets. Flowers are small, white, bisexual, anthers minute, ovary free, style incurved and stigma capitated. Fruits are pod, brownish, flat, falcate and 1seeded. This species shows epigeal to modified epigeal germination of seeds. This species is less salt tolerant and grows well at the inner side of canal banks with full sunlight. In the Sundarbans, it occurs with *Hibiscus tiliaceus* and *Clerodendrum inerme*.



Distribution

This species is native to Asia and frequently occur in Bangladesh, India, Malaysia and Myanmar. In Bangladesh, it occurs in the Sundarbans and other coastal areas.

Form

- Habit: Shrub
- Height: 3-6 m
- Bark: Smooth, greenish brown

Common use

- Wood is used for fuel wood, charcoal production
- Leaves and root have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



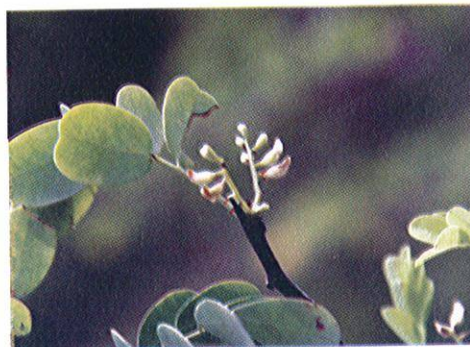


Leaves

- Arrangement: Compound, alternate
- Blade shape: Obovate (Leaflet)
- Margin: Entire-smooth
- Apex: Emarginate
- Base: Obtuse
- Upper surface: Green
- Lower surface: Silvery green
- Venation: Pinnate/net
- Size: 1-1.5 cm long (Leaflet)

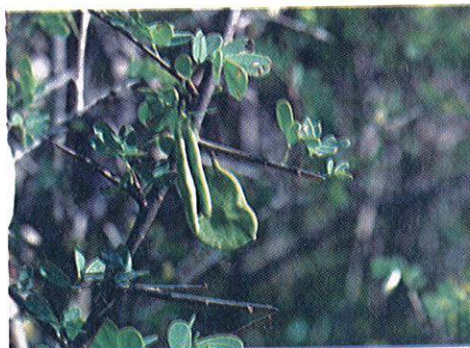
Flowers

- Inflorescence: Raceme, axillary
- Petals: 5
- Sepals: 5
- Stamens: 10
- Size: 1-1.3 cm long
- Others: Bisexual



Fruits

- Type: Pod
- Shape: Kidney shaped
- Colour: Brownish at mature stage
- Texture: Smooth
- Size: 2.5 x 1.7 cm



Adaptation

- Lenticels



Derris scandens (Roxb.) Benth.

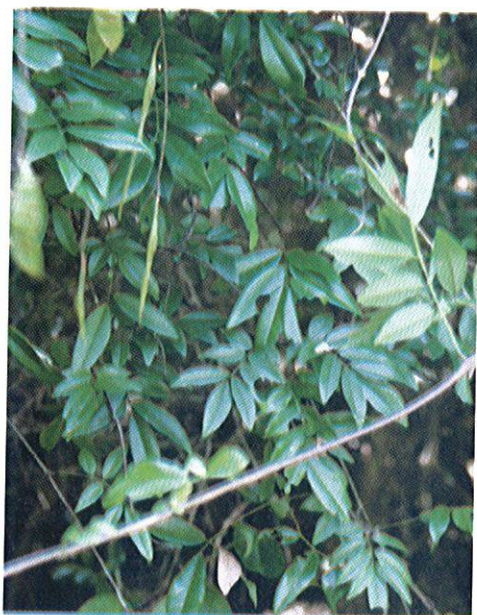
Local name: Kalilata, Noalata

English name: Hog creeper, Jewel vine

Family: Fabaceae

Description

This is a mangrove associate species. It is an evergreen, perennial, much branched woody climber with twining habit that grows up to 20 m long. Bark surface is slightly rough and dark brown to blackish in colour. Numerous lenticels are observed at the stem and younger branches. Leaves are compound, imparipinnate, alternate and about 19 cm long; 7-13 leaflets are arranged oppositely, upper pairs are bigger than the lower pairs. Flowers are pinkish on axillary raceme. The fruits are pods, flat, elliptic, acute at both ends and 1-4 seeded. This species shows epigeal type of germination. It can tolerate less saline condition; and grows well at the areas of full sunlight, fresh water input and infrequent tidal inundation. It grows at the land ward margin of mangrove habitat and also found in the secondary scrub and tropical forest. In the Sundarbans, this species is associated with *Heritiera fomes*, *Excoecaria agallocha*, *Hibiscus tiliaceus*, *Dalbergia spinosa*, *Cynometra ramiflora*, *Sarcolobus globosus* and *Derris trifoliata*.



Distribution

This species is native to Bangladesh, India, Sri Lanka, Laos, Myanmar, Thailand, Vietnam, Indonesia, Malaysia, Papua New Guinea, the Philippines and Australia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans, and coastal areas of Chittagong, Cox's Bazar, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna, Chittagong, Chittagong Hill Tracts and Sylhet district.

Form

- Habit: Woody climber
- Length: 3-15 m
- Bark: Slightly rough, dark brown to blackish
-

Common use

- Bark and root are used as fish poison
- Stem is used as rope
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

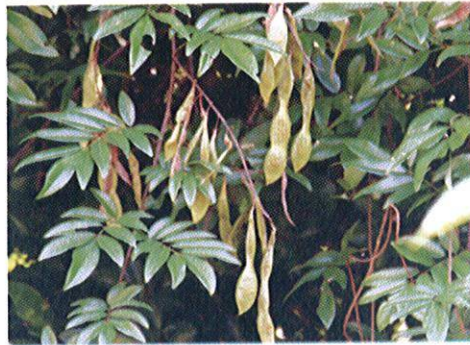
- Arrangement: Compound, alternate
- Blade shape: Elliptic to lanceolate to ovate (Leaflet)
- Margin: Entire-smooth
- Apex: Emarginate
- Base: Rounded
- Upper surface: Dark green
- Lower surface: Light green
- Venation: Pinnate
- Size: 4-10 cm long (Leaflet)

Flowers

- Inflorescence: Raceme, axillary
- Petals: 5
- Sepals: 5
- Stamens: 10
- Size: 1-1.2 cm long
- Others: Bisexual

Fruits

- Type: Pod
- Colour: Yellowish green
- Texture: Smooth
- Size: 4-5 cm long



Adaptation

- Lenticels



Derris trifoliata Lour.

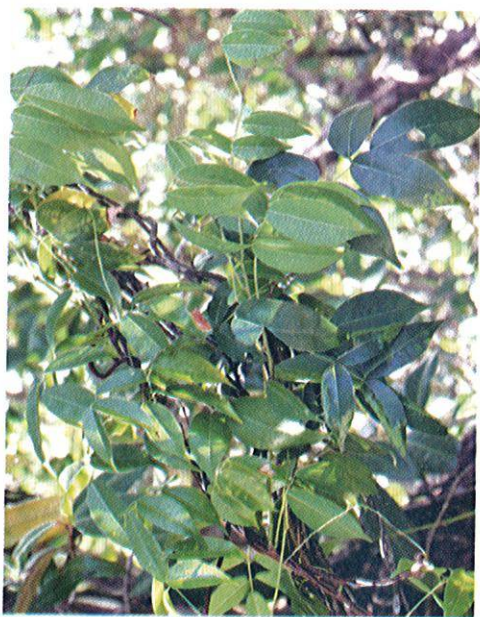
Local name: Kalilata

English name: Common derris, Trifoliate derris

Family: Fabaceae

Description

This is a mangrove associate species. It is an evergreen, perennial, much branched common woody climber of mangroves with twining habit that grows up to 15 m long. Bark surface is slightly rough and dark brown to blackish in colour; inner bark is pinkish white. Numerous lenticels are observed at the stem and younger branches. It develops aerial roots from the base of stem. Leaves are compound, imparipinnate, alternate and 3-5 leaflets. Flowers are whitish on axillary raceme. The fruits are pod, narrowly winged along the suture and one seeded. This species shows epigeal or modified epigeal type of germination and also shows vegetative propagation by root suckers. This species can tolerate moderate saline condition; and grows on variety of soil types at the land ward margin of mangrove habitat with fresh water input, infrequent tidal inundation and full sunlight. In the Sundarbans, this species is associated with *Heritiera fomes*, *Excoecaria agallocha*, *Hibiscus tiliaceus*, *Dalbergia spinosa*, *Cynometra ramiflora*, *Sarcolobus globosus* and *Derris scandens*.



Distribution

This species is native to Australia, Madagascar, and Papua New Guinea and also found in other South and East Africa countries, tropical and subtropical Asian countries to southern China. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans, and coastal areas of Chittagong, Cox's Bazar, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

- Habit: Woody climber
- Length: 2-10 m
- Bark: Slightly rough, dark brown to blackish

Common use

- Bark and root are used as fish poison
- Stem is used as rope
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Elliptic to oblong (Leaflet)
- Margin: Entire-smooth
- Apex: Acuminate
- Base: Rounded
- Upper surface: Dark green
- Lower surface: Pale green
- Venation: Pinnate/net
- Size: 6-15 cm long (Leaflet)

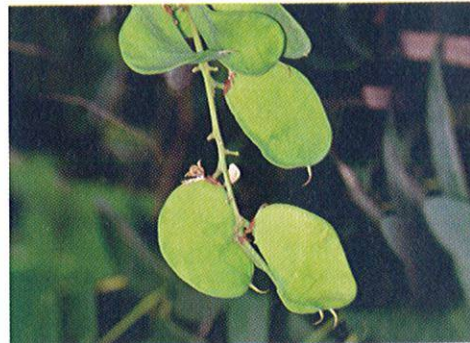
Flowers

- Inflorescence: Raceme, axillary
- Petals: 5
- Sepals: 5
- Stamens: 10
- Size: 1-1.2 cm long
- Others: Bisexual



Fruits

- Type: Pod
- Shape: Disk like
- Colour: Yellowish green
- Texture: Smooth
- Size: 3-5 cm long



Adaptation

- Aerial root
- Lenticels



Excoecaria agallocha L.

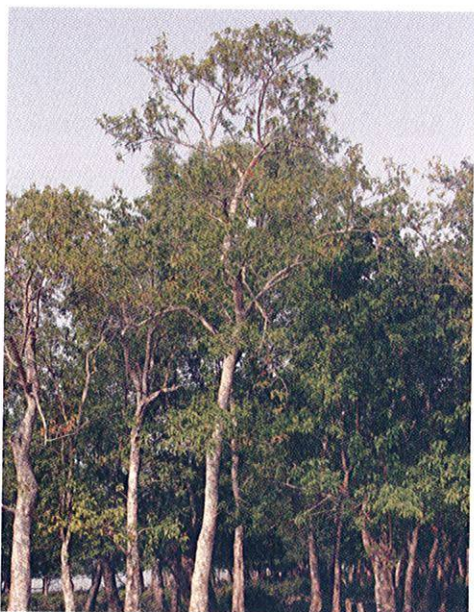
Local name: Gewa

English name: Milky mangrove, Blind your eye

Family: Euphorbiaceae

Description

This is an exclusive mangrove species. It is a deciduous, much branched shrub to small tree that grows up to 5–15 m in height with irregular crown. This plant as a whole yields a milky white latex. Bark is smooth, dark grey to light brown and about 3–4 mm thick; red colour is observed after removing the upper surface of bark. Profuse pale pinkish corky lenticels are present on stem, branches and superficial roots. Heartwood is soft, light and greyish yellow in colour. Leaves are simple, alternate and spirally arranged. Leaves turn orange to red before they shed. Trees bear either male or female flowers. The tiny flowers are spirally arranged on erect catkin-like elongated clusters. The scented male flower clusters are green and up to 11 cm long. The female flower clusters are much smaller, measuring up to 3 cm. Fruits are capsule, 3-lobed, contains dark brown seeds. This species shows epigeal or modified epigeal type of germination. It shows coppicing ability; and grows well at the non-saline to moderate saline areas with full sunlight. In the Sundarbans, it occurs with *Heritiera fomes* and *Ceriops decandra*.



Distribution

This species is distributed in India, Bangladesh, Sri Lanka to throughout the Southeast Asia, Southern China, Taiwan, Southern Japan, Australia and the West Pacific. In Bangladesh, it occurs in the Sundarbans, and coastal areas of Bagerhat, Khulna, Satkhira, Chittagong and Cox's Bazar district.

Form

- Habit: Tree or shrub
- Height: 6–15 m
- DBH: 15–40 cm
- Bark: Smooth, grey to brown
- Root: Cable root system

Common use

- Wood is used for fuel wood, matchsticks, carving, pulp and aromatic wood
- Latex is used as fish poison as well as dart poison
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



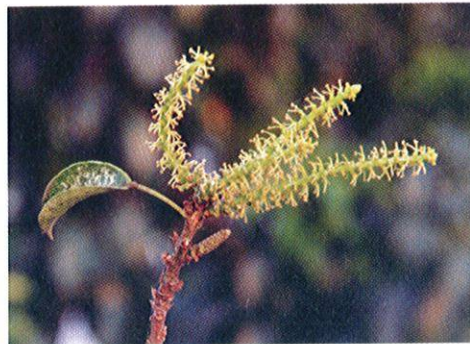


Leaves

- Arrangement: Simple, alternate
- Blade shape: Elliptical
- Margin: Entire-smooth
- Apex: Acute to acuminate
- Base: Acute
- Upper surface: Smooth, green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 3-8 cm long

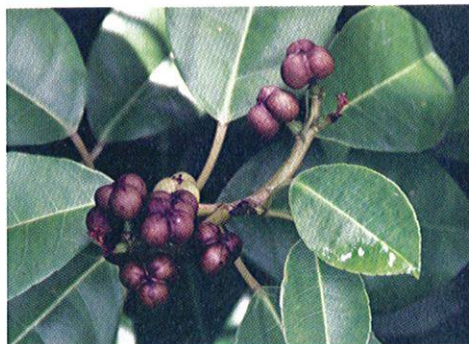
Flowers

- Inflorescence: Catkin, axillary
- Petals: Yellow
- Stamens: Yellow
- Size: 3 to 7 cm long (inflorescence)
- Others: Unisexual



Fruits

- Type: Capsule
- Shape: Round
- Colour: Green, brown at the mature stage
- Texture: Smooth
- Size: 0.4-0.6 cm in diameter



Adaptation

- Lenticels
- Superficial root
- Swollen stem base



Excoecaria indica (Willd.) Muell. Arg.

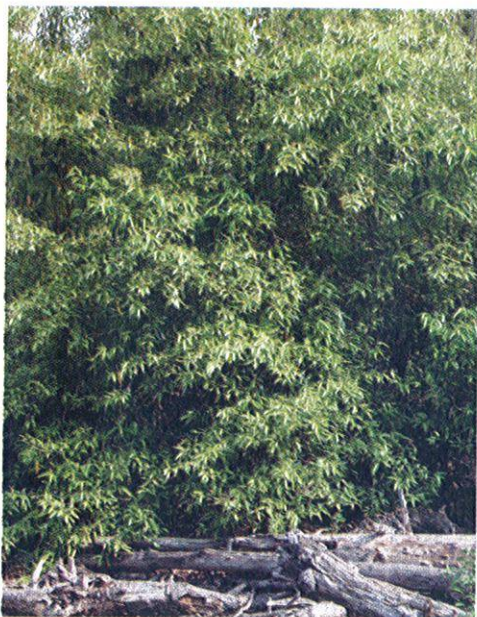
Local name: Batul, Bolas, Harua, Urmel, Batley, Batta, Melgota, Mel

English name: Mock-willow

Family: Euphorbiaceae

Description

This is a mangrove associate species. It is a small to medium-sized, evergreen to semi-deciduous, fast growing and short trunked tree. It grows up to 12 m in height with bushy crown. Bark is rough, dark brown to blackish, longitudinal fissure and about 5-7 mm thick; inner bark is pale brown. Sapwood and heartwood are white. Lenticels are present at stem of seedlings, saplings and younger branches of mature tree. Leaves are simple; petioles are reddish and 7-20 mm long. Flowers are unisexual and yellowish in colour. Female flowers are larger than males, few in number and 1 or 2 at the base of the inflorescence. Fruit is woody capsule, 2.5-3 cm in diameter and 3 seeded. This species shows epigeal germination of seeds. It shows coppicing ability. This plant contains milky white latex. Swollen-based thorns are observed at the stem of sapling and younger branches. It appears as pioneer species in the marginal habitat between mangrove swamp and inland edge. This species is less salt tolerant and grows well with full sunlight. In the Sundarbans, it occurs with *Heritiera fomes* and *Excoecaria agallocha*.



Distribution

It is distributed in Bangladesh, India, Burma, Malaysia, New Guinea and the Solomon Island. In Bangladesh, it occurs in the Sundarbans and coastal areas of Bagerhat, Khulna, Patuakhali, Pirojpur, Barisal and Chittagong district.

Form

- Habit: Tree
- Height: 8-12 m
- DBH: 40 cm
- Bark: Rough, dark brown to blackish

Common use

- Wood is used for fuel wood and indoor construction
- Leaves are used for preparing black dye
- Young fruits are used as fish poison
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Elliptic lanceolate
- Margin: Finely serrate
- Apex: Acuminate
- Base: Acute
- Upper surface: Glossy green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 6-12 x 2-4 cm

Flowers

- Inflorescence: Catkin, axillary
- Stamens: 3
- Styles: 3
- Size: 5-10 cm long
- Others: Unisexual



Fruits

- Type: Capsule
- Shape: Round
- Colour: Green to black at mature stage
- Texture: Smooth
- Size: 2.5-3 cm diameter



Adaptation

- Lenticels
- Superficial roots



Flagellaria indica L.

Local name: Ban chanda

English name: False rattan, Supplejack

Family: Flagellariaceae

Description

This is a mangrove associate species. It is a strong climber of cane like stem. It can grow up to 15 m in height with support. Leaves are simple, alternate and short petiolate. The leaf tip is curled into a tendril that helps to climb. Flowers are small, sessile, white, fragrant and clustered at the end of the stem. Fruits are round, smooth and shiny berry; green at the younger stage, red at the mature stage and 1 seed. This species shows natural regeneration by seed. It is comparatively slow growing and shade tolerant species. This species grows in coastal forest and moist lowland forest; and frequently found along the edge of canal and river banks and non-saline areas of mangrove forest. In the Sundarbans, it occurs with *Heritiera fomes*, *Excoecaria agallocha*, *Aglaia cucullata* and *Hibiscus tiliaceus*.



Distribution

This species is native to tropical Africa, south and Southeast Asia, northern Australia and western Polynesia. In Bangladesh, it occurs in the Sundarbans, coastal areas of Chittagong, Noakhali, Patuakhali, Bagerhat, Khulna and Pirojpur district.

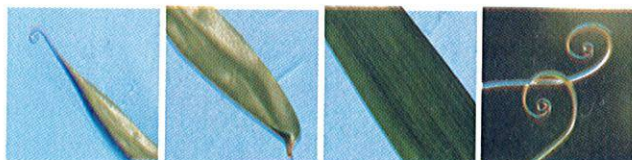
Form

- Habit: Climber
- Height: 2 to 15 m
- Diameter: 1 to 2 cm
- Stem: Green
- Root: Rhizome

Common use

- Stem is used for basket making, woven into fish traps, net and rope
- Seeds powder is edible
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Lanceolate
- Margin: Entire-smooth
- Apex: Finely acuminate, tendril
- Base: Rounded
- Upper surface: Pale green
- Lower surface: Pale green
- Venation: Parallel
- Size: 10-30 cm long

Flowers

- Inflorescence: Panicle, terminal
- Stamens: 6
- Stigma: 3
- Size: 2.5 mm diameter
- Others: Bisexual



Fruits

- Type: Berry
- Shape: Round
- Colour: Red at mature stage
- Texture: Smooth
- Size: 6-8 mm diameter



Adaptation

- Tendril at leaf apex



Heritiera fomes Buch. Ham.

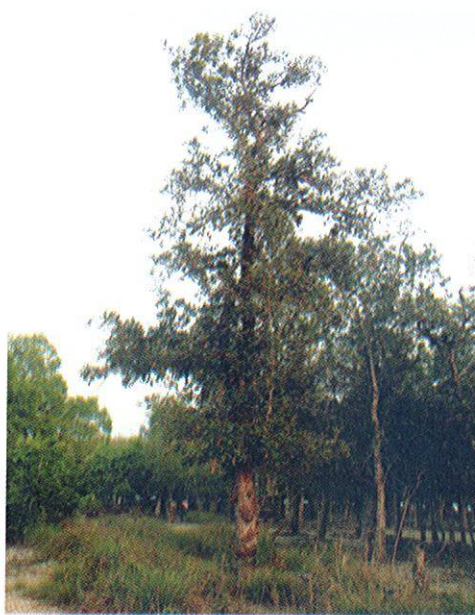
Local name: Sundri

English name: Sundari

Family: Sterculiaceae

Description

This is a non-exclusive mangrove species. It is an evergreen tree that grows up to 25 m in height. Bark is rough with longitudinal fissure, grey and about 2-4 mm thick. Brown to dark brown colour is observed after removing the upper surface of bark; inner bark is red. Heartwood is very hard, heavy, closed grained and dark red in colour. It has long peg like pneumatophores with cable root system. Leaves are simple, alternate and short petiolate; upper surface is dark green but lower surface is silvery white; midrib is grey and slightly woody. Flower clusters are pendulous and much branched. The flowers are unisexual, cream to pale brownish and organized in panicles. The fruit is woody, indehiscent and 1 seeded. This species shows hypogeal type of germination. It is shade bearer at the early stage of growth. It can tolerate moderate saline condition, but grows well on well-drained soil of non-saline areas. In the Sundarbans, it occurs with *Excoecaria agallocha*, *Xylocarpus moluccensis*, *Aglaia cucullata* and *Ceriops decandra*.



Distribution

This species is restricted in India (West Bengal and Orissa), Bangladesh, Myanmar, Thailand and northern Malaysia. In Bangladesh, it occurs in the Sundarbans, Chakaria Sundarbans, and coastal areas of Bagerhat, Khulna, Satkhira and Cox's Bazar district.

Form

- Habit: Tree
- Height: 15-25 m
- DBH: 20-50 cm
- Bark: Rough, grey
- Root: Cable root system

Common use

- Wood is used for fuel wood and charcoal production
- Timber is used for furniture, house and bridge construction, stakes, poles and piling
- Bark is used for tannin and dye
- Plants parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



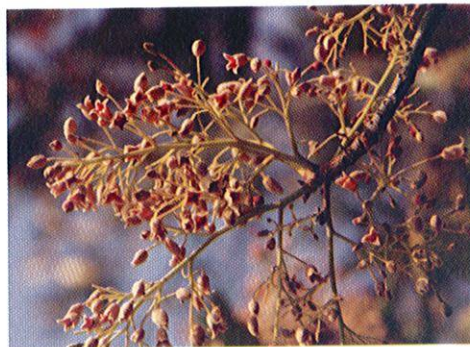


Leaves

- Arrangement: Simple, alternate
- Blade shape: Elliptic-lanceolate
- Margin: Entire-smooth
- Apex: Acute
- Base: Acute
- Upper surface: Green
- Lower surface: Silvery white
- Venation: Pinnate
- Size: 10-18 cm long

Flowers

- Inflorescence: Panicle, axillary
- Sepals: 4-5
- Stamens: 5
- Carpel: 4-5
- Size: 5-6 mm long
- Others: Unisexual



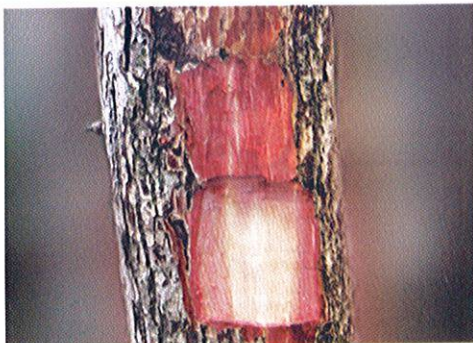
Fruits

- Type: Samara, woody
- Shape: Boat-shaped
- Colour: Pale green to brown
- Texture: Woody
- Size: 2-4 cm long



Adaptation

- Buttresses
- Lenticels
- Pneumatophores
- Cryptoviviparous germination



Hibiscus tiliaceus L.

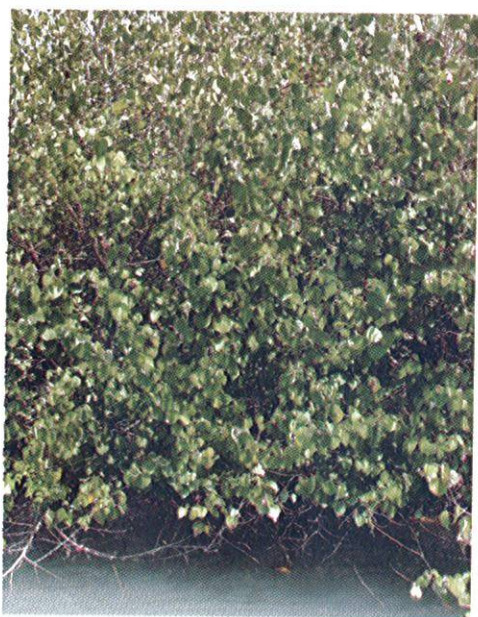
Local name: Bhola, Bola

English name: Beach hibiscus, Coastal hibiscus, Coastal cottonwood, Hibiscus, Green cottonwood

Family: Malvaceae

Description

This is a mangrove associate species. It is an evergreen, fast growing, shrub to small-sized tree. It grows up to 10 m in height with low spreading crown. Bark is smooth, grey to light brown and about 10 to 15 mm thick; inner bark is pinkish with whitish strips. Stem and branches contain sporadic lenticels. Heartwood is light weighted and porous. It contains spreading lateral root system with few main roots. Leaves are simple and spirally arranged with pair of leaf like deciduous stipules. Flowers are solitary, large, cup-shaped, bright yellow in colour with maroon throats at the morning and became red at the evening before fall. The fruits are capsules, light brown at the mature stage and splitting into 5 segments. This species shows epigeal type of germination. It can be propagated from cuttings and shows coppicing ability. It grows well with open sunlight to defuse shade. This species can tolerate moderate saline condition and shallow flooding for extended period. It grows with variety of soil types along the banks of rivers and canals, and inner margins of mangrove. In the Sundarbans, it occurs with *Pongamia pinnata*, *Brownlowia tersa*, *Clerodendrum inerme* and *Dalbergia spinosa*.



Distribution

This species is native to tropical coasts of Pacific and Indian oceans but presently distributed in tropical and subtropical America, Africa, Asia, Australia and throughout the pacific islands. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans and coastal areas of Chittagong, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

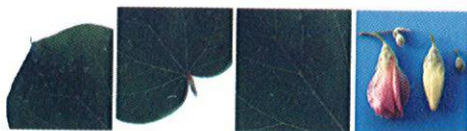
Form

- Habit: Shrub or small tree
- Height: 4-10 m
- DBH: 5-15 cm
- Bark: Smooth, grey

Common use

- Wood is used for fuel wood, carvings and house hold instruments
- Fibers from bark is used to made rope
- Leaves are used as fodder
- Ornamental and soil stabilization for slope, embankment and riverbank
- Plant parts have medicinal use

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Broadly cordate
- Margin: Fine serrated
- Apex: Acute
- Base: Cordate
- Upper surface: Green
- Lower surface: Greyish green
- Venation: Palmate
- Size: 6-15 cm long

Flowers

- Inflorescence: Racemes, axillary/terminal
- Petals: 5
- Sepals: 5
- Stamens: 10
- Size: 5-7 cm long
- Others: Bisexual



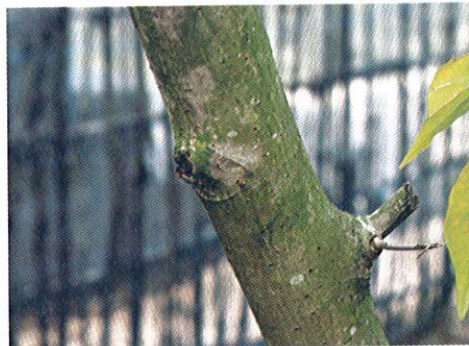
Fruits

- Type: Capsule
- Colour: Light brown
- Texture: Woody
- Size: 2-3 cm long



Adaptation

- Lenticels



Kandelia candel (L.) Druce

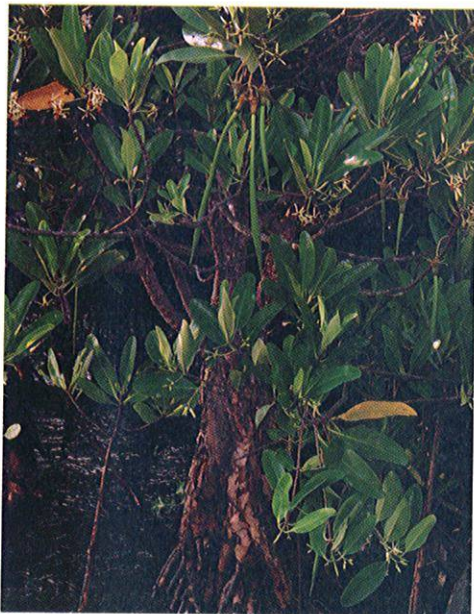
Local name: Gorla, Rohini, Guria

English name: Narrow-leaved kandelia, Kandal-guriya, Dichotomous cymed mangrove

Family: Rhizophoraceae

Description

This is an exclusive mangrove species. It is an evergreen small tree or shrub that grows up to 6 m in height. Bark is smooth and about 2-3 mm thick; contains small sized lenticels. Bark surface is dark brown and inner bark is pinkish in colour. Heartwood is moderately hard and light brown in colour. It shows aerial roots at the stem base; these aerial roots are defused and form short buttress. Leaves are simple, opposite and curled inward margin. Inflorescence is axillary dichotomously branched 4 flowered cymes. Flowers are white, numerous stamens and long peduncled. The green fruit is ovoid and about 2.5 cm long. The hypocotyl smooth, cylindrical and narrowed at the end. This species shows viviparous germination with modified epigeal type. It shows coppicing ability. It can tolerate strong saline condition but grows well at the moderate saline areas on the muddy banks of tidal rivers and canals of moderate saline areas. It appears as undergrowth and found to occur with *Excoecaria agallocha*, *Xylocarpus moluccensis*, *Bruguiera sexangula*, *Rhizophora mucronata*, *Ceriops decandra*, *Aegiceras corniculatum* and *Acanthus ilicifolius* in the Sundarbans.



Distribution

This species is restricted in the indo pacific region and occurs in India, Bangladesh, Myanmar, Thailand, Indonesia, Malaysia, the Philippines, Singapore and Japan. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans.

Form

- Habit: Shrub
- Height: 2-6 m
- DBH: 5-15 cm
- Bark: Smooth, dark brown

Common use

- Stems are used for fuel wood and stakes
- Leaves are used as fodder and green manure
- Bark is used for dye
- Leaves have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Elliptic-oblong
- Margin: Entire-smooth
- Apex: Obtuse
- Base: Acute
- Upper surface: Dark green
- Lower surface: Yellowish green
- Venation: Pinnate
- Size: 10-16 cm long

Flowers

- Inflorescence: Cyme, axillary
- Petals: 5
- Sepals: 5
- Stamens: Numerous
- Size: 1.5-2 cm long
- Others: Bisexual



Propagules

- Shape: Cylindrical, slender
- Colour: Green
- Texture: Smooth
- Size: 20-30 cm long



Adaptation

- Aerial roots
- Buttress
- Lenticels
- Viviparous germination



Lumnitzera racemosa Willd.

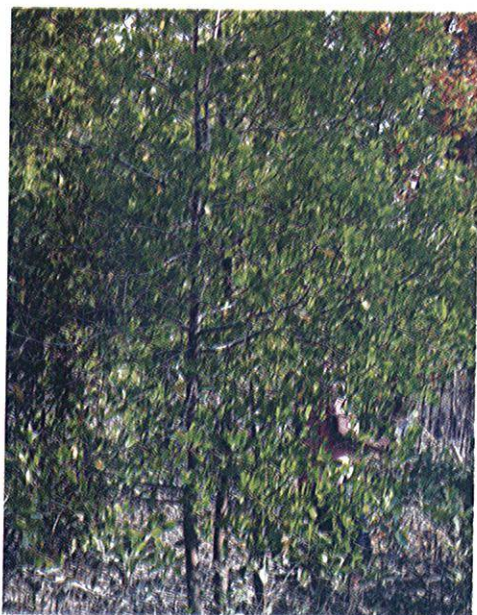
Local name: Kripa

English name: White-flowered black mangrove

Family: Combretaceae

Description

This is an exclusive mangrove species. It is a medium sized evergreen tree or shrub that grows up to 10 m in height with much branched canopy. Bark is smooth at the early stage and become fissured longitudinally with maturity; and about 9 to 12 mm thick, surface is reddish brown and inner bark is pinkish. Larger sized lenticels are arranged longitudinally at the base of stem. Heartwood is hard, durable and medium textured. Lateral roots system is extensive. Leaves are simple, alternate and clustered towards the end of branches. Flowers are on the short axillary or terminal spikes or raceme, small, fragrant and white in colour. The fruits are vase-shaped, yellowish green in colour at the early stage, blackish brown when ripe, drupe-like (pseudocarp) and 1 seeded. This species shows hypogeal type of germination. It is the most salt tolerant species among mangroves. It is shade intolerant and found to grow with variety of soil types at the elevated open areas in estuarine and backwater mangroves. In the Sundarbans, it occurs with *Excoecaria agallocha* and *Ceriops decandra*.



Distribution

This species is native to Bangladesh, India, Maldives, Sri Lanka, Myanmar, Thailand, Cambodia, Vietnam, Malaysia, Indonesia, Singapore, Brunei Darussalam, the Philippines, Taiwan, Papua New Guinea, China, Australia, Japan, Kenya, Madagascar, Somalia, Tanzania, and South Africa. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans and other coastal districts.

Form

- Habit: Tree, shrub
- Height: 4-6 m
- DBH: 5-20 cm
- Bark: Rough, brown to reddish brown

Common use

- Stems are used for house post, bridge and boat building; pole, piling and fencing
- Wood is used for fuel wood and charcoal production
- Bark is used for tanning extraction
- Ornamental and soil stabilization for slope, embankment and riverbank

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, alternate
- Blade shape: Obovate
- Margin: Entire-smooth, sometimes small serration
- Apex: Emarginate
- Base: Cuneate
- Upper surface: Light green
- Lower surface: Light green
- Venation: Pinnate
- Size: 4-8 cm long

Flowers

- Inflorescence: Spike or raceme, axillary/terminal
- Petals: 5
- Sepals: 5
- Stamens: 10 in two series
- Size: 1-1.3 cm long
- Others: Bisexual



Fruits

- Type: Drupe-like
- Shape: Vase-shaped
- Colour: Yellowish green
- Texture: Smooth and waxy
- Size: 1-1.3 cm long



Adaptation

- Lenticels
- Stilt root



Nypa fruticans Wurmb

Local name: Golpata

English name: Nipa palm, Attap, Aipa, Buahatap, Buahnipah, Ging pol

Family: Arecaceae

Description

This is an exclusive mangrove species. It is an evergreen, fast growing, clumping stemless, versatile palm that grows up to 9 m in height. This species contains horizontal creeping stem that grows under the ground level. Leaves are compound, paripinnate, long petiole with pulvinate base; up to 100 lanceolate leaflets that are arranged regularly on the rachis. The midrib of each leaflet is marked with regular linear brown scales up to 2 cm long. The inflorescence is born on a long (1-2 m) sturdy peduncle. It contains a head-like part at the tip that bears female flowers; and male flowers form a catkin below the female inflorescence. Fruit is brown to dark brown in colour that born on a spherical infructescence. Individual fruit is reversed egg-shaped to oblong elliptic and 1 seeded fibrous nut. Seeds are white, egg-shaped and about 5 cm long. This species shows cryptoviviparous germination. It can tolerate moderate saline condition; grows well with full sunlight and can form pure patch along the banks of canals, creeks and rivers with silt rich soft mud with regular inflow of freshwater and slow moving tidal water. In the Sundarbans, this species is associated with *Acanthus ilicifolius* and different grasses.



Distribution

This species is widely distributed in Bangladesh, Myanmar, Malaysia, India, Sri Lanka, China, Cambodia, Thailand, Vietnam, Indonesia, the Philippines, Papua New Guinea, Andaman and Nicobar Islands, Solomon Islands and extends up to Australia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans and coastal areas of Chittagong, Cox's Bazar, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

- Habit: Stemless palm
- Height: 2-9 m

Common use

- Old leaves are used for thatching material
- Young leaves are used as cigarette-wrappers
- Midribs are used for making brooms
- Young seeds are edible
- Sap is a good source of alcohol, sugar and vinegar

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternative
- Blade shape: Lanceolate (Leaflet)
- Margin: Entire-smooth
- Apex: Acute
- Base: Sessile leaflet
- Upper surface: Green
- Lower surface: Light green
- Venation: Parallel
- Size: 40-120 cm long (Leaflet)

Flowers

- Inflorescence: Catkin, axillary
- Petals: Yellow to orange
- Sepals: Orange
- Stamens: Yellow
- Others: Unisexual



Fruits

- Type: Nut
- Shape: Ball-shaped
- Colour: Brown to dark brown
- Texture: Woody
- Size: 20-40 cm diameter (cluster)



Adaptation

- Cryptoviviparous germination



Pandanus foetidus Roxb.

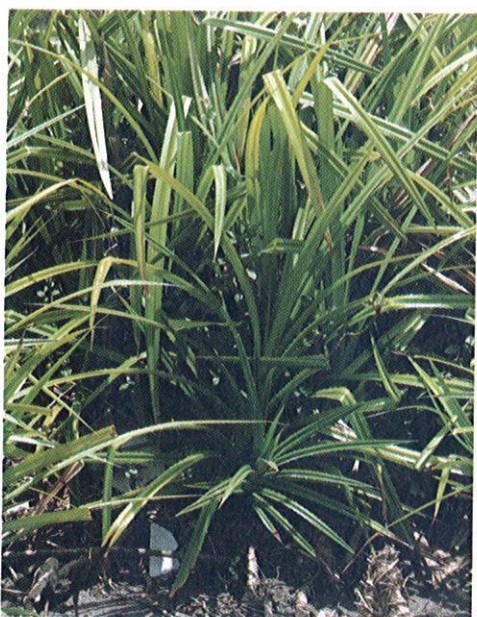
Local name: Kewa kanta

English name: Common sea-shore screwpine

Family: Pandanaceae

Description

This is a mangrove associate species. It is an evergreen, moderate growing, much branched shrub that grows up to 6 m in height. The trunk is stout and ringed with many leaf scars. Leaves are simple and linear, spirally arranged towards the ends of the branches with sheathing base. Straw coloured spines are observed at a regular interval along the leaf margin and below the midrib. Male inflorescence is a terminal spadix with numerous sub-sessile cylindrical spikes. Male trees produce large clusters of tiny, fragrant flowers surrounded by white to cream coloured bracts. Female inflorescence is also terminal on erect peduncle, spadix solitary, about 5 cm diameter and fragrant. Female trees produce a large, segmented fruit somewhat resembling a pineapple. Fruit an oblong or globose syncarpium. Fruits are thick-walled drupes, yellow-orange to reddish when ripe. This species can be propagated from stem cuttings. It can tolerate moderate saline condition; grows well with full sunlight to semi-shade condition and can form pure patch along the beaches, margins of mangroves and also in the inland. In the Sundarbans, it occurs with *Acanthus ilicifolius* and different grasses.



Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



Distribution

This species is distributed in Bangladesh, Malaysia, India, Sri Lanka, Myanmar, the Philippines, Indonesia, Taiwan, Papua New Guinea, northern Australia and Pacific island. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans and coastal areas of Chittagong, Cox's Bazar, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

- Habit: Shrub
- Height: 3-6 m

Common use

- Leaves are used for weaving mats, hats, baskets and ropes
- Tender leaves are eaten as raw or cooked
- Fruits are edible
- Plant parts have medicinal uses



Leaves

- Arrangement: Simple, alternate
- Blade shape: Linear to lanceolate
- Margin: Entire and spiny
- Apex: Acuminate
- Base: Sessile
- Upper surface: Green
- Lower surface: Silvery green
- Venation: Parallel
- Size: 0.9-1.5 m long

Flowers

- Inflorescence: Spikes, terminal
- Male flower: Creamy white
- Female flower: Yellowish
- Others: Unisexual



Fruits

- Type: Drupes-multiple
- Colour: Yellow to orange
- Texture: Woody
- Size: 15-25 cm long (cluster)

Adaptation

- Aerial roots
- Stilt roots



Phoenix paludosa Roxb.

Local name: Hatal

English name: Mangrove date palm

Family: Arecaceae

Description

This is a mangrove associate species. It is an evergreen, perennial, clustering palm that grows up to 5 m in height. The species contains slender, cylindrical and unbranched stem. The stem is covered with dark fibrous sheath. Leaves are petiolate, compound, imparipinnate with many ensiform segments, waxy, strong midrib and ending into strong sharp spine at apex; few pairs of leaflet at the lower segment are modified into sharp spines. Leaves are arching and contain light green leaflets. The inflorescence is a spadix, peduncle branched; spathe about 45 cm long, boat shaped, yellow, spongy glabrous and deciduous. Both the male and female flowers are sessile and erect; but female flowers are shorter than the male. Fruits are drupes, fleshy, one seeded, purple to black when ripe and arranged in cluster. Seeds are woody and very hard on maturity. This species shows hypogeal type of germination. It can tolerate moderate saline condition; grows well with full sunlight and can form pure patch along the raised banks of mangrove canals, creeks and rivers with less tidal inundation. In the Sundarbans, this species is associated with *Acanthus ilicifolius*.



Distribution

It occurs in Bangladesh, India, Andaman and Nicobar Islands, Myanmar, Thailand, Cambodia, Malaysia, Indonesia, Vietnam and Indonesia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans and coastal areas of Chittagong, Cox's Bazar, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

- Habit: Clustered palm, small tree
- Height: 2-5 m
- Diameter: 4-10 cm

Common use

- Leaves are used for making mats, ropes, umbrellas and thatching materials
- Stems are used to build cottages and fuel wood
- Pith of the stem is edible

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound
- Blade shape: Linear to lanceolate (Leaflet)
- Margin: Entire-smooth
- Apex: Acute
- Base: Sessile
- Upper surface: Light green
- Lower surface: Silvery grey
- Venation: Parallel
- Size: 150-200 cm long (Leaflet)

Flowers

- Inflorescence: Spikes
- Petals: 3
- Sepals: 3
- Stamens: 6
- Carpel: 3
- Others: Yellowish white, unisexual



Fruits

- Type: Drupe
- Colour: Purple to black
- Texture: Fleshy
- Size: 1-1.2 cm long



Pongamia pinnata (L.) Pierre

Synonym: *Millettia pinnata* (L.) Panigrahi

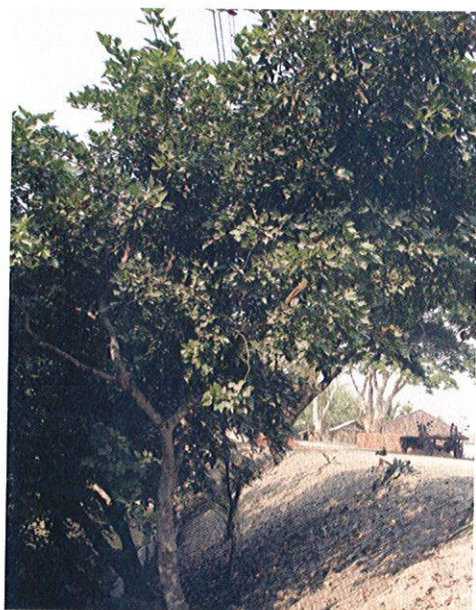
Local name: Karanj, Shita-shara

English name: Indian beach tree, Pongam oil tree, Karnaj

Family: Fabaceae

Description

This is a mangrove associate species. It is a medium sized, semi-deciduous, fast growing tree that grows up to 15 m in height with spreading crown. Bark is smooth and about 6 to 10 mm thick; surface is grey to blackish and inner bark is light yellow in colour. Stem and smaller branches contain numerous lenticels. Heartwood is medium textured and yellowish in colour. It contains extensive lateral root with a long taproot system. Leaves are compound, long petiolate and 5-9 leaflets. Inflorescence is raceme like; flowers are small pea shaped and white to light purple in colour. The fruits are pod, green in colour and one seeded. Seeds are elliptical bean, dark brown and oily. This species shows epigeal type of germination. It shows good coppicing ability; and can be propagated from cuttings and root sucker. This species can tolerate moderate saline and water logged condition; grows with variety of soil types from fresh water swamp forest to mangrove forest. In the Sundarbans, it occurs with *Heritiera fomes*, *Excoecaria agallocha*, *Hibiscus tiliaceus*, *Brownlowia tersa*, *Clerodendrum inerme* and *Dalbergia spinosa*.



Distribution

This species is native to Bangladesh, India, Myanmar, Nepal and Thailand but presently found to occur in Australia, China, Egypt, Fiji, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Papua New Guinea, the Philippines, Solomon Island, Sri Lanka and Sudan. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans and coastal areas of Chittagong, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district. It is also a component of fresh water swamp forest.

Form

- Habit: Tree
- Height: 10-15 m
- DBH: 20-80 cm
- Bark: Smooth, grey to blackish

Common use

- Leaves and flowers are used as green manure
- Seed oil is used for making soap, lamp oil and lubricants and also for tanning
- Wood is used as fire wood and tool makings
- Ornamental and soil stabilization for slope, embankment and riverbank
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Ovate elliptical or oblong (Leaflet)
- Margin: Entire-smooth
- Apex: Obtuse to acuminate
- Base: Round to cuneate
- Upper surface: Dark green
- Lower surface: Green
- Venation: Pinnate/net
- Size: 5-20 cm long (Leaflet)

Flowers

- Inflorescence: Raceme, axillary
- Size: 1-2 cm long
- Others: Bisexual



Fruits

- Type: Pod
- Colour: Green
- Texture: Smooth
- Size: 3-6 cm long

Adaptation

- Lenticels



Rhizophora apiculata Blume

Local name: Garjan

English name: Tall stilt-root mangrove, Bakhaw Lalaki

Family: Rhizophoraceae

Description

This is an exclusive mangrove species. It is an evergreen, columnar or multi-stemmed medium to large tree that grows up to 25 m in height with pyramidal crown. Bark is horizontal fissured and about 10-12 mm thick; surface is dark grey to blackish and inner bark is reddish to dark brown in colour. Stem is supported by numerous branched stilt roots. Aerial roots arise from the lower branches of the tree. Leaves are simple, opposite, spirally arranged, short petiolate with reddish base. Leaf contains a mucron (up to 6 mm) at the end of apex and tiny black spots on the underside. Inflorescence is axillary cymes with two flowers on short and dark grey peduncle that appears below the leaf clusters. The fruit is one seeded and brown in colour. The hypocotyl is cylindrical, light green, pointed apex, up to 38 cm long with smooth surface. This species shows viviparous germination with modified epigeal type. It can tolerate strong saline condition and can grow on variety of soil types. It found to grow along the banks of rivers and creeks, and at the depressed sites of the forest with frequent tidal flooding. It can form pure stand and found to occur with *Avicennia officinalis*, *Excoecaria agallocha*, *Bruguiera sexangula* and *Kandelia candel* in the Sundarbans.



Distribution

It is found in the mangroves of India, The Maldives, Sri Lanka, Bangladesh, New Caledonia, Myanmar, Thailand, Malaysia, Indonesia, Vietnam, Papua New Guinea, the Philippines, Singapore, Solomon Islands, Taiwan, Micronesia and Australia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans.

Form

- Habit: Tree
- Height: 10-25 m
- DBH: 10-50 cm
- Bark: Rough, dark greyish to blackish

Common use

- Wood is used for firewood, charcoal, house buildings, poles, piling, pulp and rayon
- Bark and leaves are used for tanning and dye
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite, spirally arranged
- Blade shape: Narrowly elliptic
- Margin: Entire-smooth
- Apex: Apiculate
- Base: Acute
- Upper surface: Dark green
- Lower surface: Green
- Venation: Pinnate
- Size: 8-19 cm long

Flowers

- Inflorescence: Cymes, axillary
- Petals: 4
- Sepals: 4
- Stamens: 12
- Size: 1.2-1.5 cm long
- Others: Bisexual



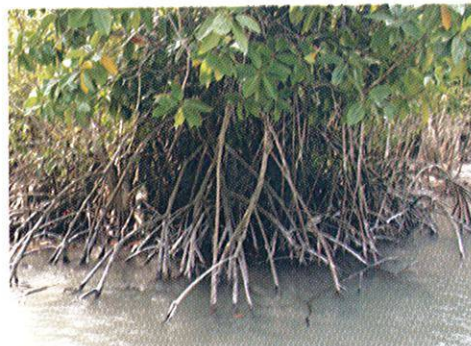
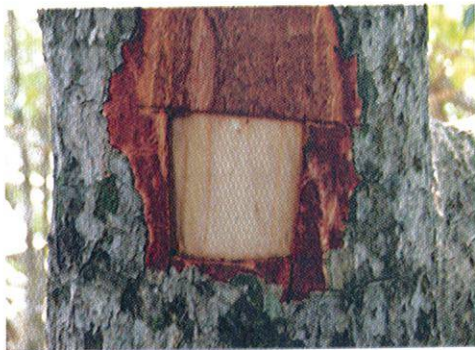
Propagules

- Shape: Cylindrical
- Colour: Light green
- Texture: Smooth
- Size: 25-35 cm long



Adaptation

- Aerial root
- Lenticels
- Stilt root
- Viviparous germination



Rhizophora mucronata Lamk.

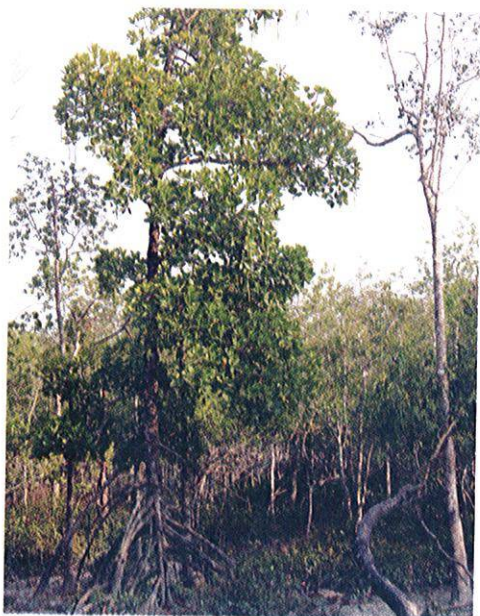
Local name: Garjan

English name: Red mangrove

Family: Rhizophoraceae

Description

This is an exclusive mangrove species. It is an evergreen, medium to large tree that grows up to 25 m in height with pyramidal crown. Bark is rough with horizontal fissures and about 10-12 mm thick; surface is blackish and inner bark is red. Heartwood is extremely hard and reddish brown in colour. Stem contains distinct annual growth rings. Stem is supported by numerous branched stilt roots; and aerial roots arise from the lower branches. Leaves are simple, spirally arranged, short petiolate, long mucron (up to 8 mm) at the end of apex and tiny black spots on the underside. Inflorescence is axillary cymes, long yellowish stalks, contains two to eight flowers and appears from the leaf cluster. Flowers are bisexual, yellow-white calyx and white petals. The fruit is one seeded and brown in colour. The hypocotyl is cylindrical, light green, pointed apex, up to 60 cm long with warty surface. This species shows viviparous germination with modified epigeal type. It can tolerate strong saline condition and can grow on variety of soil types. This species can form pure stand along the banks of rivers and creeks and at the depressed sites of the forest with frequent tidal flooding. In the Sundarbans, it occurs with *Rhizophora apiculata*, *Xylocarpus granatum*, *Bruguiera sexangula* and *Kandelia candel*.



Distribution

This species is restricted in the Indo-Pacific region. It is found in Madagascar, Kenya, Mozambique, Somalia, Tanzania, India, Sri Lanka, Bangladesh, Pakistan, Myanmar, Thailand, Malaysia, Indonesia, Cambodia, Vietnam, Papua New Guinea, the Philippines, Singapore, Solomon Islands, Ryukyu island of Japan, Taiwan and Northern Australia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans.

Form

- Habit: Tree
- Height: 10-25 m
- DBH: 10-50 cm
- Bark: Rough, blackish

Common use

- Wood is used for fuel wood, charcoal, house buildings, poles, piling, pulp and rayon
- Bark and leaves are used for tanning and dye
- Fruits and young shoot can be consumed as vegetable
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite, spirally arranged
- Blade shape: Elliptic to oblong
- Margin: Entire-smooth
- Apex: Mucronate
- Base: Acute
- Upper surface: Dark green
- Lower surface: Yellowish green
- Venation: Pinnate
- Size: 8-15 cm long

Flowers

- Inflorescence: Cymes, axillary
- Petals: 4
- Sepals: 4
- Stamens: 8
- Size: 1.2-2 cm long
- Others: Bisexual



Propagules

- Shape: Cylindrical
- Colour: Light green
- Texture: Rough and warty
- Size: 40-60 cm long



Adaptation

- Aerial root
- Lenticels
- Stilt root
- Viviparous germination



Sarcolobus globosus Wall.

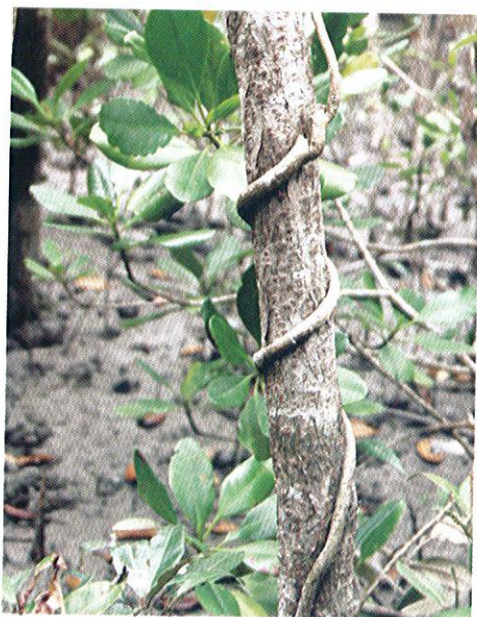
Local name: Baoli lata

English name: Protruding, Sarcolobus

Family: Asclepiadaceae

Description

This is a mangrove associate species. It is a twining climber up to 4-6 m in height with support, poorly branched and contains milky latex. Bark is smooth and sporadic lenticels are observed at the base. Aerial roots are also observed at the base. Leaves are simple, petioles are 15-30 mm long and pubescent; midrib and major veins are light green to yellowish green in colour. Flowers are bisexual; 5-10 flowers occur in a cluster. Fruit is 1-2 follicles round, 5-8 cm in diameter, light brown in colour, numerous small dark brown to black granules at the surface. The fruit is rich in milky latex and contain numerous seeds that are surrounded by a thick wing-like margin. It is regenerated by seeds and shows good natural regeneration at muddy substrate under shade. In the Sundarbans, it occurs with *Excoecaria agallocha*, *Aglaia cucullata* and other medium sized tree species at the non-saline to moderate-saline areas.



Distribution

It found in Bangladesh, India, China, Thailand, Malaysia, Myanmar, the Philippines and Indonesia. In Bangladesh, it occurs in the Sundarbans, coast of Chittagong, Cox's Bazar, Khulna and Bagerhat districts.

Form

- Habit: Climber
- Height: 4-6 m long
- Bark: Smooth
- Stem: Greyish

Common use

- The younger stems are used as rope
- Fruits are cooked as vegetables
- Leaves and roots have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Ovate-oblong
- Margin: Entire-smooth
- Apex: Acuminate
- Base: Obtuse
- Upper surface: Glossy green
- Lower surface: Pale green
- Venation: Pinnate to arcuate
- Size: 6-12 x 3.5-4.5 cm

Flowers

- Inflorescence: Cymes, axillary
- Sepals: 5
- Petals: 5
- Stamens: 5
- Size: 1.2-1.8 cm long
- Others: Bisexual



Fruits

- Type: Follicle
- Shape: Round
- Colour: Light brown
- Texture: Rough
- Size: 5-8 cm diameter



Adaptation

- Aerial roots
- Lenticels



Sonneratia apetala Buch. Ham.

Local name: Keora
English name: Mangrove apple
Family: Lythraceae

Description

This is an exclusive mangrove species. It is an evergreen, fast growing, pioneer tree that grows up to 20 m in height with pendulous branches and branchlets. Bark is smooth at the early stage and rough at the mature stage with irregular fissure; brown to dark brown in colour and about 13-16 mm thick. Dark brown colour is observed after removing the upper surface of bark and inner bark is reddish. Heartwood is moderately hard and reddish in colour. Pneumatophore is corky, height varies from 60 to 150 cm. Leaves are simple, opposite, short petiolate, midrib is yellowish green. Flowers are large, white or yellowish white, large stigma of umbrella or mushroom shaped and ovary 2-20 celled. The fruit is berry, many seeded, depressed globose, thin walled and supported by lobed calyx. Previously this species was classified under Sonneratiaceae family. It shows epigeal or modified epigeal type of germination. It can tolerate strong saline condition, but grows well on the newly accreted sites of moderate saline areas. It can form monotypic stand and occurs with *Avicennia officinalis*, *Ceriops decandra* and *Acanthus ilicifolius* in the Sundarbans.



Distribution

This is the least common in the world and restricted to southern India, Bangladesh and Myanmar. In Bangladesh, it occurs in the Sundarbans, Chakaria Sundarbans, Chittagong, Patuakhali, Bagerhat, Khulna, Satkhira and Cox's Bazar district.

Form

- Habit: Tree
- Height: 15-20 m
- DBH: 30-70 cm
- Bark: Rough, brown
- Root: Cable root system

Common use

- Wood is used for fuel wood, plank, matchbox, pulp, poles, bobbins for textile mills
- Leaves are used as fodder
- Flowers are good source of honey
- Fruits are used as vegetables and pickle

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Elliptic-lanceolate, elliptic-oblong
- Margin: Entire-smooth
- Apex: Tapering, obtuse
- Base: Attenuate
- Upper surface: Green
- Lower surface: Green
- Venation: Pinnate
- Size: 6-13 cm long

Flowers

- Inflorescence: Cymes, axillary
- Sepals: 4
- Stamens: Numerous
- Size: 1.5-2 cm long
- Others: Bisexual



Fruits

- Type: Berry, many seeded
- Shape: Rounded
- Colour: Dark green
- Texture: Smooth
- Size: 1-2.5 cm diameter



Adaptation

- Lenticels
- Pneumatophores



Sonneratia caseolaris (L.) Engl.

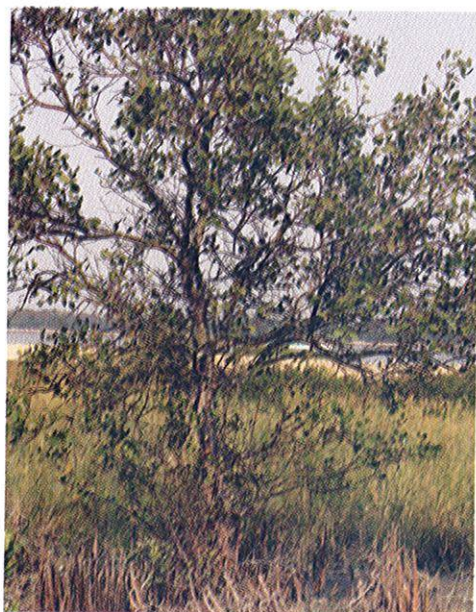
Local name: Ora, Soila

English name: Crab-apple mangrove, Mangrove apple

Family: Lythraceae

Description

This is an exclusive mangrove species. It is an evergreen, fast growing, pioneer and medium to large tree. It grows up to 15 m in height with spreading crown and pendulous branches. Bark is smooth at the early stage and slightly rough at the mature stage and about 2-3 mm thick. Upper surface of bark is grey to brownish; inner bark is dark brown in colour. Heartwood is moderately hard and greyish. Pneumatophore is corky and height varies from 50-90 cm. Leaves are simple, opposite, minute recurved point at the apex, blunt or rounded tip; petioles are short and reddish to pink in colour. Flowers are large, reddish or purple. It opens at dusk and last only for one night. The fruit is berry with persistent calyx and pointed style. Previously this species was classified under Sonneratiaceae family. It shows epigeal type of germination. It can tolerate strong saline condition, but grows well on the deep muddy bank of tidal rivers and canals at the moderate saline areas. It can form monotypic stand and occurs with *Sonneratia apetala*, *Acanthus ilicifolius* and different types of grass in the Sundarbans.



Distribution

This species is widely distributed and found to occur in Bangladesh, Brunei Darussalam, Cambodia, China, India, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Northeast Australia, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia and the Maldives. In Bangladesh, it occurs in the Sundarbans, Chakaria Sundarbans and coastal areas of Chittagong, Patuakhali, Bagerhat, Khulna and Satkhira district.

Form

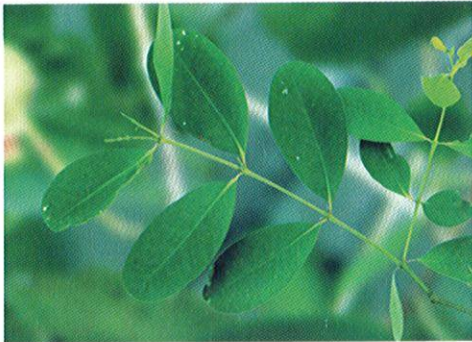
- Habit: Tree
- Height: 6-15 m
- DBH: 15-50 cm
- Bark: Smooth, slightly rough, grey to brownish
- Root: Cable root system

Common use

- Wood is used for fuel wood, piles, plank, bobbins for textile mills and pulp
- Leaves are used as fodder
- Ripen fruits are eaten as raw or cooked
- Pneumatophores are used as corks and floats
- Fruit juice has medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite
- Blade shape: Elliptic-ovate
- Margin: Entire-smooth
- Apex: Obtuse
- Base: Attenuate
- Upper surface: Dark green
- Lower surface: Dark green
- Venation: Pinnate
- Size: 6-12 cm long

Flowers

- Inflorescence: Solitary, terminal
- Petals: 4-6
- Sepals: 4-7
- Stamens: Numerous
- Size: 5-10 cm long
- Others: Bisexual



Fruits

- Type: Berry
- Shape: Rounded
- Colour: Dark green
- Texture: Smooth
- Size: 4-8 cm in diameter



Adaptation

- Lenticels
- Pneumatophores



Tamarix indica Willd.

Local name: Nona jhau, Jaora, Charmau, Ban jhau, Jhav, Jhau

English name: Salt cedar, Tamarix, Tamarisk

Family: Tamaricaceae

Description

This is a mangrove associate species. It is a small sized, evergreen tree or shrub that grows up to 8 m in height with slender erect or pendulous branches. Bark is smooth and reddish brown in colour and about 3 to 5 mm thick. Light green colour is observed after removing the outer surface of bark; inner bark is yellowish brown and sapwood is pale white in colour. Smaller sized numerous lenticels are arranged horizontally at the stem and younger branches. It has long tap root system. Leaves are simple, alternate and tiny; stalk less, ovate with triangular base, pointed without coherent margins. Flowers are small, white in colour, collected on many terminal racemes forming a very large beautiful drooping panicle. The fruit is capsule, about 6 mm long, conical and contain numerous seeds. This species can be propagated by cuttings and adventitious roots. It shows coppicing ability. It grows on the newly formed raised alluvial sandy soil along the riverbanks of coastal areas and mangroves with open sunlight. In the Sundarbans, it occurs with grasses and *Ceriops decandra*.



Distribution

This species is native to Bangladesh, India, Pakistan, Myanmar and Andaman. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans and coastal areas of Chittagong, Noakhali, Barisal, Pirojpur, Bagerhat, Khulna and Satkhira district.

Form

- Habit: Shrub, small tree
- Height: 4-6 m
- DBH: 5-10 cm
- Bark: Smooth, reddish brown

Common use

- Wood is used as firewood
- Ornamental and soil stabilization for slope, embankment and riverbank
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



Leaves

- Arrangement: Simple, alternate
- Shape: Ovate
- Apex: Acute
- Colour: Green
- Size: 0.25-0.4 cm long

Flowers

- Inflorescence: Racemes, terminal
- Petals: 5
- Sepals: 5
- Stamens: 5
- Size: 0.05 cm long
- Others: Unisexual



Fruits

- Type: Capsule
- Shape: Conical
- Colour: Pale pink
- Size: 0.5-0.6 cm long

Adaptation

- Lenticels



Xylocarpus granatum K.D. Koenig

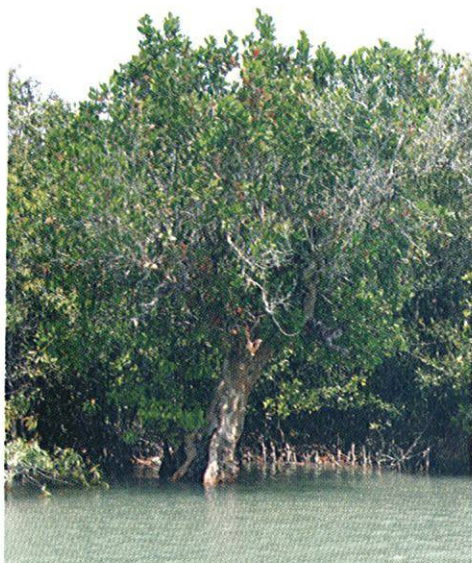
Local name: Dhundal

English name: Cannonball mangrove, The puzzle fruit tree

Family: Meliaceae

Description

This is an exclusive mangrove species. It is a medium-sized, less branched, evergreen tree that grows up to 20 m in height with narrow and compact to bushy crown. Bark is smooth, irregularly flaking, whitish to yellowish brown and about 3-5 mm thick. Inner bark is pinkish in colour, sapwood is yellowish brown; and heartwood is light reddish brown, moderately hard but prone to splitting. Older individual often display buttresses that can form ribbon like above-ground roots. Stem contain lenticels. Leaves are compound, paripinnate, occasionally simple, rachis smooth and brown or red, 1-2 pair leaflets with opposite arrangement. Flowers are small and arranged in axillary few-flowered cymose panicle. Inflorescence is 4-7 cm long. The fruit is woody capsule, large and contains 4-6 semi-triangular seeds. This species shows epigeal type of germination. It can tolerate strong saline condition but grows well along the banks of rivers and canals at the moderate saline areas. This species occurs with *Excoecaria agallocha*, *Bruguiera sexangula*, *Bruguiera gymnorrhiza*, *Rhizophora mucronata* and *Ceriops decandra* in the Sundarbans.



Distribution

This species is distributed in Africa and Madagascar towards India, and Southeast Asia and Australia. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans.

Form

- Habit: Tree
- Height: 15-20 m
- DBH: 30-50 cm
- Bark: Smooth
- Root: Plank like cable root

Common use

- Wood is used for house and boat building, furniture, pencil wood, veneer and fuel wood

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Elliptic to obovate (Leaflet)
- Margin: Entire-smooth
- Apex: Rounded to obtuse
- Base: Cuneate
- Upper surface: Dark green
- Lower surface: Pale green
- Venation: Pinnate/net
- Size: 7-15 cm long (Leaflet)

Flowers

- Inflorescence: Cymose panicle, axillary
- Petals: 4
- Calyx: 4
- Stamens: Tubular
- Size: 1.1-1.4 cm diameter
- Others: Unisexual



Fruits

- Type: Capsule, woody
- Shape: Rounded
- Colour: Green
- Texture: Smooth to slightly rough
- Size: 15-25 cm diameter



Adaptation

- Lenticels
- Low buttress



Xylocarpus moluccensis (Lam.) M. Roem.

Synonym: *Xylocarpus mekongensis* Pierre.

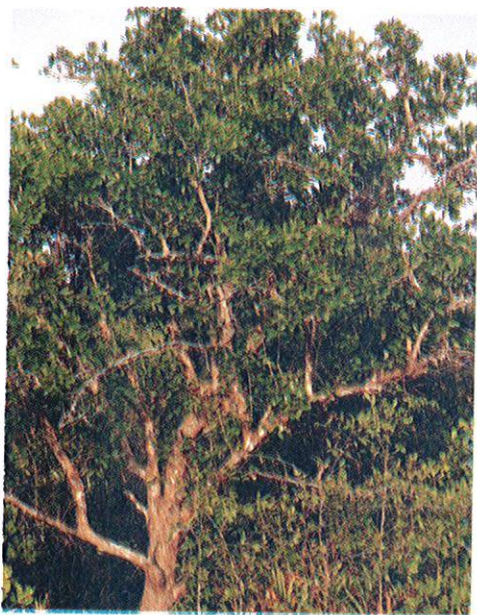
Local name: Passur

English name: Cedar mangrove

Family: Meliaceae

Description

This is an exclusive mangrove species. It is a medium-sized, much branched deciduous tree that grows up to 20 m in height with spreading crown. Bark is rough with irregular fissures, brown to dark brown in colour, and about 9-12 mm thick. Inner bark is red, sapwood is yellowish brown; and heartwood is reddish, hard and durable. Smaller sized lenticels are found on stem and branches. Generally, pneumatophores are conical but sometimes it become flattened plank like structure, varies from 20-35 cm in height. Leaves are compound, opposite and short petiolate; midrib is yellowish green. Inflorescence is 10-35 flowered panicle, up to 8 cm long; flowers are small and creamy pink in colour. The fruit is woody capsule and contains 8-12 semi-triangular seeds. This species shows epigeal type of germination. It can tolerate strong saline condition, but grows well on muddy substrate at the moderate saline areas. This species occurs with *Excoecaria agallocha*, *Bruguiera sexangula*, *Bruguiera gymnorrhiza*, *Rhizophora mucronata* and *Ceriops decandra* in the Sundarbans.



Distribution

This is distributed in Australia, Bangladesh, India, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Kenya. In Bangladesh, it occurs in the Sundarbans and Chakaria Sundarbans.

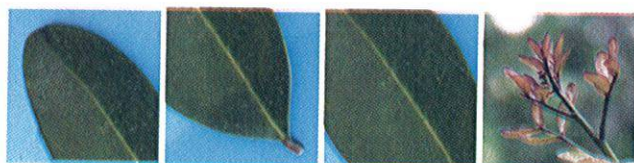
Form

- Habit: Tree
- Height: 10-20 m
- DBH: 50-100 cm
- Bark: Rough, brown
- Root: Cable root system

Common use

- Wood is used for fuel wood, house building, house post and furniture

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Ovate-elliptic or elliptic (Leaflet)
- Margin: Entire-smooth
- Apex: Acute
- Base: Cuneate
- Upper surface: Dark green
- Lower surface: Pale green
- Venation: Pinnate/net
- Size: 5-12 cm long (Leaflet)

Flowers

- Inflorescence: Panicle, axillary
- Petals: 8
- Sepals: 4
- Stamens: 8
- Size: 0.8-1 cm diameter
- Others: Unisexual



Fruits

- Type: Capsule, woody
- Shape: Rounded
- Colour: Green
- Texture: Smooth to slightly rough
- Size: 8-10 cm diameter



Adaptation

- Lenticels
- Pneumatophores



NON-MANGROVE SPECIES

Albizia lebbeck (L.) Benth.

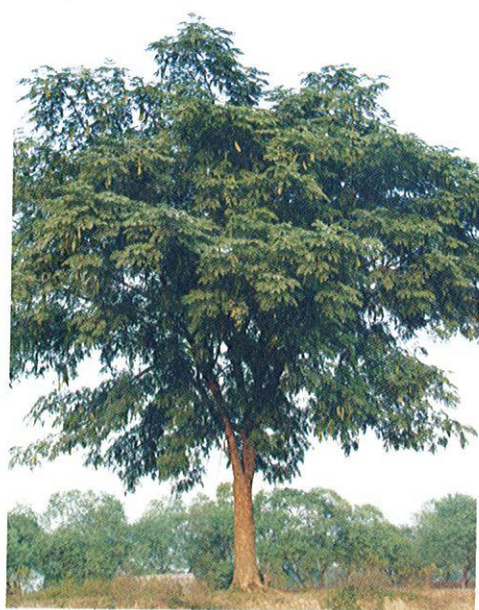
Local name: Kala-koroi, Indian siris

English name: Fry wood, Indian siris, Lebbek tree, Lebbeck, Flea tree

Family: Mimosaceae

Description

It is a medium to large-sized, deciduous, nitrogen fixing and moderate growing tree species. It grows up to 30 m in height with round spreading crown. Bark is rough, brownish grey to almost black and about 8-12 mm thick. Inner bark is red in colour; sapwood is yellowish white; and heartwood is blackish brown, heavy and durable. Leaves are compound, bipinnate, stipulate, 2-5 pairs of pinnae, leaflets 3-10 pairs, and a prominent oblong gland is observed on the base of petioles. Inflorescence is axillary to terminal pedunculate head. Flowers are bisexual, in large globose heads, born on a peduncle of 5-10 cm long, greenish to yellowish white, slightly fragrant and arranged in cluster; calyx 3 mm long, corolla 8-10 mm long, numerous 2.5-3.8 cm long stamens. The fruits are pod, flattened, smooth and alternately depressed on either side over the seeds. This species shows epigeal germination of seeds. It can tolerate drought and slight saline condition, but intolerant to waterlogged condition.



Distribution

This species is native to Indian Subcontinent, Southeast Asia and monsoon area of Northern Australia. In Bangladesh, it is planted throughout the country along the road side, canal side and homestead.

Form

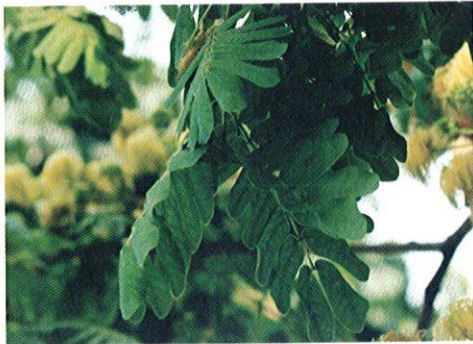
- Habit: Tree
- Height: 18-30 m
- DBH: 50-100 cm
- Bark: Blackish

Common use

- Wood is used for house building, decorative furniture, veneer and fuel wood
- Planted as an ornamental tree
- Plant parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



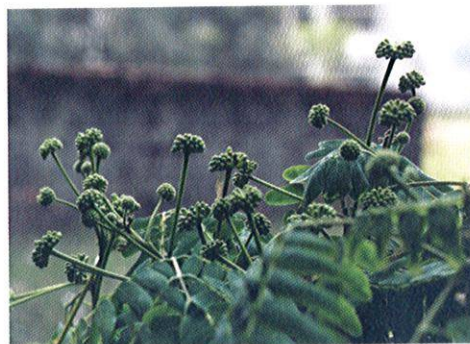


Leaves

- Arrangement: Compound, alternate
- Blade shape: Linear-oblong (Leaflet)
- Margin: Entire-smooth
- Apex: Acute
- Base: Oblique
- Upper surface: Green
- Lower surface: Green
- Venation: Pinnate
- Size: 2-4cm long (Leaflet)

Flowers

- Inflorescence: Panicles, axillary
- Stamens: Numerous
- Size: 5-6 cm diameter
- Others: Bisexual



Fruits

- Type: Pod
- Colour: Shiny brown
- Texture: Smooth
- Size: 13-25 cm long



Albizia procera (Roxb.) Benth.

Local name: Sil-koroi, Koroi, Sada koroi

English name: Albizia, Forest siris, Tall albizia, White siris, White shiris

Family: Mimosaceae

Description

It is a large-sized, deciduous, nitrogen fixing, columnar and fast growing tree. It grows up to 35 m in height with irregular medium crown. Bark is rough, grey to brownish grey and about 10-15 mm thick. Inner bark is pinkish red; sapwood is whitish to light yellow; and heartwood is brown, heavy and durable. Leaves are compound, bipinnate, stipulate, leaflets 12-20, and an elongated sessile gland is observed on the base of the petioles. Inflorescence is axillary panicles up to 20 cm long. Flowers are bisexual, sessile and yellowish-white; calyx 1.5-2.5 mm long, corolla 4-5 mm long, appearing in groups of two or three. The fruits are pod, flattened, smooth, shiny reddish-brown with distinct marks of seed. Each mature pod contains 6-12 seeds. This species shows epigeal germination of seeds. This species can tolerate drought and commonly found on alluvial ground along the streams and moist places.



Distribution

This species is native to India. But, it is distributed throughout the tropical Asia. In Bangladesh, it is planted throughout the country and naturally occurs in the forest of Chittagong, Chittagong Hill Tracts, Cox's Bazar and Dhaka-Mymensing Sal forest.

Form

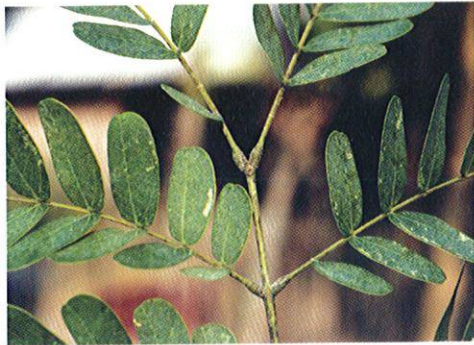
- Habit: Tree
- Height: 15-35 m
- DBH: 40-70 cm
- Bark: Grey to brownish grey

Common use

- Wood is used for house building, furniture, veneer, cabinet making, carving and fuel wood
- Bark is used as fish poison
- This species is used for soil rehabilitation
- Plant parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



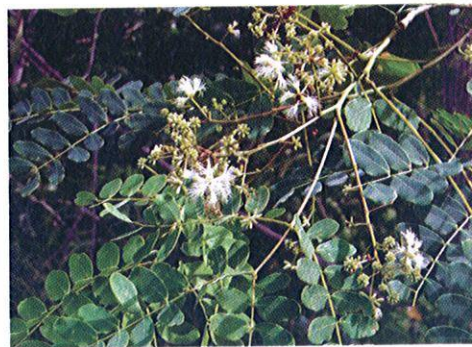


Leaves

- Arrangement: Compound, alternate
- Blade shape: Oblong-elliptic (Leaflet)
- Margin: Entire-smooth
- Apex: Rounded
- Base: Oblique
- Upper surface: Green
- Lower surface: Green
- Venation: Pinnate
- Size: 2-5 cm long (Leaflet)

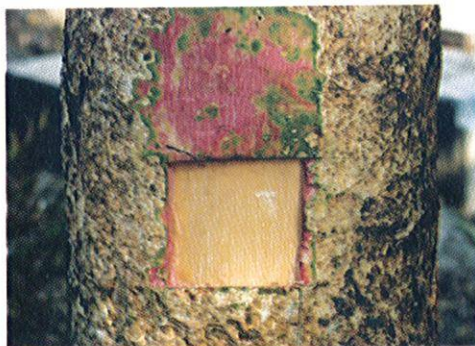
Flowers

- Inflorescence: Panicles, axillary
- Size: 1-1.5 cm diameter
- Stamens: 10-12
- Others: Bisexual



Fruits

- Type: Pod
- Colour: Reddish brown
- Texture: Smooth
- Size: 10-20 cm long



Albizia richardiana King & Prain

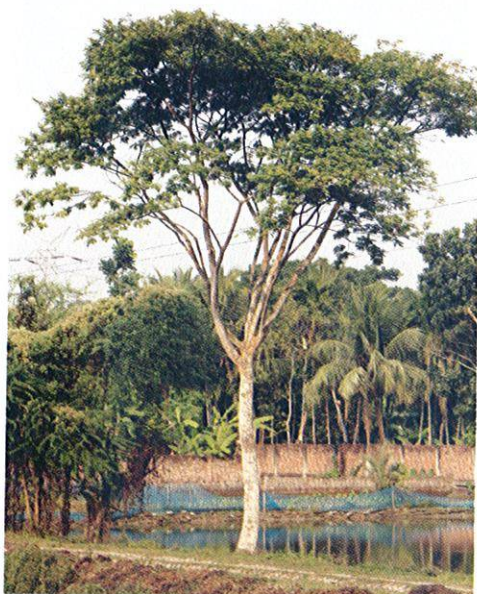
Local name: Raj-koroi, Road chambal

English name: Silk tree, Hatiamiuki

Family: Mimosaceae

Description

It is a large-sized, deciduous, nitrogen fixing, columnar and fast growing tree. It grows up to 30 m in height with beautiful wide spreading umbrella shaped crown. Bark is smooth, yellowish grey, and about 6-10 mm thick. Sapwood is whitish to light yellow; and heartwood is whitish in colour, heavy to medium texture. Leaves are compound, bipinnate, stipulate, 5-10 pairs of opposite pinnae, leaflets 30-60 pairs. A small gland is observed on the base of the petioles. Inflorescence is axillary panicles. Flowers are bisexual, sessile in axillary corymbose heads, greenish-white, fragrant and arranged in cluster; calyx 1 mm long, corolla 2-3 mm long and numerous stamens. The fruits are pod, flattened, smooth and brownish grey. Each mature pod contains 8-12 seeds. This species shows the tendency of bifurcation of the main bole into two equal limbs at a considerable height. This species shows epigeal germination of seeds. This species can tolerate drought; and commonly found with full sunlight on sandy-loamy, gritty-loam or sandy clay soil with dry to moderately moist soil.



Distribution

This species is native to Tropical America and Southern Caribbean. But, it is distributed throughout the tropical areas. In Bangladesh, it is planted throughout the country along the road side, canal side and at the homestead.

Form

- Habit: Tree
- Height: 15-30 m
- DBH: 40-100 cm
- Bark: Yellowish grey

Common use

- Wood is used for house building, furniture, veneer, boat building and fuel wood
- Planted as an ornamental tree
- Plant parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



Leaves

- Arrangement: Compound, alternate
- Blade shape: Linear (Leaflet)
- Margin: Entire-smooth
- Apex: Acute
- Base: Oblique
- Upper surface: Dark green
- Lower surface: Green
- Size: 0.5-0.6 cm long (Leaflet)

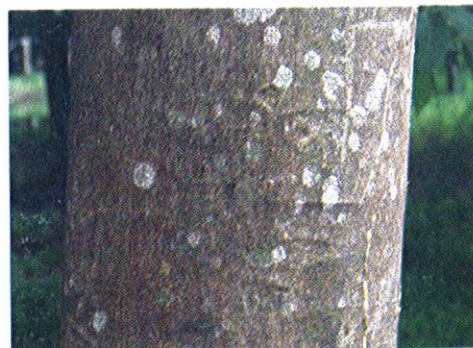
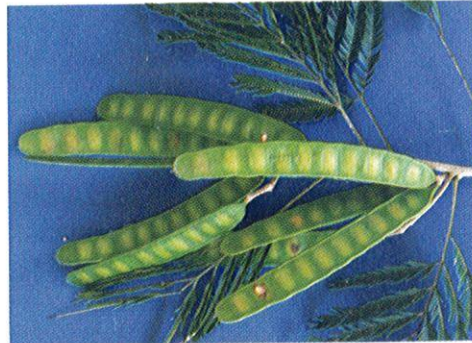
Flowers

- Inflorescence: Panicles, axillary
- Stamens: Numerous
- Others: Bisexual



Fruits

- Type: Pod
- Colour: Brownish grey
- Texture: Smooth
- Size: 8-10 cm long



Azadirachta indica A. Juss.

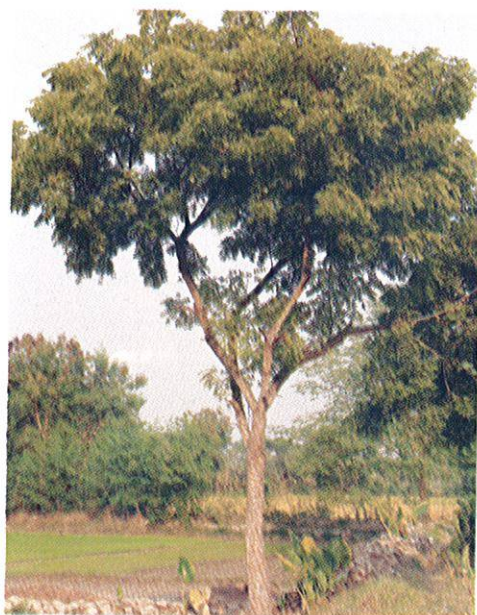
Local name: Neem

English name: Indian Lilac, Neem, Nim tree

Family: Meliaceae

Description

It is a medium to large-sized, evergreen to semi-deciduous and fast growing tree. It grows up to 20 m in height with round spreading crown. Bark is smooth at the younger stage and become rough at the mature stage, greyish brown in colour and about 6-8 mm thick. Inner bark is orange red, sapwood is yellowish white; and heartwood is light brown, heavy and durable. Leaves are compound, imparipinnate and clustered near the branch tips. Leaflets are 7-8 pairs, alternate to sub-opposite and short petiolate. Flowers are small, fragrant and arranged in panicle flower heads. The fruits are drupe, smooth, greenish yellow when ripe, exocarp thin, mesocarp pulpy with white kernels and 1 seeds. This species grows with open sunlight to moderate shade; can tolerate drought and higher temperature, but intolerant to waterlogged condition. It grows well with well drained deep and sandy soil.



Distribution

This species is native to India, Indonesia, Myanmar, Malaysia, Pakistan, Sri Lanka, Senegal and Thailand. In Bangladesh, it is widely planted along the roads, canal bank and homestead.

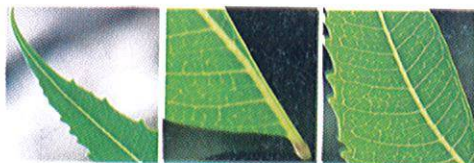
Form

- Habit: Tree
- Height: 15-20 m
- DBH: 50-90 cm
- Bark: Greyish brown

Common use

- Wood is used for house building, cabinet and furniture
- This species is used for soil rehabilitation, windbreak and avenue tree
- Plant parts have medicinal values

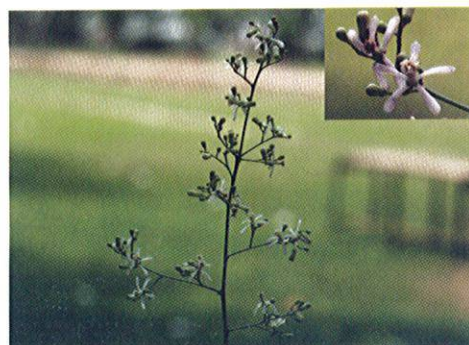
Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Ovate to lanceolate (Leaflet)
- Margin: Serrate
- Apex: Abruptly acuminate
- Base: Oblique
- Upper surface: Green
- Lower surface: Green
- Venation: Pinnate
- Size: 5-9 cm long (Leaflet)

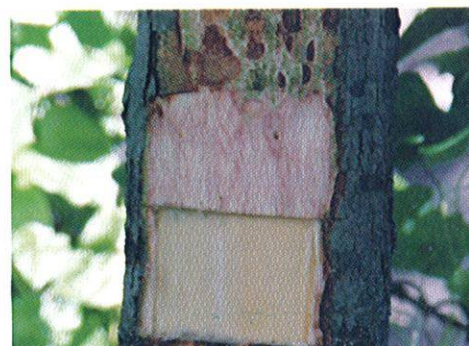
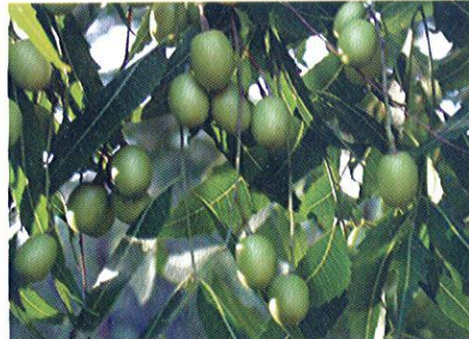


Flowers

- Inflorescence: Panicles, axillary
- Petals: 5
- Stamens: 8-10
- Size: 5-6 mm long
- Others: Bisexual

Fruits

- Type: Drupe
- Shape: Olive like
- Colour: Green
- Texture: Smooth
- Size: 1-2 cm long



Limonia acidissima L.

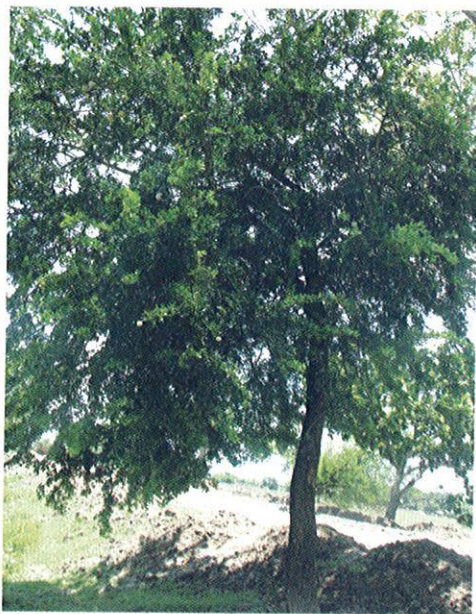
Local name: Koethbel

English name: Woody apple

Family: Rutaceae

Description

It is a small to medium-sized, deciduous, armed with straight sharp spines and slow growing tree. It grows up to 12 m in height with medium crown. Bark is rough, fissured, blackish and about 6-10 mm thick. Heartwood is yellowish grey, heavy and durable. Leaves are compound, imparipinnate, leathery, often minutely toothed margin and notched at the apex, narrowly winged, 3-9 leaflets, dotted with oil glands and slightly lemon-scented when crushed. Flowers are small, dull red or greenish white in colour. The fruits are globose berry, hard, woody pericarp, rough, sweet and sour in test. The pulp is brown and odorous with numerous white seeds. This species can be propagated by cuttings. It grows well with open sunlight. This species can tolerate drought and periodic flooding but prefers light soil.



Distribution

This species is native to South India and Sri Lanka. But, this species is introduced in Myanmar, Pakistan, Indo-China, Malaysia and Indonesia. In Bangladesh, it is quite common throughout the country.

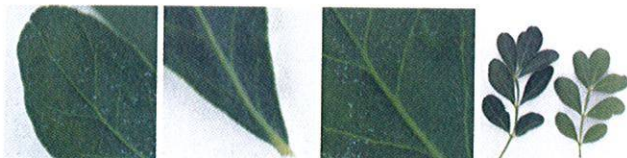
Form

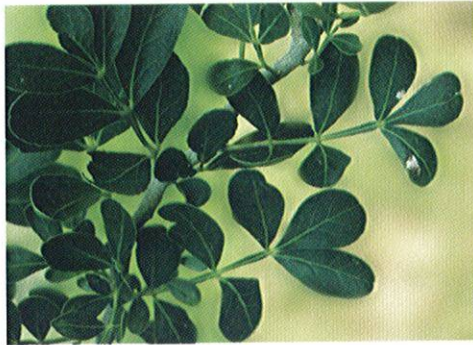
- Habit: Tree
- Height: 10-12 m
- DBH: 20-30 cm
- Bark: Blackish

Common use

- Wood is used for house building, carving, fuel wood and agricultural implements
- The pulp of ripe fruits is edible
- Plant parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Obovate (Leaflet)
- Margin: Crenulate
- Apex: Retuse
- Base: Cuneate
- Upper surface: Green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 2.5-3.5 cm long (Leaflet)

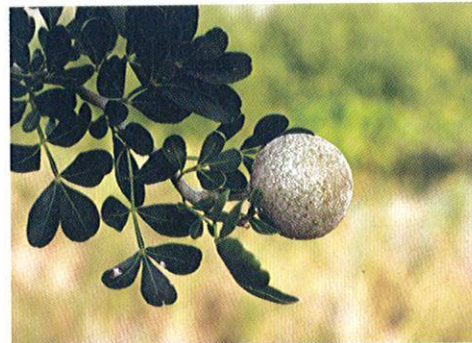


Flowers

- Inflorescence: Panicles, axillary
- Petals: 5
- Sepals: 5
- Stamens: 10-12
- Size: 1-1.3 cm diameter
- Others: Bisexual

Fruits

- Type: Berry
- Shape: Round
- Colour: Greenish-white or brownish
- Texture: Woody
- Size: 5-8 cm diameter



Moringa oleifera Lam.

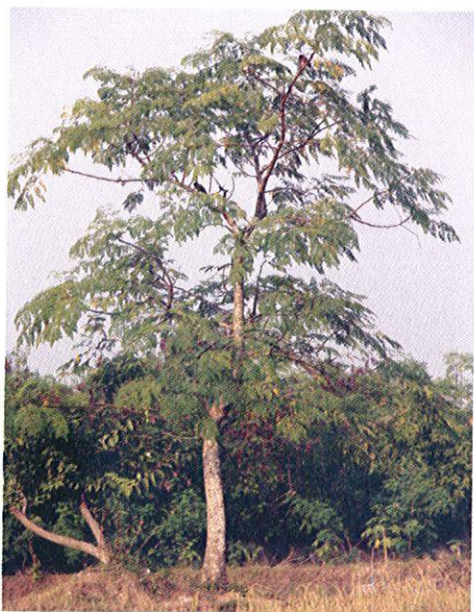
Local name: Sajna, Sujana

English name: Drumstick tree, Horseradish tree, Radish tree, Mother's best friend

Family: Moringaceae

Description

It is a small to medium-sized deciduous to semi-evergreen, very fast growing tree that grows up to 12 m in height with medium crown. Younger branches contain lenticels. Bark is smooth and about 10-15 mm thick. Inner bark is whitish; green colour is observed after removing the outer surface of bark. Sapwood and heartwood is whitish, soft and light. Leaves are compound, tripinnate, 4-7 pairs of opposite pinnae and stipules absent. Inflorescence is spreading many flowered panicle; flowers are fragrant, surrounded by five unequal thinly veined white petals and contain yellow stamens. The fruits are tri-lobed elongated capsule, 9 ribbed and 15-20 seeded. Seeds are 1-1.5 cm in diameter with 3 thin whitish papery wings. This species shows epigeal germination of seeds and can be propagated by stem cuttings. This species grows with open sunlight; can tolerate drought and grows well on fertile well-drained soil.



Distribution

This species is native to Indian subcontinent and found to introduce in many African countries. In Bangladesh, it is widely planted throughout the country.

Form

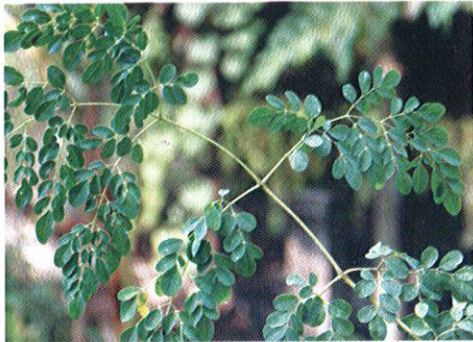
- Habit: Tree
- Height: 8-12 m
- DBH: 30-60 cm
- Bark: Light brown

Common use

- Fruits, flowers and leaves are edible and also used as fodder
- Moringa flowers tea have nutritional benefits
- Oil from seeds is used for cooking and lubrication
- Plant parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Elliptical (Leaflet)
- Margin: Entire-smooth
- Apex: Rounded to emarginate
- Base: Cuneate
- Upper surface: Green
- Lower surface: Pale green
- Variation: Pinnate
- Size: 1.5-2.5 cm long (Leaflet)

Flowers

- Inflorescence: Panicles, axillary
- Petals: 5
- Sepals: 5
- Stamens: 5
- Size: 1-1.5 cm diameter
- Others: Bisexual



Fruits

- Type: Capsule
- Shape: Elongated capsule
- Colour: Green
- Texture: Ribbed
- Size: 50-60 cm long



Pithecellobium dulce (Roxb.) Benth.

Local name: Khai-babla

English name: Madras thorn, Black bead, Sweet inga, Damortis

Family: Mimosaceae

Description

It is a small to medium-sized evergreen, nitrogen fixing and fast growing tree that grows up to 20 m in height with spreading irregular crown and pendulous branches. Bark is smooth and greenish grey at the younger stage, becoming rough and blackish at the mature stage and about 8-12 mm thick. Sapwood is yellowish and heartwood is reddish-brown in colour. Leaves are compound, bipinnate, reaches about 1-2.5 cm long and younger leaves are reddish in colour. A pair of tiny spines is observed at the base of the leaf petiole. Flowers are grouped in small, dense and sub-spherical heads; bisexual and rich in nectar. The fruits are pods and irregular in shape and flattened, coiled into 1-2 circles and bright red as they ripen. The pod contains 8-12 seeds. This species can be propagated by cuttings and root suckers. It shows good coppicing ability and can tolerate pollarding. It grows well with open sunlight along the banks of streams, rivers, roadside and wetlands. This species can tolerate moderate salinity and drought but prefers well-drained soils.



Distribution

This species is native to tropical America. But, this species is introduced in other tropical countries and became naturalized all over the tropics. In Bangladesh, it is quite common at the southern and south-eastern parts.

Form

- Habit: Tree
- Height: 15-20 m
- DBH: 50-100 cm
- Bark: Greenish grey to blackish

Common use

- Wood is used as fire wood
- Leaves are used as fodder
- Plant parts have medicinal uses

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Oblong-elliptic (Leaflet)
- Margin: Entire-smooth
- Apex: Acute
- Base: Acute
- Upper surface: Green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 2.5-5 cm long (Leaflet)

Flowers

- Inflorescence: Panicles of pedunculate heads, axillary
- Petals: 5
- Sepals: 5
- Stamens: Numerous
- Size: 0.7-1 cm long
- Others: Bisexual



Fruits

- Type: Pods
- Colour: Bright red (mature stage)
- Texture: Fleshy
- Size: 10-15 cm long



Samanea saman (Jacq.) Merr.

Local name: Biliti siris, Siris, Rendi koroï, Rain tree

English name: Monkey pod, Rain tree, Siris, Saman, French tamarind

Family: Mimosaceae

Description

It is large-sized, semi-deciduous, nitrogen fixing and very fast growing tree that grows up to 40 m in height with much branched and umbrella shaped spreading crown. Bark is rough, brownish to blackish and about 12-15 mm thick. Inner bark is dark brown in colour, sapwood is yellowish white; and heartwood is brown, heavy and durable. Leaves are compound, bipinnate, stipulate, tomentose, 6-9 pairs of pinnae, leaflets 6-10 pairs. A smaller gland is observed between the pinnae. Flowers are bisexual, born on a peduncle of 5-8 cm long, slightly fragrant and arranged solitary or in small cluster; calyx 6.5-7.5 mm long, corolla 10-12 mm long. The stamens are numerous, 2-3.5 cm long, white at the base and rosy-pink towards the top. The fruits are pod, fairly straight, smooth and ripening to black; pulp is brownish black and each mature pod contains 6-10 seeds. This species shows epigeal germination of seeds. This species grows with open sunlight; can tolerate drought and slight saline condition.

Distribution

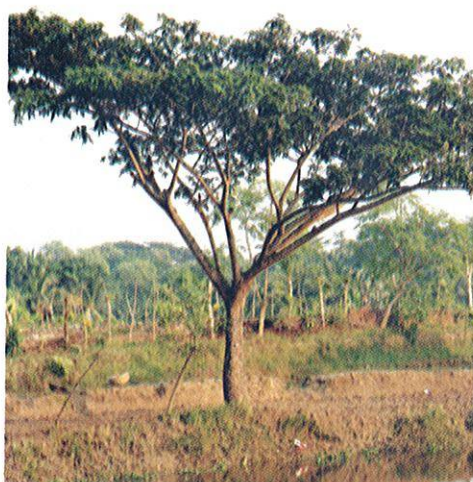
This species is native to Central America but introduced in the all over the tropics. In Bangladesh, it is extremely planted as an avenue and shade tree along the road side, canal side and homestead.

Form

- Habit: Tree
- Height: 20-40 m
- DBH: 50-200 cm
- Bark: Blackish

Common use

- Wood is used for house building, paneling, furniture, veneer, plywood and fuel wood
- Planted as an ornamental tree
- Pods are used as fodder
- Plant parts have medicinal values



Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Ovate-oblong to
- Obovate-elliptic (Leaflet)
- Margin: Entire-smooth
- Apex: Acute
- Base: Oblique
- Upper surface: Green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 2-5cm long (Leaflet)

Flowers

- Inflorescence: Pedunculate head, terminal
- Stamens: Numerous
- Size: 5-6 cm diameter
- Others: Bisexual



Fruits

- Type: Pod
- Colour: Blackish brown
- Texture: Smooth
- Size: 12-20 cm long



Swietenia macrophylla King

Local name: Mahogany

English name: Honduran mahogany, Large-leaf mahogany, Mahogany

Family: Meliaceae

Description

It is a large-sized, semi-deciduous, less branched, medium crowned tree that grows up to 35 m in height. Trunk is straight, cylindrical with buttressed based. This species shows hypogeal germination of seeds. Bark is rough, fissured and greyish to blackish and about 6-12 mm thick. Inner bark is pinkish red in colour. Sapwood is yellowish in colour and heartwood is medium-weighted, durable and reddish in colour. Leaves are compound, paripinnate, 3-8 pairs of leaflet, stipules absent, leaflets opposite. Inflorescence is axillary panicle and 10-20 cm long. Flowers are small, fragrant, pinkish white in colour and unisexual. Male and female flowers are also found in the same inflorescence. The fruits are capsule, greyish brown, hard, woody pericarp, 5 valves and many seeds. Seeds with large wing, flat, 7-10 cm long and brown in colour.



Distribution

This species is native to Honduras and distributed in Pakistan, Malaysia, Indonesia and the Philippines. In Bangladesh, it is quite common throughout the country.

Form

- Habit: Tree
- Height: 25-40 m
- DBH: 30-100 cm
- Bark: Greyish to blackish

Common use

- Wood is used for house building, construction, furniture and cabinet work
- Planted as avenue tree
- Plant parts have medicinal properties

Flowering

J F M A M J J A S O N D

Fruiting

J F M A M J J A S O N D





Leaves

- Arrangement: Compound, alternate
- Blade shape: Ovate-lanceolate (Leaflet)
- Margin: Entire-smooth
- Apex: Acuminate
- Base: Cuneate
- Upper surface: Green
- Lower surface: Pale green
- Venation: Pinnate
- Size: 8-20 cm long (Leaflet)

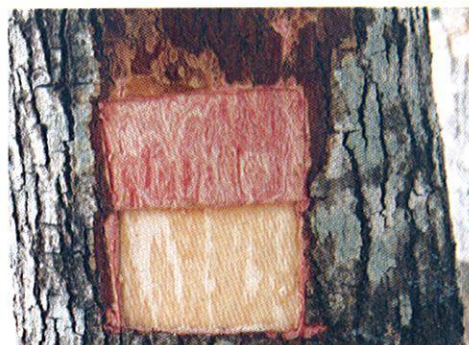


Flowers

- Inflorescence: Panicle, axillary
- Size: 0.6-1 cm diameter
- Others: Unisexual

Fruits

- Type: Capsule
- Shape: Inverted club
- Colour: Greyish brown
- Texture: Woody
- Size: 10-22 cm long



Terminalia arjuna (Roxb.) Wight & Arn.

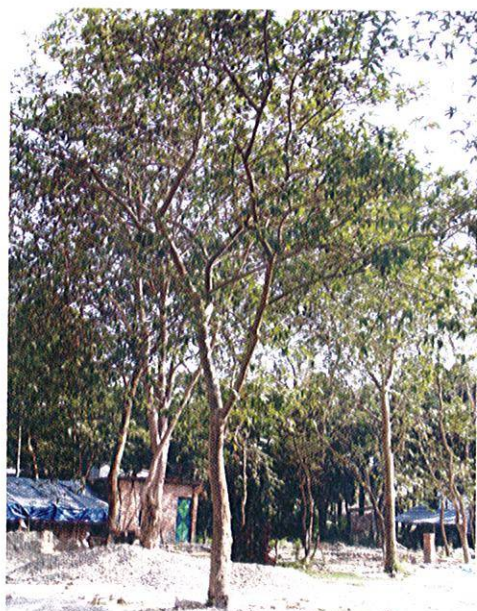
Local name: Arjun

English name: Tropical almond, White marudah, Arjuna or Arjun tree, Koha

Family: Combretaceae

Description

It is a large evergreen and fast growing tree that grows up to 25 m in height with spreading crown and dropping down branches. The stems are buttressed. Bark is smooth and grey to pinkish green in colour and about 10-15 mm thick. This species sheds bark once in a year. Sapwood is pinkish white and heartwood is brown to dark-brown in colour. Leaves are simple, petiolate, opposite or sub-opposite and a pair of prominent dotted glands at the base. Inflorescences are short axillary spikes and 9-13 cm long. Flowers are small, yellowish white, sessile, bisexual and rich in nectar. The fruits are fibrous woody with 5 hard wings. This species shows moderate (50-60%) germination of seeds. It grows well along the banks of streams, rivers, ravines and dry water courses.



Distribution

This species is distributed in India, Bangladesh, Sri Lanka and Malaysia. In Bangladesh, it is commonly found throughout the country.

Form

- Habit: Tree
- Height: 25-30 m
- DBH: 80-100 cm
- Bark: Grey to pinkish green

Common use

- Wood is used for boat, house building, electric poles, plywood and agricultural implements
- Leaves are used as fodder for silkworms
- Plant parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D





Leaves

- Arrangement: Simple, opposite or sub-opposite
- Blade shape: Oblong to elliptic oblong
- Margin: Crenate-serrate
- Apex: Obtuse
- Base: Round
- Upper surface: Green
- Lower surface: Pale brown
- Venation: Pinnate
- Size: 4-10 cm long



Flowers

- Inflorescence: Spikes, axillary
- Others: Bisexual

Fruits

- Type: Drupe, woody
- Colour: Dark brown (mature stage)
- Texture: Woody
- Size: 2.5-6 cm long



Vachellia nilotica (L.) P.J.H. Hurter & Mabb. ssp. indica (Benth.)

Kyal & Boatwr.

Synonym: *Acacia nilotica* (L.) Del. ssp. *indica* (Benth.) Brenan

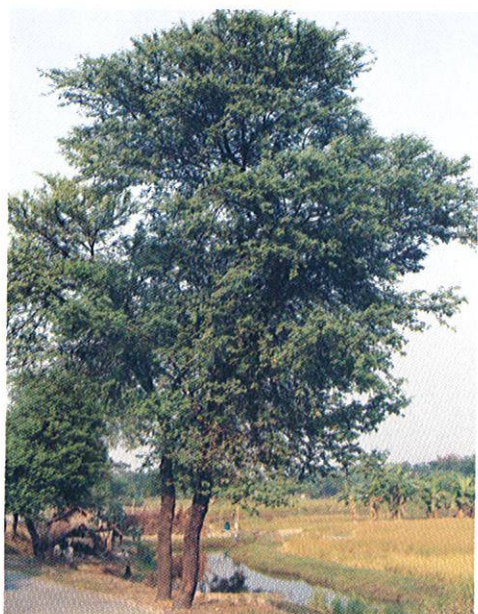
Local Name: Babla

English name: Egyptian thorn, Indian gum-arabic tree

Family: Mimosaceae

Description

It is a small to medium-sized evergreen, nitrogen fixing, thorny and fast growing tree species that grows up to 15 m in height with spreading crown. Bark is rough and longitudinal fissures and about 6-10 mm thick. Inner bark is pinkish, sapwood is whitish; and heartwood is reddish brown, hard and heavy. Root system is deep and extensive. Leaves are compound, bipinnate, tomentose, a pair of whitish stipular spines at the base, 3-6 pairs of pinnae. Leaflets are small, sub-sessile, 20-40 pairs and opposite. Flowers are in globose axillary heads, fragrant, bright yellow and sessile. The fruits are pod, solitary, stalked, flattened, straight to slightly curved, fleshy at younger stage and silvery green, deeply constricted between seeds and 8-12 seeded. This species shows epigeal germination of seeds. This species grows with open sunlight; can tolerate drought and flooded conditions for several months. It can grow on saline, sodic or alkaline soil.



Distribution

This species is native to Africa, Arabian Peninsula and Indian Subcontinent. Now it is commonly found in almost all tropical and subtropical areas of Africa, Asia, Australia and the Caribbean. In Bangladesh, it is widely planted along the roads, canal banks, railway tracts, embankments and homestead.

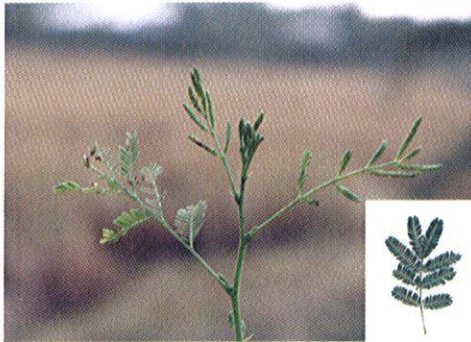
Form

- Habit: Tree
- Height: 5-15m
- DBH: 20-40 cm
- Bark: Greyish black

Common use

- Wood is used for post, pole, boat building, carts, fuel wood and agricultural implements
- Leaves and pods are used as fodder
- This species is used for soil rehabilitation and windbreak
- Plant parts have medicinal values

Flowering	J	F	M	A	M	J	J	A	S	O	N	D
Fruiting	J	F	M	A	M	J	J	A	S	O	N	D



Leaves

- Arrangement: Compound, alternate
- Blade shape: Linear-oblong (Leaflet)
- Margin: Entire-smooth
- Apex: Rounded to obtuse
- Base: Oblique
- Upper surface: Green
- Lower surface: Green
- Size: 0.2-0.6 cm long (Leaflet)

Flowers

- Inflorescence: Panicles, axillary
- Stamens: Numerous
- Size: 1.2-1.5 cm diameter
- Others: Bisexual



Fruits

- Type: Pod
- Shape: Strap-shaped
- Colour: Green
- Texture: Smooth
- Size: 10-22 cm long



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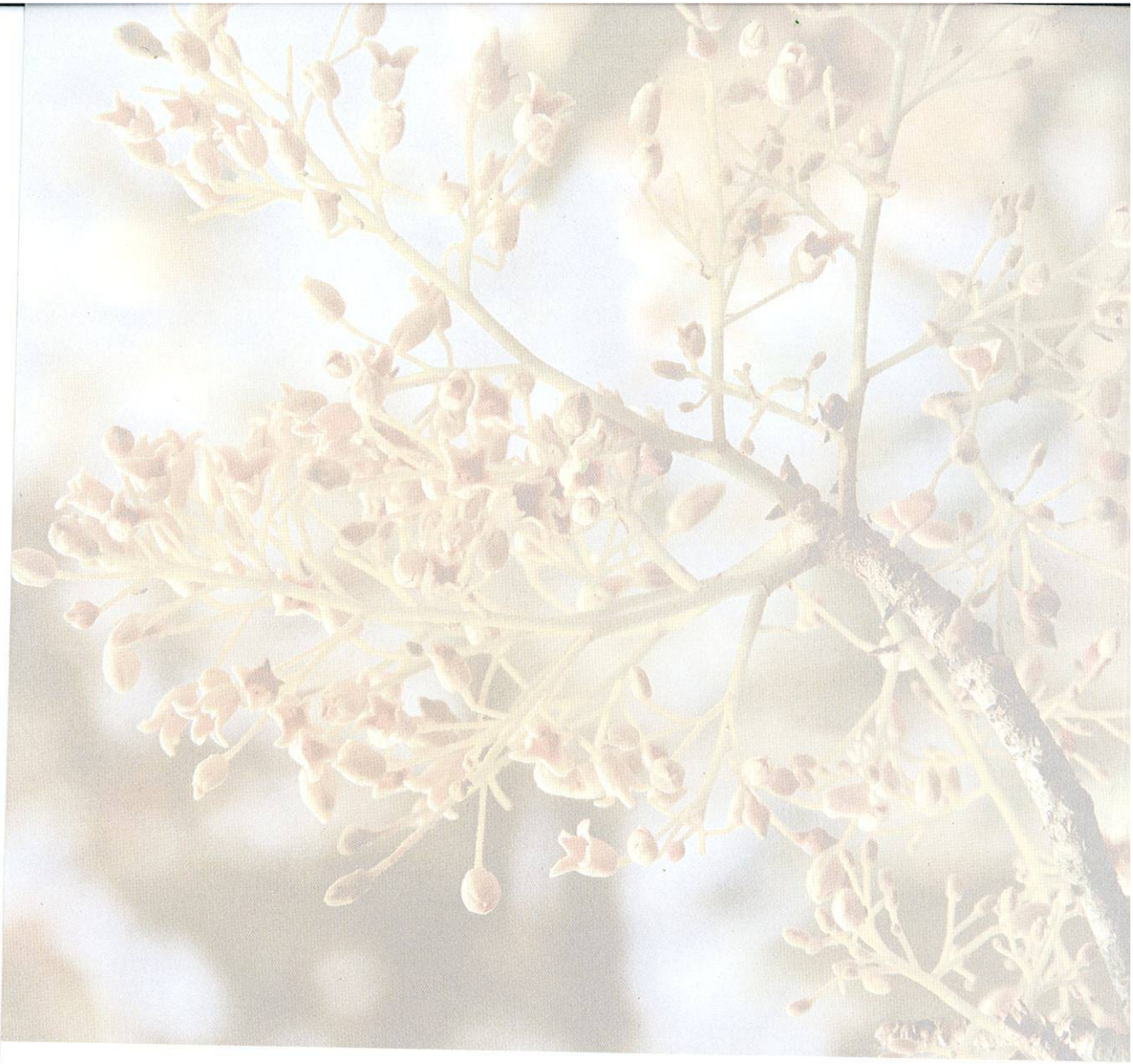
GLOSSARY

Acuminate	Sharp pointed apex with straight or convex margins that form an angle less than (<) 45 degrees
Acute	Pointed apex with margins that form an angle between 45 and 90 degrees
Aerial root	Generally un-branched roots that arises from the trunk or lower branches and descending downward but usually not reaching the substrate
Alternate	A single leaf is attached at a node
Anther	Upper part of the male floral organ (stamen) that produces pollen grains; at maturity, it splits to release them
Apical	At or near the apex of an organ
Apiculate	Ending in a short sharp point
Aril	A fleshy or leathery outgrowth, usually brightly colored cover of a seed
Attenuate	Gradually tapering to a slender point
Axillary	Arising in the axil of a leaf or bract
Bark	The outer tissue of a tree trunk
Berry	A fresh fruit, usually several-seeded, without any stony layer surrounding the seeds
Bisexual	Flowers with both stamens and carpels
Bulb	A short stem with fleshy leaves or leaf bases that function as food storage organs during dormancy
Buttress	Flattened projection or outgrowth from lower trunk which joins lateral roots to stem
Cable root	Horizontal long roots
Calyx	Part of the flower composed of all its sepals
Canopy	The uppermost layer of branches and leaves of a single tree or forest
Capitate	Head like inflorescence
Capsule	A type of simple, dry dehiscent fruit that is composed of two or more carpels and splits at maturity
Carpel	The unit of which form the gynoecium (female part of the flower)
Catkin	A unisexual spike or elongate axis with simple dichasia that falls as a unit after flowering or fruiting
Climber	A plant that lacks rigidity and grows upwards by twining, scrambling, or clinging with tendrils and suckers
Compound leaves	Leaves with blades divided into several distinct sections
Coppies	Young stems usually growing from the cut stumps of trees
Corolla	Part of the flower composed of all its petals

Crown	The upper part of a tree, which includes the branches and leaves
Cryptoviviparous	Germinating seed attached to the parent plant which is covered by the intact fruit wall
Cuneate	Triangular, with a narrow end at the point of attachment
Cuticle	Waxy layer on the outer surface of leaves, fruits etc.
Cylindrical	Long and tubular
Cyme	Compound inflorescence with flat or convex shape whose inner flowers open first
DBH	Diameter at breast height, width of trunk of a standing tree measured at 1.3 m above the ground
Deciduous	Shedding or losing foliage at the end of the growing season
Dentate	Leaf edged with pointy teeth of similar size
Drupe	A fleshy fruit with one seed surrounded by a stony layer
Elliptic	With widest axis at midpoint of structure and with margins symmetrically curved
Emarginate	With a shallow depression at the apex
Endocarp	Inner layer of wall of fruit
Entire	Leaf edge with no indentations
Epigeal germination	Germination of a plant takes place above the ground
Evergreen	Bearing foliage throughout the year
Exclusive mangrove species	Plant species are found exclusively or almost exclusively in the mangrove habitat
Filament	Cylindrical axis connecting the anther to the rest of the flower
Frond	Leaves of fern
Globose	Almost round
Heartwood	Central core of dark hard wood in tree trunks
Hypocotyl	The intermediate stem-like axis between the top of the root and the cotyledons
Hypogeal germination	Cotyledons stay below the ground
Imparipinnate	Having a terminal unpaired leaflet
Inflorescence	Arrangement of flowers or flower cluster
Infructescence	An ensemble of fruits derived from the ovaries of an inflorescence
Knee root	Aboveground roots shaped like a knee This is a modified section of c which grow upward above the substrate and then return back to the soil again able roots
Lanceolate	Simple leaf with a narrow blade that is longer than it is wide, ending in a point
Latex	Colorless or milky sap of certain plants

Leaf axil	Point at which the petiole attaches to the stem node
Leaf node	Point at which a leaf or twig attaches to the stem
Leaflets	Any of the subdivisions of a compound leaf
Lenticel	A body of cells formed on the periderm of a stem, appearing on the surface of the plant as a lens-shaped spot, and serving as a pore
Linear	Simple leaf with a long and very narrow blade and almost parallel margins
Mangrove associate species	Plant species that are found to occur above the high water line in the beach forest close to mangroves or beyond the inner landward boundary of mangrove
Margin	Part that forms the outline of the leaf blade
Midrib	The central and usually the largest vein of the leaf, representing the main vascular transport
Mucronate	A small extension of the midrib barely extending beyond the blade apex
Oblanceolate	Similar to lanceolate but broadest above the middle
Oblong	Flat shape, broadest in the middle but with nearly parallel sides
Obovate	Egg-shaped but broadest above the middle
Obtuse	A blunt apex with margins that form an angle greater than (>) 90 degrees
Ovate	Simple leaf with an egg-shaped blade
Peduncle	Terminal offshoot of the stem or twig; it first connects the flower, then the fruit, to the plant
Pendulous	Hanging or dropping
Petal	Usually colorful and scented part of the flower that surrounds the male and female reproductive organs; it often helps attract pollinators
Petiole	Narrow part of the leaf connecting the blade to the stem
Pinnate	Compound, with the leaflets arranged on both sides of a common axis
Pneumatophore	Pneumatophores are the erect branches of the horizontal cable root. They extend upward into the air
Pod	A dry, several-seeded, dehiscent fruit that develops from simple carpel and dehisces on two sides
Propagule	Seed or seedling capable of producing a new plant
Pulvinate base	Having a swelling at the base and used of a leafstalk
Raceme	An inflorescence in which the flowers are borne along the main stem, with the oldest flowers at the base. It can be simple or compound
Rhizome	A horizontal, usually underground modified stem that often sends out roots and shoots from its nodes
Rounded	Curved apex with margins that form a smooth arc
Salt extrusion	In this process mangrove plant uptake saline water and then secret the salt through salt glands in leaves

Sapwood	The soft wood, just beneath the bark in tree trunks, that consists of living tissue
Sepal	Usually green part of the flower that protects the flower's internal structures; it may fall after flowering occurs or remain until the fruit has ripened
Shrub	Low (<5 m high) woody plant with several major branches, on distinct trunk
Simple leaves	Leaves with an undivided blade
Sori	Clusters of sporangia on the back of the fronds of ferns
Spadix	A racemose inflorescence having many small sessile flowers borne on a fleshy stem, the whole usually being surrounded by a spathe: typical of aroid plants
Spores	A small, usually single-celled reproductive body that is capable of growing into a new organism, produced especially by certain bacteria, fungi, algae, and nonflowering plants
Stamen	Each of the male floral organs, consisting of a filament and an anther
Stem	Main part of the plant, extending from the soil to the terminal bud
Stigma	Upper part of the female floral organ (pistil) that receives and holds pollen
Stilt root	They are branched, looping aerial roots arising from the lower portion of the trunk and extending outward and downward into soil
Stipule	Small outgrowth at the base of the petiole in certain leaves
Style	Cylindrical axis connecting the stigma to the ovary
Style	The part of the gynoecium connecting the ovary with the stigma
Sucker	A shoot arising adventitiously from a root of a tree or shrub
Sunken	Situated at a lower level than the surrounding
Superficial root	This is a modified section of cable roots which grown very close to the soil surface and again back into the soil
Tendrils	A twisting, threadlike structure by which a twining plant, such as a grape or cucumber, grasps an object or a plant for support
Terminal	Born at the end of a stem and limiting its growth or leaf, fruit, or other organ
Thorn	A woody sharp pointed structure formed from a modified branch
Tip	Apex of the leaf blade
Tree	Higher woody plant, usually with one major trunk
Twig	Offshoot growing out of the plant's stem
Unisexual flower	A flower that possesses either stamens or carpels but not both
Vein	Branching of the midrib
Viviparous germination	In this type of germination, the seeds germinate while the fruit is still attached to the mother plant



Professor Dr. Mahmood Hossain from Forestry and Wood Technology Discipline of Khulna University has spent his research career studying mangroves. He has conducted many national and international research projects, and his research publications have been highly evaluated.