



INDIGENOUS TREE

in Cambodia

- For Community Greening -



Institute of Environmental Rehabilitation and Conservation



INDIGENOUS TREE in Cambodia
- For Community Greening –

Edited by Extension Center of Institute of Environmental Rehabilitation and Conservation (ERECON)
Written by Shizuka SUTO (Cambodia Branch Officer, ERECON Institute)

August 1, 2022

Contents

1.	<i>Azalia xylocarpa</i>	2
2.	<i>Azadirachta indica</i>	4
3.	<i>Dalbergia cochinchinensis</i>	6
4.	<i>Delonix regia</i>	8
5.	<i>Dipterocarpus alatus</i>	10
6.	<i>Hopea odorata</i>	12
7.	<i>Pterocarpus macrocarpus</i>	14
8.	<i>Sindora cochinchinensis</i>	16
	References	18
	Introduction of ERECON institute	20



1. *Afzelia xylocarpa*

Afzelia xylocarpa (Kurz) Craib. Fabaceae

បេង/ มะค่าโมง/Gõ đò/缅甸/MakhaTree/CambodiaBeng Tree/メンガ/ベン



Botanical Description

Afzelia xylocarpa is a deciduous tree, usually 15-25 m tall, The crown is broad and rounded. The trunk is sturdy and 90-150 cm in diameter, and breaks up into large, spreading branches near the base. The trunk is sturdy and 90-150 cm in diameter, and breaks up into large, spreading branches near the base. The bark is smooth but slightly rough, grayish or yellowish. The endocarp is slightly red. Leaves are elliptic, 18-25 cm long, with 3-5 pairs of opposite lobes. The leaf base is rounded or lobed, and the leaf tips are obtuse or pointed. Flowering is in March-April. Inflorescence is grayish gloss is seen. Petals are single broadly oval, 7-9 mm long, pinkish or reddish. The seeds are brown, woody, 15-20 x 7-9 cm, fruiting in October-December. The fruit contains a few black seeds covered with an orange or red pseudo-seed coat. It is classified by the International Union for Conservation of Nature Red List of Threatened Species.

Distribution

Myanmar, Thailand, Laos, Cambodia, Vietnam, and other parts of Indochina. It was imported to South-central and Southeastern China and Hainan Island.





Plantation Management

Afzelia xylocarpa is found in lowland mixed deciduous and dry evergreen forests. It grows best in annual daytime temperatures ranging from 20-32°C, but it can tolerate temperatures of 12-39°C. Temperatures below 10°C will cause poor growth. Average annual rainfall is 1,000-1,500 mm, with a dry season of 5-6 months. The young trees like a bit of shade, but as they grow up they will not need it. It has a symbiotic relationship with rhizobium, forming root nodules and doing nitrogen fixation, which changes for nitrogen in the air into ammonia. Therefore, its effect of improving soil conditions is expected. The seed coat is very hard and preprocessing with boiling water can be insufficient to break dormancy. Therefore, it is necessary to resection the thick aril and the edge of the seed coat using a knife or something tools. When seeds are stored at low temperatures, germination ability can persist for one to two years. Before seeding, the seeds should be soaked in water for 12 hours before sowing.

Use

Afzelia xylocarpa is rare and difficult to find large trees due to excessive logging and habitat loss. The wood is vivid brown with beautiful deep stripes. The heartwood is reddish yellow, red to dirty reddish brown, and often has some striations that clearly distinguish it from the grayish-white sapwood. It has low shrinkage and excellent durability. For example, in architecture, furniture, woodcarving, etc. (The durability has been confirmed to be about 10 years in tropical environments.) The processing is a bit difficult, but easier than with other high density woods, and the polished surfaces are also often shiny. The edible parts are the oil from the seeds and the leaves. The seeds and bark are used in herbal medicine. It has astringent effects and used to relieve toothache and eye ailments.

2. *Azadirachta indica*

Azadirachta indica Ant. Juss. Meliaceae

Neem Tree/Nim Tree/Indian Lilac/印度栴檀/インドセンダン/नीम



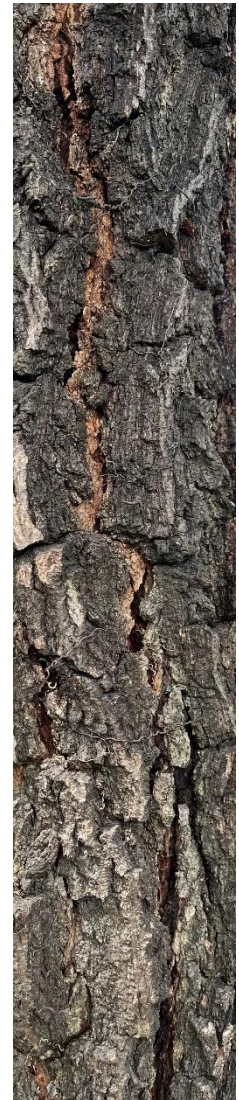
Botanical Description

Azadirachta indica is growing fast and evergreen tree. Generally 20 m high, sometimes up to 40 m tall and 1 m in trunk diameter, with low branches and dense rounded crown: a crown diameter up to 20 m. Bark is moderately thick and with deep furrows and scaly plates. Outer bark of the tree dark grey, pink inside. Leaves pinnately compound and may fall during severe drought. Each leaf has 9-17 pairs of 4-8 cm long curved, lance shaped, saw-toothed and pointed leaflets. Flowers are abundant, small, white and fragrant, arising in the corner of leaf stalks. Fruits are small, smooth ellipsoidal drupes, yellow or greenish-yellow when ripe. Neem seed approximately 4,000 seeds per kilogram, annual seed production per tree is about 44,000 to 20,000 seeds.

Distribution

South-East Asia, the Pacific Islands, Australia, South and Central Asia, the USA, the Caribbean, Sub-saharan Africa and the Middle East. According to general observations, it trees grow in almost all provinces of Cambodia.





Plantation Management

Azadirachta indica is widely distributed and it is not difficult to find seedlings for seed collection. It can adapt to a wide range of temperature and rainfall regimes. It can be established in hot and dry region, where altitude ranging from 0-1,500 m. Annual rainfall in the area where it can be found ranges from 450-1,150 mm. The tree is mature at 5 years of age, flowering January-April and fruiting May-June. The fruits can be harvested when they turn from green to yellow. After collection, pulping seeds should be used immediately. It can be preserved for 5 months in the humidity 40% with a temperature of 16°C. Seed viability can be maintained after 2 months of storage in a shaded room. The seeds are soaked in tap water for 24 hours, then the endocarp is removed, or the end of the seed coat is cut off. Neem germination rates vary between 15% for stored seed and 85% for fresh seed. Recommendations suggest that seeds should be sown four months prior to planting. (When the seedlings are about 45 cm tall)

Use

Neem is called “the tree of a thousand uses”.

It has been reported that active ingredients such as Azadirachtin contained in seeds and leaves have various inhibition effects on insects, such as feeding growth and reproduction, thus, Neem extracts which can be a biopesticide provide the excellent pest control in crop production. It can be used as timber 35-40 years after planting. The wood is insect resistant and is used as a building, furniture, paper pulp, chipboard, and fuel wood. It is also used as an excellent carving material.

3. *Dalbergia cochinchinensis*

Dalbergia cochinchinensis Pierre ex Laness. Fabaceae

Thailand Rosewood /ケランジイ / พะยูง / 𑜉𑜂𑜆𑜫 / 酸枝木 / ကးစွဲ / 交趾黄檀



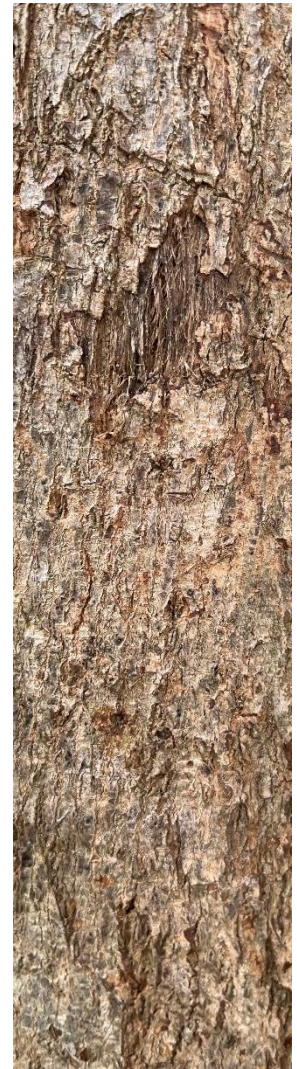
Botanical Description

Dalbergia cochinchinensis is the tall evergreen tree, 15-30 m tall, 60 cm in diameter; exceptionally, this tree can grow up to 120 cm in diameter. Abundantly branched, the tree has a rounded crown. The trunk is cylindrical, and the bark is brownish yellow and longitudinally split, sometimes peeling off in fragments. The leaves, growing on alternate sides, have 6-9 leaflets. The leaves are 10-25 cm long, egg shaped, obtuse or short-headed at the apex, obtuse or rounded at the base, shiny, and veined with reticulate veins. The flowering season is March-April. The flowers are white or whitish, 5-6 mm long and inflorescences are 10-20 cm long. The petals are obtuse or rounded at the tip, and basically oval or oblong, about 6 mm long. The seeds are 1-3 flat, brown seeds in a non-sticky, flattened pod 5-6 cm long and 1 cm wide.

Distribution

Cambodia, Thailand, Laos, Vietnam





Plantation Management

Dalbergia cochinchinensis is growing sparsely in open areas in mixed deciduous forests below 500 m elevation. It is found in areas with average annual temperatures of 20-32°C and annual precipitation of 1,200-1,650 mm. Although shade tolerant when young trees, older trees require a full sun position and has light tolerance and drought tolerance. The growth rate is slow. It has a symbiotic relationship with rhizobium, forming root nodules and doing nitrogen fixation, which changes for nitrogen in the air into ammonia.

Therefore, its effect of improving soil conditions is expected. When the pods turn dark brown, the seeds are mature. The pods will be dried, and then removed so as not to damage the seeds. Before sowing, the seeds are placed in boiling water and left to cool. It can also be propagated by cuttings and grafting. This species is classified as VULNERABLE on the IUCN Red List of Threatened Species.

Use

Dalbergia cochinchinensis produces a very valuable and very attractive aromatic wood known as "rosewood". The wood is heavy, very hard, very durable and insect repellent. The sapwood is grey, and the heartwood is red or almost black with a fine texture. When the heartwood is cut, it has a beautiful pattern with a distinctive purplish hue and a rose-like aroma. When used against processed wood, the wax makes the purple color stand out and gives a very beautiful finish. It has been most popular as a fretboard material, especially for electric guitars. It has higher than water density, finer texture, and richer in oils and resins, so, given careful impression long time. It is dimensionally stable, durable, resistant to rot and insects, and very fragrant when new. The air-dried specific gravity is 0.82-1.09, which makes some of them sink in water. The wood can be easily glued without any special preparation.

4. *Delonix regia*



Delonix regia (Bojer ex Hook.) Raf. Fabaceae

Poinciana / Phu'o.ng / Diê.p bông đơ',/ phoenix flower / 鳳凰木

Botanical Description

Delonix regia is a deciduous tree up to 10-15 m tall. The tree is fast-growing, with a flat-topped crown and an umbrella-shaped spread. The bark is grey and smooth. The leaves are fern-like, finely pinnate compound leaves, each with 10-40 pairs of narrowly oblong-elliptic 5-15 x 2-5 mm leaflets. The base is slightly oblique, and the leaf tips are rounded. The flowers are 5-10 cm long and 5-10 in number. Composed of four irregular petals about 3-7 cm long and one slightly larger yellow and white spotted petal. The stamens are 10. Pistil about 2.5 cm long, thread-like, with a shiny pattern. The tree prefers sandy soils and light, and mature trees are very drought tolerant. The roots are very shallow and often break pavements and walls, causing problems. Classified in the Encyclopedia of Life on the IUCN Red List of Threatened Species.

Distribution

Endemic to Madagascar. However, it is almost extinct in Madagascar. Cultivated in tropical and subtropical regions worldwide, including Southern and Southwestern China and in the Rio Grande Valley and Hawaii in the USA.





Plantation Management

Delonix regia is found at altitudes below 2,000 m in tropical and subtropical regions. The tree thrives in areas with average annual temperatures of 14-26°C and average annual rainfall of more than 700 mm. The seeds are hard and woody and take a long time to germinate. Dormancy-breaking methods include scraping off part of the seed coat or pouring a small amount of boiling water over the seed and removing it before boiling, and soaking the seeds in warm water for 12-24 hours before sowing. Growth after germination is very rapid. The total time required in the nursery is 3-5 months, with regular watering and weeding of the seedlings during the rainy season. Adding ash to the seeds allows them to be stored for a longer period. Trees can also be propagated from branch cuttings. Prefers hot, humid conditions and seeks sunlight. Drought tolerant and salt tolerant. It has a symbiotic relationship with rhizobium, forming root nodules and nitrogen fixation, converting nitrogen to ammonia, which is expected to improve soil conditions.

Use

One of the world's most widely cultivated ornamental plants, grown as an ornamental in gardens and along roadsides in the tropics. Sap is used in the food industry. The leaves, flowers, seeds and bark are valued for their various medicinal compounds, in particular, the leaves are the richest source of it. The bark produces an emetic sensation and aqueous extracts of the flowers are effective against roundworms. The plant is planted to provide shade in tea plantations and compounds. Cultivated to improve soil by fixing atmospheric nitrogen. The oil in the seeds is very suitable for soap and shampoo production. Heartwood yellowish to light brown, sapwood pale yellow. The wood is soft, heavy, coarse-sectioned, weak, brittle, well-polished and resistant to moisture and insects, although susceptible to attack by dry wood termites.

5. *Dipterocarpus alatus*

Dipterocarpus alatus Roxb. ex G. Don, *Dipterocarpaceae*

ຍາງນາ / yang na / Hairy-Leafed Apitong/ Sino-Tibetan/ *D.philippinensis*



Botanical Description

Dipterocarpus alatus is a high evergreen tree, 40 m tall, with a trunk around 1 m in diameter. The tree has a crown resembling an umbrella.

It is upright, cylindrical, and erect. Branches may not grow near the ground. The bark has a whitish-grey surface and a yellowish-brown inner bark, which contains resin. The leaves are 14-25 x 6-15 cm, ovate. The margins are undulate throughout, and the leaf tips are short and pointed. The petiole is grey-yellow and shiny. The entire leaf is densely covered with soft hairs. Flower petals 5-petalled. Cream-colored with a pink, red or purple stripe in the center. It has 30 stamens. The upper part of the pistil is ovoid and densely hairy. The fruit is spherical, with two large wings and three short wings. Flowering November-December, fruiting April-May. This species is classified as endangered on the IUCN Red List of Threatened Species.

Distribution

From east India and the Andaman Islands to Cambodia, Laos and Vietnam, south to the border of Thailand with Peninsular Malaysia





Plantation Management

Dipterocarpus altus is native to both tropical evergreen and dry deciduous forests. It has been described as a lowland tropical plant at altitudes of up to 500 m. It is evenly distributed throughout the year with average annual temperatures of 20-30°C and average annual rainfall of 1000-2200 mm. It is highly tolerant of shade when young and seedlings can survive under heavy shade for many years. It often grows naturally along riversides and on moist, flat land. Its fast growth in alluvial soils along rivers has led to its use as a pioneer in afforestation schemes to establish forests. The short survival rate means that it needs to be sown as soon as it is ripe. It does not require any pre-treatment and should therefore be sown directly. Germination usually starts within 4-7 days at 25°C and takes about 8-12 months to grow to 30 cm.

Use

The resin is used in paints, disinfectants, laxatives, and diuretics. Annual production of resin per tree is around 23-31 liters. It is very sticky, so care must be taken when processing. The light reddish-brown timber is used for timber, furniture, and household products due to its fine grain and ease of sawing and grinding. As a timber, it is somewhat durable with a density of 0.70-0.90 and is resistant to fungi and termites. However, it deteriorates quickly if left in the sun or rain. The oil is an excellent raw material for paints and lacquers. It is used for plaster on boats and other waterproof furniture.

6. *Hopea odorata*

Hopea odorata Roxb. Dipterocarpaceae

ta-khian / ตะเคียน / コキ / Merawan / Sao đen / Balau / Selangan batu



Botanical Description

Hopea odorata is a tall evergreen tree, growing up to 45 meters tall. It has a large crown. The tree trunk is about 80 cm in diameter. It has an upright cylindrical shape, and the roots can grow up to 25 m high. The bark surface is scaly and dark brown, the outer bark is slightly thicker, and the inner bark is dull yellow. The leaves are 8-17 x 3-9 cm, elliptic, somewhat thick and yielding. The base is rounded, and the leaf tips are short and pointed. Leaves petiolate, 1.0-1.8 cm long: petiole small. Flowers 3-9 on many branches. The petals are 5, light cream-colored, with hairs on the outside. The stamens are 15 and slender. The top of the pistil is ovoid and has hairs. The fruit is ovoid, 6-8 mm in diam. The immature fruit is light green, when mature is brown. Flowering occurs in February-March. Fruiting occurs April-July. This species is classified as Critically Endangered on the IUCN Red List of Threatened Species.

Distribution

Hopea odorata is believed to be native to India (Andaman Islands) in Southeast Asia. Myanmar, India, Bangladesh, Malaysia, Indochina.





Plantation Management

Hopea odorata is found in lowland moist tropical forests on deep soils up to 300 m altitude. Most occur near streams. It grows best in areas with annual daytime temperatures of 26-36°C and annual rainfall of 1,200 mm or more. The young plants require some shade, but as they grow older, their requirement for light increases. Flowering usually occurs every two years on trees of 8-10 years and older. The seeds viability is low, and it is advisable to avoid collecting from the forest floor. Seeds are very drought-sensitive and can only be stored for a short time; if sown within a month, they should be stored at room temperature in an airy bag. In case of storage for more than one month, the seeds should be slightly dried and stored at 15 °C. The germination rate is improved by soaking the seed in water for 8 hours before sowing. After 6-9 months, when seedlings reach 40-60 cm, transplant to the field. Vegetative propagation by cuttings is often carried out.

Use

Hopea odorata is widely used for windbreaks and roadside trees, as it is an evergreen broadleaf tree and adapts well to degraded land. The sapwood is lighter in color and the heartwood is yellow or greyish brown, darkening to dark brown when exposed. The heartwood of this timber is naturally durable, but the sapwood is susceptible to fungal infestation. The heartwood is also resistant to white ants and is rarely attacked by boring insects. However, sapwood is susceptible to parasitism by the flatworm (*Lyctus brunus*). Heartwood varies from banded greyish yellow to banded yellowish brown, becoming slightly darker when exposed to the open air. Texture moderately fine and even. Hard, heavy timber. Not difficult to dry naturally, but prone to cracking. Drying is slow. Timber is used for furniture and flooring materials, as well as railway sleepers in Vietnam and Laos. Resin, called dammar, is used as a raw material for making lacquers, varnishes, inks and linoleum. In Thailand, there is a folk belief that Nang Ta-khian (นางตะเคียน) is a tree inhabited by spirits. For this reason, it was believed that it was only used as timber in Buddhist monasteries. The leaves contain about 10% tannin by dry weight. The bark has astringent properties and is used in herbal medicine.

7. *Pterocarpus macrocarpus*



Pterocarpus macrocarpus Kurz. Fabaceae

Burma padauk/Rosewood/紫檀/オオミカリノ / ផ្កាឈាយមាត់ / ផ្កា

Botanical Description

Pterocarpus macrocarpus is a deciduous tree, 15-30 m high, with a straight, cylindrical trunk with occasional knobs. The crown is rounded but spreading. The tree tends to branch from a little above the base. The bark has a dark brown scaly surface and a reddish-brown inner bark, which contains resin. Oddly pinnate compound leaves with about 10 alternate leaflets. The leaves are 14-25 x 6-15 cm, ovate. The margins are undulate throughout and the leaf tips are short and pointed. The petiole is grey-yellow and shiny. The entire leaf is densely covered with soft hairs. Petals 5, yellow. Inflorescence of pea-like flowers, about 6 cm long, in racemes. The stamens are 30. The upper part of the pistil is ovoid and densely hairy. The fruit is approximately discoid, surrounded by a wavy wing about 4-7 cm long. It contains reddish-brown seeds less than 1 cm long. Flowering February-April, fruiting July-December; classified as endangered on the IUCN Red List of Threatened Species.

Distribution

Cambodia, Myanmar, Philippines, Bangladesh, Thailand, Viet Nam.





Plantation Management

Pterocarpus macrocarpus is native to tropical forests. It has been found at altitudes of up to 850 m above sea level. It prefers average annual temperatures of 24-34°C and average annual rainfall of 1500-2500 mm. It grows best in well-drained soils, such as alluvial soils along rivers, and in sunny areas. It can also grow on acidic soils. Often treated as a pioneer species in afforestation projects due to its fast growth. Deciduous in the dry season; flowering and fruiting occur from the 5th year onwards. It can be sown without pre-treatment; germinates from 11 days after sowing whole pea-pod and from 5 days after sowing seeds only. It has a symbiotic relationship with rhizobium, forming root nodules and doing nitrogen fixation, which changes for nitrogen in the air into ammonia, therefore, its effect of improving soil conditions is expected.

Use

The resin is used as a red dye. The timber is used as a building material because it is hard, dense, relatively heavy, very durable and insect resistant to termites. The bright yellow to dark red heartwood in particular is considered a high quality wood. The bark and roots are used as a remedy for diarrhoea. Often planted by roadsides and in parks as a shade tree.

8. *Sindora cochinchinensis*



(*Sindora siamensis*)

Sindora cochinchinensis Baill. Fabaceae

มะค่าแต้ / gụ mậ/ kâkâh sbaèk//têê 'hoho

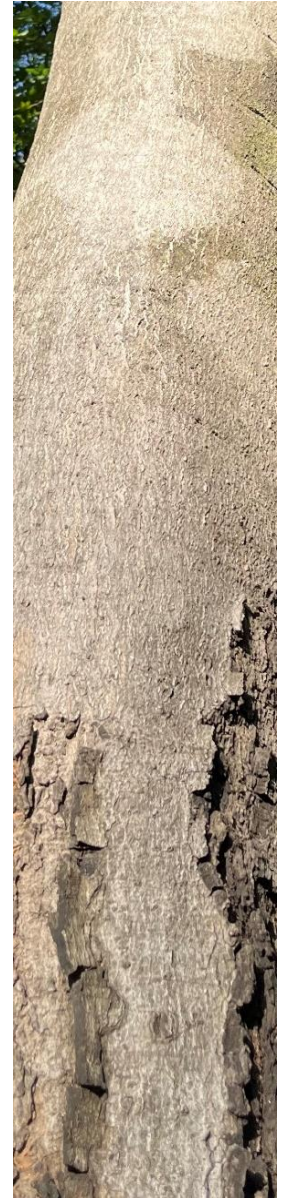
Botanical Description

Sindora cochinchinensis is a deciduous or semi-evergreen tree up to 35 m high. The trunk is cylindrical, 80-100 cm in diameter, branched. The crown spreads out in an umbrella-like shape. The bark is dark brown with grey patches and bole straight. The leaves are 15-25 cm long, opposite. Leaves broadly elliptic, 3-4 pairs, 6-15 x 4-8 cm, with rounded or convex tips and short hairs on the surface, base rounded, margin entire. A single narrowly oblong-elliptic petal, 7-10 x 2-4 mm, dull purple when dry. The stamens are 10. The pistil is absent and densely covered with hairs. The seed pods are about 8 cm long, flattened, irregularly broadly oval with numerous spines on the surface. The seeds, 1-3 in each pod, are broadly oval, flattened, 15-25 x 14 x 17 mm. This species is classified as C Least Concern on the IUCN Red List of Threatened Species.

Distribution

Vietnam, Cambodia, Laos, Thailand, Malaysia, China, Peninsular Malaysia





Plantation Management

Sindora cochinchinensis is distributed in tropical lowlands at altitudes below 500 m, with annual rainfall of 1,000-2,000 mm or more. The species prefers sunny sites and prefers sandy, brown or grey loamy soils, but has no symbiotic relationship with soil bacteria, which many legumes have. Seeds take a long time to fall to the ground until the pods open. It is therefore necessary to collect the seeds directly by shaking branches or climbing trees. The fruit is hard and the seeds are difficult to extract, so drying the fruit in the sun makes it easier to extract the seeds. If the seed coat is scraped off and soaked in tap water, the seeds can be stored for 2-3 years. Scraping the seed coat and soaking overnight in tap water can increase germination rates, with germination starting two weeks after sowing. Pollination is carried out by flies. Also, in beach forests and occasionally on landward margins of mangroves.

Use

The roasted seeds are used for tea and the fruits are edible. Other uses include oil, tannins, resins and wood. The wood oil from all trees of the genus is used to make paints and coatings. The heartwood is brown or reddish-brown with dark brown or black stripes. Sapwood is greyish brown or light brown. After processing, the surface is reasonably fine and uniform, making it widely used for construction timber and furniture. The unripe green fruit can be baked and eaten. Beans are usually rich in protein, but do not eat raw.

References

- Andrew, C. (1996). *The Encyclopedia of Medicinal Plants*. Boston: DK Pub. Retrieved from <https://archive.org/details/encyclopediaofme00chev>
- Board of the Foundation Flora Malesiana. (2022). (Daniel Thomas, Singapore Botanic Gardens, Marco Roos, Naturalis Biodiversity Center) Retrieved 4 2022, from FLORA MALESIANA: <https://floramalesiana.org/new/links/>
- Board of Trustees of the Royal Botanic Gardens, Kew. (2022). Retrieved from Royal Botanic Gardens Kew: <https://www.kew.org/>
- CIRAD, IFP, DeveloperNational University of Laos, NHN-Leiden. (2006). Retrieved from Biodiversity Information and co-Operation in Taxonomy for Interactive shared Knowledge base: <http://biotik.org/index.html>
- Deni, B. (1995). *Encyclopaedia of Herbs and their Uses*. Dorling Kindersley.
- Digital species e book. (2008). Retrieved from Digital Compendium of Forestry Species of Cambodia.
- Food and Agriculture Organization of the United Nations (FAO). (2021). Retrieved 4 2022, from Ecocrop: <https://gaez.fao.org/pages/ecocrop>
- FRANCES, L. H., NICK, B. D., ANNA, L., & DANIEL, R. P. (2014). Effectiveness of Community Forestry in Prey Long Forest, Cambodia. *Conservation Biology*, 28(2):372-81.
- Global Biodiversity Information Facility. (n.d.). Cambodia. Retrieved from Global Biodiversity Information Facility: <https://www.gbif.org/country/KH/summary>
- Ha T.T., D., John, C., Ngoc, B., Heidi, C., & Lam, D. (2019). Recovery of tropical moist deciduous dipterocarp forest in Southern Vietnam. *Forest Ecology and Management*.
- Harvard University. (n.d.). Retrieved 4 2022, from Harvard University Herbaria & Libraries: https://kiki.huh.harvard.edu/databases/publication_index.html
- Hoang Van Sam, K. N. (2004). *Trees of Laos and Vietnam: A Field Guide to 100 Economically or Ecologically Important Species*. *Blumea Journal of Plant Taxonomy and Plant Geography*. Retrieved from https://www.researchgate.net/publication/233639651_Trees_of_Laos_and_Vietnam_A_Field_Guide_to_100_Economically_or_Ecologically_Important_Species
- James, V. A. (2010). *Tropical Tree Seed Manual*. United States Department of Agriculture Forest Service. Retrieved from <https://rngr.net/publications/ttsm>JSTOR. (n.d.). *Global Plants*. (N.-f.-p. o. ITHAKA, Editor) Retrieved 4 2022, from <https://plants.jstor.org/>
- Missouri Botanical Garden. (2020). *Tropicos database*. Retrieved from Tropicos: <https://www.tropicos.org/home>
- Missouri Botanical Garden et al. (1994). *Flora of China*. Retrieved 4 15, 2022, from <http://flora.huh.harvard.edu/china/>
- Miyazawa, Y., Tateishi, M., Komatsu, H., Ma, V., Kajisa, T., Sokh, H., & Mizoue, N. (2014). Tropical tree water use

- under seasonal waterlogging and drought in central Cambodia. *Journal of Hydrology*. Retrieved from <http://tomo-kumagai.eco.coocan.jp/jh1402.pdf>
- Moritsuka E, P. C. (2017). Genetic variation and population structure of a threatened timber. *Tree Genetics and Genomes*. Retrieved from <https://www.irdfa.org/wp-content/uploads/2017/11/Genetic-variation-and-population-structure-of-a-threatened-timber-tree-Dalbergia-cochinchinensis-in-Cambodia.pdf>
- Niyomdham, C. (2014). An account of *Dalbergia* (Leguminosae-Papilionoideae) in Thailand. *Thai Forest Bulletin (Botany)*. Retrieved from <https://li01.tci-thaijo.org/index.php/ThaiForestBulletin/article/view/24860/21143>
- Norn, N., & Kim, S. (2014). Review of biological and silvicultural characteristics of timber. Retrieved from <https://www.irdfa.org/wp-content/uploads/2017/11/Review-of-biological-and-silvicultural-characteristics-of-timber-trees-planted-in-Cambodia.pdf>
- Oldfield, S., Lusty, C., & Lusty, A. (1998). *The World List of Threatened Trees*. Cambridge UK: World Conservation Press. Retrieved from <https://www.biodiversitylibrary.org/item/98488#page/1/mode/1up>
- Rong-hua, L., Xin-chao, W., Feng, S., Pu-zhao, Z., Hui-lian, H., & Shuang, Z. (2016). Flavonoids from Heartwood of *Dalbergia cochinchinensis*. *Chinese Herbal Medicines*.
- So Thea. (2011). Improving reforestation success of high-value and key forest species by direct seeding in Southeast Asia and Western Australia. Murdoch University. Retrieved from <https://researchrepository.murdoch.edu.au/id/eprint/7246/>
- Stephen, F. (1998). *Cornucopia: A Source Of Edible Plants*. University of Michigan: Kampong Publications, Technology & Engineering.
- Tamaki Y, T. T. (2010). The Chemical Structure of Galactomannan Isolated from Seeds of *Delonix regia*. *Bioscience, Biotechnology, and Biochemistry*, 74(5), 1110-1112.
- The International Union for Conservation. (n.d.). Retrieved 4 28, 2022, from IUCN Red List of Threatened Species: Retrieved from <https://www.iucnredlist.org/>
- UNEP-WCMC, C. (2007). *Strategies for the Sustainable Use and Management of Timber Tree Species subject to International Trade: South East Asia*. UNEP-WCMC, Cambridge. Retrieved from <https://www.biodiversitylibrary.org/item/98551#page/1/mode/1up>
- United States Department of Agriculture(USDA). (1984). *Tropical Timbers of the World*. Retrieved from Forest Products Laboratory: <https://www.fpl.fs.fed.us/documnts/usda/ah607.pdf>
- World Agroforestry (ICRAF). (2021). Retrieved from World Agroforestry: <https://www.worldagroforestry.org/>
- World Agroforestry(ICRAF). (2018). Seed Leaflets. Retrieved from <file:///C:/Users/magir/Downloads/A4%20Seed%20leaflets%20compiled.pdf>



International Non-Profit Organization

Institute of Environmental Rehabilitation and Conservation, Japan

I. Aims

Institute of Environmental Rehabilitation and Conservation, called ERECON has been advancing various extension and related research programs. ERECON shall aim to contribute to sustainable use of natural resources in Asian countries. Therefore, the organization shall pursue the environmental rehabilitation and conservation as well as the environmental education for the harmony between the agricultural and urban development and the natural environment.

II. Programs

ERECON shall conduct following non-profit programs on research and extension.

1. Program on Environmental Rehabilitation and Conservation in Asian Countries



2. Program on Sustainable Use of Natural Resources in Asian Countries



3. Program on Environmental Education in Asian Countries



4. Other programs for achieving ERECON aims



[ERECON Headquarters]

Institute of Environmental Rehabilitation and Conservation
2987-1 Onoji Machida-shi, Tokyo 195-0064, Japan.
Tel/ Fax +81-42736-8972 E-mail: hq-erecon@nifty.com

[ERECON Southeast Asia Office]

Institute of Environmental Rehabilitation and Conservation, Southeast Asia Office
In Association of Environmental and Rural Development (AERD)
93/64 Moo.3 Sinsab Village, Bungyeetho Sub-District,
Thanyaburi District, Pathum Thani 12130, Thailand
Tel : +66-2957-8064 E-mail: seasia-erecon@hotmail.com

[Cambodia Branch]

In Royal University of Agriculture, Cambodia (RUA)
P.O. Box 2696, Chamkar Daung, Dangkar District,
Phnom Penh, 12401, Cambodia
Tel: +855-97-603-6000