Anthocephalus cadamba

(Roxb.) Miq.

Rubiaceae

kalempayan, kadam, kaatoan bangkal, jabon

LOCAL NAMES
Burmese (mau,yemau,maukadon,mau-lettan-she); English (common bur-flower,New Guinea labula); Filipino (kaatoan bangkal); French (kadam); Hindi (rudruk-shamba,bale,kola-aiyila,kodavara,vanji,kadam,attutek,kadamba); Indonesian (kelempajan); Javanese (jabon); Lao (Sino-Tibetan) (sako,koo-somz,mai sa kho); Malay (kalempayan,kelampo,kelepayan,ludai,kelempayan); Thai (krathum,nakhon si tham arrat,sukhothai,chantanaburi,takoo); Trade name (kalempayan,kadam,kaatoan bangkal,jabon); Vietnamese (g[as] t[aws]ng,c[aa]y, tom, g[as]o)

BOTANIC DESCRIPTION
Anthocephaluscadamba is a large tree with a broad crown and straight cylindrical bole. The tree: may reach a height of 45 m with trunk diameters of 100-(160) cm. The tree sometimes has small buttresses and a broad crown.
The bark is gray, smooth in young trees, rough and longitudinally fissured in old trees.

Leaves glossy green, opposite, simple more or less sessile to petiolate, ovate to elliptical (15-50 x 8-25 cm).

Inflorescence in clusters; terminal globose heads without bracteoles, subsessile fragrant, orange or yellow flowers; Flowers bisexual, 5-merous, calyx tube funnel-shaped, corolla gamopetalous saucer-shaped with a narrow tube, the narrow lobes imbricate in bud. Stamens 5, inserted on the corolla tube, filaments short, anthers basifixed. Ovary inferior, bi-locular, sometimes 4-locular in the upper part, style exserted and a spindle-shaped stigma.

Fruitlets numerous with their upper parts containing 4 hollow or solid structures.

Seed trigonal or irregularly shaped.

A. cadamba is closely allied to the subtribe Naucleinae (Rubiaceae) but differs from them in its placentation mode. The species is in the focus of a classification controversy based on the name of the original type specimen described by Lamarck.

BIOLOGY
Birds and other animals help in dispersal of the edible fruit. At the age of 4 years kadam may start flowering. In Indonesia, flowering starts from April-August, sometimes from March-November, however, in India flowering commences from December-July. Flowers are bisexual.

Anthocephalus cadamba tree (Rafael T. Cadiz)

Anthocephalus cadamba leaves (Rafael T. Cadiz)

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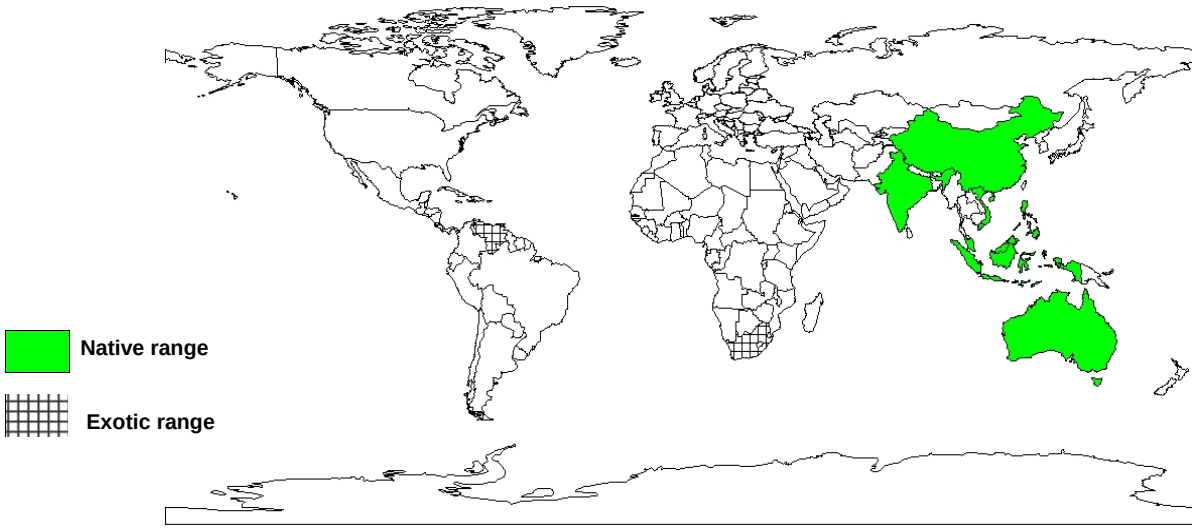
ECOLOGY
A. cadamba is an early-succession species which grows best on deep, moist, alluvial sites, often in secondary forests along riverbanks and in the transitional zone between swampy, permanently flooded and periodically flooded areas.

BIOPHYSICAL LIMITS
Altitude: 300-800 m
Mean annual temperature: 23 deg C
Mean annual rainfall: 1 600 m
Soil type: Prefers well drained entisols. Kadam does not grow well on leached and poorly aerated soils.

DOCUMENTED SPECIES DISTRIBUTION

Native: Australia, China, India, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore, Vietnam
Exotic: Costa Rica, Puerto Rico, South Africa, Surinam, Taiwan, Province of China, Venezuela



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

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PRODUCTS
Food: The fruit and inflorescences are reportedly edible.

Fodder: The fresh leaves are fed to cattle.

Apiculture: The fragrant orange flowers attract pollinators.

Timber: Sapwood white with a light yellow tinge becoming creamy yellow on exposure; not clearly differentiated from the heartwood. The wood has a density of 290-560 kg/cu m at 15% moisture content, a fine to medium texture; straight grain; low luster and has no characteristic odor or taste. It is easy to work with hand and machine tools, cuts cleanly, gives a very good surface and is easy to nail. However, the wood is rated as non-durable, graveyard tests in Indonesia show an average life in contact with the ground of less than 1.5 years. The timber air dries rapidly with little or no degrade.
Kadamb wood is very easy to preserve using either open tank or pressure-vacuum systems. The timber is used for plywood, light construction, pulp and paper, boxes and crates, dug-out canoes, and furniture components. Kadamb yields a pulp of satisfactory brightness and performance as a handsheet. The wood can be easily impregnated with synthetic resins to increase its density and compressive strength. Kadam is becoming one of the most frequently planted trees in the tropics.

Tannin or dyestuff: A yellow dye can be obtained from the rooot bark.

Essential oil: Kadam flowers are an important raw material in the production of ‘attar’, which are Indian perfumes with sandalwood (Santalum spp.) base in which one of the essences is absorbed through hydro-distillation.

Poison: The flowers exhibit slight anti-implantation activity in test animals. Kadam extracts exhibit nematicidal effects on Meloidogyne incognita.

Medicine: The dried bark is used to relieve fever and as a tonic. An extract of the leaves serves as a mouth gargle.

Other products:
Chlorogenic acid (CGA), isolated from the leaves of A. cadamba screened for hepatoprotective activity in vitro and in vivo inhibited lipid peroxidation in liver microsomes (Kapil A. et al. 1995).
The alkaloids cadamine and isocadamine are isolated from the leaves of kadam.

SERVICES
Shade or shelter: The tree is grown along avenues, roadsides and villages for shade.

Reclamation: A. kadamba is suitable for reforestation programmes.

Soil improver: Sheds large amounts of leaf and non-leaf litter which on decomposition improve some physical and chemical properties of soil under its canopy. This reflects in increases in the level of soil organic carbon, cation exchange capacity, available plant nutrients and exchangeable bases.

Ornamental: Kadam is suitable for ornamental use.

Intercropping: Suitable for agroforestry practices.

Other services:
The tree is highly regarded religiously and culturally in India, Java and Malaysia, ‘the tree’ is sacred to the Lord Krishna. The fresh leaves are sometimes used as serviettes or plates.

TREE MANAGEMENT
The tree is a light demander, however the saplings require protection from the hot sun. It is sensitive to frost, drought, excessive moisture and grazing. The young seedlings are highly susceptible to weeds and should be weeded regularly. 2-month seedlings can be transplanted in nursery beds or into polythene bags, where they can be retained before planting at the start of the monsoon rains. To ensure successful establishment, seedlings should be planted out with their balls of earth. The tree coppices well. The growth of kadam is usually fast for the first 6-8 years. At the age of 10-15 years the trees can be felled.

GERMPLASM MANAGEMENT
The epigeous germination begins in about 10-14 days in the rainy season. Successful extraction of seed from ripe fruits involves air drying, crushing, and sieving through a No. 35 US Standard sieve to separate seed from chaff. Fruits are soaked in the open until rotted, ground by hand into a thick slurry, air dried, and passed through a series of sieves terminating with a No. 35. This procedure improves seed purity up to 98%, and germination success. There are about 900 000-2 700 000 seeds/kg.

PESTS AND DISEASES
The insect, Arthroschista hilalaris attacks kadam. The fungus Scytalidium lignicola is found on living branches of A. cadamba.
Outbreaks of 'Sudden Death', a disease of unknown aetiology, has been severe in Costa Rica to justify the abandonment of the planting. The symptoms are typical of a root infection, as the disease occurs in patches and affected trees show cambial and sapwood staining spreading upwards from the roots. Death of feeding roots is another early symptom.
The nematodes Meloidogyne javanica, Hemicriconemoides, Tylenchorhynchus and Hoplolaimus are found in association with the roots of A. cadamba.
The larvae of 5 common species of Scarabaeidae, Euchlora viridis, Holotrichia constricta, H. helleri, Lepidiota stigma and Leucopholis rorida are polyphagous root pests of kadam.

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