

Anthocephalus chinensis (Lam.) Rich. ex Walp.

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RUBIACEAE (MADDER FAMILY)

Anthocephalus indicus A. Rich.; *Nauclea cadamba* Roxb.; *Saarocephalus cadamba* Kurz;
Anthocephalus cadamba Miq.

Atta vanji, kadaga, kadam, kadambe, kadambo, kaddavailo, kadwal, kalem pagem,
kalempajan, katoam bangkal, lurambo, manlettan-she, maw, roghu, sanko,
velli kadambu (Troup 1921, Gamble 1922, Chudnoff 1984)

Anthocephalus chinensis grows in the sub-Himalayan tract at latitudes from 9° S to 27° N. The species is found from Nepal eastward to Bangladesh, India (Assam province and Chotanagpur district at Bihar Province, Myanmar (Burma), Sri Lanka, the Philippines, Indonesia, and Papua New Guinea (Whitmore 1984).

Anthocephalus chinensis is a large, deciduous (or sometimes evergreen), and fast-growing species with spreading branches (Troup 1921, Zabala 1990a). Under normal conditions, it reaches 17.67 m in height and 25.3 cm d.b.h. within 9 years. A mature tree can attain 20 to 30 m in height and 50 to 100 cm d.b.h. The crown is open and round and bears drooping branches. The stem is straight, more or less cylindrical, and unbuttressed, with a somewhat regular bole. The bark is thin, slightly rough, grayish to light brown (Zabala 1990a), and smooth in young trees. It becomes darker and longitudinally fissured in older trees and exfoliates in small rectangular plates that are yellowish brown inside (Troup 1921). The leaves are simple, opposite, 12 to 25 cm by 5 to 10 cm, ovate, elliptic-oblong, shining, coriaceous and glabrous above, and pubescent beneath (Brandis 1921, Zabala 1990a). The tree becomes leafless or nearly leafless during the hot season.

Anthocephalus chinensis grows in moist, warm regions, often on alluvial ground, along rivers, and in swampy areas (Troup 1921). In Bangladesh it is a tree of the moist, deciduous and evergreen forests of Sylhet and Chittagong, and also occurs along channels and in marshy places. This broad-leaved species has high fertility requirements and does not grow well on leached soils even when soil physical conditions are good and rooting is not impeded (Evans 1982). It grows best on deep, moist, alluvial sites, often in secondary forests along

river banks (Chudnoff 1984). *Anthocephalus chinensis* can be planted along river and canal banks and the lower part of roadsides (Alam and others 1991). In stiff, badly drained areas growth is very poor, and the species does not thrive in dry areas (Zabala 1990a). High to medium texture with neutral to acidic soil is suitable for *A. chinensis*. Free and moist draining conditions are necessary. *Anthocephalus chinensis* grows at elevations of 0 to 1300 m where mean annual rainfall is 1300 to 1400 mm. The tree tolerates a 3-month dry season where the mean maximum temperature is 24 to 34 °C, mean minimum temperature is 16 to 26 °C, and mean annual temperature is 20 to 32 °C. It is sensitive to frost. In its natural conditions, the species grows in temperatures from 25 to 35 °C and grows well where annual rainfall is 1440 to 5080 mm (Zabala 1990a).

The wood is white to yellowish-white or cream-white with a yellowish cast on a longitudinal surface, often with grayish sap stain of fungi. It is moderately hard and heavy (specific gravity 0.40 and calorific value 4,800), straight grained, somewhat lustrous, and medium-coarse in texture. Pores are large, oval, elongated, subdivided (sometimes in short radial lines), and scanty. Medullary rays are fine, numerous, close together, and bent outward where they touch the pores (Gamble 1922). The wood is used in matchsticks boxes, tea boxes, bobbins, veneer, plywood, crates, and furniture (Chudnoff 1984, Zabala 1990a). The logs are used for dugout canoes, roof structures, and light construction (Alam and others 1991). It can also be used for joinery work (Gamble 1922). The sapwood of *A. chinensis* rates fair for wood wool or cement boards (Kamil and Serwandi 1975).

The tree flowers May through July. The yellow flower is terminal, 3.80 to 5.10 cm in diameter and has a single head,

2.54 to 3.80 cm peduncles, a glabrous corolla, erect lobes, and oblong persistent calyx-lobes. The small fruits of individual flowers are inserted in a central fleshy mass which forms a composite fruit and turns brownish or yellowish when ripe (Evans 1982). The fleshy fruits ripen and fall in January and February (Zabala 1990a). Cattle, birds, and other animals consume the fruits and subsequently disperse the seeds. With the early showers preceding the monsoon, the seeds are washed into heaps along with silt and germinate in dense masses at the beginning of the rainy season.

Fruits are collected in August and September (Choudhury 1975). They are collected manually from the plant or the ground. Safety belts, ladders, extension pruners, pruning shears, pruning saw, and bags are used in fruit collection. After collection, fruits are left to ripen (Pollard 1969). They are placed in protected areas, not left under the trees because they may be partially consumed by white ants. The fruits are either dried in the sun so the fleshy part can be removed manually or mechanically, or soaked to separate the seeds (Venator and Zambrana 1975). These methods are equally effective. In another method, ripened fruits are soaked in water until they rot, pulped or macerated on newspapers, and dried in a warm place (Zabala 1990a). The seeds are carefully separated from the dried pulp by slightly blowing the mass (Evans 1982, Zabala 1990a). Seeds average 18,000,000 to 26,000,000 per kg (Whitmore 1984). Seeds have several years of dormancy (Fox 1972) and can be stored satisfactorily if they are kept in air-tight or almost air-tight containers in a dark room under dry conditions (Zabala 1990a).

Germination is epigeous. Seeds germinate in 8 to 22 days. Fresh seeds germinate at 90 percent, diminishing to 5 percent at 13 months (Zabala 1990a). Old seeds germinate best in full sun, and fresh ones in shade (Whitmore 1984). Seed boxes are placed in the shade. The seedlings are 2.5 cm tall and have 2 or 3 pairs of true leaves after 3 to 4 weeks. They are pricked out with a small ball of earth surrounding the roots into plastic pots and hardened off in 30 percent shade (Zabala 1990a). During this early stage, the plants require light shade and protection from the sun; they require more light as they grow older (Zabala 1990a). Seedlings grown in shade become spindly trying to reach the light. If heavy rain is expected, the

seedlings should be protected. After pricking out, 95 percent survival is likely (Pollard 1969). Young transplanted seedlings receive intensive silvicultural care. After 6 months, when the seedlings are about 30 cm tall, they are outplanted at the onset of the rainy season with 2 by 2 m spacing (Zabala 1990a). Mechanical thinning may be required at 8 years. In Bangladesh, four, three, and two weedings are carried out in the first, second, and third years respectively (Choudhury and Choudhury 1983). Young saplings are subject to damage from browsing by cattle and deer (Troup 1921).

As a plantation tree, *A. chinensis* can be planted with leguminous species such as *Paraserianthes falcataria* (L.) I.C. Nielsen, *Albizia chinensis* (Osbeck) Merr., and *A. lebbek* (Zabala 1990a). Coppice-with-standard or clearfelling followed by artificial regeneration is used for this species. It is a good natural pruner and rarely needs artificial pruning (Evans 1982). It is a fast-growing, shade intolerant plantation species in the tropics (Evans 1982). In the Philippines, growth of *A. chinensis* is improved when it is interplanted with the legume *Leucaena leucocephala* (Lam.) de Wit (Evans 1982).

ADDITIONAL INFORMATION

In germination, the radicle emerges and the hypocotyl elongates, carrying the cotyledons enclosed in the testa above-ground. The testa usually adheres to one cotyledon for some time before falling to the ground (Troup 1921).

Sudden death is a severe problem in Costa Rica. It often occurs in sethes and the symptoms are typical of a root infection. Affected trees show cambial and sapwood staining spreading upward from the roots (Gibson and Nyland 1977). Wild populations in Sabah have very low pest populations (Thapa 1971), but dense stands are prone to attack by caterpillars of the moth *Arthroschista hilaralis* (Pyralidae) (Mastan 1969). *Margaronia hilaralis* is a common leaf-rolling insect pest of *A. chinensis* in Malaysia. This insect can be checked by spraying with 0.051 B.H.C. in water (Thapa 1970). The larva of *Mecistocerus* sp. eats out an elliptical-shaped depression, of which half is in the sapwood and the inner bark. The grub eats or irregularly winds longitudinal galleries in the bast and sapwood (Stebbling 1914).

