

Azadirachta excelsa (Jack) Jacobs

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MELIACEAE/MELIOIDEAE (MAHOGANY FAMILY)

Melia excelsa, *Azadirachta integrifolia*

Kelantas, limpaga, marango, ranggu, sadao tiam, sentang, tiam

Originating in Borneo, *Azadirachta excelsa* grows naturally in southern Thailand, peninsular Malaysia, and Palawan Island of the Philippines. It was recently introduced to many other tropical countries, including Taiwan, Guatemala, and the State of Hawaii (Appannah and Weinland 1993, Kijkar 1995).

Azadirachta excelsa is a medium- to fast-growing tree that may reach 45 m in height (with a clear bole up to 20 m) and about 2 m d.b.h. *Azadirachta excelsa* leaves are usually pinnately compound, 30 to 75 cm long with 7 to 11 pairs of leaflets. Leaflets are 3 to 5 cm long and 2 to 3 cm wide, normally elliptic, rather bluntly pointed, and asymmetric; the base is uneven and thin with 6 to 11 pairs of side veins. Young leaves are usually serrated and become even-edged when mature (Chungpongse and Buranatham 1991, Corner 1988, Kijkar 1995). The first two leaves are opposite with three to five foliated; subsequent leaves are alternate and spiral, with leaflets opposite or subopposite and serrated. The bark of young trees is pink or brownish grey and smooth. Mature trees are brownish or grayish buff and have fissured and shaggy bark with grey, fibrous, oblong flakes. Inner bark is orange-red. Old trees in partial shade will have more greyish bark and fewer shaggy flakes than those grown in the open (Chungpongse and Buranatham 1991, Corner 1988, Kijkar 1995). Normally the trees are harvested at about 15 years when they are about 20 to 30 m high, 35 to 45 cm d.b.h., with clear boles 6 to 10 m. On very fertile sites, the trees reach these dimensions in 8 to 10 years (Kijkar 1995).

Commonly found along roadsides and farm boundaries and scattered on exposed areas, the species may attain a height of 15 to 20 m with a d.b.h. of 30 cm in 7 to 8 years (Kijkar 1995). *Azadirachta excelsa* is a lowland species that will grow up to an elevation of 600 m (Burgess 1966). It thrives on well-drained, fertile, sandy loams to loamy soils with a pH of 5.0 to 6.5, especially alluvial soils along creeks. However, *A. excelsa*

cannot tolerate waterlogging or frequent flooding. The tree grows fast when annual rainfall is more than 1600 mm and mean annual temperature is 22 to 25 °C (Chungpongse and Buranatham 1991, Kijkar 1995).

The brown to golden brown wood is used in general construction and for furniture and carving. In addition, bioinsecticides are extracted from its seeds and leaves, and the edible young shoots and flowers are used in salads and in medicine to treat stomach diseases and nasal problems (Chungpongse and Buranatham 1991, Mungkorndin 1993).

Flowering and fruit setting start when *A. excelsa* is about 6 to 7 years old. In Thailand, the trees shed their leaves in January and February, and new leaves emerge immediately. When the new leaves turn green, the tree starts to flower, usually from late February through March. Flowers are greenish white, fragrant, and in panicles as long as the leaves. Flowers have five white petals, each measuring 5.0 to 6.5 mm long and 1.5 to 2.5 mm wide. Anthers are usually 4 mm long. The ovary divides into three carpels, each with two locules and one stigma (Corner 1988, Kijkar 1995). Fruit is usually 2.5 to 3.5 cm long and oblong, often with a constriction near one end. Initially green, the ripe yellow fruit contains one large seed with a rather leathery rind that gives a garlic scent when bruised or cut. Fruits usually mature in mid-June (Thailand) to August and September (Borneo). The seedcoat is membranous, and the seed has a straight embryo and thick cotyledons.

Because *A. excelsa* is usually a big tree with a long, straight, clear bole, seed collection from its crown canopy is very difficult. Fruit collection from the ground is commonly practiced by clearing directly beneath the canopy, removing debris and other organic materials from the site, and collecting only the freshly fallen fruits. After collection, immediate seed extraction is essential. The fruits are soaked in cold water for 1 day, and the seeds are extracted by hand or by Dybvig scari-



fier, then dried in shade for 1 to 2 days before sowing. Seeds average approximately 500 to 520 per kg (Kijkar 1995).

Because *A.excelsa* seeds are recalcitrant, they should be sowed immediately. *Azadirachta excelsa* seeds germinate in 6 to 23 days (Ng 1992). Direct dibbling of seeds into a prepared container to the same depth as the seed dimension (about 1 cm deep) and covering with soil is the recommended sowing method. Seeds may also be broadcast into seedbeds at scattered spacing, covered with thin layers—0.5 to 1.0 cm—of soil

or sand, mulched with straw, and watered. After about 1 week, seeds will germinate well. Because crickets may damage or destroy seedlings during this stage, seedlings should be sprayed weekly with insecticides. When seedlings reach 30 to 40 cm tall (usually in 3 or 4 months), they are ready for out-planting (Chungpongse and Buranatham 1991, Kijkar 1995). The species also can be propagated vegetatively by rooting cuttings using juvenile seedlings or rejuvenile materials from root reservoirs (Kijkar 1995).

