

Aleurites moluccana (L.) Willd.

Indian walnut

Franklin T. Bonner

Dr. Bonner retired from the USDA Forest Service's Southern Research Station, Mississippi State, Mississippi.

Synonyms. *Aleurites javanica* Gand., *A. triloba* Forster & Forster f.

Other common names. Kukui, candlenut-tree, tutui, nuez, nuez de India, lumbang, Sakan, lama.

Growth habit, occurrence, and uses. Indian walnut is well-known as kukui, the state tree of Hawaii. On the Islands, it is a large, evergreen, spreading tree of moist lowland mountains up to an elevation of 671 m. It may grow to a height of 24 m and a bole diameter of 0.9 m (Little and Skolmen 1989). This species is a probable native of Malaysia, as its name suggests that it came from the Moluccan Islands. It can be found on islands throughout the Pacific region, and it has been introduced to other tropical areas, including Puerto Rico and the Virgin Islands (Little and Skolmen 1989).

The tree was introduced by early Hawaiians for its oily, nutlike seeds. Oil pressed from these seeds was once widely used for fuel in stone lamps, for paints and varnishes, and for medicines. In past years, as much as 37,850 liters (10,000 gal) of the oil were exported annually, but the industry has become unprofitable in Hawaii (Little and Skolmen 1989). The trees are still grown for production of the oil in the Philippines and other parts of the Pacific (Eakle and Garcia 1977). In addition, the leftover oil cake can be used as fertilizer or cattle food. Local uses also included folk medicine and dyes, and a waterproofing substance can be made from the tree's sap and green fruits (Little and Skolmen 1989). Indian walnuts have been utilized in shade, ornamental, and walnut-protection plantings in Hawaii (Little and Skolmen 1989).

Flowering and fruiting. Indian walnut's flowers are borne in terminal cymes 9 to 15 cm long. The white individual flowers are approximately 10 mm long. Flowering is monoecious, with many more male flowers than female on the cymes (Little and Skolmen 1989). Fruits are round to ellipsoidal in shape, 5 to 6 cm long, and 5 to 7 cm wide, with fleshy to leathery husks (figure 1). There are 1 or 2 elliptical seeds per fruit. The seeds are 2.5 to 3.5 cm long, and the shells are hard, rough, and black (Dayan and Reaviles 1995; Little and Skolmen 1989). Flowering and fruiting occurs intermittently in Puerto Rico (Little and others 1974).

Collection, extraction, and storage. Fruits may be collected from the ground after shedding or picked from the trees. In the Philippines, it is common practice to let the fruits decay for 3 to 5 days after collection and then remove the husks by hand under running water. The seeds are then dried in the sun for 3 or 4 days to a low moisture content; there are about 116/kg (53/lb) (Dayan and Reaviles 1995). Empty or deteriorated seeds can be removed by water

flotation (Tamesis 1958; Eakle and Garcia 1977). There are no long-term storage data on Indian walnut, but the seeds are apparently orthodox in storage characteristics. Dayan and Reaviles (1995) reported that seeds dried to 10 to 12% moisture can be successfully stored at room temperature for 7 months.

Germination. Indian walnut germinates slowly, apparently due to dormancy imposed by the hard seedcoat (Eakle and Garcia 1977). Several pretreatments have been used to speed germination. In early tests in the Philippines, seeds were heated by burning grass over a layer of seeds or by planting imbibed seeds in drums of moist soil exposed to the sun (Tabat 1925; Tamesis 1958). The heat and moisture were thought to cause the seedcoats to crack. Sometimes, very good germination could be obtained by planting untreated nuts and keeping the seedbeds very moist; this method produced 86% germination 5 months after planting (Tabat 1925). Eakle and Garcia (1977) tested numerous acid scarification treatments with sulfuric, nitric, and hydrochloric acids, but none were successful. Dayan and Reaviles (1995) recommend manual cracking of the nuts, followed by an overnight soak in tap water.

Nursery practice. Seedborne fungi may be a problem for Indian walnut, so treatment with a good fungicide prior to planting is recommended. For container production, a 1:1:1 ratio of sand, topsoil, and dried organic matter should be used as a medium (Dayan and Reavile 1995). Direct seeding has also been successful in the Philippines. Seeds are allowed to start germination in a drum of moist soil heated by the sun, then removed for direct planting in the field when they start to crack open (Tamesis 1958).

Literature Cited

- Dayan MP, Reaviles RS. 1995. Seed technology manual of some reforestation species. Manila: National Forestation Development Office and Ecosystem Research and Development Bureau. 60 p.
- Eakle TW, Garcia AS. 1977. Hastening the germination of lumbang [*Aleurites moluccana* (L.) Willd.] seeds. *Sylvatrop* 4: 291B295.
- Little EL Jr, Skolmen RG. 1989. Common forest trees of Hawaii (native and introduced). Agric. Handbk. 679. Washington, DC: USDA Forest Service. 321 p.
- Little EL Jr, Woodbury RO, Wadsworth FH. 1974. Trees of Puerto Rico and Virgin Islands. Volume 2. Agric. Handbk. 449. Washington, DC: USDA Forest Service. 1024 p.
- Tabat E. 1925. An efficient method of germinating lumbang. *Makiling Echo Philippines Bureau of Forestry, Division of Forest Investigation* 4(4): 19B22.
- Tamesis F. 1958. Lumbang culture in Tungao, Butuan City. *Forest Leaves* July [1958]: 7B9, 40.