

## *Pterocarpus* Linn.

padauk or narra

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**Growth habit, occurrence, and use.** Although there are several *Pterocarpus* species scattered throughout the tropics, only Burma padauk (*P. macrocarpus* Kurz) and India padauk (*P. indicus* Willd.), also called narra or Burmese rosewood, are commonly planted. Both are large trees that produce reasonably long and straight boles in closed stands but develop short boles and spreading crowns when open-grown. Older trees have moderate buttresses and large roots that run along the surface of wet or clayey soil. Both have lush, green foliage and cast a moderately dense shade. Both have naturalized in Puerto Rico but spread very slowly.

Burma padauk is native to upland areas in Myanmar, Thailand, Kampuchea, and Vietnam (Francis 1989). Because of its annual yellow floral display and pleasing foliage and form, this species has become a very popular ornamental and shade tree in Puerto Rico, Florida, and the U.S. Virgin Islands (Francis 1989). It has naturalized in (at least) Puerto Rico (Francis and Liogier 1991). Burma padauk is quite at home in frost-free areas that receive from 1,000 to 2,000 mm of mean annual precipitation.

India padauk is native to the Andaman Islands (India), Malaysia, Indonesia, and the Philippines (Little and Wadsworth 1964). Although it has virtually the same form, foliage, and floral display as the Burma padauk, India padauk requires somewhat higher rainfall (above 1,500 mm/year) (Troup 1921). It has been planted for reforestation in Hawaii (Neal 1965) and in forestry trials in Puerto Rico.

Both species have good forestry potential. They tolerate a wide range of soil types and can be planted in cleared sites or small forest openings. The wood of both species varies from yellow to dark red; the rich colors and figures are highly prized for furniture and decorative uses (Chudnoff 1984). Even the lower grades of wood are useful for posts, ship timbers, and construction because of their resistance to termites and rot (Hundley 1956; Rendle 1970).

**Flowering and fruiting.** The sweet-scented flowers are produced copiously in panicles and racemes. Individual flowers are about 1.6 cm across. They are pollinated by honey bees (*Apis mellifera* L.) and other insects. Fruits mature about 6 months after flowering and fall off the tree gradually over several months. Padauk fruits are lenticular-shaped legumes with a flat wing that circles its edge (figure 1). The straw-colored to light brown legumes of India padauk are generally 3 to 4 cm across and the light brown legumes of Burma padauk measure 4.5 to 7.5 cm across (Little and Wadsworth 1964; Little and others 1974). However, considerable variation in size occurs between the legumes of individual trees and tress from various sources within both species. Legume production usually begins in open-grown trees between 5 and 10 years of age.

Large trees produce about 35 liters (1 bu) or more of legumes annually.

**Collection, cleaning, and storage.** At maturity, the legumes dry and turn from greenish yellow to straw colored or light brown. Seed-bearing branches can be clipped with pruning poles if the need for legumes is urgent. Because the legumes and their seeds do not deteriorate for several months after falling, it is more efficient to wait until most of the crop has fallen and pick up the legumes from the ground. A sample of air-dried legumes of Burma padauk grown in Puerto Rico yielded 1,067 legumes/kg (485/lb) (Francis 1989). The legumes of India padauk (source unknown) were reported to yield 1,200 to 1,300 legumes/kg (545 to 590/lb) (MacDicken and Brewbaker 1984). The seeds of padauk are fragile (figure 2) and the legumes are tough, making extraction impossible mechanically and difficult by hand. A sample of legumes of Burma padauk from Puerto Rico yielded an average of 2.6 seeds/legume (Francis 1989); shelled seeds averaged 11,500/kg (5,200/lb) (Francis and Rodríguez 1993). Padauk seeds are normally stored and planted in the legumes. Air-dried seeds in their legumes will still germinate after 1 year of storage in plastic bags at room temperature. The effect of refrigeration is unknown but probably beneficial.

**Germination.** The first seeds germinate within and begin to grow through the legumes about 1 to 2 weeks after planting. The remaining seeds continue germinating for several weeks thereafter. Often 2 or 3 seedlings emerge from each legume. Germination is epigeous (figure 3). In a comparison of the germination of shelled seeds to seeds within legumes in Puerto Rico, shelled seeds germinated in 5 days and gave 70 % germination within 2 weeks. Unshelled legumes did not begin germination for 11 days and only 64 seedlings/100 legumes emerged within 2 months. However, effective yield was only about two-thirds this amount because about half the seedlings occurred in multiples and only 1 germinant/legume can produce a plantable seedling. In Burma, shelled seeds gave 80 to 90% germination. Moreover, seeds from 1-year-old legumes collected from the ground germinated better than new seeds collected from the tree (Hundley 1956). Seeds from Burma padauk germinated well (around 80% over a wide temperature range; the best temperature regime seemed to be about 30 EC day and 25 EC night (Liengsiri and Hellum 1988).

**Nursery practice.** The use of shelled seeds would be recommended, except that they are so difficult to extract. The use of seeds in the legumes requires thinning the plants soon after germination to remove multiples. When true leaves have developed, seedlings are transplanted from the germination bed to bags filled with a potting mixture. After growing under light shade for a few months, the seedlings reach about 0.5 m (1.6 ft) in height and are ready for outplanting (Francis 1989). In Burma, seedlings in plantations grow to 0.6 to 1.2 m (2 to 4 ft) the first year and 1.2 to 2.1 m (4 to 7 ft) the second (Hundley 1956). Thirty planted trees in a small forest plantation in Puerto Rico (situated on clay soil over porous limestone) averaged 1.3 m tall at 14 months after outplanting (Francis 1989). Seedlings intended for ornamental use are often grown in 12- to 20-liter (3- to 5-gal-size) plastic pots until they reach 2 to 3 m (6.5 to 7.5 ft) in height before outplanting. In the Philippines, branch cuttings of India padauk about 8 cm (3 in) in diameter are rooted after hormone treatment to produce "instant trees" (Dalmacio and others 1978).

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