# *Gmelina arborea* Roxb.

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## VERBENACEAE (VERBENA FAMILY)

*No synonyms*

Gamar, gmelina, gumhar, sor, yemane

*Gmelina arborea* is native to India, Bangladesh, Sri Lanka, Myanmar, Thailand, southern China, Laos, Cambodia, and Sumatra in Indonesia. The species was introduced into many tropical countries, including the Philippines, Malaysia, Brazil, Gambia, Costa Rica, Burgina Faso, Ivory Coast, Nigeria, and Malawi (National Academy of Sciences 1980, Soerianegara and Lammens 1994).

*Gmelina arborea* is a fast-growing, deciduous tree that can grow up to 30 m in height and over 80 cm d.b.h. The tree usually grows to about 20 m with a clear bole of 6 to 9 m and a high taper. The species is moderately adaptable and survives well on a wide range of soil types: acid soils, calcareous loams, and lateritic soils. It performs best on fresh, well-drained, fertile soils where rainfall annually varies from 1200 to 4500 mm, temperatures range from 12 to 45 °C, and elevations range from sea level to 1000 m (Lamb 1968, National Academy of Sciences 1980, Smitinand and others 1975, Soerianegara and Lammens 1994).

*Gmelina arborea* wood is relatively light with a density of 420 to 640 kg per $m^3$ and a calorific value of about 4800 kcal per kg (National Academy of Science 1980). The straw-colored wood is one of the best utility timbers of the tropics, where it is used in light construction, general carpentry, packaging, furniture, particle board, plywood, and matches. The wood produces average yields of paper with properties superior to those from most hardwood pulps. Its leaves can be used as fodder, and its flowers produce abundant nectar from which high-quality honey is produced (National Academy of Sciences 1980, Smitinand and others 1975, Troup 1921).

*Gmelina arborea* begins to flower and set fruit at about 6 to 8 years. Clusters of yellowish-brown flowers appear when the trees are generally leafless in January through March, but some trees flower and fruit throughout the year. The panicle is about 30 cm long and appears at terminal and lateral shoots; the bract is about 0.5 cm. The flower is about 2.5 cm in diameter. The fruits ripen during the last few days of April to late May. The fruit is a fleshy, oblong drupe, 2 to 3 cm long. The immature green fruits turn yellow with leathery shining pericarp, sweetish pulp, and a hard, bony, stone when ripe. The stone is 1.5 to 2.0 cm long, pointed at one end, and two- or three-celled with two or three seeds.

The fruits can be collected from the crown canopies or from the forest floor. Because fresh fruits are eagerly devoured by cattle, the seeds can also be collected from their excretion. However, collecting yellowing fruits from the trees is recommended. The fermenting of fallen fruits on the ground may induce a fungi attack that damages the seeds. Collecting ripe fruits from the trees ensures good seed quality from known sources. Tarpaulins or plastic sheets are placed under the trees to collect the mature fruits that fall when the branches are shaken. The fruits are soaked in cold water to facilitate seed extraction by hand or depulper. The Dybvig scarifier successfully extracts the seeds without presoaking. *Gmelina arborea* seeds average 1,250 per kg (Yap and Wong 1983) to 2,750 per kg (Hor and Pukittayacamee 1993). Fresh seeds can be stored in bags in a cool dry place for about 3 months without losing much viability. Fresh seeds show a 90-percent germination rate (Hor and Pukittayacamee 1993).

Seeds are soaked in tap water for 1 day before sowing. Floating seeds should be discarded because they have been aborted, are nonviable, or both. Seeds are sowed in loosened soil and covered thinly (0.5 to 1.0 cm) with soil. Seeds can also be dibbled directly into prepared containers with appropriate media. Germination occurs 7 to 21 days after sowing.

Young seedlings grow quickly and reach appropriate size for outplanting in 2 to 3 months when they are about 40 to 45 cm high. Stump planting is also practiced (Troup 1921). *Gmelina arborea* coppices well after felling. Coppicing shoots

are ready for rooted-cutting production when they are about 60 days old. A section of half-leaf single node is commonly used for rooting with or without rooting hormone. However, treatment with rooting hormone may induce earlier and more vigorous rooting than no treatment (Hijoyo 1993). *Gmelina arborea* cuttings root well when the relative humidity is above 80 percent and the temperature is lower than 30 °C.