

Shorea javanica

white meranti, damar

Koord. et Valeton

Dipterocarpaceae

LOCAL NAMES

English (white meranti, damar); Filipino (manggasinoro); Indonesian (damar jaca, damar sibosa, mesegar lanang); Khmer (lum'-baô); Malay (temak, meranti pa'ang); Thai (phayom, saya-khao, kiam-khanong); Trade name (white meranti, damar); Vietnamese (s[ees]n, v[ee]n v[ee]n)

BOTANIC DESCRIPTION

Shorea javanica is a medium-sized to fairly large tree of up to 40 m tall; bole is straight, cylindrical, branchless for up to 20 (max. 30) m and with a diameter of up to 150 cm; buttresses prominent, up to 1.5 m high; bark surface with irregular section fissures, rarely scaly, grey or light brown; outer bark usually thick, chocolate brown; inner bark laminated with bands of orange-yellow (rarely pink) and whitish tissue, exuding a clear, yellow resin; mature crown hemispherical or dome shaped, sympodial.

Leaves elliptical-oblong to ovate, thin, leathery, (min. 6.5) 10-15 x (max. 3.5) 4-8 cm, with 19-25 pairs of secondary veins; underside evenly tomentose on the veins; petiole 16-22 mm long; stipules and bracts often large and more or less persistent.

Inflorescence terminal or axillary, paniculate; flowers secund or distichous, bisexual, pentamerous, actinomorphic, scented; calyx lobes free, hirsute; petals broadly elliptical to ovate lanceolate, loosely connate at base, white, often tinged with pink, the outer surface hirsute.

Fruit usually shortly stalked; the outer 3 calyx lobes much elongated, up to 18 x 1.5 cm, more or less thickened and saccate at base; nut 1 seeded, free from calyx, subglobose to ovate, sharply pointed.

'Damar mata kucing' (Indonesian) means cat's eye resin.

BIOLOGY

S. javanica is a hermaphroditic, self-incompatible species. Pollen vectors in its natural habitat are insects from the family Thysanoptera. Flowering and fruiting intervals are irregular, possibly every 3-5 years; flowering is gregarious and correlated with a previous drought period. There is a decrease in resin production when the tree is flowering and fruiting, with the tree only gradually reaching its maximum production again 1 year later. Major fruit dispersal agents include wind and water.



Damar agroforest with *Shorea javanica* and other trees, Krui, Sumatra. (Mike Chapman)



Shorea javanica being tapped for Damar resin, Location, Krui, Sumatra (Mike Chapman)

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ECOLOGY

Shorea species are confined to tropical climates with a mean annual rainfall exceeding 1600 mm and with a dry season of less than 6 months. In general *S. javanica* is more abundant in seasonal than in aseasonal forests. *S. javanica* occurs in primary and secondary forest on dry or periodically inundated places on flat land or on slopes up to 300(500) m altitude. Naturally found in some forests of Sumatra which has no dry season, and in central Java. The natural vegetation of the area is typical primary and secondary lowland rainforests.

BIOPHYSICAL LIMITS

Altitude: 0-500 m, Mean annual temperature: About 25 deg. C, Mean annual rainfall: Over 3 000 mm

Soil type: Soils vary from quite deep loamy alkaline soils to sticky acid clays. Grows best on deep loamy soils.

DOCUMENTED SPECIES DISTRIBUTION

Native: Indonesia

Exotic: Brunei, Cambodia, Malaysia, Philippines, Singapore, Thailand, Vietnam



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

PRODUCTS

Fuel: The lower part of the trunk is scarified from tapping for resin and hence can be used only for firewood.

Fibre: The wood is satisfactorily used for pulp in the manufacture of paper.

Timber: *S. javanica* is a lightweight hardwood. The heartwood is yellowish-white and when freshly cut is indistinct from the sapwood, but it gradually becomes yellowish-brown or light brown, and on exposure is slightly more distinct from the sapwood. The density of the wood is 450-840 kg/m³ at 15% mc. Grain is usually interlocked, and the texture moderately coarse but even. The planed surface is lustrous, often with subtle ribbon figures. The wood is not very durable and should therefore be kept away from contact with the ground unless it is treated. Because of its high silica content, *S. javanica* is not popular as a sawn timber, but it has been used for a wide variety of purposes, such as door and window frames, posts, beams, joists, rafters, planking, light flooring, ceiling, furniture, interior and shop fitting, vehicle bodies, sports goods, vats, wine casks, food containers, stair stringers, and ship and boat building. The creamy white and uniform colour, the even texture and the good gluing properties make *S. javanica* a highly preferred timber for plywood production, which is its most important use.

Gum or resin: The bark yields an unusually clear, pale yellow damar (resin). The resin was formerly used for torches, for caulking boats and handicrafts, and more recently local traders export it to industrial countries, where it is used principally in paints, varnishes and linoleum industries; it is also used in cosmetics, as a food additive and for medication. In 1954 about 70 ha of *S. javanica* were under damar production in southern Sumatra.

SERVICES

Soil improver: Roots are well fortified by typical mycorrhizal association, which enables them to absorb and accumulate nitrogen, phosphorus, potassium and calcium more rapidly and for longer periods than non-mycorrhizal roots.

Intercropping: *S. javanica* is a good example for the tree component in an agroforestry system for resin production. Other useful trees, such as clove, are simultaneously planted with damar trees so that although the latter largely dominate, the resulting stand is multilayered, comprising different useful plants such as fruits, vegetables and medicinal plants.

In southern Sumatra, a multistorey agroforestry system has been in use for decades, in which damar from *S. javanica* is produced and other crops such as coffee are also grown. The trees grow in a rotation of about 50 years and in that period form a stand 40-50 m high. The damar-producing trees are often planted mixed with other multipurpose tree species, or bamboo or rattan.

TREE MANAGEMENT

Seedlings need shade until they reach a height of about 1.5 m. Then the shade trees can be gradually removed to provide sunlight. The young trees, when exposed to full sunlight, show a tendency to form multiple leaders. Mycorrhizal infection considerably promotes growth. Five species of common ectomycorrhizal fungi associated with the roots of *S. javanica* have been identified: *Amanita hemibapha*, *Cantharellus cibarius*, *Lactarius* spp., *Russula* spp. and *Scleroderma* spp. Many damar gardens are not monospecific plantations. Mycorrhizae, especially the ectomycorrhizae, appear to increase the tolerance of trees to drought, high soil temperatures, soil toxicity (organic and inorganic) and extremely low soil pH caused by high levels of sulphur or aluminium.

The growth of *S. javanica* trees is moderately fast; trees may reach a height of 40-50 m in 50 years. Natural regeneration in the forest is often gregarious. However, in logged-over forest, enrichment planting may be necessary to maintain an important proportion of *S. javanica* in the forest.

The harvest of resins begins when the tree is 15-50 years old and continues for 30 years. At 50 years of age the tree is already physiologically old because of reduced photosynthetic and metabolic capacity due to regular tapping, hence the silvicultural rotation lasts approximately 50 years. The resin is harvested from cuts made on the trunk. With an approximate density of 100 trees/ha, the average production of resin is an estimated 48 t/ha per year.

GERMPLASM MANAGEMENT

Although seed storage behaviour is generally intermediate, seeds rapidly lose their viability. Storage at 20 deg. C with 60-66% r.h. (or 13-14% mc) is recommended; chilling damage occurs at temperatures below 10 deg. C. Storage in ventilated containers or sealed bags at 16-21 deg. C enables seeds to survive for up to 10 months with over 50% viability. Germination tests showed that seeds are best kept at 20-27 deg. C and 60-67% r.h. There are about 830 nuts (fruit wings removed) per kg.

PESTS AND DISEASES

Beetles of the family Scolytidae can damage the fruits. A potential pest is a leaf-eating insect, which causes some trees to lose all photosynthetic activity and then stop producing resin. The bee *Trigona serica* has also been noted to take away fresh resin to build its nest.

Galls caused by the bacterium *Phytoplasma tumefaciens* often infest plantations of *S. javanica*. The gall disease occurs 1st on 1-2 year-old seedlings and is not necessarily fatal as new sprouts arise when the diseased part of the plant is removed. Pathogenic fungi of *Fusarium* cause sapling defoliation and death.

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FURTHER READING

Hong TD, Linington S, Ellis RH. 1996. Seed storage behaviour: a compendium. Handbooks for Genebanks: No. 4. IPGRI.

Lindgren M. 2004. Management of Damar trees *Shorea javanica* to prevent damage caused by longhorn beetles Coleoptera; Cerambycidae in Sumatra.

Soerianegara I, Lemmens RHMJ (eds.). 1993. Plant Resources of South-East Asia. No. 5(1): Timber trees: major commercial timbers. Backhuys Publishers, Leiden.

Torquebiau E. 1984. Man-made Dipterocarp forest in Sumatra. *Agroforestry Systems*. 2:103-127.

Vincent G, Foresta H. 1999. How much variability in growth can crown form, crown position and local crowding indices in complex damar agroforests account for?: Multistrata agroforestry systems with perennial crops. p.69-74.

SUGGESTED CITATION

Orwa C, Mutua A, Kindt R, Jamnadass R, Simons A. 2009. Agroforestry Database: a tree reference and selection guide version 4.0 (<http://www.worldagroforestry.org/af/treedb/>)