



Agroforestry Facts Sandalwood



Botanical Name	<i>Santalum album</i> L.
Name in English	Sandalwood
Name in Kannada	Shreegandha
Family	Santalaceae
Seeds Collection	Sandal fruits are collected fresh from the tree or as soon as they have fallen on the ground during April-May and September-October. They are soaked in water and rubbed to remove the soft pulp. The wet seeds are dried under shade and dry seeds stored in polythene or gunny bags.
Seeds Processing & Treatment	About 6,000 seeds weigh to a kilogram. Fresh seeds take 4 to 12 weeks to germinate after dormancy period. Eighty percent of seeds are viable up to 9 months. Germination is about 80 percent under laboratory conditions and 60 percent under field conditions. Germination can be hastened by soaking seeds in 0.05% gibberellic acid overnight and then sowing, which ensures uniform germination. Soaking seeds in cow dung slurry will not improve germination.
Nursery	Viability (i.e., seed fertility) is 25 to 40% up to one year – seeds of 28 months gave 6% success. De-pulped seeds give better germination per cent. Rats eat away the seeds and so it is usual to roll the seeds in main red lead



	<p>or in Acorus paste. Germination takes place 1 to 3 months after sowing.</p> <p>Seed beds are formed with only sand and red earth in the ratio 3:1 and are thoroughly mixed with nematicides (Ekalux or Thimet at 500 g per bed of 10 m x 1 m). Around 2.5 kg seed is spread uniformly over the bed, covered with straw which should be removed when the leaves start appearing on the seedlings. Sandal suffers from a very virulent disease caused by combined fungal and nematode infection. The initial symptom is that of wilting of leaves followed by sudden chlorosis and root decay. On account of this the mortality rate is very high, which can be controlled by the application of nematicide (Ekalux) and fungicide (Dithane). Seeds beds are to be sprayed with fungicide Dithane Z-78 (0.25%) once in 15 days to avoid fungal attack and 0.02% Ekalux solution once in a month to avoid nematode attack.</p> <p>When seedlings have reached 4 to 6 leaf stage, they are transplanted to polybags along with a seed of tur dal (<i>Cajanus cajan</i>), the primary host for better growth of sandal. Seedlings are carefully removed from beds with all roots intact; roots should not be allowed to dry. Shade can be provided for a week immediately after transplantation. Watering is to be done once a day, but excess moisture is to be avoided. Host plants are to be pruned frequently, so that they do not over grow sandal and hamper its growth. Polybags should contain soil mixture of ration 2:1:1 (Sand: Red earth: Farmyard manure). It has been found that polybags of 30 x 14cm size are the best. To avoid nematode attack Ekalux of 2 gm/polybag or 200 gm for 1m³of polybag mixture should be thoroughly mixed before filling the bags. Shifting may be done once in two months to avoid root penetrating soil and grading is to be done once in three months. Weeding is to be done at regular intervals.</p>
Plantation Management	<p>Rainfall in the chief sandal tracts varies between 625 mm to 1625 mm. Temperature 19°C to 28.5°C.</p> <p>Soil: Flourishes best generally on red ferruginous loam of the underlying rock being often metamorphic, chiefly gneiss. Found also on rocky ground stony or</p>



	<p>gravelly soil. Is not exacting as to depth of soil. Grows best on moist fertile alluvium along banks of stream. Those grown on proper soils are said to form more scented heartwood. Requires good drainage and does not stand water logging. Avoids saline and calcareous soil and is not generally found on black cotton soil.</p> <p>Coppice – Young trees coppice well. Older trees are stated not to coppice at all except on ground along the banks of water courses.</p> <p>Root sucker – Freely produces when roots are exposed or cut through or where parent tree has been grubbed up.</p> <p>Tending in earlier stages: 1) Maintenance of good host plants and their tending, 2) Provision for free and natural expansion of the crown, 3) Felling of suppressed plants, 4) Providing light lateral shade to avoid sun-scorch with free overhead light.</p> <p>In the later stages, 1) Tending of hosts and, 2) Climber cutting</p> <p>Drought – Capable of withstanding moderate drought, but prolonged drought kills it.</p> <p>Fire – Extremely fire tender and may be killed outright or injured and rendered unsound.</p> <p>Grazing and browsing – Moderate grazing does not seem to have any adverse effect. Grazing is in fact intimately connected with its occurrence to keep out fires by keeping the grass low. It is readily browsed by cattle and deer and rabbit particularly in the dry season when grass is scarce and this constitutes the real danger to which it is subjected.</p> <p>Injury by man – Being very much prized for its scented wood, it is always subject to heavy illicit felling.</p>
Model/Spacing	Ideal spacing is 2.5 x 2.5 m
Pests, diseases and Management	<p>The possible danger to the species is from some of the forest insects which are vectors of spike disease.</p> <p>Spike disease – This disease is responsible for very serious loss year after year as it ultimately kills the trees in all the stages. It is caused by a virus carried from tree to tree by perhaps some forest insects. Experiments to isolate the insects concerned and to prevent infection are in progress. The insect is believed to be of the family – <i>Cossidae</i>.</p>
Plant Rotation	30 – 35 years
Yield	5000 kg per acre
Uses	<p>Sandalwood works as an anti-inflammatory agent.</p> <p>Sandalwood is mainly used in perfumery products.</p>



	<p>Sandalwood essential oil used in aromatherapy to reduce stress, hypertension.</p> <p>Sandalwood essential oil heals wounds and treating skin blemishes.</p> <p>Sandalwood used in deodorants and can be blended with other essential oils to make different fragrances.</p> <p>Sandalwood is used in religious rituals.</p> <p>Sandalwood essential oil has antiseptic, anti-inflammatory, antispasmodic and astringent properties.</p> <p>Sandalwood essential oil is a memory booster.</p>
Buyers /Industries	Karnataka soaps and detergents ltd. Mysore Sandal soaps
Harvesting	Usually, sandalwood trees will be ready for harvesting after 30 years of planting. During harvesting of sandalwood, the soft wood is removed and then hard wood is chipped which would be converted into powder in a mill. After soaking the powder in water for 2 days (48 hours) and distilled. The essential oil from sandalwood is rectified by re-distillation and filtration
Economic Returns	<p>Valued for its heartwood which is strongly scented. The wood is used for carving and fancy work. Oil distilled and used in perfumery and medicines for which it is the most valuable wood in India.</p> <p>Sandalwood heart wood is costing about 6,000 Rs/kg.</p> <p>Total yield of 5,000 kg can be expected per acre</p> <p>Net profit can be expected is about 2,74,00,000/acre.</p>
Current Market Rate	Rs. 6000 per kg