

# Phenology, Cultivation and Market Demands of Sandalwood

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## ABSTRACT

Sandal (*Santalum album* L.) a valuable tree species belonging to the family Santalaceae is the most precious tree species with high commercial value in Indian culture and heritage (Srinivasan *et al.*, 1992). *S. album* is an evergreen species capable to flourish well under variety of soils and climatic conditions under annual rainfall of 600-1600 mm and an altitude upto 1200 m. It attains a height of 10-15m and 1-2m girth at full maturity (Jain *et al.*, 1999). India produces 400 tons of Sandalwood which contributes to only ten per cent at global level, while the global demand for Sandalwood production is approximately 5000-6000 tons/year. At present Indian Sandalwood oil market price is 2.5 to 3 lakh rupees per kg and heartwood rate is 9,500 Rs /kg (Anon., 2020). Due to the high value of oil and timber, *S. album* has been central among the all Sandalwood species in the aspect of research. Currently most of the world demand of sandalwood is supplied from Australia using *S. spicatum* known as Australian sandalwood.

## INTRODUCTION

**H**eartwood of Sandalwood has fine grain with good aroma and is well set for carving viz., carving idols, cabinet panels, chess boards, pen-holders, paper weights, picture frames. Its wood oil is valued in perfumery, cosmetics, aromatherapy and pharmaceuticals. Even its benefits as antiseptic, anti-inflammatory, antispasmodic, astringent, carminative, diuretic, disinfectant, memory booster, sedative and tonic are well appreciated (Patel *et al.*, 2015). Among the known 18 sandalwood species *Santalum album* is highly valued. (Subasinghe, 2014). Globally, Sandal is distributed in India, Indonesia, Australia, Timor and Hawaii (Orwa *et al.*, 2009). In India its distribution is around 9600km<sup>2</sup> (Gairola *et al.* 2008 and Srinivasan *et al.*, 1992), of which 90 percent lies in Karnataka and Tamil Nadu states (Dutt and Verma, 2005). Government owned land in Karnataka State cover 10,400 ha. and 375 ha under private owned (Dhanya *et al.*, 2010). Out of the 18 Sandal species, about 6 species can be found in Hawaii Islands which shows the highest sandalwood diversity. The main reason for the economic and cultural value of sandalwood is the oil contained in the sandalwood timber, mainly in the heartwood. Heartwood oil content varies, however, widely between species and even within species. *S. album* known as Indian sandalwood is renowned for its oil, which is highly rated for its sweet, fragrant, persistent aroma and the fixative property which is highly demanded by the perfume industry. Jain *et al* (2003) reported that heartwood of *S. album* was priced at 12 lakhs of Indian rupees per tonne and oil was priced at 22,000 Indian rupees per kg. However, the prices are highly depended on the quality. Due to the high value of oil and timber, *S. album* has been central among all sandalwood species in the aspect of research. Currently most of the world demand of

sandalwood is supplied from Australia using *S. spicatum* known as Australian sandalwood.

**Phenology:** It is a true evergreen tree; foliage gets thinner during dry season. **Flowering and fruiting** occur

twice in a year i.e March- April and September-October. It is a **Cross-**

**pollinated** plant

mainly pollinated by insects, honey bees &

ants. *S. album*

is a small

evergreen tree, a

partial root

parasite,

attaining a

height of 12 to

13 meters and girth of 1 to 2.4 meters with

slender

drooping as well

as erect

branching.

Leaves are

opposite and

decussate, and

sometimes show whorled arrangement.

Flowers are purplish brown, unscented and are borne in axillary or terminal cymose panicles.

Flowers are tetra or pentamerous. The ovary is semi-inferior and unilocular. The tree starts flowering at an early age of 2 to 3 years. Generally, trees flower twice a year from March to May, and September to December. Sometimes the two flushes of flower production may overlap each other so that the same tree may show all stages of development of flower initiation to mature fruits at one time. Fruit is a drupe, purplish when fully matured and single seeded.

Seeds are naked, lack testa and are dried and stored in polybags or gunny bags. Initially, the

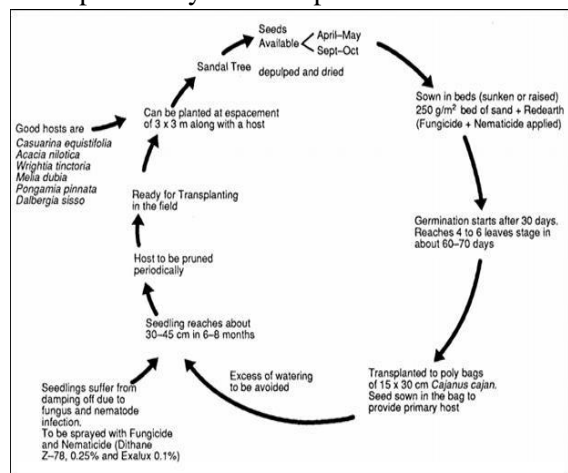


flowers are straw yellow coloured and gradually turn to deep purplish brown on maturation. The flowers occur in axillary or terminal cymose panicles that are shorter than leaves and the floral organs develop in acropetal succession. It takes 30 to 35 days from initiation of bud stage to the anthesis and 85 to 95 days from initial stage to ripening of the fruit (Srinivasan *et al.* 1992). Generally, the tree starts flowering at an early age of 2 to 3 years and flowering and fruiting season vary.

Flowering time differs according to altitude. Trees growing in lower altitudes initiate flowering about a month earlier than those growing in higher altitude. Based on the flowering calendar, Ananthapadmanabha *et al.* (1988) classified sandalwood trees into three distinct groups:

- i) **Trees flowering twice a year** (Once during March – May and second time during September – December)
- ii) **Trees flowering once a year** (September – December) and iii) Trees which do not flower even after 15 years of age.

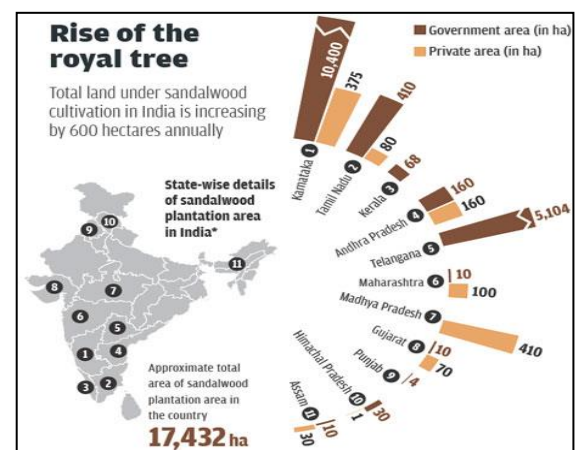
**Sandalwood cultivation:** The Sandalwood seeds should be collected from best sources. The seeds are mainly available twice in a year i.e April- May and September – October.



After collecting the seeds sown in Sand bed with standard size of 10m length and 1m width. Presowing treatment is to be given for

better germination of the seeds. The germination starts after 30 days of sowing. Once the seedlings 4-6 leaves stage immediately start transplanting into polybags. After transplanting host species is to be introduced to enhance the growth of the sandal seedlings. Primary host such as *Cajanus cajan* and *alternanthera sessile* etc. can be preferred. Sandal seedlings do not prefer much water therefore excess of water is to be avoided. In the initial stages sandal seedlings mainly affected by Powdery mildew and some other diseases such as damping off, wilt, collar rot diseases. Host is to be pruned at regular interval. After 6–8-month Sandal seedlings can be planted in field.

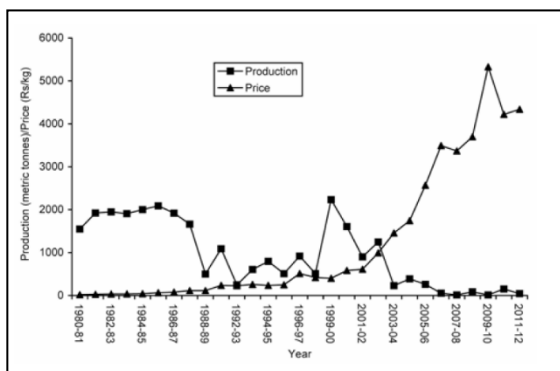
The total land under sandalwood cultivation in India is increasing by **600 hectares** annually. Among different lands the area under sandal cultivation if found in **Karnataka state** with **10,400 ha government area** and **375 ha private area**. Approximate total area of Sandalwood plantation area in the country is about **17,432ha**.



**Market Trade:** Sandal is recognized worldwide as one of the most valuable commercial tree species with an estimated market value of more than \$1 billion (Viswanath *et al.*, 2008). Despite high value in the international markets, its annual production has dropped from 4000 Mg heartwood during 1950's to 500 Mg in 2007. Against the annual demand 6000 Mg wood (Gairola *et al.*, 2008).

Government provides sufficient incentives to farmers growing Sandal on a commercial scale. But, the area under sandal tree is decreasing fast because of pilferage and difficulty in its field establishment. Poor understanding of host–parasite relationships might attribute for regeneration and establishment problems.

India produced **1000 tons** of **heartwood** and **40 tons** of **oil** per annum. Sandalwood oil alone contributed nearly **25%** of the revenue earned from the export of various essential oils (Jain *et al.*, 2003). Global demand for sandalwood was about **5000-6000 tons/year** and that of oil is **100 tons/year** (Joshi and Arun Kumar, 2007). Out of this, nearly **70-80%** was met from Karnataka (Rao *et al.*, 2007). Market trend indicates that the sandal **heartwood** prices **Rs. 60 lakhs/ton** and **oil** are **3 lakh/kg** (Arunkumar *et al.*, 2011).



## CONCLUSION:

In the present scenario, the area coming under sandalwood cultivation is increasing due to increased demand for sandalwood in the market. Better quality of planting stock which requires huge quantity of quality planting stock for successful sandalwood plantation establishments. Healthy seedlings are the key to successful plantations. Selection of effective host during initial establishment of sandal is essential for the better growth performance of sandal.

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