



Sandal Wood Plant Cultivation



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चन्दन की व्यवसायिक स्तर पर खेती

Introduction:



S*Santalum album* commonly known as East Indian Sandalwood or Chandan belongs to the family Santalaceae. It is highly valuable and becoming endangered species. It is distributed all over the country and more than 90% lies in Karnataka and Tamil Nadu covering 8300 sq kms. Sandalwood plays an important role in the religious life of Indians. The essential oil obtained from this wood has occupied significant place in perfumery industries/market. Although it is available in some other countries still the Indian Sandalwood has retained its dominance over other sources because of

its quality.

Sandalwood is light demanding and can be easily suppressed by faster-growing species. Cultivation of sandal in India is less attempted though the potential is high. Sandal trees freely produce seed and natural regeneration occurs both via seedlings and through root suckers after trees have been uprooted and the stump removed from the ground.

To encourage sandalwood cultivation, the Karnataka Forests Act, Tamil Nadu Forests Act, Kerala Forests Act and Andhra Pradesh forests Act have been amended. The ownership of sandalwood trees grown on private lands now vests with the landowners. The rules governing felling, transport, conservation and disposal of sandalwood have been liberalized. Provision has been made for payment of market value to owner of sandalwood trees.

Conservation action for economically important sandalwood of India needs to be guided by an authentic knowledge base on such plant species. This website has visualized and maintained a well-designed computerized web database providing quick access to some of the most important basic information relating to *S. album* tree e.g. distribution, morphology, tree improvement, soils, silviculture, physiology, biotechnology, diseases and pests, chemistry and utilization, Production and export management, etc.

Variety: Red Sandalwood and White Sandalwood

Usage:

Sandalwood oil also known as fragrance oil, perfume oil, body oil and air fresheners. The oil has a woody, exotic smell, subtle and lingering and the colour is pale yellow to pale gold. The essential oil contains Alpha-santalol and beta-santalol amount to more than 90 % of the oil – making it very superior sandalwood oil. The main chemical components are santalol, santyl acetate and santalene (Bo Jensen, Denmark). Sandalwood oil is used in many therapies to control muscle problem, mental disorders, fighting bacteria and many more.



Soil:

Red ferruginous loam is the most common soil on which sandal tree occurs, the underlying rock often is metamorphic and chiefly gneiss. It is not exacting as to the depth of the soil and is frequently found on rocky ground and on stony or gravelly soils.

Sandal requires good drainage and does not stand water logged ground. Best growth of tree is on rich fairly moist such as garden loam and well drained deep alluvium on the river banks. (Troup, 1921) Sandal grows better in slight alkaline condition soil PH Range between 6.7. To 7.5.

Climate:

Sandalwood grows best between attitudes of 700 to 1100m though it may go up to 1500m and descend as low as 300m.

Silviculture:

Silviculture guidelines to minimize fungal attack risk to the Tropical sandalwood industry. The recommendations will as follows:

- High risk periods of high spore count in the air and what weather events cause a greater presence of spores.
- High risk periods of high spore count in the water system and what irrigation events cause a greater presence of spores. Methods of branch pruning – branch size, optimum length of stump, sealing of pruning, chemical spraying after pruning the plantation.
- A pruning strategy of single verses multiple stems on heartwood production. On the one hand, multiple stems may produce less heartwood oil than a single stem; however, the reduced pruning may reduce fungal attack.
- The effect of root pruning on fungal presence in sandalwood trees.
- The risk of keeping infected trees within a plantation

Heart Wood Formation & Oil Content:

Hearthwood formation in sandal trees generally starts around 10-13 years of age, but what triggers this process has not been very well understood. Certain factors, generally relating to stress, such as gravelly dry soil, insolation, and range of elevation (500-700 m), seem to provide the right environment for the formation of heartwood, irrespective of the size of the stem after 10 years of age. The occurrence of heartwood varies. The value of heartwood is due to its oil content, and the superiority of the oil is due to the percentage of santalol.

(i) In a tree the oil content is highest in the root, next highest in the stem at ground level, and gradually tapers off towards the tip of the stem.

(ii) Similarly, there is a gradient in oil content from the core to the periphery of the heartwood in a stem.

Depending upon their age, trees can be called young or mature, although this is an empirical classification and holds good only for a particular population. The oil content and its composition may differ at the same age:

(i) Young trees (height less than 10 m, girth less than 50 cm, and heartwood diameter 0.5-2 cm) have heartwood with 0.2-2 percent oil content, which has 85 percent santalol, 5 percent acetate, and 5 percent santalenes.

(ii) Mature trees (height 15-20 m, girth 0.5-1 m, and heartwood diameter 10-20 cm) have heartwood with oil content of 2- 6.2 percent, which has over 90 percent santalol, 3-5 percent acetate, and 3 percent santalenes.

Pest And Disease:

Spike disease is one of the important diseases of sandal. This disease is caused by mycoplasma-like organisms (MLO). It can occur at any stage of development of the tree. As the disease progresses, the new leaves become smaller, narrower or more pointed and fewer in number with each successive year until the new shoots give an appearance of fine spike. At the advance stage of disease, the inter nodal distance on twigs becomes small, haustorial connection between the host and sandal breaks and the plant dies in about 2 to 3 years.

Spread of disease is sporadic and the disease is transmitted in nature by insect vectors. It has been found that other insect vectors in addition to *Nephotettix virescens* may also be responsible for transmission of disease. So far no permanent remedial measures have been prescribed for control of spike disease.

Stem borers *Zeuzera coffeae* Nietn (red borer) *Indarbela quardinotata* Walker (bark-feeding caterpillar) and *Aristobia octofasciculata* Aurivillius (heartwood borer) are some of the pests causing considerable damage to living trees.

Harvesting, Yield & Returns:



The price of Sandalwood in India is everyday increasing price Rs. 20,000 per tonne in 1980, Rs. 200,000 per tonne in 1990; Rs. 4000,000 per tonne in 2004 and 7500,000 per tonne in 2014. India uses all *S. album* domestically and export is prohibited (USDA, 1990). Export of timber from India is totally banned except for handicraft pieces of sandalwood up to 50g weight. FAO, 1984 notes that it is a priority species for in setup con-

servation. Since then, sandalwood oil and handicrafts have become more important. International demand for sandalwood is estimated to the 10,000 mt per year. USA and France are the two largest importers of Indian sandalwood oil. Imports into the Middle are also increasing.

Economics Of One Acre Sandalwood Cultivation:

Expenditure:

Distance (in acre)	Sapling (in land)	Cost of plants (per plants)	Total	Other expenses (as per requirement)	Cost of cultivation
10X10	440	120rs	440X120=52,800	Fertilizers Land preparation Labor expenses etc.	52,800
Total Cost Of Cultivation:52,800					

Income:

In- come in year	Heart- wood (Per Tree)	Total Heart- wood From Tree	Compa- nies buy back (per kg)	Total In- come	Sapwood and middle wood (per plant)	Total Sapwood & middle wood	Compa- nies buy back (Per cut ft.)	Total Income
In 15 th year	15kg per tree	440plants X15kg= 6600kg	Rs. 3000/-	3000X 6600= 1,98,0 0,000	30kg	440X30= 13200kg	50rs/kg	13200k gX50 =6,60,0 00 rs
Income From Heartwood: 1,98,00,000				Income From Sapwood & Middle- wood:6,60,000				
Total Income: 2,04,60,000								

Technical Support & Services:

We also provide technical support for farming. Our Service Department with technically qualified staff provide after sales service and farmers' advisory services to our customers to get better plant establishment and faster growth of Herbal and Horticultural plantations.

We have largest network of employees who deliver Plants to customers at their door steps. Free technical services to customers on planting method, management practices and plant protection measures. Our teams of Agricultural Experts periodically visits and supervise the plantations and suggest necessary guidelines to get better growth and higher returns. The income expenditure indicated by the company is an approximate figure, as it also depends on the nature and hard work of the farmer.

Services:

1. This includes Supervision, consultancy, guidance, Transportation cost first year.
2. First production start after 15th year and every production start in every 15th year.
3. Buy back agreement of Sandalwood.
4. The income expenditure indicated by the company is an approximated figure, as it also depends on the nature and hard work of the farmer.

Terms & Conditions Of Company:

1. For 1 Acre plantation the cost of Plants is Rs. 62,200/-, out of which 50% i.e. Rs. 31,100/- has to be paid before the cultivation and the remaining half after the planting is done.
2. The Buy Back Agreement Stamp paper of Rs.100/- has to be stamped by District Court of your area.
3. For 10 Acre or more yield the buy Back Agreement Stamp Paper will be of Rs.500/-.

For More Information Contact Us:



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We, Amritanjali Ayurved (OPC) Pvt. Ltd. are one of the reputed manufacturers and exporters of Herbal products like Dry powder, Nixoderm Skin Ointment, Cavifast Dental Cream, Cavisian Dental Cream and much more. These products are processed using natural herbs and quality ingredients, sourced from trusted names of the industry. As demands of our clients differ from each other, we are offering our products in different size packaging as per their requirements. Owing to superior quality, effectiveness, purity, precise composition, healthy to use and long shelf life, our products are used in various commercial areas like parlors, spas, pharmacies, cosmetic industries and for daily use also. Since our establishment, we have been associated with dedicated team of professionals, who are experienced and knowledgeable professionals. Our entire team is assigned with different activities who work in complete sync to process good quality Herbal Products. We provide regular training sessions to them, organize workshops and seminar in order to sharpen their industrial knowledge and skills.