

Sandalwood Species Significantly Associated With Culture and Heritage of India

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Abstract

The small evergreen hemi-parasitic tree *Santalum album* L. (sandal), known for its aromatic heartwood, has long been associated with ancient Indian culture and heritage. Sandalwood is only found in India, and its distribution is confined to about 9600 km², largely in the deciduous woods of peninsular India's Deccan region. It is regarded as one of the most valuable commercial tree species on the planet. Due to its inherent blending capabilities, India has always enjoyed a niche market for the premium coveted sandal wood oil, which has outstanding therapeutic effects and is often utilised as a fixative in the creation of world-class perfumes and aromatic oils. Sandalwood is used extensively in carving and turnery, as well as having religious importance.

Introduction

The expensive tree sandalwood (*Santalum album* L.) is associated with Indian culture. It is the world's second most costly wood. Sandalwood is a cherished botanical gift that is intertwined into India's culture and heritage (Fox, 2000). Sandalwood's native range extends from 30°N to 40°S, from Indonesia to the Juan Fernandez Islands (Chile) in the west, and from the Hawaiian Archipelago to New Zealand in the north (Srinivasan *et al.*, 1992). It's a small to medium-sized hemiparasitic tree that's found all over India. The species is native to India, and its range is confined to around 9600 km², largely in the deciduous forests of peninsular India's Deccan region (Gairola *et al.*, 2008). More than 90% of the natural population of *S. album* in India is found in the southern Indian states of Karnataka and Tamil Nadu (Parthasarathi and Rai, 1989; Baruah, 1999). The population density is higher in the southern states, particularly in Karnataka, Tamil Nadu, and Kerala. Tamil Nadu covers over one-third of the country's sandalwood distribution area, with the state spanning 3,040 square kilometres across multiple districts. The sandalwood distribution in India spans 9,000 square



kilometres and is dispersed throughout eight states, with Karnataka having the largest area at 5,245 square kilometres (Tejonmayam, 2018). Apart from Karnataka and Tamil Nadu, states with sandalwood trees include Kerala (15 sq km), Andhra Pradesh (200 sq km), Odisha (25 sq km), Madhya Pradesh (33 sq km), Maharashtra (33 sq km), and Rajasthan (sparse). Sandalwood trees can be found in Salem, Dharmapuri, Erode, Tiruvannamalai, Vellore, the Nilgiris, Villupuram, and to a lesser extent, Madurai, Virudhunagar, and Tirunelveli in Tamil Nadu. The Indian Forest Act, 1927, the Wildlife (Protection) Act, 1972, and the Forest (Conservation) Act, 1980, among other state-specific regulations and norms, were used to address sporadic occurrences of sandalwood tree felling (Tejonmayam, 2018). Although India has long been recognised for its sandalwood (*Santalum album*), farmers have only recently expressed an interest in cultivating the plant in their own backyards. Sandalwood was mostly restricted to the woods of Karnataka, Tamil Nadu, and Kerala, as well as state-owned plantations, until the year 2000. In the rest of the country, there was no agriculture on private agricultural property. However, in 2001 and 2002, policy changes in Karnataka and Tamil Nadu permitted people to produce sandalwood. This prompted other states to plant sandalwood trees (Pallavi, 2015).

Habit and Habitat

Sandalwood is an evergreen tree and it can reach a height of 20 metres and a girth of 1.5 metres. It blooms and bears fruit twice a year, in March to April and September to October. From the age of three, trees begin to bloom. Seed production generally is good in one of the seasons. Some trees only bloom once a year, whereas others do not bloom on a regular basis. About 6000 seeds make 1 kg. The tree's seeds can be gathered directly from the tree, depulp the fruits, wash them completely in water, dry them in the shade, and store them in sealed containers. Sandalwood is a parasitic hemiroot, it has the ability to parasitize over 300 different species, ranging from grass to another sandal plant. Self-parasitism is frequent in gregarious growth circumstances. Past failures of pure plantations have been attributed to a lack of understanding of parasitism dynamics. Sandalwood forms haustorial linkages with its host plants and relies on them for its nitrogen, phosphorus, and potassium requirements. Other nutrients can be obtained on its own. Seedlings can survive for three years without a host, but they eventually perish. In a natural population, 2% of seedlings do not generate haustoria, and they do not live to be 3 years old on their own (Rai, 1990).

Ecology and Floristics

Sandal is primarily a tree of dry deciduous forests. It is prone to fire damage. It generally avoids hill slopes and grassy banks that are prone to annual fires; however, when these areas are protected from fire, sandalwood appears again. Similarly, under moist deciduous conditions when a site becomes more mesic, sandalwood recedes to drier portions. Its main associates in the top canopy are these: *Terminalia tomentosa*, *T. chebula*, *Anogiessus latifolia*, *Sapindus trifoliatus*, *Diospyros melanoxylon*, *Albizia lebbek*, *A. odoratissima*, *A. amara*, *Chloroxylon swietenia*, *Feronia elephantum*, *Limonia acidissima*, *Zizyphus xylopyrus*, *Grewia tilaefolia*, *Bridelia retusa*, *Ixoraparviflora*, *Pterocarpus marsupium*, *Dendrocalamus strictus*, *Bauhinia racemosa*, *Acacia sundra* and others. The under-growth consists of *Carissa carandus*, *Dodonea viscosa*, *Randia dumetorum*, *Cassia fistula*, *C. auriculata*, *Lantana camara*, *Zizyphus oenoplea*, *Flacourtia montana* and others. Sandalwood regenerates naturally under the protection of thorny bushes, along streams (some seeds that float in water germinate faster), and under trees where birds generally roost. Dispersal of seeds and spread of the species effectively takes place through birds, provided the area is free from recurrent fire and browsing animals (Ananthpadmanabhe, 1988; Rai, 1990).

Use of Sandalwood and Oil

The most precious portion of the sandalwood tree is the heartwood. It produces sandalwood oil, which is quite aromatic. Sandalwood and its oil were among the earliest products traded from India to the Middle East and other countries, alongside spices and silk. Hindus, Buddhists, and others utilise the wood to burn in particular rites. As coolants, wood paste and oil are used. The wood paste is also used as a heat-dissipating ointment and as a cosmetic. In his Sanskrit epics, Kalidasa describes the use of sandalwood in great detail (300 B.C.). The perfume industry primarily uses sandalwood oil. Other high-grade perfumes might use the oil as a foundation and fixative. Sandalwood oil is used as a foundation in most high-end perfumes. Although it is a wonderful, moderate, long-lasting, and sweet perfume in and of itself, the industry has discovered that it blends well with other perfumes and does not transfer its scent when used as a basis. Antipyretic, antibacterial, antiscabietic, and diuretic effects are all found in sandalwood oil. It can also be used to treat bronchitis, cystitis, dysuria, and other urinary tract illnesses. The oil plays an essential role in the indigenous medical system. It is thought to be a migraine remedy. Carving and other items are made from



sandalwood. The sapwood and, on occasion, mixed woods are used to make joss sticks. From the exhausted sandalwood powder, an entirely new essential oil has been produced by the process of hydrolysis (Ananthpadmanabhe, 1988; Rai, 1990).

Problems with the Resource

Annual fires, tree felling for fodder/grazing, sandal spike disease (Rai, 1990), invasive weeds such as *Lantana camara*, and the development of eucalyptus monoculture plantations (Basappanavar, 1977) have all affected the ecology of natural sandal ecosystems. While these conditions impede forest regeneration and reduce the growing stock, overexploitation and illegal felling exacerbate the problem (Swaminathan *et al.*, 1998), and signs are that such problems will only get worse. In Karnataka, for example, between 1980 and 1997, poached sandalwood accounted for only around 30% of the gross sandal output (Meera *et al.*, 2000), however in 2006-07, the quantity of recovered wood was about 78 percent higher than the gross yield (Meera *et al.*, 2000). (Government of Karnataka, 2007).

Sandal wood policies in the context of property rights in natural resource management sector

Sandal in private lands is an example of mixed rights, with the state claiming value for a natural resource that is located on private territory. In the case of the eastern Indonesian island of Timor, the consequences of such entangled ownership regimes have been thoroughly discussed. For example, in 1986, the government claimed ownership of all sandal trees on private lands in Nusa Tenggara Timur (NTT) province, establishing annual harvest quotas and periodically inventorying the stock of trees, as well as declaring itself the sole buyer of sandalwood and prohibiting the export of unprocessed logs (Marks, 2002). Due to high rates of illegal cutting and removal of young trees by locals to avoid any need to preserve the trees once they have been inventoried, these regulations led in a rapid reduction in the standing stock of sandal (Rohadi *et al.*, 2000). Relaxation of harvest quotas in 1996 and 1997 resulted in additional depletion of stock trees, necessitating a five-year moratorium on felling. According to Marks (2002), the depletion of sandalwood in NTT is mostly due to temporary policies that generated perverse incentives to harvest the wood, as well as insufficient replanting due to government confiscation of private property rights on the trees.

Legal provisions governing sandal conservation in India - a retrospect



The great Vijaya Nagara Empire (13th–16th century CE) in the Deccan region is a prime example of Indian monarchs attempting to monopolise sandal resources in order to assure financial strength for dominance and warfare (Ganeshaiyah *et al.*, 2007). In contrast, Tippu Sultan, the king of Mysore, declared sandal to be a royal tree in 1792, even amputating the hands of sandalwood thieves to enforce the royal proclamation (Rai, 1990). Even after independence, provisions were created in state forest legislation to allow states to maintain the control regime. The Karnataka Forest Act (KFA), 1963, contains a particular chapter (Chapter X) dedicated to sandalwood, as it is the heart of sandal production in India and a major beneficiary of sandal profits. All sandal trees growing on any territory, including private properties, are the exclusive property of the state government, according to Section 84 of the KFA (Government of Karnataka, 1963). The tree did not belong to the landowners, but they were responsible for its upkeep. The timber could only be sold or traded by the government. The landowner was awarded a bonus (75 percent of net value, i.e., actual worth less cost of extraction, transport, and cleaning) when the tree was removed, which happened all too often after long delays and numerous bureaucratic headaches (Jeeva *et al.*, 1998). The law's punitive sections exposed landowners to harsh penalties even for small offences involving the sandal trees that grew on their property. The entire structure operated as a tremendous deterrent to private sandal cultivation. The farmers had been forced to burn even the saplings that had grown up organically due to the responsibility to protect the trees and the fear of persecution and compensation to be given to the government in the event of theft.

Conclusions

Sandalwood is inextricably linked to Indian culture and customs. Its use may be traced all the way back to the Indus Valley Civilization and up to the present day. Many homes in south Indian regions have sandalwood trees in their backyards. Growing *S. album* in one's backyard is thought to provide prosperity in life (since Goddess Lakshmi lives there), fight off evil spirits, and remove the destructive effects of black magic. As a result, it may be claimed that this historic notion has set the road for effective conservation of this flagship species, whether deliberately or unknowingly. Furthermore, Indian sandalwood has significant commercial worth in both national and international markets in the present period. *S. album* has always played a major role in practically all religions, not only Hinduism. The significance of *S. album* is mentioned in the Epics, Scriptures, Vedas, Puranas, and Buddhist

literatures. *S. album's* sanctity is also reflected in Indian mythology. All of these considerations point to its relevance to humanity, and it should be protected in its natural habitat.

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