



POPULAR ARTICLE

Sandalwood Tree: India's fragrant green gold

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Introduction

Throughout history, civilizations have been remembered not only for their architecture and literature but also for the sensory impressions they leave behind. In India, one such enduring signature is the gentle, soothing fragrance of sandalwood. Its warm, woody scent has been part of religious ceremonies, royal lifestyles, and traditional healing systems for thousands of years. Commonly known as “Green Gold,” the sandalwood tree (*Santalum album*) is far more than a forest species. It represents a unique blend of cultural heritage, medicinal value, economic importance, and spiritual relevance. Few natural resources command such deep respect while also holding immense commercial worth. Indian sandalwood holds a distinctive place due to its highly prized heartwood and essential oil. For centuries, it has been used in rituals, perfumery, medicine, and fine craftsmanship. Even today, it continues to attract attention from farmers, researchers, and entrepreneurs because of its high market demand and long-term financial potential.

Botanical characteristics

Indian sandalwood belongs to the family Santalaceae and is primarily found in the dry tropical regions of southern India, including Karnataka, Tamil Nadu, Telangana, Andhra Pradesh, and parts of Kerala. One of its most fascinating biological traits is its hemiparasitic nature. Although the tree can produce its own food through photosynthesis, it partially depends on nearby plants for water and nutrients by attaching to their roots through specialized structures. This dependency contributes to its slow growth and the need for a balanced ecological environment. Typically, sandalwood grows into a small to medium-sized evergreen tree, reaching heights of around 10–15 meters. It has smooth leaves, small purplish flowers, and a relatively slender trunk. Unlike most timber species, its value lies not in its outer wood but in its inner heartwood, which develops fragrance gradually over many years. The species usually reaches a height of 10–15 m and is characterized by glossy oval-shaped leaves and clusters of small purplish-brown flowers borne in panicles (Annapurna *et al.*, 2006). The characteristic fragrance of sandalwood originates from its heartwood, which holds the valuable aromatic oil (Jones *et al.*, 2006).

Fig: (A) A juvenile Indian sandalwood tree with a slender trunk and characteristic leaves, supported by stakes; (B) a mature plantation showing trees planted in orderly rows for commercial harvesting; along with a general view of sandalwood plantation rows.



Historical and cultural importance

Sandalwood has been deeply woven into India's cultural and spiritual fabric since ancient times. References to it appear in Vedic literature, Ayurvedic texts, and classical writings.

Traditionally:

- Sandalwood paste was applied to cool the body and calm the mind
- Temples used it to anoint deities
- Royal households valued it for its fragrance
- Spiritual practitioners used it during meditation for focus

Even in funeral practices, sandalwood symbolizes purity and a peaceful transition of the soul, highlighting its sacred status across life and death rituals.

The chemistry behind its fragrance

The characteristic scent of sandalwood comes from compounds called sesquiterpenes, mainly alpha-santalol and beta-santalol. These compounds accumulate slowly in the heartwood and roots, often taking 15–20 years to reach peak levels.

Unlike many synthetic fragrances, sandalwood oil acts as a base note, meaning its aroma lasts for extended periods. Remarkably, even after harvesting, the wood can retain its fragrance for decades if stored properly, making it highly valuable in perfumery.

Growing conditions

Sandalwood thrives in tropical climates with temperatures ranging from 12°C to 35°C. It prefers annual rainfall between 600 and 1,600 mm.

Suitable soil conditions include

- Well-drained sandy loam or gravelly soils
- Slightly neutral pH (around 6.0–7.5)
- Moderate fertility (excess nutrients can reduce heartwood quality)

Role of host plants

As a hemiparasite, sandalwood relies on host plants throughout its life cycle. Early-stage hosts may include crops like pigeon pea or cowpea, while long-term hosts often include trees such as neem and pongamia.



Selecting appropriate host species is essential for healthy growth and better oil production.

Economic and commercial importance

Sandalwood is one of the most valuable woods in the world due to its essential oil, which is widely used in:

- High-end perfumes
- Cosmetics
- Ayurvedic medicines

The oil content in Indian sandalwood is considered superior globally. Due to declining natural reserves and increasing demand, its market value remains consistently high, making it an attractive option for agroforestry.

Medicinal applications

In traditional Indian medicine, sandalwood is known for its cooling and therapeutic properties. It has been used to treat:

- Skin conditions such as acne and irritation
- Fever and heat-related issues
- Anxiety and sleep disorders
- Digestive and urinary problems

Modern studies support its anti-inflammatory, antimicrobial, and antioxidant properties. It is also widely used in aromatherapy for relaxation and stress relief.

Contemporary relevance

In today's world, sandalwood continues to gain importance across various industries:

- Luxury fragrance brands rely on natural sandalwood notes
- Herbal skincare products incorporate sandalwood extracts
- Wellness sectors promote its use in aromatherapy
- Scientific research is exploring pharmaceutical applications

Its alignment with natural and sustainable product trends makes it highly relevant in modern markets.

Cultivation practices

Sandalwood is typically grown from seeds in nurseries and later transplanted to fields along with host plants.

Key management practices include:

- Protecting young plants from grazing
- Controlling weeds
- Ensuring proper host plant maintenance

Harvesting usually takes place after 15–20 years to achieve optimal economic returns.

Why it is called “Green Gold”

The nickname “Green Gold” reflects the high economic value of sandalwood. Its worth increases with age, oil content, and quality of heartwood. Even small quantities can fetch premium prices in domestic and international markets. Historically, sandalwood trade has contributed significantly to regional economies, and its demand continues to rise globally.

Legal and policy changes

During colonial times, sandalwood was heavily regulated due to its high value. Strict government control continued after independence, discouraging farmers from cultivating it.

This led to:

- Reduced private cultivation
- Increased illegal harvesting
- Decline in natural populations

In recent years, many Indian states have relaxed these regulations. Also Indian Farmers can now grow and sell the tree of the



sandalwood under regulated systems, encouraging wider adoption as an agroforestry crop.

Environmental benefits

Beyond its economic importance, sandalwood also contributes to ecological sustainability. When integrated into agroforestry systems, it:

- Enhances land productivity
- Supports biodiversity
- Improves soil conditions
- Reduces pressure on natural forests

Its adaptability makes it suitable for climate-resilient farming systems.

Conclusion

Sandalwood represents a rare convergence of cultural heritage, scientific relevance, and economic value, making it one of the most remarkable natural resources associated with India. For centuries, it has held a sacred place in religious rituals, traditional medicine, and social customs, while simultaneously evolving into a globally demanded commodity in perfumery, cosmetics, and wellness industries. This continuity—from ancient spiritual practices to modern commercial applications—highlights its enduring significance across generations.

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