

Boswellia serrata: The Fragrant Tree of India

**Dr. P. Kumar*, Dr. S. Sathiyamurthi, Dr. P. Mangammal and
Dr. T. Hariprasanth**

Horticultural College and Research Institute, Tamil Nadu Agricultural University, Paiyur – 635112

Corresponding Author

Dr. P. Kumar

Email: kumar.p@tnau.ac.in



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ABSTRACT

Boswellia serrata Roxb. ex Coleb. (Indian frankincense or Salai) is a valuable medicinal and aromatic tree species of the family Burseraceae, widely distributed in the dry deciduous forests of India. The species is renowned for its gum resin, essential oils and diverse therapeutic properties, particularly in Ayurvedic and Unani medicine for treating inflammatory disorders, arthritis, respiratory ailments, gastrointestinal diseases and skin conditions. Besides its medicinal importance, the resin is utilized in the production of incense, varnishes, turpentine and pharmaceutical products. Despite its economic and ecological significance, *B. serrata* faces threats from poor natural regeneration, habitat degradation, climate change and unsustainable resin extraction. Sustainable harvesting, improved propagation, genetic conservation and effective management strategies are essential for its long-term conservation and utilization.

INTRODUCTION:

Boswellia serrata Roxb. ex Coleb. commonly known as Indian Olibanum or Indian Frankincense tree belongs to the family Burseraceae. The vernacular names are Shallaki, Salai (Hindi), Kungilyam (Malayalam) and Parangisambrani (Tamil).

The word olibanum is derived from the Arabic 'al-luban' and it means 'the milk'. The tree is well known for their aromatic resins, which have been used as incense and traded for over 6000 years. The Frankincense mentioned in the Bible is also a species of *Boswellia*. Other

plants in the family which give aromatic resin are Guggulu - *Commiphora wightii* and Kala dammar - *Canarium strictum*.

Plant description

Boswellia serrata is a moderate sized to large deciduous tree that can easily be spotted in the forest because of its peeling papery bark. The bark peels off in large flakes that can be white to shades of brown and red. The leaves are pinnate - pairs of leaflets attached along a stalk which can be up to 25 cm long, crowded at the ends of branches. Tiny white bell-shaped flowers appear at the tips of branches when the tree is leafless. The fruits are small capsules with three ridges. They split open on maturity to release tiny brown winged seeds. The crown of the tree is open and airy and has a pleasing appearance. The bark when injured exudes a fragrant resin, which has various uses and is heavily harvested by the locals.

Environmental Conditions and Distribution

A sentinel like tree of the dry deciduous forests of India, it can withstand extreme heat and drought. They are usually seen growing in dry deciduous forests along with trees like *Terminalia*, *Anogeissus*, *Acacia* etc. Such savannah and dry deciduous forest ecosystems occur throughout peninsular India, North India and the foothills of the Himalayas. *Boswellia serrata* is endemic to India (found only in India). Being a deciduous tree, the tree loses all its leaves during the start of the dry season and remains completely leafless for 2-3 months. The flowers appear during January - February. The fruiting period is from March to May. Recent studies indicate that *Boswellia* tree populations are declining, partly due to over-exploitation and habitat-loss. Distribution is in Tropical Dry Deciduous Forest of India. The tree is found in dry, rocky ridges and slopes, as well as flat terrain. It grows at altitudes up to 1,150 m in regions with annual temperatures between 0-45°C and annual

rainfall between 500-2,000 mm (Brendler *et al.*, 2018). Occurrence of *B. serrata* has been reported in the natural forests of following states namely, Andhra Pradesh, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal (ISFR,2019). It is also grown on drier ridges of metamorphic rocks and easily planted in shelter-belts, windbreaks and hedges too

Seed Production

The fruits of *B. serrata* are 1.3 cm long, trigonous, with three valves and three heart-shaped, 1-seeded pyrenes, winged, along the margins. Reported weights for seed range from 13,400-25,600 seeds per kilogram. Seeds are collected manually by hand picking. Seeds cannot be stored more than 6 to 9 months. They can be stored in dry tins. (MFD,2020).

Planting Material

It is propagated by seeds as well as cutting. Seeds are germinated immediately after collection. The rate of germination was found to be 25-30%. About two months old seedlings of 15-20 cm height are ready for planting in the field. A cutting of 1.0-2.0 cm thickness recorded 26% success but has poor survival in the field

Threatened Status

Boswellia serrata has been listed in the threatened species of India (Barik *et al.*, 2018). Major threats are slow growth coupled with poor regeneration. However, stable trends have been reported in its population habitat. Indiscriminate exploitation for its high economic value, the tree has been identified by the government of India for its genetic improvement. There are several constraints in the cultivation of *Boswellia serrata* under natural conditions. Seed viability is very poor

and germination percentage is very low (10-12%). the seeds require high humid conditions for germination. In India, changing climate, and soil conditions, dwindling habitats, degradation of forests and over-exploitation, are major threats faced. Over-tapping to meet the international demand has been reported.

Reasons for Deterioration

Reduction in the distribution range of *B. Serrata* has been reported during intensive population assessments. Changes in the natural regeneration of this species are due to over-exploitation for traditional medicines, shrinking habitats, forest degradation, climate change, changes in soil properties and grazing of saplings by wild animals like boar.

Genetic Resources and Tree Improvement

Seed Production Areas of this tree species is being maintained by the research wing of Maharashtra Forest Department. For seed collection a seed stand of 5 Ha has been established at Palaskheda (Jalgaon) having 173 trees by the forest department. The territorial wing receives the seeds for raising plantations. The forest department of Maharashtra is also entrusted with raising of its saplings on a regular basis. Collaborative research is being conducted with Tropical Forest Research Institute, Jabalpur for sustainable harvesting of gum. 147 occurrences of this tree have been recorded from various regions of India.

Raising Propagules and Transplanting:

The seeds obtained during May-June from selected plus trees. Seeds are sown during July-August and about two months old seedlings are planted in the field at a spacing of 5m x 5m. Thus, about 400 plants per hectare are required for raising plantation.

Planting in the Field

The ploughing is done early in April followed by furrowing till a good tilth of soil is obtained and field is made free of weeds. Well decomposed Farm Yard Manure (FYM) is added @ 20 t/ha during land preparation. It should be spread well and thoroughly mixed the soil. During initial 5-6 years, crops like ginger, turmeric, aloe, pine apple etc. can be grown as catch crops in between the trees. The crop requires irrigation at 15 days interval during dry season beginning from December to June. Hoeing and weeding is done during first few years of growth. No disease or pests or any other physiological disorder was observed in its cultivation. However, it would be advisable to dust pesticide against white-ants.

Method of Harvesting/Tapping

Gum resin is obtained by tapping of trees of 90 cm girth and above at 1.37m from the ground level. It is not advisable to tap from the trees of lower girth classes. This may adversely affect their growth. From the trunk of a tree, a thin band of bark of about 30 cm in length and 20 cm wide is shaved at a reasonable height from the ground thereby exposing the reddish phloem. Every fourth or fifth day the blaze is freshened. After two weeks the first collection of the gum-resin starts. A scraper is used for collection keeping a tray having a semicircular edge around the blazed surface. The blaze is freshened from time to time thereby widening the original blaze.

Period of Harvesting

Boswellia trees are tapped and used for collection of gum generally from the month of November. It is usually continued up to end of May. By the onset of monsoon, the tapping is stopped. The gum is usually collected after a month of blazing. Fortnightly freshening of the blazes and collection may be done subsequently

Yield

Approximately 1 kg of *Boswellia* gum is collected per tree and a tree may yield up to 2 to 2.5 kg of resin in a year. According to season, locality and size of the tree the yield of the gum may vary. Larger trees yield better yield. In wet or moist areas, the yield has generally been found to be poor. Older trees with black bark or dwarfed and suppressed trees yield less. Better yields have been noticed from middle aged, sound and vigorous trees (Vikaspedia; 2020).

Economic Importance

Boswellia serrata is valued for its volatile oil, resin and gum. The oil obtained from salai is very similar to turpentine oil. The oil has been found suitable for paint making, varnish and used as printing ink in textile industries and in making distempers. It is a unique non coniferous source of turpentine employed for the manufacture of paints and varnishes. The resin obtained from salai is used for preparation of varnishes. The tree exudes of *B. serrata* resembles Canada balsam in colour and consistency

Uses

The resin is fragrant and burns with a pleasant odour and is used as incense in religious ceremonies and worship. In recent years salai guggul has been used extensively in pharmaceutical formulations for relieving pains and aches, particularly associated with arthritis. Many commercial formulations of salai guggul in the form of ointments, creams and capsules are available on the market. In Ayurveda, the gum is being used for treating inflammatory diseases affecting skin, eye, gums and gastrointestinal tract. It is also effective in the treatment of respiratory and inflammatory disorders. *B. serrata* bark is used for the treatment of dysentery, diarrhoea and fractured bones. The resin has application in curing diseases like haemorrhage, pulmonary

infections cough, dyspnea, cardiac diseases, polyuria, leucorrhoea, boils and wounds, skin diseases, urinary disorders, urethritis, piles, ulcers, diabetes and dysentery. The exudates of Sallaki mixed with sugar and honey is applied over the eyes in conjunctivitis. Powder of Sallaki mixed with coconut oil and made into a paste is applied externally to relieve joint pain. Sallaki is used in ayurvedic preparations such as *Jirakadi modaka*, used for the treatment of digestive tract diseases, and the oil/resin is used extensively to relieve pain and improve joint mobility and flexibility. The extracted gum is used for Binding agent in tablets. The tree is the only non- coniferous source of turpentine and resin in India. It is being used by the traditional Ayurvedic and Unani medicinal formulations for treatment of asthma, arthritis and for the treatment of renal disorders.

Processing and value addition

The gum-resin of *Boswellia* is collected in a semi-solid state. The bark and other impurities are removed manually after collection. The crude gum-resin is collected in a bamboo basket for up to a month. The fluid portion locally known as 'ras', flows out during this period. The 'ras' is being used as a raw material for manufacturing paints and varnishes. The semi-solid to solid part remaining is the gum resin. This is dried thoroughly and treated with soapstone powders often to make it brittle. Wooden mallet or chopper is used to break it into small pieces. Bark and other impurities are again removed manually during this process. Based on the colour and impurities, the gum-resin is then graded. Four grades are categorized in the market as follows.

Industrial application

Because of its unique fragrance, *Boswellia* gum resin is traditionally used as incense. It is extensively used in Ayurvedic medicines for

treating asthma and arthritis. *Boswellia* gum has been reported to be better than drugs like Phenylbutazone. It also finds a place in various indigenous medicine especially for the treatment of rheumatism, nervous diseases and as diaphoretic and astringent. Certain ointments contain its formulations. *Boswellia* gum also has a usage for lighting fires.

CONCLUSION

Boswellia serrata is much more than a source of fragrant resin. It is a distinctive tree of India's dry forests, a part of ancient cultural traditions, a valuable medicinal resource and an important source of livelihood. Its greatest strength its ability to survive in harsh, dry environments—is matched by a significant weakness: slow growth and poor regeneration. Increasing demand for its resin makes sustainable harvesting and conservation increasingly important. The future of *Boswellia serrata* will depend on finding a balance between use and conservation. Scientific research, improved propagation, sustainable resin harvesting and protection of natural habitats can help ensure that this remarkable Indian tree continues to thrive for generations to come

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