



## Shorea Tumbuggaia Roxb.: The Endangered Miracle of Traditional Medicine

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*Shorea tumbuggaia* Roxb. is a unique and endangered tree species which is commonly known as the Green Dammar, it is known for its valuable medicinal properties. This tree has been used for centuries by local communities for healing and spiritual practices despite its cultural significance.

### Scientific Classification

Division	: Magnoliophyta
Class	: Magnoliatae
Order	: Malvales Juss.
Family	: Dipterocarpaceae Blume
Order	: Theales
Genus	: Shorea Roxb. ex C. F. Gaertn.
Species	: Shorea tumbuggaia Roxb.

### Vernacular Names

English	: Green dammar tree
Hindi	: Kala dammar
Kannada	: Jujula, Karidamara
Tamil	: Tambagom, Tambugai, Karuppu dammar, Kangu, Kungiliam
Telugu	: Googilapu, Guggilamu, Guggilapukam, Nallaguggilamu, Thamba
Malayalam	: Tampakam

### Ecology

*S. tumbuggaia* is found in Southeast parts of Asia, India, Malaysia, Indonesia and the Philippines. In India, it is primarily distributed in the Southern Eastern Ghats, at altitudes up to 100 m with notable populations in the Seshachalam, Veligonda Hills of Cuddapah, the Tirupati Hills in Chittoor District, Andhra Pradesh, the North Arcot and Chingleput districts of Tamil Nadu moreover, it is endemic to the Middle Eastern Ghats and listed as globally endangered by the Conservation Assessment and Management Plan (CAMP).

### Biophysical limits

Temperature- 25-35°C

Annual rainfall - Grows well in rainfall up to 1,000-2,500 mm per year

Soil- Thrives in well-drained soils, such as sandy loam or clay loam. It prefers slightly acidic to neutral soils (pH 5.5–7.0) and requires moist conditions without waterlogging, as it is sensitive to stagnant water.

## Morphology

**Table 1. Morphological description of *S. tumbuggaia***

Morphological Feature	Description
Tree	Monoecious, medium-sized deciduous tree, 12–18 m tall, with a girth of up to 2 m. The crown is dome-shaped, providing a characteristic silhouette.
Leaves	Simple, alternate, broadly ovate to cordate, 6–21 cm long and 3.5–12 cm wide. Base is truncate to shallowly notched, margins smooth and entire, apex abruptly short acuminate. Leaves are coriaceous, dark green, glabrous on both sides, with prominent lateral veins and a stout, tomentose petiole.
Flowers	Bisexual, cream-white, and fragrant. Arranged in axillary or terminal panicles up to 20 cm long, either glabrous or hoary. 5-lobed calyx (outer 3 lobes larger than inner 2), 5 lanceolate petals. Stamens number 15 or more with hairy appendages. Ovary tri-locular, pubescent, with 2 ovules per locule. Style subulate with a tri-lobed stigma.
Fruit	Capsule or nut-like structure, about 2 cm long with an acute apex and densely pubescent. Enclosed in a calyx tube with 3 larger accrescent lobes on the outer side and 2 smaller spatulate inner lobes. Measures 3.5–4.5 cm long and 1.5 cm wide. Contains a single seed.
Seed	Single, enclosed within the fruit. Features large, fleshy cotyledons that store nutrients for young plants during germination. The seed structure supports initial seedling growth.

## Biology

*S. tumbuggaia* flowers from the fourth week of April to the first week of May, and the fruiting period occurs from May to June. The reproductive cycle of this tree aligns with the early monsoon season. Flowering and fruiting are critical for its regeneration and propagation.

## Medicinal Importance

The medicinal importance of different plant parts of *S. tumbuggaia* is as follows:

**Table 2. Medicinal Properties of *S. tumbuggaia***

Part of Plant	Medicinal Property	Description
Leaves	Anti-inflammatory, Analgesic	The leaves are traditionally used for reducing inflammation and relieving swelling and pain, particularly in joint issues and common pains.
Bark	Anti-inflammatory, Analgesic	The bark exhibits anti-inflammatory effects and is used to reduce swelling and pain, especially in joint-related conditions.
Resin	Antimicrobial	Used as incense and for treating duodenal ulcers and amoebic dysentery.

## Cultural Significance

*S. tumbuggaia* is very important culturally, especially among tribal people in India's Eastern Ghats, which include Tamil Nadu, Andhra Pradesh, and Telangana. The Irula and Konda Reddy tribes employ tree bark and resin in a variety of rites. The bark is thought to have protective properties, warding off disease and evil spirits during ceremonies, and the resin is widely burned as incense for spiritual purposes. In local folklore, *S. tumbuggaia* is seen as a symbol of strength and resilience, representing the deep connection between the people and

the forest. Its sacred status in some communities means it is included in seasonal festivals and rites of passage, such as marriages and birth celebrations.

### **Phenology, Reproductive Challenges, and Threats to Survival**

*S. tumbuggaia* faces significant challenges related to its reproductive biology, which are central to its endangered status. The tree produces a large number of flowers, many of them lacking anthers, which results in poor seed production. Additionally, the fruiting cycle of species is irregular rather than annual, the healthy fruiting occurring only once every 1-3 years, as seen in many other species of *Shorea*.

The seeds of *S. tumbuggaia* do not exhibit dormancy; because of this, some seeds are germinated prematurely, either before falling or immediately after they hit the ground. This rapid germination creates a barrier for the successful seedling establishment due to only a small fraction of seedlings surviving to maturity. The rapid seed germination process involves the emergence of a cylindrical red hypocotyl that penetrates the litter layer to form a root. However, in the case of *S. tumbuggaia*, only a few plants manage to develop a complete root, shoot and leaf structure, which results in a very low seedling survival rate of about 0.01 %.

Seed collection is particularly challenging due to ants covering the tree, requiring mechanical shaking of the tree to gather fallen seeds. Unfortunately, the seeds cannot be stored artificially, as bacteria, viruses and fungi cause rapid loss of viability. The damage caused to seedlings in nurseries by pests and insects exacerbates the difficulty in regenerating the species.

High temperatures during flowering impede good seed set, and the tree's inability to store seeds artificially complicates conservation efforts even further. Furthermore, insect damage frequently disrupts seedling production in nurseries, restricting the ability to propagate the particular plant for reforestation initiatives. Endangered status *S. tumbuggaia* is due to a mix of issues, including a lack of seed dormancy, imperfect germination, excessive insect predation, and difficulty in seed storage.

### **Conservation Efforts**

Efforts to conserve *S. tumbuggaia* have gained momentum, with a range of strategies being implemented to address its endangered status. The primary approach has been to protect its natural habitat, particularly in the Southern Eastern Ghats, where the species is endemic. Initiatives such as the establishment of conservation areas, including the Talakona Medicinal Plants Conservation Area in Tamil Nadu, aim to preserve the tree in its native ecosystem. In addition to habitat protection, advancements in propagation techniques are being explored to boost the regeneration of *S. tumbuggaia*. A promising area of research involves the use of tissue culture techniques for mass propagation and conservation of the species. While many members of the Dipterocarpaceae family are considered non-amenable to in vitro culture, studies on *S. tumbuggaia* have shown potential for successful regeneration through tissue culture. Research indicates that half-strength MS medium without plant growth regulators (PGRs) enhances seed germination.

These tissue culture techniques not only facilitate the propagation of *S. tumbuggaia* but also ensure the preservation of its genetic integrity. The use of ISSR markers to analyze the genetic stability of the regenerated plants ensures that conservation efforts are not compromised by somaclonal variation. This method offers a significant advantage in maintaining the species genetic diversity while providing high-quality plants for reforestation and field cultivation. Furthermore, local community involvement plays a key role in conservation efforts. Collaboration with tribal communities, particularly in the regions where *S. tumbuggaia* is native, enhances the effectiveness of preservation programs. Education and awareness initiatives have been established to encourage sustainable use of the tree resources, ensuring that their medicinal and cultural significance is respected while safeguarding their long-term survival. Despite these positive steps, the challenges of seed dormancy, high pest predation and low seedling survival rates remain significant hurdles. However, ongoing

research and the application of advanced propagation methods like tissue culture offer promising solutions to ensure the conservation and recovery of *S. tumbergaia*.

## Conclusion

*Shorea tumbergaia*, a valuable species with significant ecological, medicinal, and cultural importance, faces critical conservation challenges due to reproductive issues, poor seed germination, and high pest predation. Despite these hurdles, ongoing conservation efforts, including habitat protection, community involvement, and innovative propagation techniques like tissue culture, hold promise for the species' recovery. By ensuring the preservation of its genetic integrity and involving local communities in sustainable practices, these efforts aim to safeguard *S. tumbergaia* for future generations. Continued research and the application of advanced conservation methods are crucial to overcoming its reproductive challenges and ensuring its long-term survival.

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