

Streblus asper Lour. : a medicinal tree of India

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Abstract

Streblus asper Lour. is a medicinally important evergreen tree of the family Moraceae, widely distributed in South and Southeast Asia. The plant has been extensively used in Ayurveda and traditional folk medicine to treat toothache, diarrhea, dysentery, filariasis, skin diseases, wounds and various inflammatory disorders. Different plant parts contain diverse bioactive compounds such as flavonoids, triterpenoids, sterols, lignans and cardiac glycosides that contribute to its therapeutic potential. Pharmacological studies have demonstrated cardiogenic, antifilarial, antimicrobial, anticancer, anti-allergic, antiparasitic and antimalarial activities. Owing to its rich phytochemical composition and broad spectrum of biological properties, *S. asper* represents a significant source for the development of novel therapeutic agents.

Keywords: Moraceae, medicinal tree, traditional practices, pharmacology

Introduction

Streblus asper is an evergreen tree belonging to the family Moraceae, widely distributed in South and Southeast Asia, including India, Sri Lanka, Thailand, Malaysia, Vietnam and Indonesia. It is commonly known as the toothbrush tree or sandpaper tree due to the rough texture of its leaves and its traditional use as a natural dental cleaning tool. The plant has been deeply integrated into various traditional medical systems such as Ayurveda, Sidha and folk medicine for centuries (Kumar et al., 2022). *S. asper* is a medium-sized, rigid and hardy tree that thrives in dry and tropical climates. The leaves are simple, rough and scabrous, while the bark is greyish and often used in traditional preparations (Roy et al., 2013). The plant is widely cultivated and also grows wild in forested and rural regions. It is considered an important ethnomedicinal species in Asian countries, particularly in India and Thailand (Sen and Behera 2024). The plant has long been valued in traditional medicine systems for its broad therapeutic applications. Traditionally, it has been employed for the treatment of toothache, gingivitis, diarrhoea, dysentery, piles, filariasis, leprosy and skin diseases. In some cultures, it is also used for wound healing and general antiseptic purposes. Its use as a chewing stick reflects its importance in oral hygiene practices in rural

communities (Rastogi et al. 2006). Scientific investigations have revealed that *S. asper* contains a wide range of bioactive phytochemicals. Reported constituents include flavonoids, sterols (β -sitosterol, stigmasterol), triterpenoids (oleanolic acid, betulin), lignans and glycosides. These compounds are largely responsible for its medicinal properties. The root bark has been found to contain several cardiac glycosides and lignan derivatives, while leaves exhibit rich antioxidant and phenolic content (Singh et al., 2015). Modern pharmacological studies support many of its traditional claims. Research has demonstrated that *S. asper* exhibits antimicrobial, antioxidant, anti-inflammatory, antidiabetic, analgesic, hepatoprotective, cardioprotective, neuroprotective and anticancer properties. Some isolated compounds, such as asperuloside and strebloside, have shown activity against parasitic infections like filariasis. Leaf extracts have also demonstrated protective effects against oxidative stress and neurodegeneration in experimental models (Rastogi et al. 2006). *S. asper* is a pharmacologically important medicinal plant with a strong foundation in traditional medicine and growing scientific validation. Its diverse phytochemical profile supports a wide range of biological activities. Continued investigation into its bioactive compounds may help in developing novel therapeutic agents, especially for infectious, inflammatory and metabolic diseases.

Morphology

S. asper is a small to medium-sized evergreen tree widely distributed in tropical and subtropical regions of Asia. It exhibits a xerophytic and hardy habit, allowing it to survive in dry and marginal soils. The plant is well known for its rough-textured leaves and dense branching pattern. It is a much-branched, rigid tree or large shrub, typically growing 5-15 meters in height. The crown is dense and irregular, with spreading branches. Young branches are often stiff and pubescent, while mature stems become greyish and rough in texture. The stem is woody, hard and cylindrical. The bark is grey to dark brown, rough and fissured in older trees. It exudes a milky latex when cut. Leaves are simple, alternate and elliptic to obovate in shape. They are typically 3-10 cm long with an acute or obtuse apex and serrated or entire margins. The most distinctive feature is their scabrous (sandpaper-like) surface, due to the presence of stiff hairs. Venation is pinnate with a prominent midrib. Leaves are dark green and leathery, adapted to reduce water loss. The plant bears small, inconspicuous flowers arranged in axillary clusters or cymose inflorescences. The inflorescences are often hidden among foliage and are not showy. Flowers are small, greenish and unisexual. Male and female flowers are usually found on the same plant. Male flowers: reduced, with stamens as the main reproductive structures. Female flowers: contain a superior ovary with a simple stigma. The flowers lack petals or have highly reduced perianth segments. The fruit is a small, fleshy, drupe-like or syncarpous structure. It turns yellowish to orange-red when mature.

The fruit is edible for birds and plays a role in seed dispersal. Seeds are small, hard and enclosed within the fruit. They possess a well-developed seed coat and exhibit good viability under natural conditions (Roy et al. 2013; Sen and Behera 2024; Figure 1).



Figure 1: Flowers of *Streblus asper*

Ethnomedicinal uses

S. asper is an important ethnomedicinal plant widely used in Ayurveda and traditional folk medicine across South and Southeast Asia. Different parts of the plant are used to treat ailments such as toothache, diarrhea, dysentery, fever, filariasis, epilepsy, skin diseases, wounds and oedema. Its twigs are traditionally used as natural toothbrushes to maintain oral hygiene and strengthen teeth and gums. The plant is also valued for its antiseptic, anti-inflammatory and wound-healing properties (Rahman et al. 2021; Kongsinkaeo and Kongsinkaeo 2022; Kumar et al. 2022).

Medicinal uses of *S. asper* according to plant parts

Plant part	Traditional medicinal uses
Root	Used as an application for unhealthy ulcers and sinus infections; acts as an antidote to snakebite; used in epilepsy and obesity; employed in the treatment of oedema, heart disorders and inflammatory swellings; root paste or powder with curd is taken to cure menorrhoea in females.

Stem	Used traditionally as a toothbrush to strengthen teeth and gums; employed in treating toothache, pyorrhoea, constipation, mouth ulcers and dental caries.
Stem bark	Bark decoction is used in fever, diarrhea, dysentery, stomachache, urinary complaints, piles, oedema, wounds and filariasis; effective against lymphoedema and chyluria; warm bark decoction relieves gum pain, mouth ulcers and dental problems; bark paste is applied to wounds and acne.
Leaves	Used for liver disorders and liver damage; applied in eye complaints, fever, piles, eczema, stomach disorders and hypertension; leaf powder with honey is taken for piles; leaf ash is used for eczema; leaves also possess insecticidal activity against mosquito larvae; used to reduce labour pain and inflammation.
Milky latex	Acts as an antiseptic and astringent; applied to chapped hands, sore feet, painful heels, neuralgia, glandular swelling and cheek swelling; traditionally used in pneumonia and as an antibacterial agent.
Fruit	Young fruits are chewed to stop tooth bleeding and strengthen teeth; fruits are also used in eye complaints.
Seeds	Used in diarrhoea, epistaxis (nose bleeding), piles, itching, scabies and ringworm; seed powder with honey is taken on an empty stomach for skin diseases.
Whole Plant	Used in traditional medicine for cancer, cholera, colic, diarrhoea, dysentery, epilepsy, inflammatory swellings, leprosy, elephantiasis, rheumatic pain, impotence, burns, dysuria and wound infections.

Pharmacological activity

S. asper possesses a wide range of pharmacological activities that support its traditional medicinal uses. Studies have demonstrated cardiogenic, antifilarial, anticancer, antimicrobial, anti-allergic, insecticidal, antiparasitic and antimalarial properties in various experimental models. Bioactive compounds such as asperulooside and streblolide contribute significantly to these therapeutic effects, particularly against filarial parasites and cancer cells. These findings highlight the potential of *S. asper* as a valuable source of novel pharmaceutical agents (Rastogi et al. 2006; Kongsinkaeo and Kongsinkaeo 2022; Pandey and Rastogi 2022)

Cardiogenic activity: The ethanolic extract of the root bark of *S. asper* shows significant cardiogenic activity on isolated frog heart and animal smooth muscles. Pharmacological studies indicate that the plant has a definite stimulatory effect on the myocardium.

Antifilarial activity: The aqueous stem bark extract exhibits strong antifilarial activity against *Litomosoides carinii* and *Brugia malayi*. Cardiac glycosides such as asperulooside and streblolide are mainly responsible for its macrofilaricidal effect.

Anticancer activity: Methanol and dichloromethane extracts of stem bark possess cytotoxic activity against KB cancer cell lines. Compounds such as streblaside and mansonin showed potent anticancer properties.

Antimicrobial activity: Leaf and stem extracts inhibit the growth of several microorganisms, especially *Streptococcus mutans*. The plant exhibits antibacterial and antifungal activities useful in oral and general infections.

Oral hygiene activity: The leaf extract shows selective bactericidal action against oral pathogens causing dental caries and gingivitis. Mouth rinses containing *S. asper* extract reduce salivary bacteria and improve gingival health.

Activity against anaerobic bacteria: Leaf extracts demonstrate inhibitory activity against anaerobic oral bacteria such as *Porphyromonas gingivalis* and *Prevotella intermedia*, which are associated with periodontal diseases.

Anti-allergic activity: *S. asper* exhibits anti-allergic and mast cell stabilizing activity in experimental animals. It significantly reduces passive cutaneous anaphylaxis and prevents mast cell degranulation.

Insecticidal activity: Stem bark extracts possess insecticidal effects against agricultural pests such as *Dysdercus cingulatus*. Polyphenol-rich fractions showed strong toxicity and potential use as biopesticides.

Antiparasitic activity: Aqueous leaf extracts have been evaluated for antiparasitic activity against trypanosomes and filarial parasites. The plant also affects glucose metabolism in parasites, leading to their death.

Antimalarial activity: Stem bark extract stimulates host immune response against *Plasmodium berghei* in experimental murine malaria, indicating potential antimalarial properties.

Conclusion

Streblus asper Lour. is a valuable medicinal tree with a long history of use in traditional healthcare systems across South and Southeast Asia. Its diverse phytochemical constituents, including flavonoids, triterpenoids, sterols and cardiac glycosides, contribute to a wide range of therapeutic properties. Scientific studies have validated many of its traditional applications, demonstrating cardiogenic, antifilarial, antimicrobial, anticancer, anti-allergic and antimalarial activities. The plant also plays an important role in oral healthcare and wound management. Considering its extensive

ethnomedicinal significance and promising pharmacological potential, *S. asper* deserves further investigation for the development of safe, effective and novel plant-based therapeutics.

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