



CHAPTER 1

Comprehensive Analysis of *Streblus asper* Lour.- Ethnobotanical Relevance, Pharmacological Potential, and Bark Phytochemistry

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Abstract: *Streblus asper* Lour., commonly known as the “Sand paper tree” or “Siamese rough-brush tree”, holds significant ethnobotanical, pharmacological, and ecological importance. Ayurvedic and local medicinal practices, traditionally utilize it for dental hygiene, skin ailments, and gastrointestinal disorders. The plant exhibits diverse pharmacological activities. Phytochemical investigation reveals the presence of cardiac glycosides, flavonoids, tannins, and saponins in the bark, contributing to its antimicrobial, anti-inflammatory, antioxidant, anticancer, and antidiabetic properties. Present chapter summarizes the current understanding of *S. asper*, particularly emphasizing the bark’s chemical constituents and their therapeutic potential. This chapter aims to provide a phytochemical analysis of the bark of *S. asper*, which is a crucial source of bioactive compounds.

Keywords: Ethnomedicinal, ecological, pharmacological, phytochemical



INTRODUCTION

According to POWO (Plants of the World Online), about 880 accepted *Ficus* species were recorded (**POWO, 2025**). *Ficus* was originally split into several genera in the mid- 1800s, providing the basis for a subgeneric classification when reunited into one genus in 1867. Corner (**1965**) reorganized the genus based on the breeding system, uniting four dioecious subgenera into a single dioecious subgenus, *Ficus*. Monoecious figs were classified within the subgenera *Urostigma*, *Pharmacosycea* and *Sycomorus*. (**Corner, 1965; Weiblen, 2000**). The first systematic account of the Indian *Ficus*, composed of 113 species and 47 infraspecific taxa across British India. Of these, only 75 species and 16 infraspecific taxa were reported from India. More recently, based on morphological features and distributional patterns, the genus has been reclassified into six genera, 19 sections, and 27 subsections (**Lepcha and Sharma, 2021**). The genus *Streblus*, a captivating member of the 'Fig' family (Moraceae), encompasses approximately 25 species distributed primarily throughout tropical and subtropical Asia (**Singh et al., 2012**). In China, the genus is represented by seven species, viz., *S. taxoides* (Roth) Kurz, *S. tonkinensis* (Dubard & Eberhardt) Corner, *S. asper* Lour., *S. indicus* (Bureau) Corner, *S. zeylanicus* (Thwaites) Kurz, *S. ilicifolius* (S. Vidal) Corner and *S. macrophyllus* Blume (**Singh et al., 2012**). In India, the genus is represented by five species (**Roy et al., 2013**). *S. asper* Lour., *S. ilicifolius* (S. Vidal) Corner, *S. indicus* (Bureau) Corner, *S. taxoides* (Roth) Kurz, and *S. zeylanicus* (Thwaites) Kurz. Some literature reviews indicate that four *Streblus* species have been recorded from Northeast India; *S. asper*, which is distributed throughout the regions; *S. ilicifolius*, found in Mizoram; *S. indicus*, occurring in Assam and Meghalaya; and *S. zeylanicus*, reported from Assam (**Roy et al., 2013**). *Streblus asper* Lour., a member of the Moraceae family, stands as a plant of significant historical and contemporary relevance, particularly within the traditional medicinal systems of South and Southeast Asia. Commonly known as the “Sand paper tree or Siamese rough -brush tree”, this species has been employed for centuries in ethnobotanical practices, addressing a diverse spectrum of ailments. Flowering occurs January to March, and fruiting April to May (**Figure 1**). It is distributed in several countries throughout India, Sri Lanka, Thailand, China, Malaysia, Philippines and Vietnam. In India, it is found in Assam, Andaman Islands, Maharashtra, Odisha, Tamil Nadu, and Uttar Pradesh (**Sen and Behera, 2024**). It is small to medium-sized evergreen tree. It typically grows to a



height of 6 to 10 meters (**Figure 2**). Its widespread use in traditional medicine has spurred scientific interest in its pharmacological potential, leading to investigations into its chemical constituents. Among the various parts of the plant, the bark has emerged as a particularly valuable source of bioactive compounds. Apart from the medicinal value, it possesses cultural values, as it is recognized as ‘Sthalavriksha’ or sacred plant in Tamil Nadu (**Sen and Behera, 2024**).



Figure 1: Flowers of *S. asper* in natural habitat

The root and bark of *S. asper* possess rich compounds such as cardiac glycosides, kamloside, asperoside, strebloside, indroside, canno-dimemoside, strophalloside, strophanolloside, 16-O-acetyl-glucogitomethoside, glucogitodimethoside, glucokamloside, sarmethoside and glucostrebloside. Many researchers reported the presence of phytoconstituents in roots like b-sitosterol-3-O-b-d-arabino-furanosyl-O-a-l-rhamnopyranosyl-O-b-d-glucopyranoside, lupanol-3-O-b-d-glucopyranosyl-[1-5] -O-b-d-xylofuranoside and vijalloside, i.e., periplogenin-3-O-b-d-glucopyranosyl-1-5] -O-b-d-xylopyranoside. The roots also contain lupeololeate, sterblusteryl palmitate, lupeollinoleate, cerotic acid, stigmasterol palmitate, and octacosanoic acid (**Aeri et al., 2015**).



Figure 2: Habit and leaves of *S. asper*

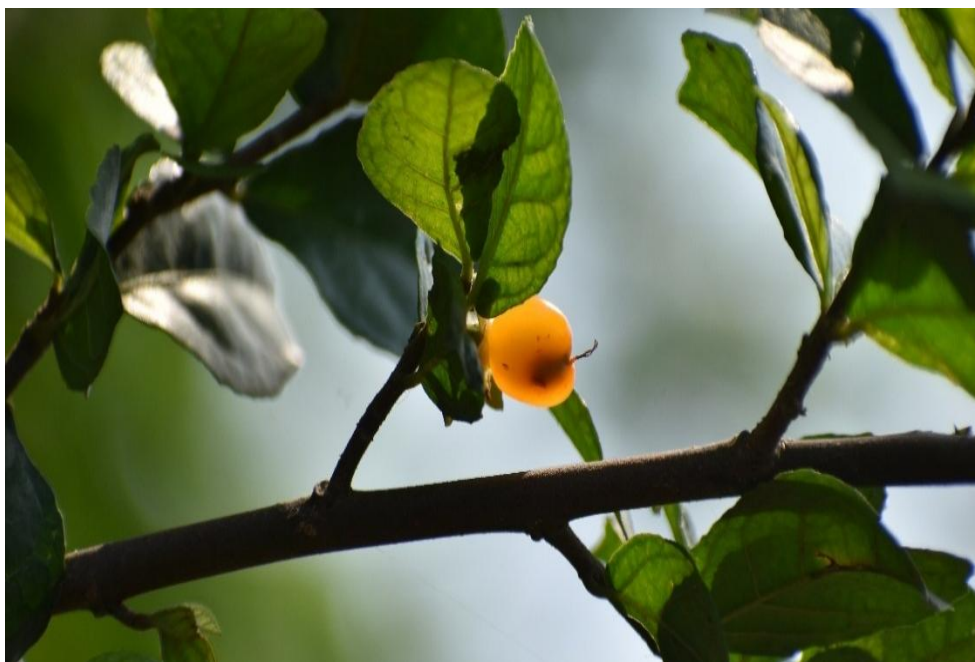


Figure 3: Fruit of *S. asper*

This chapter focuses on comprehensive exploration of the ethnomedicinal, pharmacological and ecological significance of *S. asper*, with a focused investigation of the phytochemical profile of its bark. Present study highlights the therapeutic potential of the bark's constituents and their contributions to the plant's overall medicinal efficacy, while also acknowledging the ecological role of this important plant.

MORPHOLOGY

It is a rigid, much branched shrub or small tree having rough, stringy, and light grey bark. Leaves are very shortly petiolated, obovate or rhombic-elliptic, obscurely toothed, acute, subacute or acuminate, stiff, scabrid on both sides, secondary nerves 7-9, nervules raised beneath. Petiole length is 2-3mm. Stipules are 2.5 mm long. Male heads are 5.9-7.3 mm in diameter. Bracts are very small, ovate, under 1.2 mm long and outer bracts are involucre. Flower peduncles are 7.5-10 mm in length. Tepals are free but closely wrapping round the ovary. Length of style 1.8 mm, excluding the 7.5 mm long arms. Fruits are yellow, succulent, globose, 3.7 mm in diameter. (Saxena and Brahmam, 1995; Figures 3).



BIOCHEMICAL ASPECTS

Mostly, the frugivorous avifaunal species consume the tender flowers and ripen fruits. Since all parts of *S. Asper* shows medicinal values including its bark. Tannin, phenol, reducing sugars and alkaloids are present in hydro-ethanolic extracts of the bark of *S. asper* (**Table 1; Figures 4-5**).

Table 1: Phytochemical screening using different extracts of *S. asper* bark

Bioactive compounds	Hydro-ethanolic extract
Tannin	+
Saponin	-
Flavonoid	-
Terpenoids	-
Phenols	+
Reducing sugars	+
Steroids	-
Alkaloids	+

(+ve – Positive; -ve – Negative)

The people of tribal communities of south-eastern states like Odisha and Andhra Pradesh use the plant parts of *S. asper* for medicinal purposes, as the leaves are used to treat injuries and wounds. For some avifaunal species, it is also one of the sources of food. There are many biologically active constituents in *S. asper*. Structural details of some constituents are given ahead (**Figure 6**). The presence of tannin may be responsible for astringent effects, anti-inflammation activity, antidiarrheal activity, hemostatic activity, antioxidant activity, antimicrobial activity, and anti-ageing (**Makkar et al., 1987; Cosme et al., 2025; Lin et al., 2001; Czerkas et al., 2024**). Phenols can exhibit antioxidant, anti-inflammatory, antimicrobial, antidiabetic, anticancer activity and neuroprotective effects (**Platzer et al., 2022; Kauffmann and Castro, 2023; Chimento et al., 2023; Williamson and Sheedy, 2020**).



Figure 4: Bark of *S. asper* for phytochemical analysis



Figure 5: Screening of secondary metabolites using hydro-ethanolic extract

Alkaloids may be responsible for analgesic, antibacterial, antimalarial, and anticancer effects (Heinrich et al., 2021; Dey et al., 2020). Other researchers have also reported the medicinal uses of this plant. Bark, leaves and roots are considered for treating different diseases such as toothache, diabetes, dysentery, piles, ulcers, and fever. Decoction, infusion, paste, and powder is



made available utilizing different plant parts like bark of stem, seeds, leaves, roots etc. (**Table 2**).

Table 2: Ethnomedicinal uses of *S. asper*

Plant parts	Mode of uses	Diseases	Sources
Bark and stem	Powder	Toothache	Pandey and Rastogi, (2022); Aeri et al., (2015)
Bark	Infusion	Digestive system disorders	Pandey and Rastogi, (2022)
Bark	Paste	Acne	Sen and Behera, (2024)
Leaves	Decoction	Diabetes	Pandey and Rastogi, (2022); Rahman et al., (2021)
Leaves	Juice	Dysentery	Pandey and Rastogi, (2022); Kumar and Saravanan, (2022)
Leaves	Decoction	Piles	Sen and Behera, (2024)
Root	Juice	Ulcers	Rastogi et al., (2006)
Root	Juice	Fever	Pandey and Rastogi, (2022)
Root	Paste	Menorrhoea	Sen and Behera, (2024); Neekhra et al., (2017)
Seed	Powder	Ringworm	Sen and Behera, (2024)



Stem	Decoction	Constipation	Sen and Behera, (2024)
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Traditional uses are being investigated by modern science, with studies showing potential for antimicrobial, anti-inflammatory, antioxidant, anticancer and other pharmacological activities. Literature data, concludes that photochemical constituents of leaves, bark, and stems possess various pharmacological activities (**Table 3**).

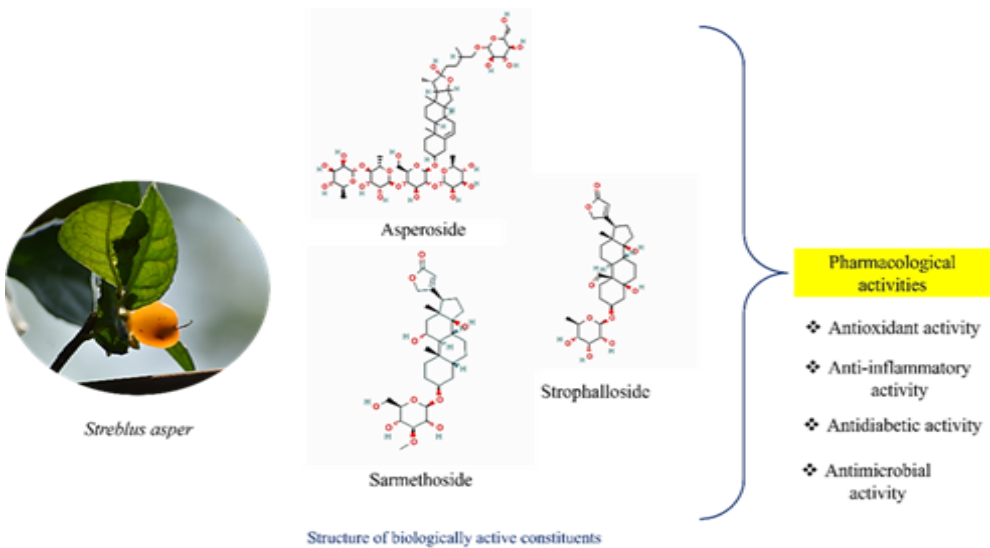


Figure 6: Structure of biologically active constituents in *S. asper*

Table 3: Pharmacological values of *S. asper*

Plants parts	Pharmacological values	Sources
Leaves	Antioxidant activity	Pandey and Rastogi, (2022)
Leaves	Anti-inflammation activity	Pandey and Rastogi, (2022)
Leaves	Antimicrobial activity	Pandey and Rastogi, (2022); Rastogi et al., (2006)



Leaves, stem, bark and root	Antidiabetic activity	Pandey and Rastogi, (2022)
Root bark	Cardiotonic activity	Neekhra et al., (2017); Madhavan et al., (2009)
Stem bark	Anticancer activity	Rastogi et al., (2006)
Stem bark	Antifilarial activity	Neekhra et al., (2017)



Figure 7: Ecological services of *S. asper* many bird's species consume the flowers and fruits

ECOLOGICAL FACTORS

S. asper plays an important role in the form of biotic factor for ecological balance (**Figure 7**). At the time of the flowering and fruiting period, in the months of January to March and April to May, many frugivorous birds remain active. The fruits are consumed by various birds (e.g., Bulbuls, Mynas) which



act as important agencies of seed dispersal for this plant species. Apart from birds, other small animals also consume fruits and seeds and help in seeds dispersal (**Aruna and Balasubramanian, 2014**).

CONCLUSION

Streblus asper, a wild edible fruiting plant, has been found to possess significant medicinal, pharmacological, and ecological importance. Present chapter highlights the bioactive compounds especially present in its bark. Various aspects of *S. asper* provide valuable insights into its food, medicinal, and ecological uses, emphasizing the need for advanced research and conservation efforts to harness its potential.

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