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Medicinal and pharmacological importance of *Semecarpus anacardium*

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ABSTRACT

Semecarpus anacardium, commonly known as marking nut, is an important medicinal plant belonging to the family Anacardiaceae and has been widely used in traditional systems of medicine. The plant is known for its diverse pharmacological activities, mainly attributed to its rich content of bioactive compounds such as flavonoids, phenolic compounds, bhitawanols and anacardic acids. It exhibits significant antioxidant, anti-inflammatory, antimicrobial, anticancer, immunomodulatory and cardioprotective properties. It has been traditionally used in the treatment of disorders like arthritis, skin diseases, tumours, neurological disorders and digestive ailments. Modern pharmacological studies have validated many of these traditional claims, demonstrating its role in inhibiting tumour growth, reducing oxidative stress and enhancing immune response. Despite its therapeutic potential, the plant contains irritant and toxic constituents and therefore requires proper purification (Shodhana) before medicinal use. *S. anacardium* holds great potential as a source of novel therapeutic agents, but further clinical studies are needed to establish its safety, efficacy and standardisation for widespread medical application.

Keywords: Marking nut, medicinal tree, pharmacology, traditional uses

INTRODUCTION

The genus *Semecarpus*, belongs to the Family Anacardiaceae and the name is derived from the Greek words “Simeion”, meaning “stamping,” and “carpus”, meaning “nut,” reflecting its traditional use as a marking substance. The species epithet *anacardium* refers to its heart-shaped nut. The genus *Semecarpus* comprises approximately 87 species distributed across the Indian subcontinent and other tropical regions, with several species native to India (Ayate et al. 2025).

Semecarpus anacardium Linn., is one of the significant species, widely distributed in the sub-Himalayan region as well as the tropical and central parts of India. The nut is commonly known as the “marking nut” and, in the vernacular, as “Bhallataka” or “Bhilwa.” Due to its extensive therapeutic applications, it holds a high priority in the indigenous systems of medicine (Semalty et al. 2010).

The nuts of *Semecarpus anacardium* contain a wide range of biologically active compounds, including biflavonoids, phenolic compounds, bilawanol, minerals, vitamins and amino acids. These phytoconstituents contribute to its diverse medicinal properties. Extracts from the fruit and nut have demonstrated multiple pharmacological activities such as antiatherogenic, anti-inflammatory, antioxidant, antimicrobial, anti-reproductive, central nervous system stimulant, hypoglycemic, anticarcinogenic and hair growth-promoting effects (Ayate et al. 2025).

According to Ayurveda, *S. anacardium* is widely known as Bhallataka and has been used since ancient times as a household remedy for various diseases throughout India. The nuts are primarily used for oil extraction. Traditionally, this oil has been applied to mark clothes for identification purposes, which is why the plant is commonly known as the marking nut or dhobi nut. Beyond its medicinal uses, the oil has also been employed in waterproofing timber and in paint formulations, demonstrating its versatile traditional and practical significance (Solankar et al. 2018).

This comprehensive understanding highlights the plant as one of the significant therapeutic potential species and systematic scientific investigation to bridge the gap between traditional knowledge and evidence-based medicine. The present study highlights pharmacological activities and traditional medicinal uses.

MORPHOLOGY

S. anacardium is a medium to large deciduous tree belonging to the family Anacardiaceae. It usually grows to a height of about 15-25 meters and is commonly found in dry deciduous forests and tropical regions of India (Mishra and Tiwari et al. 2017; Prabhakar et al. 2022; Figure 1).

Stem and Bark: The stem is woody, erect and much-branched, forming a wide canopy. The bark is generally grey to dark brown and rough.

Leaves: The leaves are simple, alternate, exstipulate and very large, measuring about 30-60 cm long and 12-30 cm broad. They are obovate oblong in shape, with a rounded apex and entire margin. The upper surface is smooth and glabrous, while the lower surface is slightly pubescent. The texture is coriaceous or leathery and the venation is reticulate with prominent lateral veins.

Inflorescence: The inflorescence is usually a terminal or axillary panicle. It bears numerous small flowers arranged in branched clusters. The panicles are often pubescent and appear along with the new leaves, mainly during May and June.

Flowers: The flowers are small, greenish-white and mildly fragrant. They are generally polygamous, with both bisexual and male flowers present. Each flower has a small calyx, five petals, five stamens and a superior ovary. The flowers are arranged closely on the panicle branches.

Fruit: The fruit is a drupe, which is ovoid to oblong, smooth, compressed and shining black when ripe. It is about 2.5-3.8 cm long and is seated on a swollen orange-red fleshy receptacle, giving it a very distinctive appearance. This accessory fleshy part resembles a pseudo-fruit. It contains a single seed enclosed within the hard black pericarp.

MEDICINAL USES

Fruit: The ripe orange-red accessory fruit is sometimes used as a food item after proper processing. In traditional medicine, fruit preparations are used in bronchitis, asthma, dysentery, fever, hemorrhoids and rheumatic pain (Semalty et al. 2010).

Nut / Seed: The seed (nut) is the most important medicinal part in Ayurveda. After detoxification (Shodhana), it is used for skin diseases, arthritis, tumours, chronic rheumatism, intestinal worms, constipation, diabetes, dysmenorrhea,

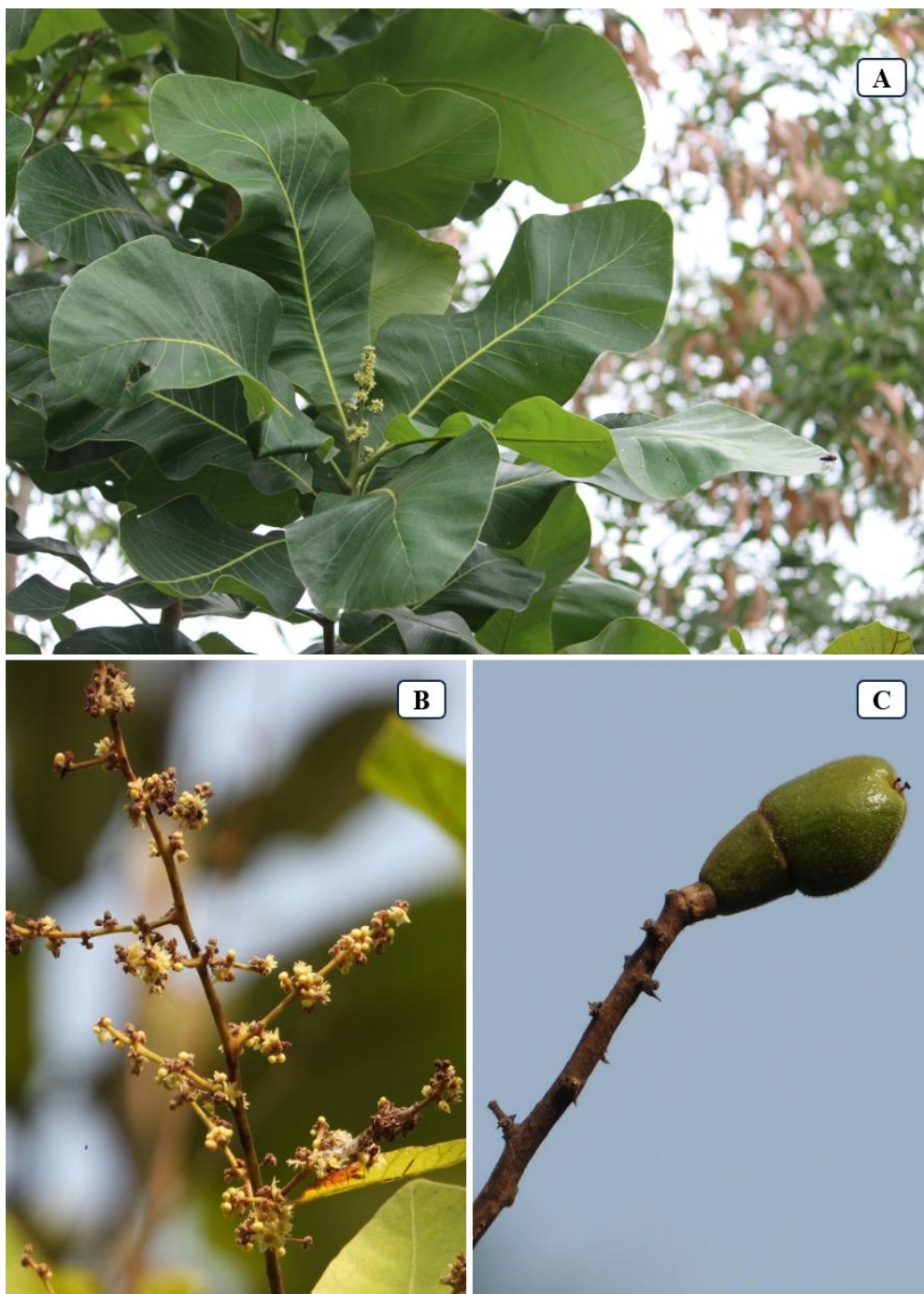


Figure 1: Vegetative parts of *S. anacardium*; A) Leaves with flowers, B) Flowers, C) Fruit

oligomenorrhea and as a rasayana. It is also used as a brain tonic, blood purifier, aphrodisiac and hematinic tonic (Jain and Sharma 2013).

Seed oil: The oil extracted from the seed is used both internally in minute doses and externally. It is highly useful in wound healing, chronic ulcers, glandular swelling, filariasis, abscess drainage, pus formation prevention, rheumatic pain and skin disorders. It is often medicated with garlic, onion, ajwain or sesame oil for better therapeutic action (Mishra et al. 2025).

Bark: The bark exudes an irritant secretion and is traditionally used in snake bite, scorpion sting and some external medicinal applications. In folk medicine, bark preparations are also used for pain relief and skin-related conditions, though it is less commonly used than the seed (Deepa et al. 2024).

Leaves: Leaves are occasionally used in traditional remedies, mainly in poisonous bites, inflammatory conditions and external applications. Some folk medicinal systems also mention leaf use in skin disorders and wound-related conditions (Semalty et al. 2010).

Gum / Latex: The gum or latex obtained from the plant is used externally in headache, scabies, skin diseases, chronic pain and local inflammatory swellings. It also has industrial use as marking ink, dye and protective coating material (Deepa et al. 2024).

Pericarp / Fruit wall: The pericarp contains strong, active irritant compounds and is used only after purification. Traditionally, it is included in preparations for Kapha disorders, piles, dyspepsia, wounds and urinary reduction therapy (Mishra et al. 2025).

PHARMACOLOGICAL POTENTIAL

S. anacardium possesses a wide spectrum of pharmacological activities due to the presence of diverse bioactive constituents such as biflavonoids, bharilawanol, phenolic compounds, flavonoids, vitamins, minerals and amino acids. These phytochemicals are responsible for its significant therapeutic effects reported in both traditional medicine and modern pharmacological studies.

Antioxidant and antiatherogenic activity

One of its most extensively studied properties is its antioxidant and antiatherogenic activity. The extracts have shown the ability to scavenge free radicals such as superoxide and hydroxyl radicals, thereby reducing oxidative

stress and inhibiting lipid peroxidation, which plays a crucial role in the prevention of atherosclerosis. Additionally, it has been reported to reduce serum lipid levels by inhibiting intestinal cholesterol absorption and enhancing peripheral lipid metabolism (Sahoo et al. 2008; Semalty et al. 2010).

Anti-inflammatory and analgesic activity

The plant also exhibits potent anti-inflammatory and analgesic effects, making it valuable in the management of inflammatory disorders such as arthritis and chronic pain conditions. Experimental studies have demonstrated significant inhibition of inflammatory mediators and a reduction in pain responses (Ramprasath et al. 2006).

Antidiabetic and hypoglycemic activity

Another important pharmacological property is its antidiabetic and hypoglycemic activity. Various extracts of *S. anacardium* have been found to lower blood glucose levels, improve glucose metabolism and enhance antioxidant defence mechanisms, suggesting its therapeutic potential in diabetes management (Arul et al. 2004).

Anticancer activity

Recent studies have also highlighted its anticancer and chemoprotective potential. The fruit and nut extracts, along with isolated phytoconstituents, have shown cytotoxic effects against various cancer cell lines and have demonstrated the ability to suppress inflammatory markers involved in tumour progression. These findings indicate its promise as a potential source for novel anticancer agents (Semalty et al. 2010).

Antimicrobial activity

S. anacardium exhibits broad-spectrum antimicrobial activity against several clinically important microorganisms. Studies have reported that different extracts of the nut, leaves, twigs and fruits are active against both Gram-positive and Gram-negative bacteria, including *Staphylococcus aureus*, *Bacillus licheniformis*, *Bacillus cereus*, *Corynebacterium diphtheriae*, *Escherichia coli*, *Salmonella typhi*, *Proteus vulgaris*, *Shigella flexneri*, *Vibrio cholerae*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. The antibacterial effect has been attributed to bioactive constituents such as phenolic compounds, biflavonoids and acyclic isoprenoids isolated from the

seeds. These findings validate its traditional use in the treatment of infectious diseases and suggest its potential as a natural source for the development of novel antimicrobial agents (Mohanta et al. 2007).

Neuroprotective activity

The plant also possesses CNS stimulant and neuroprotective effects, including acetylcholinesterase inhibitory activity, which may be beneficial in neurodegenerative disorders (Semalty et al. 2010).

CONCLUSION

S. anacardium is a highly valuable medicinal plant with remarkable significance in both traditional Ayurvedic medicine and modern pharmacological research. Its rich phytochemical profile, consisting of biflavonoids, phenolic compounds, bharbicanols, vitamins, minerals and amino acids, contributes to its wide range of therapeutic properties. Scientific studies have demonstrated diverse pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, antiatherogenic, antidiabetic, neuroprotective and anticancer activity, which strongly support its traditional use in the management of various diseases. Despite its immense therapeutic potential, the plant still requires extensive clinical validation, standardisation of active constituents, dosage optimisation and long-term safety evaluation because the crude nut oil is known to possess irritant and toxic properties if not properly processed. Therefore, future research should focus on isolating bioactive principles, elucidating precise mechanisms of action and developing safe evidence-based formulations.

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