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**Ethnomedicinal and pharmacological uses
of *Solanum erianthum*: a medicinal tree**

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ABSTRACT

Solanum erianthum D.Don is an important medicinal shrub of the family Solanaceae, widely distributed in tropical and subtropical regions. The plant has long been used in traditional medicine systems for the treatment of headache, hemorrhoids, dysentery, fever, body pain, inflammatory swellings, leprosy, sexually transmitted diseases and malaria. Different plant parts, especially the leaves, roots, root bark and fruits, are used in the form of decoctions, poultices and topical applications. Modern pharmacological studies support many of these traditional claims and reveal that the plant possesses significant antioxidant, antimicrobial, analgesic, anti-inflammatory, enzyme inhibitory, antidiabetic and anti-tyrosinase activities. These biological effects are mainly attributed to the presence of steroidal alkaloids, saponins, flavonoids, phenolics and glycoalkaloids, including solasodine-related compounds. Recent studies further indicate that methanolic extracts, particularly of the fruits, show strong antimicrobial and analgesic effects, suggesting promising pharmaceutical potential. Thus, *S. erianthum* represents a valuable source of bioactive compounds with both ethnomedicinal relevance and modern therapeutic importance.

Keywords: Medicinal tree, pharmacology, Solanaceae, *Solanum*, traditional uses

INTRODUCTION

The family Solanaceae is one of the largest families among angiosperms, comprising approximately 90 genera and nearly 1,700 species distributed widely across the temperate and tropical regions of the world (Xavier et al. 2013). Members of this family are predominantly herbs, shrubs, climbers, or scrambling plants and several species are of great medicinal as well as toxicological importance. Among the genera of this family, *Solanum* L. is one of the most diverse and economically significant, containing nearly 1,500 species worldwide, of which 48 species have been reported from India (Mujaffar et al. 2020).

Among these species, *Solanum erianthum* D. Don, commonly known as velvet nightshade, potato tree, mullein nightshade or Salvadoran nightshade, is an important medicinal small tree characterised by its dense stellate tomentose indumentum (Xavier et al. 2013; Uzoekwe et al. 2021). The species is native to the northern regions of South America and the southern parts of the United States, but it is now widely distributed throughout tropical Asia, Oceania, Africa and other tropical nations (Chen et al. 2013). It is a fast-growing evergreen shrub or small tree, attaining a height of 4-10 m, with stems reaching up to 20 cm in diameter and commonly occurs from sea level to elevations of 1,500 m. The plant thrives in diverse habitats such as riparian zones, dry and moist forests, roadsides, fields, disturbed lands and waste places, where it may sometimes be considered a weed (Babalola et al. 2016).

Solanum erianthum has long been recognised in traditional medicine systems across various cultures. In Nigeria, the leaves are used in the treatment of cancer and malaria, while in Taiwan, the leaves serve as a maternal tonic and are used for lumbar neuralgia (Ajasa et al. 2004; Chen et al. 2013). The stems and roots are traditionally employed for treating rheumatism, colds, stomachache, abdominal pain, fractures, bruises and chronic granulocytic leukaemia (Xavier et al. 2013). In West Africa, leaf extracts are valued for their diuretic and laxative properties and are also used in the management of leprosy, malaria, communicable diseases and liver disorders (Modise and Mogotsi 2008). Similarly, in the Oaxaca region of Mexico, the plant is used orally as a pain reliever for stomach aches and as an antimicrobial agent. In Indonesia, *S. erianthum* has been regarded as an important herbal medicine for centuries (Villa-Ruano et al. 2013).

The medicinal significance of *Solanum erianthum* is largely attributed to its rich phytochemical composition, particularly the presence of flavonoids, polyphenols and other antioxidant compounds (Chen et al. 2013). These bioactive constituents are believed to contribute to its antioxidant, anti-inflammatory, analgesic, antimicrobial and therapeutic properties, making it a potential natural source for the prevention and management of oxidative stress-related disorders. Previous studies have also reported that the ethanolic extract of the plant exhibits significant anti-inflammatory and analgesic effects (Xavier et al. 2013). Despite its widespread ethnomedicinal use across the world, comprehensive scientific investigations on its phytochemical profile and health-promoting potential remain limited, highlighting the need for further systematic research.

MORPHOLOGY

S. erianthum is a small tree that usually grows 2-8 m tall. It develops a flat-topped, spreading crown, giving it a broad appearance in open habitats. The trunk may reach up to 25 cm in diameter, while the bark on older stems is generally grey to brown and smooth (Babalola et al. 2016; Mujaffar et al. 2020; Kumar et al. 2022; Figure 1).

Stem: The stem is woody, much-branched and supports a dichasial branching pattern. Younger stems are densely hairy with sessile and short-stalked stellate trichomes, whereas mature stems become smoother. The branches are often brittle but sufficiently strong to support the broad canopy.

Leaves: The leaves are simple, alternate and ovate to ovate-elliptic, usually measuring 10-25 cm long and 3-15 cm wide. They are typically 1.5-3 times longer than broad, with an entire margin, rounded to acute base and acute to acuminate apex. The upper surface is softly velvety or finely roughened, while the lower surface is densely whitish-tomentose, a highly distinctive feature of the species. The leaves show 9-13 pairs of primary veins and the petiole is 1-10 cm long, densely granular-tomentose.

Inflorescence: The inflorescence is pseudo-terminal and highly branched, usually 5-20 cm long, bearing approximately 70-110 flowers. It is densely covered with granular tomentum similar to the young stems. The peduncle is long and branched, while the rachis remains short. Pedicels are 2-6 mm long, articulated at the base and densely tomentose. The flower buds are turbinoid and enclosed by the tomentose calyx before anthesis, which is another characteristic feature of the species.

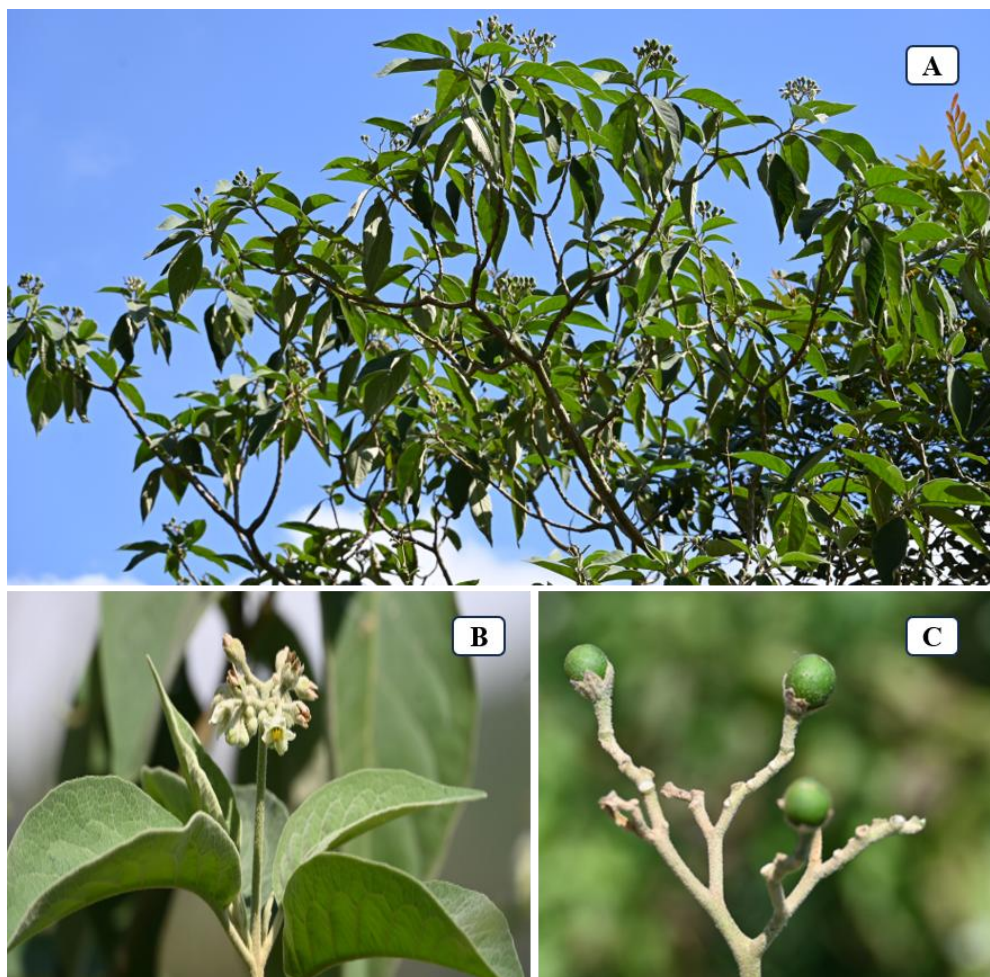


Figure 1: vegetative parts of *S. erianthum*, A) Canopy, B) Flowers, C) Fruits

Flowers: The flowers are bisexual, actinomorphic and 5-merous, with a white stellate corolla measuring 1.1-1.8 cm in diameter. The corolla is deeply lobed, with ovate-lanceolate lobes densely hairy on the outer surface. The calyx is subcampanulate and tomentose, lobed to about half its length. Stamens are equal and connivent, with yellow ellipsoid anthers 2.3-3.4 mm long, opening by apical pores, which is typical of *Solanum*. The ovary is semi-spherical and tomentose, while the style is slender, cylindrical and slightly exserted beyond the stamens.

Fruit: The fruit is a fleshy, globose berry, usually 0.9-1.8 cm in diameter. It turns bright yellow when ripe and retains a persistent tomentose covering, especially in earlier stages. The fruiting calyx enlarges and partially surrounds

the berry, but does not completely enclose it. Fruiting pedicels are erect and slightly elongated. The yellow berry standing above the foliage is a striking field character.

Seeds: The seeds are numerous, flattened, lenticular to deltoid and measure about 1.4-2 mm long. They are yellowish tan in colour with a reticulate-punctate surface texture. The large number of seeds within each berry contributes to the species' efficient dispersal and invasive tendency in disturbed habitats.

MEDICINAL USES

S. erianthum is widely used in traditional medicine across Tropical Asia, Africa, the Caribbean and parts of Latin America. Different plant parts, such as leaves, roots, root bark and occasionally fruits, are employed in indigenous healing systems for treating a broad range of ailments. The ethnomedicinal importance of the species is mainly attributed to its steroidal alkaloids and saponins, especially solasodine and tomatidine, which are known for their pharmacological significance (Kaunda and Zhang 2019; Kumar et al. 2022).

Leaves: The leaves are the most commonly used medicinal part. In Nigeria, it is used in the treatment of cancer and malaria, while in Taiwan, the leaves serve as a maternal tonic and are used for lumbar neuralgia (Ajasa et al. 2004). Crushed fresh leaves are applied externally as a poultice for haemorrhoids, piles and scrofula, while heated leaves are placed on the forehead to relieve headache and pain. A decoction of the leaves is also used in the treatment of vertigo and in some folk traditions, the leaves are used to induce abortion, indicating their strong bioactive nature (Bhargavi et al. 2013; Kumar et al. 2022).

Roots and root bark: The roots and root bark are valued in several ethnomedical systems. A root decoction is traditionally administered for dysentery, diarrhoea, fever, digestive disorders and severe body pain. In many African healing traditions, the root bark is specifically used as an anti-inflammatory remedy and is given for arthritis and painful swellings. These uses suggest the significance of the plant in the treatment of inflammatory and gastrointestinal disorders (Alawode et al. 2018).

In West African traditional medicine, leaf decoctions of *S. erianthum* are used for leprosy, sexually transmitted diseases and malaria. These remedies are often administered orally because of their believed laxative and diuretic

effects, which are thought to cleanse the body. Some ethnopharmacological reviews also mention its use in anti-hepatitis B formulations and anti-tumour folk remedies, reflecting the broader medicinal reputation of the species (Ajasa et al. 2004).

Beyond direct folk use, *Solanum erianthum* has substantial ethnopharmaceutical value because its steroidal alkaloids serve as precursors for the synthesis of steroid drugs in the pharmaceutical industry. The presence of solasodine-rich berries and leaves has made the plant important in traditional knowledge systems that overlap with modern medicinal chemistry.

PHARMACOLOGICAL POTENTIAL

Antioxidant activity: *Solanum erianthum* exhibits strong antioxidant activity due to its rich content of phenolics, flavonoids and glycoalkaloids. Different solvent extracts of leaves, fruits and stem bark have shown significant free radical scavenging potential, reducing oxidative stress in experimental studies. Among the tested extracts, methanolic extracts often show the highest antioxidant effect, indicating that polar phytochemicals are largely responsible for this activity (Senizza et al. 2021).

Antimicrobial activity: Extracts of *S. erianthum* demonstrate broad-spectrum antimicrobial activity against several bacterial and fungal pathogens. Experimental studies reported inhibitory effects against Gram-positive and Gram-negative bacteria, as well as medically important fungi. This activity is mainly linked to the presence of alkaloids, saponins, tannins and phenolic compounds, which interfere with microbial cell walls and enzyme systems. The methanolic fruit extract has been reported to show especially high antimicrobial efficacy (Ajaib et al. 2024).

Analgesic activity: The plant also possesses analgesic activity. Recent pharmacological investigations using plant-part extracts showed that the fruit methanol extract produced the highest writhing inhibition in pain models, confirming its significant peripheral analgesic effect. This supports its traditional use in relieving body pain, headache and inflammatory discomfort (Ajaib et al. 2024).

Enzyme inhibitory and antidiabetic potential: Studies have shown that *S. erianthum* extracts inhibit important enzymes such as α -amylase and α -glucosidase, suggesting potential antidiabetic activity by slowing carbohydrate digestion and glucose absorption. In addition, inhibition of

acetylcholinesterase (AChE) and butyrylcholinesterase indicates possible neuropharmacological applications, especially in disorders involving neurotransmitter imbalance (Senizza et al. 2021).

Anti-tyrosinase activity: The plant has shown tyrosinase inhibitory activity, which may be useful in controlling hyperpigmentation disorders and cosmetic skin applications. Tyrosinase inhibition also suggests a possible role in reducing melanin overproduction and oxidative browning processes. This activity correlates strongly with its phenolic-rich stem bark and leaf extracts (Senizza et al. 2021).

Anti-inflammatory potential: Although direct species-specific reports are fewer than for other *Solanum* species, the presence of steroidal alkaloids and phenolic metabolites suggests marked anti-inflammatory potential. These compounds are known to suppress inflammatory mediators, stabilize membranes and reduce tissue swelling, supporting the plant's traditional use in painful swellings and inflammatory conditions (Kaunda and Zhang 2019).

CONCLUSION

Solanum erianthum is a pharmacologically promising medicinal plant with a long history of ethnomedicinal use. Traditional applications of the plant in treating infectious diseases, pain, inflammation, digestive disorders and skin-related ailments are increasingly supported by experimental pharmacological evidence. The diverse biological activities observed in leaf, fruit and root extracts confirm its therapeutic significance and highlight the role of its steroidal alkaloids, flavonoids and phenolic constituents as major active principles. Among various extracts, methanol extracts have demonstrated superior antioxidant, antimicrobial and analgesic activities, especially from the fruits. Despite these encouraging findings, most available studies are limited to in vitro and animal models and further research is needed to isolate specific active compounds, determine mechanisms of action, evaluate toxicity and establish clinical efficacy in humans. *S. erianthum* holds considerable potential for future drug discovery, phytopharmaceutical development and evidence-based herbal medicine.

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