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Review

Unlocking the Potential of *Strychnos potatorum*: A Review of its Pharmacognostical, Phytochemical and Pharmacological Properties

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	<p>Abstract</p>
<p>Published on: 18 Sep 2025</p>	<p><i>Strychnos potatorum</i> Linn. f., commonly known as the “clearing nut tree,” is a medicinally important plant belonging to the family Loganiaceae. It has been widely used in traditional medicine systems such as Ayurveda, Siddha, and Unani for treating various ailments, including diabetes, diarrhea, liver disorders, eye diseases, urinary complications, and inflammatory conditions. The seeds, roots, bark, fruits, and leaves are rich in diverse secondary metabolites such as alkaloids, flavonoids, glycosides, phenolics, saponins, and sterols, which contribute to its broad spectrum of pharmacological activities. Numerous studies have reported anti-diabetic, anti-inflammatory, hepatoprotective, anti-ulcer, antidiarrheal, antioxidant, antipyretic, and antiarthritic properties. Additionally, its seeds are traditionally used as natural coagulants in water purification, highlighting its environmental relevance. Despite extensive ethnomedicinal usage and promising experimental evidence, further research is required to establish its safety profile, isolate bioactive compounds, and validate its therapeutic potential through clinical studies. This review consolidates the pharmacognostical features, phytochemical composition, and pharmacological properties of <i>S. potatorum</i>, providing a comprehensive outlook on its medicinal significance and future prospects in drug development.</p>
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<p>2025 All rights reserved.</p>  <p>Creative Commons Attribution 4.0 International License.</p>	<p>Keywords: <i>Strychnos potatorum</i>, clearing nut tree, phytochemicals, pharmacognosy, pharmacological activities, traditional medicine, water purification, natural therapeutics.</p>

INTRODUCTION

Strychnos potatorum (S. Potatorum) A deciduous, medicinal tree species, Linn.F. is a member of the Loganiaceae family. It is the only species of *Strychnos* that is native to both Asia and Africa. Medicinal plants have been an integral part of healthcare systems since ancient times, and they continue to serve as a major source

of bioactive compounds with therapeutic potential. *Strychnos potatorum* Linn. f., a deciduous tree belonging to the family Loganiaceae, holds a prominent place in traditional medicine due to its diverse applications. It is the only species of *Strychnos* that is native to both Asia and Africa and is commonly distributed across India, Sri Lanka, and Myanmar. Known as “Akkolam” in Tamil and “clearing nut tree” in English, it has been extensively used in Ayurveda, Siddha, and Unani systems for the treatment of diabetes, liver disorders, urinary problems, diarrhea, eye diseases, and respiratory ailments. The seeds are particularly valued for their dual role in medicine and environmental health, serving as both therapeutic agents and natural coagulants for water purification. Modern phytochemical studies have identified alkaloids such as diaboline, along with flavonoids, glycosides, sterols, saponins, and tannins, which contribute to its wide spectrum of pharmacological activities. This review aims to consolidate the pharmacognostical characteristics, phytochemistry, and pharmacological findings of *S. potatorum*, thereby bridging traditional knowledge with modern scientific validation.

Taxonomical classification

Domain : Eukaryote
 Kingdom: Plantae
 Subkingdom : Viridiaeplantae
 Phylum: Tracheophyta
 Subphylum: Euphyllophytina
 Infraphylum : Radiastropes
 Botanical Name : *Strychnos potatorum* Linn
 Class: Magnoliopsida (also known as Dicotyledonae or Eudicots)
 Subclass : Lamidae
 Order: Gentianales
 Superorder : Gentiananae
 Family: Loganiaceae
 Genus: *Strychnos*
 Species: *Strychnos potatorum*

Synonyms:

Strychnos heterodexa Gilg.
Strychnos monosperma Stokes.
Strychnos stuhmanii Gilg.
Strychnos tetenkotta Retz.

Common names

Tamil : Akkolam, Ilalam, Kadali, Sillam, Tetta, Tettankottai, Teru
 English : Clearing nut tree
 Kannada : Nimali beeja
 Telugu: Andugu, Indugu, Indupu, Kattakamu, Shilla
 Hindi : Neimal, Nelmal, Nirmali
 Punjab : Nirmali
 Malayalam : Kattakam, Tetta, Tettamparal, Tettamparalkaniram
 Bombay : Gajrah, Nirmali
 Santal : Kuchala
 Urdu : Nirmali ^[1]

GEOGRAPHICAL DISTRIBUTION

Tamil Nadu : All districts of Tamil Nadu
 Andhra Pradesh : All districts of Andhra Pradesh
 Kerala : Kozhikode district, Palakkad district, Idukki district
 Odisha : Ganjam district, Mayurbhanj district, Puri district, Angul district, Cuttack district, Sambalpur district, Kalhandi district
Native : India

World distribution : India, Srilanka, Myanmar, Burm

ETHNOMEDICINAL USES

In Ayurveda, seeds are recognized for their intense properties and possess characteristics that can neutralize toxins and dissolve stones, aiding in conditions like strangury, urinary problems, and disorders related to the head. Additionally, they support the digestive system, promote relaxation, serve as an emetic, and help treat diabetes, diarrhea, and gonorrhoea, while also being beneficial for eye-related issues. Roots are utilized to treat

leucoderma, while fruits are advantageous in addressing problems linked to the eyes, thirst, poisoning, and hallucinations. The fruits also act as an emetic and promote sweating while having toxin-counteracting properties. In the Unani medical system, seeds are noted for their bitter and astringent effects on the intestines, serving as an aphrodisiac, tonic, and diuretic, while also aiding in liver and kidney ailments, including gonorrhoea. Both powdered seeds and the aqueous extract of *Strychnos potatorum* have been identified as protective for the liver and demonstrating antioxidant properties against acute liver injury. The methanol extract from the seeds has exhibited marked diuretic effects with indications of increased sodium, chloride, and potassium levels.[2,3]

Eye conditions

The plant is beneficial in managing a variety of eye ailments, such as cataracts, diabetic retinopathy, dry eye syndrome, and chalazion (stye). [4]

Respiratory conditions

In the Siddha medicinal system, the seeds and fruits of *Strychnos potatorum* are employed to address specific respiratory issues like asthma, chronic obstructive pulmonary disease (COPD), and bronchitis.[5]

NUMERICAL TAXONOMY

The *Strychnos* genus of flowering plants, from the family loganiaceae includes about 200 species most commonly found widespread species distributed around the world tropic regions. The following four different species of *Strychnos* was selected for numerical taxonomy

- *Strychnos potatorum*
- *Strychnos minor*
- *Strychnos nux-vomica*
- *Strychnos wallichiana*

CHART OF SIMILARITY

Parameters	<i>Strychnos potatorum</i>	<i>Strychnos minor</i>	<i>Strychnos nux-vomica</i>	<i>Strychnos wallichiana</i>
Leaf arrangement	Typically ovate in shape with an Acuminate mucronate apex and truncate round base	Arranged in opposite pattern along the stem	Grow in pairs directly across from each other on the stem	Opposite and elliptic lanceolate to oblong lanceolate in shape
Leaflet margin	Entire	Entire	Entire	The leaflets are smooth and without teeth or lobes
Leaflet venation	The leaves of strychnos have spurious 3-0 or 5 Nerved ventation	Three veined structure at the base with numerous lateral veins forming a ladder line pattern	<i>Strychnos nux-vomica</i> have 3-5 prominent basal veins that extend from the base of the leaf blade	<i>Strychnos wallichiana</i> is 3-7 prominent veins visible
Leaflet shape	The typically ovate or elliptic	The leaflets of strychnos minor as elliptic	The leaflets of strychnos nux-vomica are ovate	The leaflets of strychnos are elliptic
Leaflet size	6-17 cm long 3-7.5cm wide	6.5 to 17cm in length and 2 to 8cm in width	6-2cm long 6-10cm broad	5-17cm long 3-5cm wide
Leaflet apex	Acuminate mucronate	The leaf Tapers to a pointed tip	Typically obtuse or shortly acuminate	The tip of the leaf tapers to a sharp point
Leaf base	Truncate -rounded or cuneate-rounded	Typically obtuse to broadly round	Euneate or attenuate	Cuneate
Petiole	Very short or partially absent	Typically 3-10cm globrous	The stalk that attaches leaf to the stem of plant	Typically 5-7mm long

Leaf texture	Tiny and textured	The leaves are described as papery ,thin and fixable	Simple, opposite and coriaceous	elli,leathery and oppositely arranged
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Chart of similarity

Parameters	<i>Strychnos potatorum</i>	<i>Strychnos minor</i>	<i>Strychnos nux-vomica</i>	<i>Strychnos wallichiana</i>
Leaf arrangement	1	0	0	0
Leaflet margin	1	1	1	0
Leaflet venation	1	0	1	1
Leaflet shape	1	1	1	1
Leaflet size	1	0	0	0
Leaflet apex	1	0	1	0
Leaf base	1	0	0	0
Petiole	1	0	0	0
Leaf texture	1	0	0	0

CHART OF DISSIMILARITY

species	<i>Strychnos potatorum</i>	<i>Strychnos minor</i>	<i>Strychnos nux-vomica</i>	<i>nux-</i>	<i>Strychnos Wallichiana</i>
<i>Strychnos potatorum</i>	1	0.22	0.44		0.22
<i>Strychnos minor</i>	0.22	1	0.44		0.22
<i>Strychnos nux-vomica</i>	0.44	0.22	1		0.22
<i>Strychnos Wallichiana</i>	0.22	0.22	0.44		1

Morphology of *Strychnos potatorum*

S.no	Parts and its Diagram	Morphological features	Uses
1.	<p>LEAF</p> 	Typically ovate in shape with an acuminate mucronate apex and truncate round base	They are traditionally used to treat conditions like Gastropathy, bronchitis,ulcer and their antimicrobial, antidiabetic properties
2.	<p>SEEDS</p> 	It fruit is a berry and the seeds are , roughly spherical or ovoid ,glossy ,and have an obscure circular ridge around their edge	Traditional medicine and water purification

3.	FRUITS		<p>The strychnos potatorum fruit is a globose to spherical berry, usually 1-2.5cm in diameter, that is dark blue to black when ripe and has a thin hard pericarp</p>	<p>Fruits are traditionally used for eye diseases, thirst, and poisoning</p>
4.	BARK		<p>Bark is 1-1.2cm thick, brownish-black, rough, corky with deep and narrow vertical cracks; blaze creamy yellow.</p>	<p>Barks are used in traditional medicine for its anti-inflammatory, anti-diabetic, anti-microbial, and anti-arrhythmic properties.</p>
5.	STEM		<p>The Stem is characterized by its fluted and flaking nature, covered in black, thick, square to rectangular scales.</p>	<p>Stems are used in head diseases, strangury, and urinary discharges.</p>

Phytochemical review

Phytochemicals of *Strychnos potatorum*

Phytochemical Class	Compound(s) Identified	Plant Part	Reported Role
Alkaloids	Diaboline, Brucine, Strychnine (trace)	Seeds, Bark	CNS activity, anti-inflammatory, analgesic
Flavonoids	Flavone glycosides, Quercetin derivatives	Seeds, Leaves	Antioxidant, hepatoprotective
Phenolic Compounds	Tannins, Ellagic acid	Seeds, Fruits	Antidiarrheal, antimicrobial
Sterols	β-sitosterol, Stigmasterol	Seeds, Bark	Anti-inflammatory, hypocholesterolemic
Glycosides	Iridoid glycosides, Phenolic glycosides	Seeds, Roots	Anti-diabetic, hepatoprotective
Saponins	Triterpenoid saponins	Seeds	Antioxidant, immunomodulatory
Fixed Oils	Fatty acids (oleic, linoleic, palmitic)	Seeds	Nutritional, hepatoprotective
Other Constituents	Proteins, Carbohydrates, Minerals (Mg, Ca, K)	Seeds	Nutritional support, water purification

Phytochemical analyses indicated the presence of diaboline (the primary alkaloid) along with its acetate, brucine, loganin, mannose, sucrose, arachidonic acid, lignoceric acid, linoleic acid, oleic acid, palmitic acid, and stearic acid. Following the saponification of the oil, compounds such as β -sitosterol, stigmasterol (which are also found in the leaves and bark alongside campesterol), oleanolic acid and its 3 β acetate, saponins containing oleanic acid, galactose, and mannose (from the seeds), as well as triterpenes and sterols, were identified. The healing properties of medicinal plants are likely attributed to a variety of secondary metabolites, including alkaloids, flavonoids, glycosides, phenols, saponins, and sterols. Successive extracts from the root, stem bark, and seeds of *Strychnos potatorum* have shown the presence of alkaloids, flavonoids, glycosides, lignins, phenols, saponins, sterols, and tannins. Lignan glycosides, such as vanprukoside, strychnoside, and glucopyranoside, isolated from *Strychnos vanprukii*, have demonstrated notable antioxidant properties. Among the five categories of phytochemicals extracted from the root, stem bark, and seeds of *Strychnos potatorum*, tannins proved to be the most prevalent, followed by saponins and alkaloids, while phenols and flavonoids were present in lower concentrations. Twenty types of quenching and fluorescing alkaloids have been identified from various parts of the plant, with a higher concentration of alkaloids found in the root and stem bark. However, the interconversion of these compounds into other derivatives may occur due to prolonged storage and processing methods applied to market seeds. The most prevalent alkaloid, diaboline, was detected in all samples of *Strychnos potatorum* and confirmed by comparison with an authentic sample.

Three flavonoids were identified in the root. Seed samples collected from the market exhibited various colors and Rf values. In the stem bark, four alkaloids were detected. Flavonoids are types of phenolic compounds and represent the largest category of phenols. These compounds generally consist of a C6-C3 unit connected to an aromatic ring. Three glycosides with comparable colors and Rf values were identified in both the root and stem bark, while four glycosides were noted in both seed samples. The highest concentration of phenols was found in the market seed. Additionally, five phenolic compounds displaying similar colors and Rf values (6.67, 16.67, 44.0, 58.67, and 90.0) were discovered in both the root and stem bark. Furthermore, it's been noted that five alkaloids were consistently present in the root, stem bark, and collected seed. Plants possess an unlimited capacity to generate phenols or their derivatives. The presence of phenolic compounds in all tissue types is a distinctive characteristic of plants. The thin layer chromatography analysis of saponins from *Strychnos potatorum* has indicated the existence of five yellow to intensely yellow saponins in all plant parts. Saponins are glycosides derived from both triterpenes and sterols, typically containing five sugar units alongside a gluconic component. The occurrence of saponins has been documented in more than 70 families of higher plants. Thin-layer chromatography results for sterols in *Strychnos potatorum* revealed four sterols in the stem bark and seeds. Conversely, three sterols—potentially isomitol, sitosterol, stigmasterol, or campesterol—were detected in the root. The high-performance liquid chromatogram (HPLC) exhibited 61 peaks, with 18 notable peaks demonstrating significant area and height (>0.5%). The most prominent peak, likely diaboline, is recognized as the principal alkaloid in this plant as noted in previous reports. The total alkaloid fraction extracted from the seeds of *Strychnos potatorum*, when administered to mice and rats at doses between 70-100 mg/kg via intraperitoneal injection (i.p.), resulted in symptoms such as restlessness, irritability, and tremors followed by tonic convulsions throughout the body, alongside a hypotensive effect. The methanolic extract of dried seeds exhibited diuretic and antidiarrheal properties. Furthermore, the seed powder (SPP) demonstrated antidiabetic effects. Mannogalactans obtained from the seeds of *Strychnos potatorum* showed antihypercholesterolemic activity in experimental rats.

Pharmacological Review

While numerous pharmacological investigations have been conducted based on the chemical compounds present, there remains potential for more exploration, investigation, and application. Key pharmacological findings are outlined below:

Pharmacological Activities of *Strychnos potatorum*

Pharmacological Activity	Extract/Compound Used	Experimental Model	Key Findings	Reference
Anti-diabetic	Ethanollic seed extract	Streptozotocin-induced diabetic rats	Significant reduction in blood glucose, improved lipid profile	Mary et al., 2003
Anti-inflammatory	Seed extract	Carrageenan-induced paw edema (rats)	Dose-dependent inhibition of inflammation	Ganapathy et al., 2011
Anti-ulcer	Seed extract	Pylorus ligation & ethanol-induced ulcer in rats	Reduced ulcer index, improved mucosal protection	Ganapathy et al., 2011

Hepatoprotective	Ethanollic seed extract	CCl4-induced liver injury (rats)	Decreased SGOT, SGPT, bilirubin; improved histology	Ganapathy et al., 2011
Antiarthritic	Seed extract	Freund's adjuvant-induced arthritis (rats)	Significant reduction in paw swelling	Ganapathy et al., 2011
Antinociceptive & Antipyretic	Ethanollic seed extract	Hot plate, tail flick, yeast-induced pyrexia	Analgesic and antipyretic effects comparable to standard drugs	Ganapathy et al., 2011
Antidiarrheal	Seed extract	Castor oil-induced diarrhea (rats)	Reduced frequency & severity of diarrhea	Reddy et al., 2012
Toxicological Studies	Ethanollic seed extract	Rats	Safe up to 2000 mg/kg (acute toxicity)	Sanmugapriya et al., 2006

Anti-diabetic properties

Strychnos potatorum exhibits anti-diabetic properties. In Wistar albino rats, diabetes was induced via intraperitoneal injection of alloxan at a dosage of 100 mg/kg of body weight. The animals were categorized into different groups: normal rats (control), alloxan-induced diabetic rats, diabetic rats treated with the extract, rats treated solely with the extract, and diabetic rats treated with the standard anti-diabetic medication tolbutamide. The animals were evaluated for various parameters, including body weight, blood glucose levels, total protein levels, cholesterol, and enzyme levels such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP), to assess the anti-diabetic effects of the plant. Alloxan-treated rats exhibited a 26% reduction in body weight and a 40% decrease in liver weight. Following extract treatment, blood glucose levels dropped by 53%, highlighting the anti-diabetic efficacy of the plant. Serum enzymes AST and ALT rose from 24 and 18 IU/l to 60 and 65 IU/l respectively, while ALP decreased from 14 IU/l to 5 IU/l. The total serum protein levels also increased to 5 mg/ml in animals treated with the extract. Furthermore, insulin levels rose to 61 µg/ml after 30 days of extract administration in comparison to the control group, which measured 51 µg/ml. The plant extract effectively lowered the initial cholesterol level from 219 µg/ml to 170 µg/ml. In the liver, AST, ALT, and ALP levels decreased to 160, 60, and 140 IU/l from 178, 79, and 156 IU/ml respectively.

Anti-inflammatory effect

The anti-inflammatory properties of SPP and SPE derived from Strychnos potatorum Linn. Seeds were assessed using carrageenin-induced hind paw edema and cotton pellet granuloma models. It was observed that both SPP and SPE effectively normalized the elevated levels of alkaline and acid phosphatases, along with lipid peroxides, indicating their ability to stabilize membranes and scavenge free radicals. Moreover, both SPP and SPE demonstrated a dose-dependent anti-inflammatory effect in both acute and subacute inflammatory models, with their efficacy being comparable to the standard drug diclofenac sodium.

Antiulcerogenic potential

The potential of Strychnos potatorum Linn seeds to prevent ulcers was investigated through an aspirin plus pyloric ligation (aspirin PL) gastric ulcer model. The SPP and SPE showed antiulcerogenic activity via both antisecretory and mucoprotective mechanisms. The mucoprotective effects of SPP and SPE are likely attributed to the presence of polysaccharides in the seeds. Their antiulcerogenic efficacy was evaluated against the standard antiulcer medication, ranitidine, and was further supported by histopathological examination of the gastric mucosa.

Hepatoprotective and antioxidant activity

The SPP and SPE from Strychnos potatorum seeds were found to have hepatoprotective and antioxidant effects in the context of CCl4-induced acute liver injury. The hepatoprotective benefits are realized through a decrease in serum marker enzymes such as serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT), as well as a reduction in alkaline phosphatase (ALP) and serum bilirubin levels. Additionally, the administration of SPP and SPE led to the normalization of both enzymatic and non-enzymatic antioxidant levels and a decrease in lipid peroxides. Histopathological analyses supported the hepatoprotective effect of SPP and SPE when compared with control groups treated with CCl4. The standard reference for this study was silymarin.

Antiarthritic activity

The impact of the seed extract (SPE) and the whole seed powder (SPP) of *Strychnos potatorum* Linn on paw swelling, body weight variations, and changes in hematological and biochemical parameters was assessed in rats with arthritic conditions induced by Freund's complete adjuvant (FCA). The study also examined the histopathology of the proximal interphalangeal joints and conducted radiological assessments of the hind limbs. Both the SPP and SPE at designated dosage levels demonstrated a reduction in paw swelling volume and significantly corrected hematological and biochemical abnormalities in FCA-induced arthritic rats during both the early and late stages of arthritis. Additionally, the histopathological and radiological examinations validated the antiarthritic properties of SPP and SPE [24].

Antinociceptive and antipyretic effect

The evaluation of the antinociceptive and antipyretic effects of SPP and SPE from *Strychnos potatorum* was carried out in albino mice and rats, respectively. Antinociceptive activity was assessed using both chemical-induced writhing and thermal models to provoke pain. It was observed that SPP and SPE of *Strychnos potatorum* exhibited antinociceptive effects in both models, indicating mechanisms of action that were both central and peripheral in nature regarding nociception suppression. The antipyretic effect was found to be dependent on the dosage [25].

Antidiarrheal activity

The antidiarrheal properties of the methanol extract from the dried seeds of *Strychnos potatorum* (MESP) were tested in rats using various diarrhea models, including castor oil-induced diarrhea, assessments of gastrointestinal motility, and evaluations of gastric enteropooling induced by prostaglandin (PG) E₂. MESP significantly decreased the frequency of bowel movements and lessened the moisture of fecal matter in cases of castor oil-induced diarrhea, lowered the transit of charcoal meal through the gastrointestinal system, and reduced PG E₂-induced enteropooling.

CONCLUSION AND FUTURE PROSPECTS

Strychnos potatorum Linn. f., widely recognized as the “clearing nut tree,” has been traditionally employed in the treatment of diverse ailments ranging from diabetes and diarrhea to liver disorders and inflammatory conditions. The plant possesses a rich phytochemical profile, including alkaloids, flavonoids, glycosides, saponins, sterols, and tannins, which contribute to its broad pharmacological activities such as anti-diabetic, hepatoprotective, anti-inflammatory, anti-ulcer, antidiarrheal, and antioxidant effects. Moreover, its seeds are valued not only for their medicinal benefits but also for their environmental utility in water purification, making *S. potatorum* a plant of both therapeutic and ecological importance.

Despite the wealth of ethnomedicinal knowledge and promising preclinical findings, research on *S. potatorum* is still at an early stage. Most studies are limited to animal models and in vitro assays, while comprehensive clinical trials are lacking. Additionally, there is a need for bioactivity-guided isolation of active constituents, standardization of extracts, and detailed toxicological evaluations to ensure safety. Future research should focus on exploring its potential in the development of novel phytopharmaceuticals and nutraceuticals, as well as investigating its synergistic effects with existing therapeutic agents.

In conclusion, *Strychnos potatorum* represents a valuable but underexplored medicinal plant. Bridging traditional wisdom with modern scientific validation will not only strengthen its therapeutic credibility but also pave the way for the discovery of safe, effective, and sustainable plant-based drugs.

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