



Review Article

## NIRMALI (*STRYCHNOS POTATORUM* LINN.) A PRECIOUS PLANT- A REVIEW

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### Article info

#### Article History:

Received: 21-11-2022

Revised: 16-12-2022

Accepted: 25-12-2022

#### KEYWORDS:

*Nirmali*, *Strychnos Potatorum*, Medicinal plant, Alexipharmic, lithotriptic, Hallucination.

### ABSTRACT

Ayurveda is one of the oldest health-care systems. The ancient Vedic literature contains scattered allusions to Ayurvedic remedies and other aspects of medicine and health. The vast majority of *Atharvavedic* knowledge is related to Ayurveda. One of Ayurveda's eight divisions, *Agad Tantra*, focuses on the identification of poisons, different poisons from the mineral, plant, and animal kingdoms, as well as artificial poisons made from toxic drugs and their treatment. *Nirmali* (*Strychnos potatorum* Linn) is one of a *Vishagna* (non-toxic) plant mentioned by *Acharya Charak* in 4<sup>th</sup> chapter of *Sutrasthana* in *Charak samhita*. *Nirmali* is a widely growing medium sized medicinal plant of *Loganiaceae* family. Seeds of *Nirmali* (*Katak*) have been used for the purification of water. This plant has contributed various pharmacological actions in the scientific field of Indian systems of medicine like *Nirmali* (*Strychnos potatorum*) seeds are alexipharmic, lithotriptic and cures strangury, head diseases etc., Roots of *Nirmali* cure leukoderma whereas fruits are useful in eye diseases, thirst, poisoning, and hallucinations. The fruits are emetic, diaphoretic, alexiteric etc. It contains a variety of phytochemical constituents such as alkaloids, flavonoids, glycosides, lignins, phenols, saponins, sterols, and tannins. This review article of *Nirmali* (*Katak*) plant is going to provide brief information about its modern view.

### INTRODUCTION

Drugs are substances that are used or intended to be utilised to alter or investigate physiological systems or pathological states for the benefit of the recipient, according to the WHO.<sup>[1]</sup>

*Nirmali* (*Strychnos potatorum*)<sup>[2]</sup>

Botanical Name: *Strychnos potatorum* linn

Family: *Loganiaceae*


### Taxonomic Classification<sup>[3-4]</sup>

Kingdom	Plantae
Class	Mangnoliopsida
Subclass	Eudicots
Order	Gentianales
Family	<i>Loganiaceae</i>
Genus	<i>Strychnos</i>
Species	<i>Potatorum</i>

### Morphological Characters<sup>[5,6-7]</sup>

*Strychnos potatorum* is a medium-sized, glabrous tree. Stem- fluted and covered with black, thick, square to rectangular scales. Bark- 1.32cm thick, black or brownish- black, corky, with deep and narrow vertical, thin ridges. Branches have enlarged nodes. The leaves are 57.5cm long, almost sessile, subcoriaceous, ovate or elliptic, acute, glabrous and glossy, spuriously three or five nerved, and have lateral nerves that spring from the midrib's lower portion and

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almost reach the tip. Petioles are 2.5mm long, and the base is rounded or sharp. Brooms- large flowers for the species, in short, nearly glabrous, practically sessile axillary cymes; 0.5mm long peduncles; and very short pedicels. Caly is around 2mm long, five-lobed, and has 2.5mm long, oblong, sharp lobes that each has a tuft of hair inside near the base. Ovary is oval, smooth, tapering into a long glabrous style. The stigma is obscurely two lobed. Fruit is like berry, globose, 12cm in diameter, pale, shiny, and covered in short, silky yellow hairs when mature. Seeds are globose in shape.

#### Description<sup>[8]</sup>

It can be found in Bengal, Central, and Southern India's deciduous forests up to 1200 metres.

#### Pharmacognosy<sup>[9]</sup>

Description of Seed

#### Macroscopic

The seed is up to 8mm in diameter, circular, bluntly lenticular, shiny, and covered in short, appressed silky hairs. It is cream-white in colour with a tiny border ridge, and it is slightly bitter.

#### Powder

Powder of *Strychnos potatorum* is creamish-yellow in colour, little bit oily and showing fragments of testa, trichomes, endosperm cells and oil globules.

#### Identity, Purity and Strength

Foreign matter- Not more than 2%

Total Ash- Not more than 2%

Acid-insoluble ash- Not more than 0.5%

Alcohol- Soluble extractive- Not less than 1%

Water- Soluble extractive- Not less than 5%

#### T.L.C.

T.L.C. of the alcoholic extract utilising a toluene, ethylacetate, and diethylamine mixture on a silica gel "G" plate (70:20:10). Two spots appear at Rf. 0.38 and at Rf. 0.55 after spraying with Dragendorff reagent and tartaric acid (faint orange and corresponding to that of Strychnine).

#### Constituents

Alkaloids

#### Preliminary Phytochemical Screening<sup>[10]</sup>

The test solution of the extraction of *Strychnos potatorum* seeds was used through the experiment process to detect the presence of various chemical secondary metabolites. This experiment was studied by cold maceration method. The results were as follows

**Phytochemical Screening:** Some secondary metabolites were present through phytochemical screening. These were as follows:

- Phenols
- Flavonoids

- Alkaloids
- Glycosides
- Tannins
- Lignins
- Steroids
- Saponins

#### Phytochemical Constituents<sup>[11,12-15]</sup>

Different parts of *Strychnos potatorum* contain a lot of phytochemical constituents. The extract of root, stem bark, and seeds of *Strychnos potatorum* have revealed the presence of alkaloids, flavonoids, glycosides, lignins, phenols, saponins, sterols and tannins.

- 1- Diaboline and its acetate
- 2- Brucine, Loganin, Mannose, Sucrose, Oleic acid, Palmitic acid
- 3- On saponification of the oil-  $\beta$ -sitosterol, stigmaterol oleanolic acid
- 4- Secondary metabolites such as alkaloids, flavonoids, glycosides, phenols, saponin, sterols

Among the five groups of phytochemicals determined from the root, stem bark, and seeds of *Strychnos potatorum* tannins were found to be the most abundant one followed by saponins. These compounds, which are heterocyclic indoles, have been shown to possess pharmacological features including hypotensive, anticonvulsant, anti-protozoal, antimicrobial, and anti-malarial actions.

#### Pharmacological Properties

##### Antidiabetic Activity<sup>[16]</sup>

*Strychnos potatorum* has anti-diabetic activity. The diabetic state was induced in Wistar albino rat. Animal experimentation was done upon different groups of rats. *Strychnos potatorum* plant extract was used for experimentation. Animals were screened for different parameters.

Parameters	Result
1- Blood glucose level	Decrease
2- Total serum protein	Increase
3- Initial cholesterol level	Decrease
4- AST	Decrease
5- ALT	Decrease
6- ALP	Decrease

##### Antimicrobial Properties<sup>[17]</sup>

The antimicrobial activity of the alcoholic extract of *Strychnos potatorum* has been evaluated in both bacteria and fungi. The extract shows antibacterial activity against gram positive, gram negative, and acid-fast bacteria and fungi, *Staphylococcus aureus*, and *Escherichia coli*. Growth of

*Proteus vulgaris*, *Staphylococcus aureus*, *Vibrio cholerae*, *Mycobacterium tuberculosis*, *Aspergillus niger*, and *Candida albicans* were significantly reduced.

**Antinociceptive and Antipyretic Effect<sup>[18]</sup>**

The seed powder and extract of *Strychnos potatorum* have antinociceptive and antipyretic effect. The experimentation was evaluated in albino mice and rats.

**Metal Binding Properties<sup>[19]</sup>**

*Strychnos potatorum* linn seeds have metal binding properties. Some bench scale experiments were conducted to establish the binding of metal ions from dilute HCL solution.

**Contraceptive Efficacy<sup>[20]</sup>**

The methanolic extract of *Strychnos potatorum* seeds has contraceptive efficacy. Experimentation was done upon male rats. In this experiment aqueous solution of extract was given orally to male rats. Some parameters were carried out to assess the contraceptive effect. These parameters were sperm motility, sperm density, serum testosterone level, biochemical analysis and testicular cell population

dynamics. *Strychnos potatorum* seed possesses suppressive effect on male fertility.

**Anti-inflammatory Effect<sup>[21-22]</sup>**

The powder and extract of *Strychnos potatorum* seeds have anti inflammatory effect. The experiment was studied in carrogeinum induced hind paw edema and cotton pellet granuloma models.

The powder and extract of *Strychnos potatorum* seeds shows dose dependent anti inflammatory activity.

**Antiulcerogenic Potential<sup>[23]</sup>**

*Strychnos potatorum* Linn seeds have anti-ulcerogenic activity. The seeds were studied on aspirin plus pyloric ligation induced gastric ulcer model. The model shows anti-ulcerogenic activity by both anti-secretory & mucoprotective action.

Mucoprotective action of SPP & SPE was due to presence of polysaccharides.

Antiulcerogenic potential was confirmed by histopathological studies.

**Hepatoprotective and Antioxidant Activity<sup>[24]</sup>**

The powder and extract of *Strychnos potatorum* seeds have hepatoprotective and antioxidant activity against CCl<sub>4</sub> induced acute hepatic injury.

Activity	Results
Hepatoprotective action	<ul style="list-style-type: none"> <li>➤ Reduced serum marker enzyme. These enzymes are:                             <ul style="list-style-type: none"> <li>1-SGOT</li> <li>2-SGPT</li> </ul> </li> <li>➤ Reduced the elevated levels of ALP</li> <li>➤ Reduced the elevated levels of serum bilirubin</li> </ul>
By the administration of the powder and extract of <i>Strychnos potatorum</i>	<ul style="list-style-type: none"> <li>➤ Reduced the enzymic and non-enzymic antioxidant levels &amp; elevated lipid peroxide levels were restored to normal</li> </ul>
Hepatoprotective activity	<ul style="list-style-type: none"> <li>➤ Confirmed by histopathological studies</li> </ul>

**Antiarthritic Activity<sup>[25]</sup>**

The powder and extract of *Strychnos potatorum* seeds have anti-arthritis activity. The experiment was studied on the Freund's complete adjuvant (FCA) induced arthritic raw paw edema. This experiment shows changes on different parameters like body weight, hematological parameters and biochemical parameters.

**CONCLUSION**

The plant *Katak* (*Strychnos potatorum* linn) is a well-known medicinal plant. The multiple benefits of *Katak* made it a true miracle of nature. The present review reveals that the plant is used in treating various ailments. The powder and extract of *Nirmali* seeds (*Strychnos potatorum*) have antidiabetic, anti-microbial, antinociceptive & anti-pyretic effect, anti-inflammatory, anti-ulcerogenic potential, metal binding properties, contraceptive efficacy, hepatoprotective & antioxidant activity.

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**Cite this article as:**

Priyanka, Ramesh Chandra Tiwari, Ved Bhushan Sharma. Nirmali (Strychnos Potatorum linn.) A Precious Plant - A review. AYUSHDHARA, 2022;9(6):69-72.

<https://doi.org/10.47070/ayushdhara.v9i6.1118>

**Source of support: Nil, Conflict of interest: None Declared**

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