

## **STRYCHNOS NUX-VOMICA - A POISON NUT PLANT WITH MEDICINE TREASURE**

**Indrani Chakraborty\***,

Assistant Professor, Department of Zoology,

Jogamaya Devi College, Kolkata.

\* Corresponding Author: [indrani.nrs@gmail.com](mailto:indrani.nrs@gmail.com)

### **Abstract**

The strychnine tree, *Strychnos nux-vomica* L. belongs to the family Loganiaceae has been used as a very promising medication for certain disorders and it is used in various systems of medicines like Ayurvedic, Unani, Homeopathy, Ethnomedicine etc. It has a wide range of phytochemical groups like alkaloids, phenolics, flavonoids of diverse pharmacological importance and great therapeutic significance. Almost all parts of *S. nux-vomica* contain alkaloids of medicinal importance, but the seed is official in Ayurveda and other pharmacopoeias. The present work reviewed the different aspects of this plant. This review will be helpful to elucidate the further research scopes with this plant.

**Keywords:** nux-vomica, Morphotaxonomy, Pharmacognosy, Ethnopharmacology, Bioprospection, strychnine.

### **Introduction**

*Strychnos nux-vomica* L. (loganiaceae) is a well-known drug plant in classical medicines. It is a medium sized deciduous tree of tropical and sub-tropical biome. Almost all parts of this drug plant are rich in flavonoids, alkaloids, tannins, triterpenoids, glycosides, lignins and steroids of medicinal values [1]. However, it is popular due to its seeds which contain an alkaloid strychnine that exhibits the medicinal and toxicological properties. This drug plant is highly used in many traditional systems of medicine including Unani, Ayurveda, Tibetan, Chinese and Homeopathy for the poisonous principles of strychnine and brucine. In Ayurveda, plant is used in the treatment of anemia, lumbago, asthma, bronchitis, constipation, diabetes, malarial fever, skin disease, paralysis, muscle weakness, and loss of appetite [2]. The plant is one of the most prescribed homoeopathic medicines in general clinical practices for various ailments in the homeopathy system of medicine including treatment for alcoholism, anger effects, colic etc. [3-5]. Pharmacologically the drug plant has been tested on animals for its action as antifungal, antibacterial, antioxidant, anti-inflammation, anticancerous, antidiabetic, neuropharmacological and toxicological properties etc. [6], but there are several scope remains to research on this particular plant species in the line of conservation biology, phytochemistry, pharmacology and bioprospection. Keeping mind on these issues this review is undertaken on *Strychnos nux-vomica* on its morphology, ecology, distribution, phytochemical, pharmacological, and relevant medicinal uses.

**Botanical name:** *Strychnos nux-vomica* L. Sp. Pl.: 189 (1753).

**Synonyms:** *Strychnos vomica* St.-Lag. in Ann. Soc. Bot. Lyon 7: 70 (1880), nom. superfl. (Homotypic synonym); *Strychnos nux-vomica* var. *oligosperma* Dop in Mém. Soc. Bot. France 19: 18 (1910), *Strychnos ovalifolia* Stokes in Bot. Mat. Med. 1: 412 (1812), *Strychnos spireana* Dop in Mém. Soc. Bot. France 19: 19 (1910) (Heterotypic synonyms).

**Family:** Loganiaceae R.Br. ex Mart.

**Vernacular names:** Karaskara (Sanskrit); Kucchla, Kajra (Hindi); Kuchila (Bengali); Etti, Kancirai, Murimuri (Tamil); Mushti (Telegu); Kanniram (Malayalam); Nux-vomica, Strychnine tree, Snake-wood, Poison nut, Quaker button (English).

**Etymology:** The generic name is derived from the Ancient Greek *strukhnon* – “acid”, bitter. The species epithet comes from the Latin *nux* (“nut”) and *vomica* (“vomiting”).

**General morphology:** A medium sized evergreen tree of about 20 metres. Leaves opposite, simple, estipulate; lamina 5-14 × 2-9 cm, ovate or broadly elliptic-oblong or elliptic-ovate, base acute to attenuate, apex subacute or obtuse, margin entire, shiny, glabrous, coriaceous, 3-5 nerved from base, glabrous, prominent; petiole 5-13 mm, glabrous; Flowers greenish-white or yellowish-green coloured, funnel-shaped, in terminal pedunculate cymes; corolla tube 10 mm long, longer than lobes, slightly hairy near the base within, lobes 4, each 4 × 1.5 mm, oblong, acute; bract 5 mm; bracteole 1.5 mm; calyx lobes 4, each 1 mm long, triangular, acute, pubescent; ovate, outside densely hairy; stamens 4, anthers sessile, inserted at the throat of corolla tube, pale cream in colour, ditheous, intorse; style is filiform, glabrous and as long as corolla tube; stigma capitate; ovary is superior, glabrous, ovoid, bicarpellary with axile placentation. Fruit is globose, indehiscent berry with a smooth and hard shell. Seeds 1-3, hard, lens-shaped to orbicular or ellipsoid, convex at one side and the other is concave with a small depression in the center of each side, hairy hairs radiating from the centre, giving a characteristic shine to the seed.

**Distribution & Ecology:** It is native to tropical and subtropical regions of south East Asia and Australia [7], Indonesia. In India it is commonly observed in most deciduous and semi evergreen forests of West Bengal, Bihar, Maharashtra, Odisha, Central and South India at an altitude of 500 m AMSL [8].

The plant is observed in plains, shifting cultivation areas, degraded hillocks and uplands in few agro-ecological regions of India [9]. This plant thrives well in areas receiving 750-2000 mm annual rainfall and experience a mean annual temperature of up to 35°C. It grows well on a wide variety of soils, ranging from loamy, loamy-sandy soil and lateritic soils with a preferable pH range of 5.5 – 6.

**Flowering & Fruiting:** It flowers between March to May and fruiting season continues up to December.

### Medicinal uses

*Strychnos nux-vomica* L. commonly known is a promising drug plant used in many of the traditional systems of medicine including Unani, Ayurveda, Tibetan, Chinese and Homeopathy [10-12]. It is used in folk medicines for alleviating many disorders. Perusal of classic and modern literatures reveals a wide range of therapeutic utility of almost every part of it [5]. The Ayurvedic Pharmacopoeia of India recommends seeds for ailment of sciatica, paralysis, facial paralysis and impotency [10].

There are several uses reported in Indian Folk medicine. The root bark is useful in cholera, snake bite and intermittent fever. The leaves are applied as poultice in the treatment of chronic wounds and ulcers whereas seeds are reported to cure colic [13]. The pulp of the ripe fruit is used in treating paralytic affections of palms and foot [14]. The seeds are bitter and used as aphrodisiac, appetizer, anti-periodic, digestive, purgative, and stimulant [15]. Apart from these uses, seeds are applied in the treatment of asthma, anemia, lumbago, bronchitis, diabetes, constipation, malarial fever, skin disease, muscle weakness, paralysis, emphysema, colic, dyspepsia, insomnia, nervous debility, diarrhea, epilepsy, hysteria, mental emotions, chronic constipation, gout, chronic rheumatism, hydrophobia and spermatorrhoea [13, 16-18]. The folk people of Andhra Pradesh use the stem bark topically to cure arthritis, [19] whereas in Tamil Nadu it is used in curing wounds, fever, bodyache, etc. [20]. The dried fruit powder is used in treatment of menstrual problem of Lodha tribal people of West Bengal [21]. In homoeopathy, *S. nux-vomica* is reported to be useful in the treatment of alcoholism [22-24], effects of anger, colic, constipation, dyspepsia, gastrodynia, haemorrhoids, tea and tobacco habit, insomnia, nightmares and lumbago [3].

Apart from medicinal uses, *S. nux-vomica* is also used as rodenticide, avicide [25], insecticide [26], nematicide [27] and piscicide [28].

### Phytochemistry

*Strychnos nux-vomica* L. is a well-known drug plant as almost all plant parts like leaves, fruits, bark, root and most importantly seeds contains alkaloid, flavonoids, phenolics, tannins and triterpenoids, glycosides, lignins and steroids of medicinal importance. [29]. More than 90 chemical compounds have been isolated from different parts of *S. nux-vomica*. Indian *S. nux-vomica* seeds contain 2.6 to 3% of total alkaloids approximately, of which 1.25 to 2.5% is strychnine and 1.5 to 1.7% is brucine. The seeds also contain chlorogenic acid, a glycoside (loganin), and 3% of fixed oil [5]. A number of minor alkaloids of medicinal importance are also recorded which are  $\alpha$ -colubrine,  $\beta$ -colubrine, protostrychnine, novacine, 3-methoxyicajine, n-oxystrychnine, pseudostrychnine, isostrychnine, chlorogenic acid, and glycoside [30]. Phytochemical investigation of *S. nux-vomica* leaf extract proved the presence of five different phenolic compounds of pharmacological importance, viz., Kaempferol-7-glucoside 1, 7 Hydroxy coumarin 2, Quercetin-3-rhamnoside 3, Kaempferol 3-rutinoside 4, and Rutin 5 [31].

### Pharmacology

Various solvent extracts of this plant containing chemical compounds which have a wide range of pharmacological activities like antioxidant, antifungal, antibacterial, antidiabetic, anti-inflammation, anticancerous, neuropharmacological properties as well as for the specific actions on gastrointestinal, bone cells and cardiovascular systems [6, 32]. The current study indicates that these phenolic compounds are promising as cytotoxic, analgesic, antipyretic and anti-inflammatory activities. A potent cytotoxic activity of aqueous methanolic leaf extract has been detected against human epidermoid larynx carcinoma cells, (Hep -2), breast carcinoma (MCF-7) and colon carcinoma cell lines [31]. Such cytotoxic activities could be due to the presence of apoptotic and anti-proliferative flavonoids and other phenolics [33, 34]. Shu *et al.* [35] have studied the effect of brucine on hepatocellular carcinoma cell migration and metastasis. The root extract shows antiproliferative and cytotoxic activity in human MM – cell line, RPMI 8226 due to presence of alkaloids [36]. Anti-allergic and immune-modulatory property of aqueous stem extract have suppressive activity on allergen-specific IgE antibody response [37].

## Conclusion

*S. nux-vomica* acts as panacea. Use of this plant in different systems of medicine confirms its importance in curing wide range diseases and ailments. Present review work may also infer a contribution to the existing knowledge of this traditional medicinal drug plant. This is also high time to conserve this medicinal plant applying *in-situ* and *ex-situ* methods. Tissue culture and related biotechnological research with this plant will help to increase the population of the species whereas micropropagation of the species could be promising for the large scale production of different important secondary metabolites present in *S. nux-vomica*.

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