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Nux-vomica – The Strychnine Tree

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SUMMARY

Strychnos nux vomica (Family: Loganiaceae) is a widely distributed poisonous medicinal plant. Different parts of this plant mainly seeds have been used in traditional Chinese and Indian systems of medicine. Although nux vomica is extremely poisonous, still it considered to be useful for treating many diseases such as paralytic and neuralgic affections, dyspepsia, itching, urinary disorders, joint pain, dysentery, emotional disorders, epilepsy, rheumatism and insomnia. Phytochemical studies of different parts revealed the presence various constituents mainly alkaloids together with flavonoids, iridoids and phenolic glycosides. Various types of preparations and constituents of nux vomica exerted hepatoprotective, antioxidant, antinociceptive, anti-allergic, anti-inflammatory, antimicrobial, anticancer, antipyretic, gastroprotective, antidiabetic, anti-alcoholic, anti-snake venom and neuropharmacological properties. Moreover, clinical studies on nux vomica preparations showed positive outcome against sinusitis, insomnia and rhinitis. However, most of the pharmacological and clinical studies are too preliminary to conclude the effectiveness of nux vomica.

INTRODUCTION

Botanical name : *Strychnos nux-vomica*
Common name : Nux vomica, Poison Nut, Semen strychnos and Quaker Buttons
Family : Loganiaceae
Origin : Srilanka
Native : India and Burma

Botanical description

Medium-sized tree up to 25 m tall; bole up to 100 cm in diameter; branchlets slightly short-hairy. With a short thick trunk. The wood is dense, hard white, and close-grained. The branches are irregular and are covered with a smooth ashen bark. The young shoots are a deep green color with a shiny coat.

Leaves: Opposite, simple and entire; stipules absent; petiole 5 – 15 mm long; blade orbicular to broadly elliptical or ovate, 5 –18 cm × 4 –13 cm, base rounded to cordate, apex shortly acuminate or acute, glabrous and shiny above, minutely hairy especially on veins beneath, 3 –5-veined from the base and smooth on both sides.

Inflorescence: An axillary thyrse 3–7 cm long, many-flowered. Flowers bisexual, regular, 5-merous; calyx lobes ovate, outside densely hairy; corolla with a slender tube 1 cm long, abruptly widening at the throat, outside glabrous, inside sparsely woolly hairy in lower part, lobes narrowly ovate, 3 mm long, margin thickened and minutely hairy, greenish white to white with a funnel shape stamen inserted at the mouth of the corolla tube, exserted; ovary superior, ovoid, glabrous, style up to 1 cm long, stigma head-shaped. They bloom in the cold season and have a foul smell.


Fruit: A globose berry 2 – 4 (to 6) cm in diameter, orange, glabrous, the fruit are about the size of a large apple with a smooth and hard shell which when ripened is a lovely orange color. The meat of the fruit is soft and white with a jelly-like pulp containing five seeds covered with a soft woolly substance.

Seed: The seeds are removed from the fruit when ripe. They are then cleaned, dried and sorted. The seeds have the shape of a flattened disk, lens-shaped to orbicular or ellipsoid, 20 – 23 mm × 18 – 20 mm × 4 mm, silky hairs. Completely covered with hairs radiating from the center of the sides. This gives the seeds a very characteristic sheen. The seeds are very hard, with a dark gray horny endosperm where the small embryo is housed that give off no odor but possess a very bitter taste.

Uses:

- The medicinal use of *Strychnos nux-vomica* in Africa is limited. In Ghana the seeds are eaten to treat anemia.
- The seed, bark, wood and roots have numerous applications in traditional medicine in Asia, Europe and the United States.
- In India the fruit is used in both the Ayurvedic and Unani systems of medicine and is considered acrid, pungent, bitter, poisonous and heating.
- It is used as an appetizer, tonic, astringent, aphrodisiac and antipyretic, and it is claimed to cure leukoderma, blood diseases, itching, ringworm, piles, ulcers, anemia, jaundice, urinary discharges, joint pain, lumbago and weakness of limbs.

- In Europe a description of medicinal use of *Strychnos nux-vomica* dates back as early as 1540 A.D. It was especially used to treat nervous disorders and problems of the digestive organs and the respiratory system.
- Nowadays it is mainly used in phytotherapy to treat upset stomach, abdominal pain, constipation, hangover, heartburn, insomnia, circulatory problems, depression, migraine, nervous conditions, problems related to menopause and respiratory diseases.
- In India the seeds are used for dying cloth pale brown. The seeds are an ingredient of liquors. The wood is hard and termite proof and is used in manufacturing furniture, cart wheels and agricultural implements. The leaves are used as a green manure.
- The Ayurvedic medical system regards the seed as a tonic and stimulant and especially as an aphrodisiac.
- In Indian folk medicine, the juice of the root cortex, along with cow's milk, is applied externally to treat snakebite.
- The bark also is used there to treat cholera. In Nepal, the seeds are used for palsy and rabies. In Iran, the seeds were still being used as a tonic in the twentieth century.
- In Europe, poison nut seed was once seen as a remedy for the Black Death and was long regarded as an "agent for strengthening the nerves".
- The seeds are used in folk medicine to treat migraines, nervousness, and depression. Homeopathic preparations of poison nuts (*Strychnos nux-vomica* hom).
- HAB1, Nux vomica hom. PFX, Angustura spuria hom. HAB34 are used in accordance with the medical description to treat such ailments as ill moods, headaches, and nervous overstimulation. Nux-vomica D6 is said to be a good, dependable treatment for a hangover, even when accompanied by a severe headache (Olaf Rippe, pers. comm.).

Ethnomedicinal uses:

The medicinal properties of nux vomica are substantially due to the abundance of alkaloids strychnine and brucine. In India the fruits are used in both the Ayurvedic and Unani systems of medicine as appetizer, tonic, aphrodisiac and antipyretic. It has been also claimed to be a curative medicine for leukoderma, blood diseases, itching, ringworm, piles, ulcer, anemia, jaundice, urinary disorders, joint pain, lumbago and limb weakness. In India, nux vomica seeds are used in the treatment of dyspepsia, nervous system disorders, chronic dysentery, atonic diarrhea, cholera, diabetes, emotional disorders, hysteria, epilepsy, intermittent fevers, gout, rheumatism, hydrophobia, insomnia, urinary incontinence, spermatorrhoea, paralytic and neuralgic affections and as antidote to alcoholism. The juice of the stem and root barks are claimed to be useful in intermittent fevers, cholera and acute dysentery. Internally, the infusion of barks is used to treat epilepsy and is externally applied for the treatment of ulcers and leprotic. Leaves are externally applied as poultice and promote healthy action in sloughing wounds or ulcers especially when maggots have formed

Chemical constituents:

- The bark, the roots, and especially the seeds contain the indole alkaloids strychnine and brucine, as well as colubrine, pseudo strychnine, vomicine, and strychnine.
- The seeds contain an average of 2 to 3 % alkaloids but, less frequently, can contain as little as 0.25% or as much as 5.3 %. The strychnine content lies between 1.1 and 1.5% but can sometimes reach 2.3%. Also present are 1.1 to 2.1% brucine as well as the secondary alkaloids (comprising a total of no more than 10 % 12-hydroxystrychnine, 15hydroxystrychnine, α-colubrine, β-colubrine, icajine, 11-methoxyicajine, novacine, vomicine, pseudo strychnine, pseudo brucine, pseudo-a-colubrine, pseudo-colubrine, N-methyl-sec-pseudo-colubrine, and iso strychnine.
- The flesh and the shell of the fruit contain essentially the same alkaloids as the seeds. In addition, the alkaloid 4-hydroxystrychnine has been demonstrated to be present. The iridoids loganaine and secologanine have been detected as well.
- The total alkaloid content of the leaves can range from 0.3 to 8.0 %. The flowers also contain alkaloids. The bitter fruit pulp, which is sometimes characterized as edible, contains only 0.35 % alkaloids.
- The stem cortex contains up to 9.9 % alkaloids, and the root cortex as much as 18 %. The wood of the roots can contain as much as 1.8%, the bark of the branches up to 6.8 %, the wood of the branches up to 104 %, and the wood of the trunk only 0.3 % alkaloids. Strychnine is always the primary alkaloid. The root cortex of a sample from Sri Lanka was found to contain a new alkaloid, which was named protostrychnine.

History:

Probably the first person to describe the poison nut was Theophrastus, who discussed it under the name strychnos manikos, "strychnos that makes manic." It was once thought that this name referred to the thorn apple (cf. *Datura stramonium*), an interpretation that is now considered highly doubtful. The "sleeping strychnos" of Dioscorides is now interpreted as *Solanum dulcamara*, and the "garden strychnos" as *Solanum nigrum* (cf. Solanum *spp*.). Many very early Persian sources mention the poison nut as an agent that can induce paralysis. In Europe, the plant first became well known in the fifteenth century.

Origin and geographic distribution:

Strychnos nux-vomica originates from India and South-East Asia and is introduced and locally naturalized in tropical Africa. It is cultivated in Ghana and Sudan. The tree, which probably originated in the dry forests of Sri Lanka (Macmillan 1991), is native to India and Burma (Myanmar) but has now spread into all the tropical areas of the Indian Ocean and Southeast Asia (Bremness 1995). It is most con1monly encountered in dry forests.

Climate and Soil:

In its natural habitat *Strychnos nux-vomica* occurs at the edge of dense forest, on river banks and along the shore, mainly on loamy or loamy-sandy soil, although it also occurs on lateritic and clayey loam soils. The annual rainfall varies from 1200–3500 mm. Prefers Wet soil a pH of 7. For this plant those sunlight conditions are well described.

Propagation:

Strychnos nux-vomica regenerates from seeds and suckers. Seeds take 70–120 days to germinate. In India seeds are sown in nurseries and seedlings are transplanted to the field. *Strychnos nux-vomica* plants have been successfully regenerated from tissue culture.

Seed Collection and Storage: The seeds are collected from about middle of December to end of April. The pulp of the fruit is washed and the seeds are dried in the sun. Seeds can be stored for one year in gunny bags.

Pretreatment: Mild boiled water treatment and soaking in water for 48 hours; or keeping the seeds in cow dung slurry for 24 hours.

Nursery Technique: Very difficult species to germinate. Seed put in the polybags in March and hay is spread over the bags in order to maintain the heat. The seeds germinate after 45 to 50 days. Growth of the seedlings is very slow and the growth of the root is very fast.

Transplanting in the field:

Distance between two plants is 4.5 x 4.5. In the first week of July the ditches should be fill with 20kg of cow dung and 5 kgs of neem or madar leaves. During second or third week of July when 1-2 rain showers occur, the plant should be carefully planted in the ditch after removing the polybags.

Manures and Fertilizers:

For this plant the suggested fertilizer program would be based upon
Typical mix of: 3 parts Nitrogen (N), 2 parts Phosphorous (P) and 3 parts Potassium.

Irrigation:

Immediately after planting, irrigation should be undertaken. Further watering should be undertaken at the intervals of 5-7 days in little amount.

Harvesting:

Flowering starts in the July-August of third year and by October the fruits get ripened. Fruiting starts 10–15 years after planting. Fruits are usually gathered from the trees. Fallen fruits are considered to be of inferior quality. After collecting, seeds are cleaned and dried in the sun. Dried seeds can be stored in jute bags for a long period without loss of alkaloid content, but they should be kept in dry conditions to prevent deterioration by fungi.

Yield:

Yield (per 1000 trees)	Seed yield per year
After 3 yrs of sowing	2000 kgs
After 4 yrs of sowing	4000 kgs
After 5 yrs of sowing	6000 kgs
After 6 yrs of sowing	8000 kgs

Like this from 6th year onwards, up to 50-60 years of age 8000 kgs of seed per 1000 tress can be obtained.

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