A Review on *Saraca asoca* and *Strychnos nux-vomica*

Anushka Agarwal*and Harshwardhan Gupta

Department of Botany, St. Xavier's College (Autonomos), Mumbai, India
**E-mail: anushka.agarwal@xaviers.edu.in*

Abstract:

Ayurveda is a traditional medical system that has been used for centuries. Asoka is a sacred and legendary tree in India. Saraca asoca is a tree that is listed as Vulnerable by the IUCN. Strychnos nux vomica is a poisonous medicinal plant that is widely distributed. Different parts of this plant, primarily the seeds, have been used in classical Chinese and Indian medical systems. According to reports, Saraca asoca contains phytoconstituents like flavonoids, steroids, glycosides, saponins, carbohydrates, and proteins. It also reportedly has a variety of pharmacologic effects, including anti-diabetic, CNS-depressant, cardioprotective, anti-helminthic, anti-bacterial, anti-menorrhagic, anti-hyperglycaemic, and anti-cancer effects. Even though nux vomica is extremely poisonous, many diseases, including paralytic and neuralgic affections, dyspepsia, itching, urinary disorders, joint pain, dysentery, emotional disorders, epilepsy, rheumatism, and insomnia are thought to benefit from its use. This review's goal is to provide a detailed description of botany, phytochemicals, medicinal value, and pharmacological activity.

***Key Words**: ethnobotany, native, vulnerable, Fabaceae, Loganiaceae*

Introduction:

For millennia, people have employed medicinal plants to treat a variety of illnesses. Two such plants with well-established therapeutic uses in conventional medicine are *Saraca asoca* and *Strychnos nux-vomica*. The Ashoka tree, also known as *Saraca asoca*, is a venerated tree in Hindu mythology and is a native of India. It has historically been used to treat gynaecological diseases, dysmenorrhea, menorrhagia, and other inflammatory conditions because of its uterine tonic and anti-inflammatory qualities (Sharma and Basu, 2010). Poison nut, also known as *Strychnos nux-vomica*, is a native of Australia and Southeast Asia. It has historically been used to treat digestive issues, anxiety, and sleeplessness and functions as a digestive and nerve tonic (Huang et al., 2011). *Saraca asoca* and *Strychnos nux-vomica* both contain a variety of bioactive substances, including terpenoids, flavonoids, and alkaloids, which may contribute to their medicinal potential. The pharmacological effects of these substances have been discovered to include anti-inflammatory, analgesic, antipyretic, antibacterial, antioxidant, and anticancer actions. Also, numerous research have shown that these plants and their bioactive

components are safe and effective in a variety of animal models and clinical tests (Sharma and Basu, 2010; Huang et al., 2011). Some herbs have therapeutic promise, but there are also safety issues with their use. *Strychnos nux-vomica* in particular has poisonous alkaloids including brucine and strychnine that, in large concentrations, can be lethal. It is crucial to use these herbs under the supervision of a licensed healthcare professional. The goal of this review is to present a thorough evaluation of the therapeutic potential of *Strychnos nux-vomica* and *Saraca asoca* based on the currently available scientific research. The review will go through these plants' historical applications, phytochemical make-up, and pharmacological implications of their bioactive constituents. The review will also draw attention to the toxicity and safety issues related to the use of these plants.

Figure 1: Flowering twig of Saraca

Saraca asoca (Roxb.) de Wilde is commonly known as Ashoka. It is a perennial evergreen tree that can reach a height of ten meters. It is seen flourishing in red lateral alluvial soil and requires 2000 to 4000 mm of yearly rainfall (Devan et al., 2021). Hindus and Buddhists regard *Saraca asoca* as a "holy tree," and it has a substantial role in folklore, culture, and history. A single plant selection approach was used to release the first Ashoka variation, Aswani-I, which has a high bark production and higher tannin content (Smitha & Thondaiman, 2016).

1. *Saraca indica* Linné,
2. *Saraca asoca* (Roxb.) De Wilde,
3. *Saraca griffithiana* Prain,
4. *Saraca thaipingensis* Cantley ex Prain,
5. *Saraca celebica* De Wilde,
6. *Saraca hullettii* Prain,
7. *Saraca declinata* (Jack) Miq.,
8. *Saraca dives* Pierre, and
9. *Saraca celebica* De.

The above are all species that fall under the genus Saraca. In India, *Saraca indica* Linné, *Saraca asoca* (Roxb.) De Wilde, *Saraca thaipingensis* Cantley ex Prain and *Saraca declinata* (Jack) Miq. have been identified. *Saraca asoca* grows in the wild whereas the others are found in botanical gardens. (Cooke, 1983; Hooker, 1879).

Au contraire, *Nux vomica* was first introduced to America as well as several European countries in the 17th century, where it was commonly sold in powdered form for the purpose of poisoning rats and other rodents (McIntosh, 1940) (Guo et al., 2018). It is generally found in evergreen, semi-evergreen, and deciduous forests of Maharashtra (Roychoudhury et.al., 2017). Numerous traditional healthcare frameworks, namely Ayurvedic medicine, Chinese, Homeopathy, Unani and Tibetan prize *Nux-vomica*. *Strychnos-nux-vomica* is a moderate tree with a short thick trunk that belongs to the Loganiaceae family. The wood is dense, hard, and finely grained (Harry, 1968).

Figure 2: Flowering twig of Strychnos nux-vomica

A seamless ashen bark contains irregular branches. The young shoots have a glossy coat and are a deep green colour. The leaves are opposite decussate, short stalked, oval shaped, shiny on both sides and are about ten centimetres long and seven centimetres wide. The flowers are small and funnel-shaped, with a pale green colour. They bloom in the winter and have an unpleasant odour. When ripe, the fruit is as large as an apple, with a hard, smooth shell that turns a light shade of orange (Cooke, 1983; Hooker, 1879; Choudhury et.al., 2017). *Strychnos* dried ripe berries have been used as a potent arrow poison. Strychnine and brucine were discovered in Nux vomica about two centuries ago, and knowledge of their physiological effects improved over time. The drug gradually became an important therapeutic agent in both human and veterinary medicine. *Strychnos nux-vomica* is a possible medicinal plant for agricultural production in the common pasture lands, uplands and shifting cultivation areas of Deccan and peninsular India.

1.1 Classification:

Kingdom: Plantae	Kingdom: Plantae
Clade: Tracheophytes	Clade: Tracheophytes
Clade: Angiosperms	Clade: Angiosperms
Clade: Eudicots	Clade: Eudicots
Clade: Rosids	Clade: Asterids
Order: Fabales	Order: Gentianales
Family: Fabaceae	Family: Loganiaceae
Genus: *Saraca*	Genus: *Strychnos*
Species: ***S. asoca***	Species: ***S. nux-vomica***

Accepted Names:

Saraca asoca	***Strychnos nux-vomica***
Hindi: Ashoka	English: Nux-vomica, Poison nut, Sanke wood, Strychnine tree, Quaker button
Sanskrit: Kankeli	Hindi: Kuchila
Kannada: Ashokadamara	Sanskrit: Vishmushti, Kapilu
Telugu: Ashokapatta	Malayalam: Etti, Kangnalam, Kanjeram, Kanjiram, Kanniram, Kariram
Malayalam: Asokam	Tamil: Kanjaram, Yetti
Tamil: Asogam	Assamese: Masuri-kendu, Nak-bhomika

Distribution:

Despite being native to India and found across Peninsular India, including the Western and Eastern Ghats, as well as the sub-Himalayan regions, up to a height of 750 meters, *Saraca asoca* can also be found in Sri Lanka and the Indo-Malaysian region (Devan et al., 2021). Also found growing along river streams and prefers semi-evergreen and damp deciduous woodlands. (Refer to Fig. 3.)

Figure 3: Map of the occurrence of Saraca asoca across the globe

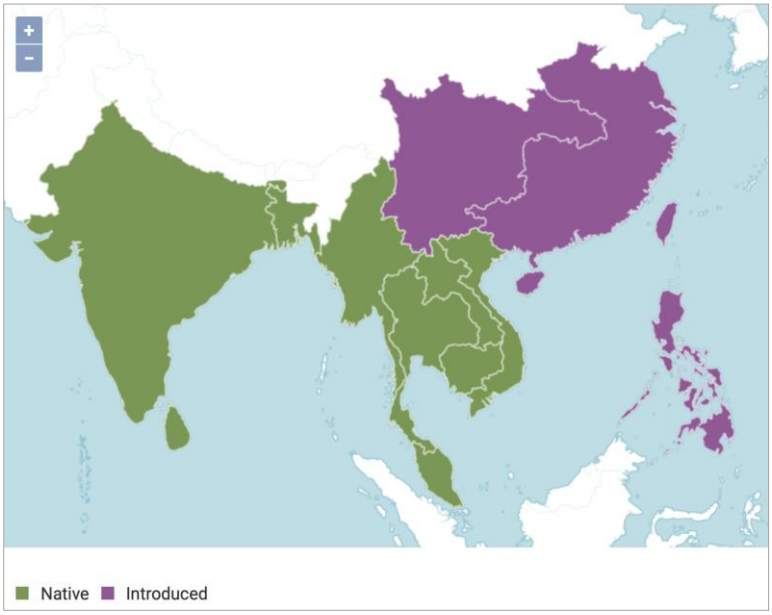


Figure 4. Map of the distribution of Strychnos nux-vomica as Native or Introduced species

Map courtesy- https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:547371-1

India, Bangladesh, Burma, Cambodia, Ceylon, East Bengal, Thailand, Laos, Malaya, Myanmar, Sri Lanka, and South Vietnam are all home to *Strychnos nux-vomica* **(native)**. And is **introduced** to China's south-central and southeast regions, as well as Cuba, Hainan, the Philippines, Taiwan, and Trinidad and Tobago. (Refer to Fig. 4).

Table. 1. Associated species (Patwardhan et al., 2016).

- *Antiaris toxicaria Lesch.*
- *Artocarpus heterophyllus Lam.*
- *Bridelia retusa Spreng*
- *Butea superba Roxb*
- *Caryota urens L.*
- *Chionanthus mala-elengi (Dennst.) P.S. Green*
- *Chukrasia tabularis A. Juss.*
- *Dillenia pentagyna Roxb.*
- *Dimocarpus longan Lour.*
- *Diospyros candolleana Wt.*
- *Drypetes roxburghii (Wall.) Hurusawa*
- *Dysoxylum binectariferum Hook.f. ex Bedd.*
- *Erinocarpus nimmonii J. Graham*
- *Erythrina variegata L.*
- *Flacourtia montana Graham*
- *Garcinia talbotii Raiz. & Sant*
- *Grewia microcos L.*
- *Holigarna grahamii (Wt.) Kurz.*
- *Hydnocarpus pentandra (Buch.-Ham.) Oken*
- *Lagerstroemia parviflora Roxb.*
- *Macaranga peltata (Roxb.) Mueller*
- *Mallotus philippensis (Lam.) Muell.-Arg.*
- *Mammea suriga (Buch.-Ham. ex Roxb.) Kosterm.*
- *Mangifera indica L.*
- *Memecylon umbellatum Burm.f.*
- *Meyna laxiflora Robyns.*
- *Neolamarckia cadamba (Roxb.) Bosser*
- *Nothapodytes nimmoniana (J. Graham) Mabb.*
- *Nothopegia castaneifolia (Roth) Ding Hou*
- *Pandanus odoratus Thunb.*
- *Sageraea laurifolia (Graham) Blatt.*
- *Sterculia guttata Roxb.*
- *Sterculia urens Roxb.*
- *Stereospermum chelonoides (Lf.) DC.*
- *Symplocos racemosa Roxb.*
- *Syzygium cumini (L.) Skeels*
- *Terminalia bellirica Roxb.*
- *Terminalia tomentosa Roxb. (ex DC) Wight & Arn*

Methodology:

The trees were thoroughly investigated over a prolonged period of time in Mumbai to better understand their morphological traits. In addition to making direct observations of the trees, this required a detailed analysis of the previous research, which offered helpful insights for bridging any gaps in the observational data. While published floras were utilised to identify the trees' important characteristics and to compare them to other related species, taxonomic databases were accessed to confirm the trees' identities and to learn more about their taxonomic classification. This meticulous and methodical approach led to a thorough comprehension of the tree roots, laying the groundwork for subsequent investigation and analysis.

Results:

Descriptions: Description of *Saraca asoca*:

As seen in Fig. 5. The outer surface of the bark is rough and has watery protuberances, dark brown, grey, or virtually black in colour, and rusty brown in colour due to exfoliation. Smooth, velvety, and reddish brown on the inside. Radially elongated but irregularly flowing medullary

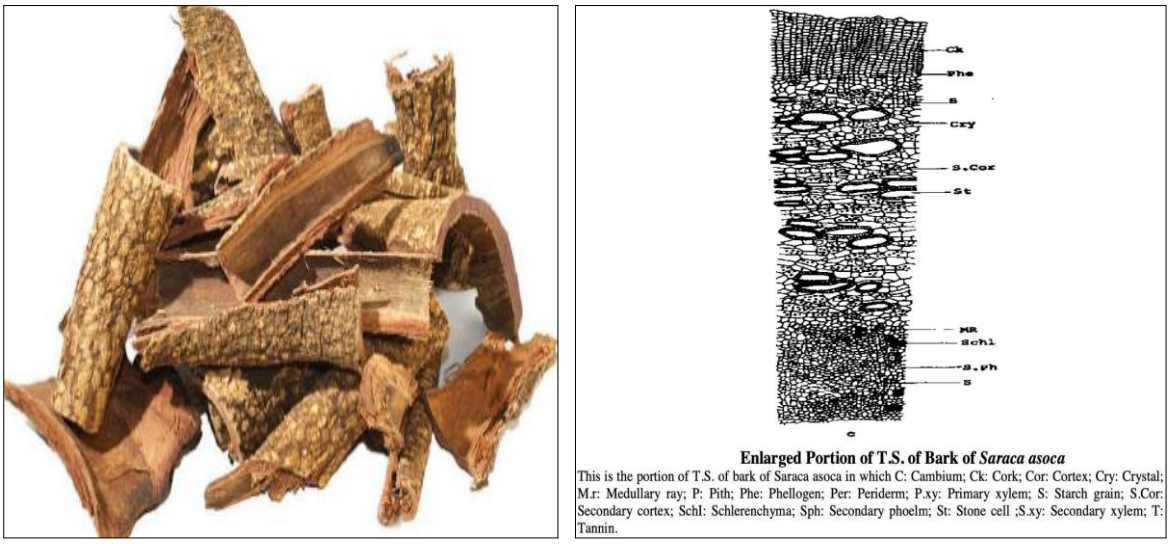


Figure 5: Bark and T.S. of Bark of Saraca asoca

rays of varied width are visible on the smoothed transverse surface. The bark is dark brown, grey, or nearly black in colour and has a warty surface (Bhalerao et al., 2014). A closer look at the bark at the microscopic level shows that the periderm is made up of a wide layer of cork, radially flattened narrow cork cambium, secondary cortex is made up of one or two continuous layers of stone cells with many patches of sclereids, and parenchymatous tissue contains yellow masses and prismatic crystals- Secondary phloem shows the presence of phloem parenchyma, sieve tubes with companion cells, and show the presence of phloem fibres occurring in groups, crystal fibres. The stem's transverse section is circular. On the surface, there are small rounded

to oval projecting lenticels. The epidermis is only one layer thick, with a thin cuticle. 5-6 layers of cork can be seen beneath the epidermis. Cortex is made up of 12-16 layers. 3-5 layers of stone cells can be seen in the cortex's middle region. The phloem region, just above, is very distinct and contains tannin cells. Cambium has 2-3 layers and is very clear. Tracheids and a few vessels make up the majority of the xylem region. The primary xylem is visible. There is a prominent pith, which is made up of thin-walled parenchyma with polygonal calcium oxalate crystals in many of the pith cells (Pradhan et al., 2009).

As shown in Fig. 6. the leaves are glabrous and lengthy, bitter, and corky at the base. The petioles are short, and the leaves are grouped in 6-12 pairs to form a leaflet and these are glabrous and shaped oblong-lanceolate. The leaves are seen undergoing colour changes from sprouting (from immaturity to maturity) - from copper red to light green to dark green.

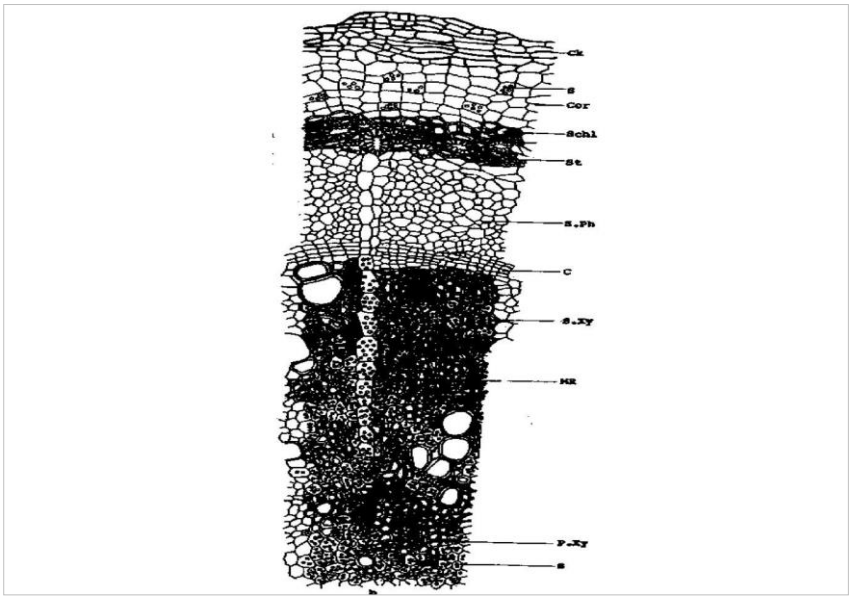
Figure 6: Saraca asoca: A specimen from Kew's Herbarium - K000780046
Courtesy: Herbarium, RBG Kew

Between the months of January to March is when orange/yellow coloured flowers bloom in the form of axillary corymbs. They have an astringent flavour and are aromatic, hermaphrodite, and staminate. Numerous tiny, long tube flowers open into four oval lobes in each cluster, with half-white, half-crimson stamens bulging from the top ring of the tube. When the flowers are young, they are yellow, but as they mature, they turn orange and crimson. Because of the sun's rays, they eventually turn into vermillion. Flowers have a pleasant scent (Mishra & Vijayakumar, 2015).

The tree blooms from December to May, with the best months being February and March. Pollination occurs with the help of the Syrphid fly, white ants, the Arctiidae moth, butterflies, black ants, and bees (Smitha & Thondaiman, 2016b). The flowers are compact sessile and show the older flowers are present at the base and younger flowers are present at the apex, with partial gamopetalous petals. Unlike hypanthium, colourful bracteoles are shorter. The tetramerous petaloid overlaps the calyx and has no corolla. Two outer whorls and one inner whorl seem to be substantially bigger than the others. The gynoecium is sigmoidal in shape

and lengthy stipitate, growing solely on a single side of the hypanthium (Mishra & Vijayakumar, 2015). When the style is coiled like a thread, with an obtuse stigma and plenty of ovules then it can be said that the ovary is in a pubescent stage. The anther is versatile (Bisht et al., 2017).

The seeds have a brown seed coat and are flat and ovoid-ellipsoid in shape. Each pod contains between two and eight seeds (Smitha & Thondaiman, 2016b). The pods are dehiscent, with tapered ends (Sanyal & Paria, 2015). The green pods mature into brownish-purple/black pods that feel leather-like after which seeds are dispersed. The green seeds mature into black seeds that are tenacious (Chauhan, 2019).



This is the portion of T.S. of bark of Saraca asoca in which C: Cambium; Ck: Cork; Cor: Cortex; Cry: Crystal; M.r: Medullary ray Phe: Phellogen; P.xy: Primary xylem; S: Starch grain; Schi: Schlerenchyma; St: Stone cell; S.ph: Secondary phloem; S.xy: Secondary xylem

Figure 7: An enlarged portion of T.S. of Root of Saraca asoca

The roots are long, grey-brown, and slightly hard. They have an extensive taproot system with numerous side roots (Sanyal & Paria, 2015). The root appears circular in outline in the transverse section. Cork makes up the outermost layer, which is made up of 8-10 layers of tangentially elongated thick walled cells. Phellogen does not have a distinct flavour. Secondary cortex with two distinct zones can be seen just inside the cork region. The upper zone is made up of 5-7 layers of parenchyma cells with thin walls, some of which contain a few small rounded starch grains. Below the parenchymatous layer, there are 3-5 layers of mechanical cells, the outer layer being sclerenchymatous and the inner layers being stone cells. A broad zone of primary and secondary phloem follows this supporting region. The cells are polygonal, parenchymatous, and have thin walls. Below the bast zone, 4-6 cambial layers are very visible. Tracheids, vessels, and parenchyma cells in the secondary xylem region are arranged in an unusual pattern, with xylem parenchyma and tracheids in alternating patches. Starch grains fill the ray cells in the secondary xylem region. Exarch primary xylem groups, which are aligned with the medullary rays, can be seen towards the centre (Pradhan et al., 2009). (Refer to Fig. 7.)

Description of *Strychnos nux-vomica*:

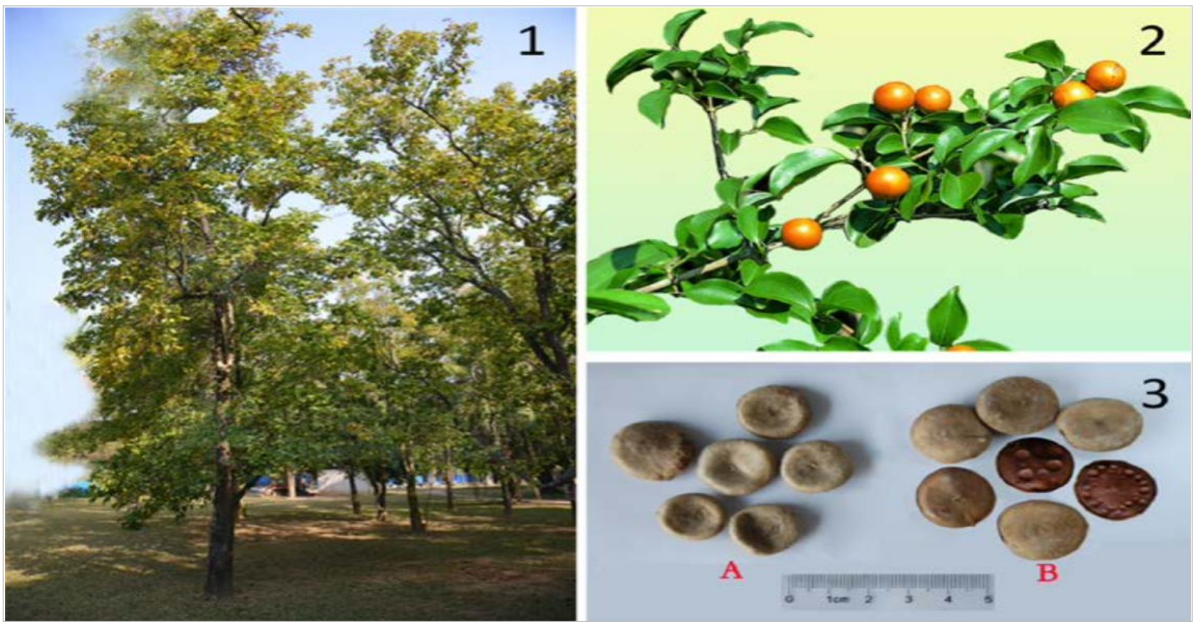


Figure 8: Strychnos nux-vomica: 1.The whole plant, 2. The fruit 3. The seeds- A. Crude seeds and B. Processed seeds.

Strychnos nux-vomica is a deciduous tree with a medium size. The trunk is tall, thick, straight, and cylindrical, with smooth, thin bark that ranges from yellowish grey to dark grey. The inflorescence is a terminal cyme with many flowers that appears at the end of branchlets or on axillary shoots with young leaves (Behera et al., 2017). Hermaphrodite, actinomorphic, homogamous flowers that are greenish-white in colour, small in size, nectariferous, funnel-shaped, and have an unpleasant odour. The stamens are inserted at the mouth of the corolla tube and exerted altering with corolla lobes; lobes thinly ovate, 3 mm in length, margin thickened and minutely hairy, greenish white to white. The superior ovary is ovoid, glabrous, bicarpellary, and axile placentation. The stigma capitates are filiform, glabrous, and as long as the corolla tube (head-shaped). The berry has a hard, smooth shell and is globose and indehiscent. The soft, white, fleshy, jelly-like pulp of the fruit contains 1-5 seeds. (Refer to Fig. 8.) (Cooke, 1983; Hooker, 1879; Behera et al., 2017).

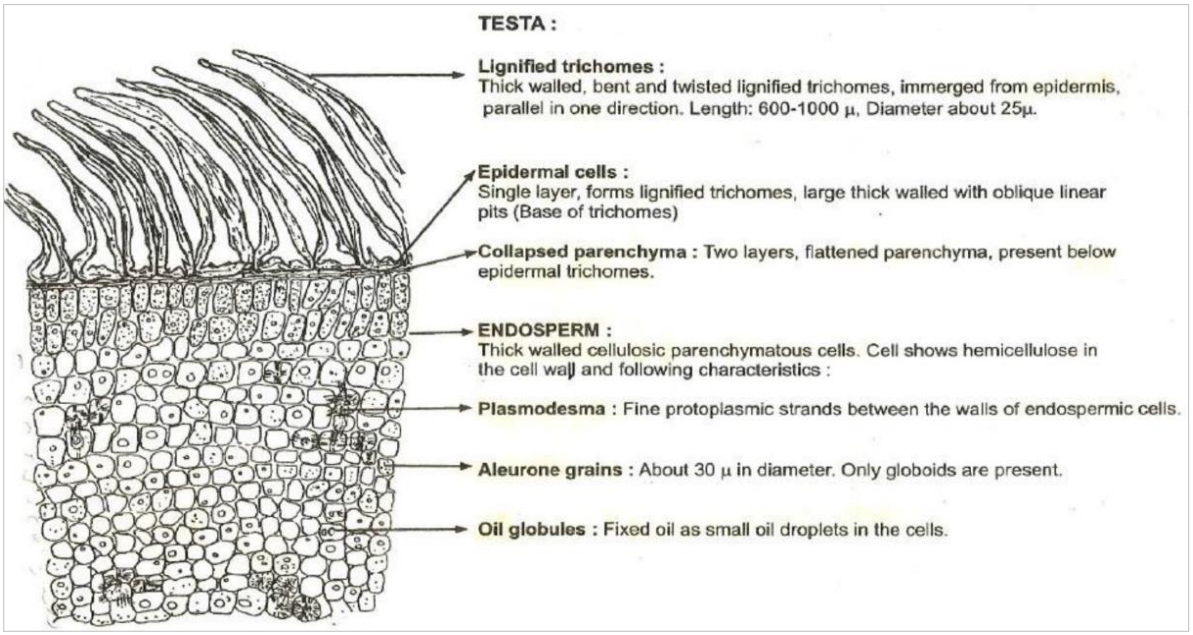


Figure 9: T.S. of the seed of Nux-vomica

The seeds of *Strychnos nux-vomica* are incredibly hard, and it takes on average an hour to soften enough to dissect. Greenish-grey disc-shaped seeds with a diameter of 10–30 mm and a thickness of 4–6 mm. A few seeds are inconsistently bent and oval shaped, despite the fact that a large number of the seeds are relatively flat and consistent in shape. It has a rounded or acute edge. Silky, closely appressed, radiating hairs cover the testa. One of the flatter sides has a distinguishable hilum in the centre, and a tiny significance on the circumference marks the position of the micropyle, which is connected to the hilum by a radial ridge. A boiled seed should be split diagonally and afterwards opened like an oyster with a scalpel blade inserted at a spot on the circumference furthest from the micropyle. The tiny embryo will be encapsulated in a horny endosperm with two cordate cotyledons and a cylindrical radicle trying to point more towards the micropyle. A slit-like cavity runs through the seed's centre. The seeds have no unpleasant smell when dry, but they establish a strong unpleasant smell after being soaked in water for a day or two. They have a strong bitter flavour. (Fig. 9.) (Cooke, 1983; Hooker, 1879; Behera et al., 2017).

Phytochemical Properties:

Antimicrobial activity: *Saraca asoca* has been discovered to have significant antibacterial action against a variety of bacteria and fungi (Kumar et al., 2012). The management of a variety of infectious disorders brought on by bacteria and fungi may benefit from *Saraca asoca's* antibacterial properties. *Escherichia coli, Pseudomonas aeruginosa, Proteus vulgaris,* and *Klebsiella aerogenes* were among the pathogenic bacteria strains that the ethyl acetate extract

of the bark of *Strychnos nux-vomica* demonstrated antibacterial efficacy against. The disc diffusion method was used to test the extract, and the zone of inhibition was calculated. The study was performed following standard methods (Shah et al., 2016).

Anti-diabetic activity: *Saraca asoca* has been discovered to have anti-diabetic properties, which are due to the presence of different flavonoids and alkaloids (Saxena et al., 2013). The therapy of diabetes and its consequences may benefit from *Saraca asoca's* anti-diabetic activity. An extract from the leaves of *Strychnos nux-vomica* was tested for in vitro antidiabetic activity. The leaves were dried and ground into an extract after which it was repeatedly extracted using chloroform, ethyl acetate, and methanol. At a dosage of 1000 mg/mL, the activity was at its peak, and the level of inhibition was 34.866% (Kumar et al., 2013).

Anti-inflammatory properties: The presence of different flavonoids and tannins in *Saraca asoca* extract has been proven to have strong anti-inflammatory properties (Kumar et al., 2012). The anti-inflammatory effect of *Saraca asoca* may be helpful in the therapy of these problems because inflammation is a frequent underlying factor in many chronic diseases, such as arthritis, cancer, and heart disease.

Antioxidant activity: *Saraca asoca* has also been discovered to possess strong antioxidant properties, which are due to the presence of flavonoids and other phenolic components (Saxena et al., 2013). Antioxidants are crucial in defending the body from oxidative damage brought on by free radicals, which can aid in the emergence of a number of diseases.

Analgesic activity: The presence of different alkaloids in *Saraca asoca* extract has been proven to have analgesic properties, which are responsible for this (Kumar et al., 2012). The analgesic properties of *Saraca asoca* may help in the treatment of pain brought on by a number of illnesses, such as neuropathy, arthritis, and menstrual cramps.

Uterine stimulant activity: The extract of *Saraca asoca*, which has historically been used to treat menstruation issues, has been discovered to have a strong stimulant impact on the uterus (Saxena et al., 2013). The care of a variety of gynaecological problems, such as dysmenorrhea, menorrhagia, and uterine fibroids, may benefit from *Saraca asoca's* uterine stimulating effects.

Anticonvulsant properties: *Strychnos nux-vomica* seed ethanol extracts were discovered to exhibit anticonvulsant properties. Pentylenetetrazol (PTZ)-induced convulsions were significantly suppressed by the extract, which also decreased spontaneous motor activity and

catalepsy. It also demonstrated maximum hypnotic potency and was determined to be the safest LD50 (Shah et al., 2016).

Anti-tumor effects: *Strychnos nux-vomica* has three main alkaloids, brucine, strychnine, and isostrychnine, all of which have been reported to inhibit the proliferation of HepG2 cells. Using the MTT assay, these alkaloids' growth-inhibitory effects on the human hepatoma cell line (HepG2) were investigated (Shah et al., 2016).

Central Nervous System: Strychnine, a key alkaloid found in *Strychnos nux-vomica*, stimulates the central nervous system throughout, but especially the anterior horn cells of the spinal cord, leading to significantly increased reflex excitability. When the normal inhibition of motor cell activation is missing, even mild stimuli like noise, light, or air movement can cause intense widespread muscular spasms (Shah et al., 2016).

Discussion and Conclusion:

Saraca asoca's drug bark has been extensively described in ethnobotanical and secondary and primary research, and it has been reported to have a variety of actions. In Gulbarga district, Karnataka, to regulate menorrhagia, stem bark is boiled in water and cow milk. After the water is drained, the mixture is divided into three parts and administered starting on the day of the menstrual cycle. Amoebic dysentery is treated orally with dried flower paste diluted in water. Kidney calculi (stones) can be removed with oral administration of seed powder and honey, which has a diuretic effect (Ghatapanadi et al., 2011).

The following are some pharmacological activities and therapeutic applications: The plant's bark has astringent, haemostatic, alexiteric, anthelmintic, antibacterial, demulcent, and diuretic properties. Anti-estrogenic, anti-inflammatory, anti-implantation, antioxidant, anti-tumour, oxytocic, anti-progestational, and CNS depressant. It's also been described as a uterine tonic, stomachic, and constipative. Traditionally in order to control menorrhagia a bark is boiled in a mixture of water and milk. The liquid evaporates, and the mixture is divided into three parts and administered beginning during the first day of menstruation. To treat amoebic dysentery, a dried flower paste in water is taken orally. Orally, seed powder and honey have a diuretic effect and dissolve kidney stones.

The above-mentioned activities can be seen due to the presence of the following chemical constituents (Bhalerao et al., 2014):

- 5-methoxy- 9-β-xylopyranosyl
- Ash - 2.43 to 6.69%

- Catechin
- Cyanidin-3, 5- diglucoside
- Gallic acid
- Glycosides
- Isolariciresinol, and
- Kaempferol
- Leucocyanidin
- Leucocyanidin
- Leucopelargonidin
- Linoleic
- Linolenic
- Lyoniside
- Nudiposide
- Oleic
- Palmitic
- Pelargonidin- 3, 5-diglucoside
- Procyanidin
- Quercetin
- Schizandriside
- Stearic acids
- Tannins - 0.57 to 7.85%
- β-sitosterol glucoside

Some of the uses of *Strychos nux-vomica* seen are anti-cancer activity, anti-tumour activity, analgesic action, anti-diabetic activity, gastroprotective, neuropharmacological activity, larvicidal activity, the antidote for snake venom, anti-pyretic, anti-alcoholic, anti-oxidant, hepatoprotective, anti-microbial, anti-diarrhoeal, anti-convulsant, antiallergic, and anti-cholestatic activity (A. F. Stephens et al, 1904; Maji Amal Kanta et al, 2017; S. Arivoli et al 2012). The fruit pulp is a popular food of several birds, and as a result, seeds are dispersed far from the mother tree. When seeds pass through the digestive system of birds, their dormancy is easily broken. Seedlings establish easily in open spaces because they are a light demander and hardy species. Commercial cultivation has been observed in the United States, the European Union, Fujian, Guangdong, Guangxi, Hainan, North Australia, Taiwan, and other tropical Asian countries (Dinesh Kumar Patel et al 2012, Madhab Chandra Behera et al2017, Maji Amal Kanta et al 2017, Vinaya, 2021). Commercial cultivation is practised in India to a limited extent in the southern states.

The above mentioned activities can be seen due to the presence of the following chemical constituents (Liu, 2010; Martin et.al., 1952, Cai et.al.; 1994; Monache et al. (1968); Zhang et al. (2003); Guo et al., 2018):

- Brucine chloro methochloride
- Daucosterol
- Ethyl gallate

- Geniposide
- Icajine
- Isobrucine
- Loganic acid
- Methyl gallate
- Novacine
- Stearic acid
- Strychnine
- Strychnine chloromethochloride
- Vanillin
- Vomicin,
- α-amyrin
- β-sitosterol

The characteristics, possible applications, and ecological relevance of *Saraca asoca* and *Strychnos nux-vomica* are thoroughly examined in this review. These plants are among the most promising botanicals with a variety of medicinal characteristics and have a long history of usage in Ayurvedic medicine. The most plausible mechanisms behind the observed pharmacological effects are antimicrobial, antidiabetic, anthelmintic, CNS depressant, antimenorrhagic, uterine tonic, analgesic, anti-inflammatory, anti-ulcer, anticancer, larvicidal, and antioxytocin action. The two species are, however, under various challenges from habitat loss, overuse, and climate change. The International Union for Conservation of Nature (IUCN) has S. asoca on its list of threatened species and it is close to going extinct in the wild. Similar to how S. nux-vomica is in danger from habitat loss and overuse, which has caused population decreases in some locations. Hence, in order to secure the long-term survival of these plants, conservation activities are required. This can entail taking action to save their natural habitats, encourage sustainable harvesting methods, and create community-based conservation plans. Further population studies must be conducted in order to comprehend the state of the plants now and pinpoint any regions that require conservation measures. These plants also have a significant ecological role in their natural settings. One of the most important species in India's deciduous woods, *Saraca asoca* offers food and habitat to a variety of animals, including birds, mammals, and insects. Similar to this, *Strychnos nux-vomica* is a vital part of tropical and subtropical ecosystems and offers a variety of wildlife with a home and food source. This research concludes by highlighting the potential applications and ecological significance of *Strychnos nux-vomica* and *Saraca asoca*, as well as the dangers they face and the necessity for conservation efforts. To secure the survival of these significant plant species and to realise their potential for the creation of novel medications and treatments, more investigation and conservation measures are required.

References:

A. F. Stephens, A. S. Brecount, C. W. Pagel, W. N. Mundy (1904): A treaties on nux vomica.1-16.

Akbar, S., Khan, S., Masood, A., & Iqbal, M. (2010). Use of strychnos nux-vomica (azraqi) seeds in unani system of medicine: role of detoxification. *African Journal of Traditional, Complementary and Alternative Medicines*, *7*(4). https://doi.org/10.4314/ajtcam.v7i4.56689

Behera, M., Mohanty, T., & Paramanik, B. (2017). Silvics, phytochemistry and ethnopharmacy of endangered poison nut tree (Strychnos nux-vomica L.): A review. *Journal of Pharmacognosy And Phytochemistry*.

Bhalerao, Satish & Verma, Deepa & Didwana, Vinodkumar & Teli, Nikhil. (2014). Saraca asoca (Roxb.), De. Wild: An overview. Annals of Plant Sciences. 770-775.

Bhati, R., Singh, A., Saharan, V. A., Ram, V., & Bhandari, A. (2012). Strychnos nux-vomica seeds: Pharmacognostical standardization, extraction, and antidiabetic activity. *Journal of Ayurveda and integrative medicine*, *3*(2), 80–84. https://doi.org/10.4103/0975-9476.96523

Cai, B.C., H. Wu, X.W. Yang, M. Hattori and T. Nainba. Analysis of spectral data for 13 CNMR of sixteen Strychnos alkaloids. Acta Pharm. Sinic. 29: 44–48, 1994.

Cherian, Tom & Thambi, Mity. (2021). Pesticidal Properties on the Leaf Extracts of Strychnos-Nux-Vomica Plant.

Cooke, T. (1983). *The flora of the presidency of Bombay*.

Das, S., Majumder, S., & Pradhan, S. *Floristic diversity of Matheran, Maharashtra*.

Devan, A., & Warrier, R. (2021). Saraca asoca – morphology and diversity across its natural distribution in India. *International Journal Of Complementary & Alternative Medicine*, *14*(6), 317-323.

Eldahshan, O., & Mohamed. (2012). phytochemical and antiproliferative investigations of strychnos nux-vomica leaves. *Al-Azhar Journal of Pharmaceutical Sciences*, *45*(1), 236-243. https://doi.org/10.21608/ajps.2012.7241

Ghatapanadi, S., Johnson, N., & Rajasab, A. (2011). Documentation of folk knowledge on medicinal plants of Gulbarga district, Karnataka. *Indian Journal Of Traditional Knowledge*, *10 (2)*, 349-353.

Guo, R., Wang, T., Zhou, G., Xu, M., Yu, X., Zhang, X., Sui, F., Li, C., Tang, L., & Wang, Z. (2018). Botany, Phytochemistry, Pharmacology and Toxicity of Strychnos nux-vomica

L.: A Review. *The American journal of Chinese medicine*, *46*(1), 1–23. https://doi.org/10.1142/S0192415X18500015

Harry L. Arnold Poisonous Plants of Hawaii. Tokyo, Japan: Charles E. Tuttle. ISBN 0-8048-0474-5, 1968, 20.

Hooker, J. (1992). *The Flora of British India*.

Huang WJ, Chen CC, Wu SJ, Lin YC, Lee MF, Wu YC, Wu TS. Strychnos alkaloids and their synthetic analogues as anti-inflammatory agents. Fitoterapia. 2011; 82(5): 749-757.

Kausar, Ansari & Hasan, Azhar & Parray, Shabir & Ahmad, Wasim. (2016). Ethnobotanical, phytochemical and pharmacological properties of Saraca asoca bark: A Review. European Journal of Pharmaceutical and Medical Research. 3. 274-279.

Kumar, S., Kumar, V., Prakash, O., & Singh, R. P. (2012). Medicinal properties of Saraca asoca: A review. Journal of applied pharmaceutical science, 02(06), 153-157.

Madhab, Chandra & Behera, Madhab. (2019). Strychnos nux-vomica Linn -Strychnine Tree.

Maji Amal Kanta, Banerji Pratim 2017: Strychnos nux vomica: A poisonous plant withvarious aspects of therapeutic significance. J. Basic Clin. Pharma, 8, S087-S103.

Martin, W.F., H.R. Bentley, J.A. Henry and F.S. Spring. The isolation of novacine, an alkaloid from Strychnos nux-vomica L. and its identification as N-methyl-sec.-pseudobrucine. J. Chem. Soc. (Resumed)0: 3603–3604, 1952.

Mokat, Digambar. (2014). GROWTH PERFORMANCE AND FLOWERING IN PLANTED SAPLINGS OF SARACA ASOCA (ROXB.) DE WILDE. Lifesciences Leaflets. 56. 10.1234/lsl.v56i0.156

Monache, F.D., A.G. de Brovetto, E. Cor and G.B. Marini-Bettòlo. The separation of the minor alkaloids of Strychnos Nux vomica L. J. Chromatogr. A 32: 178–179, 1968.

O'Neill, M. J. (1996). Trease and Evans' pharmacognosy. *The Lancet*, *348*(9042), 1645.

Patel, K., Laloo, D., Singh, G. K., Gadewar, M., & Patel, D. K. (2017). A review on medicinal uses, analytical techniques and pharmacological activities of Strychnos nux-vomica Linn.: A concise report. *Chinese journal of integrative medicine*, 10.1007/s11655-016-2514-1. Advance online publication. https://doi.org/10.1007/s11655-016-2514-1

Patwardhan, A., Pimputkar, M., Mhaskar, M., Agarwal, P., Barve, N., & Gunaga, R. et al. (2016). Distribution and Population Status of Threatened Medicinal Tree <i>Saraca asoca</i> (Roxb.) De Wilde from Sahyadri-Konkan Ecological Corridor. *Current Science*, *111*(9), 1500. https://doi.org/10.18520/cs/v111/i9/1500-1506

Pradhan, P., Joseph, L., Gupta, V., Chulet, R., Arya, H., Verma, R. and Bajpal, A., 2009. Saraca asoca (Ashoka): A Review 1111223. *Journal of Chemical and Pharmaceutical Research*, [online] 1(1), pp.62-71. Available at: https://www.jocpr.com/articles/saraca-asoca-ashoka-a-review.pdf

Roychoudhury, Nilanjan & Meshram, P.B. & Mishra, Rajesh. (2017). Documentation of Strychnos nux-vomica in Bhitarkanika National Park, Odisha. Van Sangyan. 4. 29-32.

Saini, A., Hegde, S., Hegde, H., Kholkute, S., & Roy, S. (2018). Assessment of genetic diversity of Saraca asoca (Roxb.) De Wilde: a commercially important, but endangered, forest tree species in Western Ghats, India. *New Zealand Journal Of Forestry Science*, *48*(1). https://doi.org/10.1186/s40490-018-0122-x

S. Arivoli, Samuel Tennyson (2012): Larvicidal efficacy of Strychnos nux-vomica Linn. (Loganiaceae) leaf extract against the filarial vector Culex quinquefasciatus say (Diptera:Culicidae), World journal of zoology, ISSN: 1817-3098, DOI:10.5829/idosi.wjz.2012.7.1.56374. 7(1), 6-11.

Sasmal, S., Majumdar, S., Gupta, M., Mukherjee, A., & Mukherjee, P. (2012). Pharmacognostical, phytochemical and pharmacological evaluation for the antipyretic effect of the seeds of Saraca asoca Roxb. *Asian Pacific Journal Of Tropical Biomedicine*, *2*(10), 782-786. https://doi.org/10.1016/s2221-1691(12)60229-9

Saxena, M., Saxena, J., Nema, R., & Singh, D. (2013). Phytochemistry of medicinal plants. Journal of Pharmacognosy and Phytochemistry, 1(6), 168-182.

ScienceDirect. (2022). Retrieved 19 April 2022, from https://www.sciencedirect.com/topics/medicine-and-dentistry/nux-vomica.

Senapati, S., Das, G., Aparajita, S., & Rout, G. (2012). Assessment of genetic variability in the Asoka Tree of India. *Biodiversity*, *13*(1), 16-23. https://doi.org/10.1080/14888386.2012.665205

Sharma, B. (1993). *Flora of India*. Botanical Survey of India.

Sharma AK, Basu SP. Saraca asoca (Ashoka): A Review. Journal of Chemical and Pharmaceutical Research. 2010; 2(1): 62-71.

Singh, S., Anantha Krishna, T., Kamalraj, S., Kuriakose, G., Valayil, J., & Jayabaskaran, C. (2015). Phytomedicinal Importance of <i>Saraca asoca</i> (Ashoka): An Exciting Past, an Emerging Present and a Promising Future. *Current Science*, *109*(10), 1790. https://doi.org/10.18520/cs/v109/i10/1790-1801

Smitha, G., & Thondaiman, V. (2016). Reproductive biology and breeding system of Saraca asoca (Roxb.) De Wilde: a vulnerable medicinal plant. *Springerplus*, *5*(1). https://doi.org/10.1186/s40064-016-3709-9

Sreedevi, B., Kuchana, V., & Shobharani, S. (2021). Ethanobotanical, Phytochemical and Pharmacological Review on Strychnos nuxvomica. *Journal Of Natural Products And Plant Resources, 2021, 11 (1): 1-11.*

Tari, D. V. (2021). Strychnos nux vomica: 'Kajara' A wild plant. doi: 10.6084/m9.figshare. 14135948.v1.

Thambi, Mity. (2015). Phytochemical investigation of the bark of Strychnos- nux-vomica and its antimicrobial properties. 70-72.

Zhang, J.Y., N. Li., K. Hu and P.F. Tu. Chemical constituents from processed seeds of Strychnos nux-vomica. J. Chin. Pharm. Sci. 21: 187–191, 2012.

Suggested citation:
Agarwal A. & Gupta H. (2023). A Review on Saraca asoca and Strychnos nux-vomica, Prithivya, An Official Newsletter of WCB Research Foundation and WCB Research Lab. Vol 3(1) 23-40.