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A TOXICOLOGICAL STUDY ON ANCIENT AND CONTEMPORARY STUDY ON KUCHALA (STRYCHNOUS NUXVOMICA) PLANT

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ABSTRACT

Strychnous nuxvomica A well-known toxic plant with several health advantages in the Indian medical system is linn, also known as kuchala in Ayurveda. It has been utilized as a common folk remedy in Ayurveda from ancient times under the name Upavisha. In the form of medicine, this Kuchala is still utilized in rural India. Kuchala, which was originally used for medicinal purposes in 1540, contains strychnine, which has since been utilized in several stimulants, tonics, and cathartics. It contains elements including flavonoids, iridoids, and phenolic glycosides together with alkaloids. According to research investigations, it has anti-allergic, anti-inflammatory, antimicrobial, anticancer, antipyretic, gastroprotective, antidiabetic, antialcoholic, hepatoprotective, antioxidant, antinociceptive, anti-snake venom, and neuropharmacological effects. Despite being regarded as a plant with a high level of toxicity, it has several medical uses.

KEYWORDS - Kuchala, Strychnous nuxvomica, Upavisha, Therapeutic uses, etc.

INTRODUCTION

In the Agada tantra branch of Ayurveda, this idea of Visha and Upavisha is discussed. Kuchala is a medicinal herb from India that has been extensively used in Ayurvedic medicine. It falls under the upavisha varga or sub division and is also known as Kuchila or Kupilu. Upavishas are a term used to describe a class of medications that have a lower hazardous potential and are less fatal but nevertheless cause certain toxic symptoms when administered. The Upavishas, or poisonous medications, can be employed for medicinal reasons after being thoroughly purified (Sodhana), according to ancient Ayurvedic writings.¹

These herbs have been used into a number of Ayurvedic illness care formulations. One such substance is Kuchala, also known as *Strychnos nux-vomica*, which is widely grown not just in India but also in the US, Europe, and other places. According to ancient literature, Kuchala, also known as Kupilu or Kuchila, is a toxic deciduous tree. So, in the current study, we thoroughly investigated Kuchala's therapeutic, toxicological, and medical-legal aspects.²

PROPERTIES OF KUCHALA

S.No Botanical name *Strychnos nux-vomica* Linn.

- Family - Loganiaceae
- Common names - Nux-vomica, poison nut, snakewood
- Synonyms - Kupeelu, Kuchala, Kakapiluka, Karaskara visha-tinduka
- Rasa - Katu, Tikta
- Guna - Laghu
- Virya - Ushna
- Vipaka - Katu
- Karma Kapha - Vata hara, Grahi, Vishaghna

BOTANICAL DESCRIPTION

The medium-sized deciduous tree *Strychnos nux-vomica* has solid, close-grained white wood. **Trunk**-The trunk is tall, thick, straight, and cylindrical, and it is coated in thin, smooth, scaly bark that ranges in color from light to dark grey. **Branches**-Uneven, with smooth, ash-

colored bark and new, glossy, dark green sprouts. Simple, whole, smooth, short-stalked, opposite **leaves** with blades that range from oblong to broadly elliptical or ovate in shape, with bases that are rounded to cordate. Its traits include an apex that is acute or short-acuminate, glabrous and lustrous above, minutely hairy below, especially on veins, and 3-5 veins that branch out from the base. **Inflorescence**- Displayed with many flowers, it can be found on axillary shoots or at the tips of branchlets. It also has juvenile leaves. Hermaphrodite flowers in terminal cymes that are actinomorphic, homogamous, tiny, greenish-white in color, nectariferous, funnel-shaped, and produce an awful odor. Pentamerous with calyx lobes, oval on the exterior, and very hairy **flowers**- Its corolla is a thin, 1 cm long tube that is glabrous outside of the neck and widens there; it has pubescence at the base; the lobes are narrowly oval and measure 3 mm long; the edge is thickened and minutely hairy; and the stamens are inserted at the mouth of the corolla tube and act in concert with the lobes to change color. Anthers are a light cream color, ditheous, introrse, and longitudinally dehisce. **Ovary**-The stigma is capitated (head-shaped), the style is filiform, and the lengthy corolla tube is glabrous. It has an ovoid form, is bicarpellary with axile placentation, superior, and is glabrous. **Fruits**- include an indehiscent berry and a globose with a firm, smooth shell. Soft, white pulp that is mushy and jelly-like and contains 1 to 5 seeds. These **seeds**- have an orbicular or elliptical form, and their thick, silky hairs give them a distinctive luster. This seed has two sides, one of which is concave and the other of which is convex, both of which include depressions. A little embryo is present in the endosperm, which is the inner layer and is odorless, dark gray in color, very hard, and bitter in flavor.³

PHYTO-CHEMICAL COMPOSITION

Although the Kuchala tree contains several alkaloids of therapeutic use, the seed is more abundant in these components as listed in pharmacopeias. Alkaloids, flavonoids, tannins and triterpenoids, glycosides, lignins, and steroids are abundant in this plant. Strychnine and brucine are the two main poisonous alkaloids that have been identified from various portions of nux vomica, out of more than 90 distinct chemical components. They can be found in fruit pulp, hard fruit shells, roots, wood, bark, and seeds in addition to seeds. The

overall number of alkaloids in seeds ranges from 2.6 to 3.0%, with strychnine accounting for 1.25 to 2.5% and brucine for 1.5 to 1.7%. The seeds also contain 3.0% fixed oil, a glycoside called loganin, and chlorogenic acid.⁴

TOXICOLOGICAL IMPORTANCE

- Strychnine can inhibit the spinal cord receptors for the inhibitory neurotransmitter glycine as well as the brainstem's post-synaptic absorption of glycine.⁵
- Glycine's inhibitory action is lessened, and decreased neurotransmitter concentrations stimulate neuronal impulses.⁶
- In the absence of an inhibitory effect, the motor neurons continue to fire stimuli, resulting in continuous muscular contractions (release excitation) in the victim.⁷
- Strychnine does not influence the neurotransmitter of presynaptic inhibitory neurons, and its major activity is in the Renshaw cells of the spinal cord, or the anterior horn cells.⁸

It is mostly processed in the liver.

STRYCHNINE: 15–50 mg (1-2 mg/kg body weight) is the lethal amount.

FATAL DOSE - A single smashed seed.

FATAL TIME: 1-2 hours

SIGN & SYMPTOMS

- A bitter flavor, A feeling of choking and rigidity in the neck and face.
- Restlessness,
- Increased acuity of perception,
- Increased rigidity of muscles and muscular twitching.
- Cyanosed Face
- Look is anxious
- Eyes are staring
- Convulsions: Because the threshold for CNS activation is decreased, any sensory stimulus—pain, touch, or noise—can cause a severe spasm of the muscles. Clonic at first, but ultimately turns tonic and affects every muscle at once.

- Risus sardonicus: This ailment is caused by the jaw and face muscles contracting, drawing the corners of the mouth together.

THERAPEUTIC MANAGEMENT OF KUCHALA

- Maintain enough breathing and a clean airway. Controlling convulsions involves keeping a room dark, quiet, and distraction-free. The standard of care for strychnine-induced muscle hyperactivity continues to be benzodiazepines. 0.1-0.5 mg/kg IV of diazepam gradually. Ineffective general anesthetics should be followed by the use of muscle relaxants like gallamine.⁹
- Antidotes such pentobarbital sodium or sodium amytal (Barbiturates) are administered intravenously in doses ranging from 300 to 600 mg.¹⁰
- If no convulsions occur, careful gastric lavage with KMnO₄ may be performed. After one hour of consumption, strychnine is provided with activated charcoal to absorb it and lessen its absorption.¹¹
- Ice water immersion, cooling blankets or spray, and fans are used to actively cool patients with hyperthermia.¹²

FINDINGS IN POST MORTEM STUDY

- Not distinctive.
- Rigor mortis develops quickly.
- Asphyxial warning signs.
- Blood that has extravasated may be seen in the muscles.
- The viscera are clogged.

ABOUT MEDICO -LEGAL ASPECT OF KUCHALA

- One of the worst toxins. Typically, overdoses, poison mistaking for other safe drugs, quack medicines, or children ingesting the seeds result in unintentional death.¹³
- It is employed as a rat- and dog-killer as well as an aphrodisiac and a poison for livestock and arrows.¹⁴

SODHANA SANSKARA OF KUCHALA

The outer layer of the Kuchala seed is scraped off with a knife after it has been dried and marinated in cow's milk for 20 hours at night. After that, it is divided into little pieces and cooked for three days (approximately four hours each day) in cow milk. It is warmed with warm water after each day of boiling, dried, and then used the next day. It is dried under cover and cooked with cow's ghee after three days so that it may be used as a medicine.¹⁵

PHARAMCOLOGICAL STUDIES

ANTI-CANCER STUDY

The aqueous extract of nux vomica roots was used in the study by Rao et al., and it demonstrated dose- and time-dependent anti-proliferative activity against human multiple myeloma cell lines with an IC₅₀ value of 11 mg/ml, indicating that the root extract also caused myeloma cells to undergo apoptosis in addition to the disruption of mitochondrial membrane potential and subsequent leakage of mitochondrial cytochrome c.¹⁶

ANTI-REHUMATIC STUDY

In 109 children who had acute rhinitis, the nux vomica 6C dilution was used. This open, multicenter clinical research showed the efficacy of the homeopathic nux vomica dilution (potency) in treating acute rhinitis. Within 7 days of the trial period, 5.50% of the children had made a considerable improvement, 14.68% had seen a complete recovery, and 79.82% had been entirely cured.¹⁷

ANTI DIABETIC STUDY

Healthy albino rats of both sexes weighing 150–250g were used in the study, and diabetes was produced in the animals by giving them 110 mg/kg of alloxan intraperitoneally and fasting the rats for 24 hours beforehand. Blood samples were taken after 72 hours and tested for blood glucose. The present investigation employed albino rats that had blood glucose levels more than 200 mg/dL and were therefore classified to have diabetes. To prevent bias, the blood samples from these rats were taken at random. Aqueous and 50% ethanolic extracts of S.nux-vomica were delivered using an oral feeding needle and distilled water as

the carrier fluid. Additionally, this work demonstrated that per-oral administration of the hydroalcoholic and aqueous *S. nux-vomica* seed extracts was successful in reducing.¹⁸

HEPATO- PROTECTIVE STUDY

A vivo study showed the hepatoprotective potential of processed seed extract in assays involving CCl₄- induce liver injury. The results showed that oral administration of varying doses of processed seed extract for 5 days reduced serum levels of glutamate oxaloacetate transaminase (GOT), glutamate pyruvate transaminase (GPT), alkaline phosphatase (ALP), bilirubin, and cholesterol.¹⁹

DISCUSSION

The Shodhana sanskara, also known as the purifying process, is a technique used to transform deadly pharmaceuticals into life-saving ones by using certain Sanskaras (processes) like Shodhana, Marana, etc. and by rubbing, boiling, etc. to remove their detrimental effects. Since ancient times, Ayurvedic science has adhered to the notion of Visha and Upavishas and the process of employing these substances in medical concoctions. The purificatory methods, or shodhana sanskara, assist to lessen negative effects and boost their therapeutic advantages. One of the Upavishas, Kuchala, or *Strychnos nux-vomica*, has been thoroughly detailed in Rasatarangini with regard to its characteristics, medicinal applications, and purifying techniques, among other things.²⁰

CONCLUSION

Kuchala, a deadly substance also known as an upavisha, has the potential to be used as both a remedy and a poison. It is a toxin that is fatal when consumed, but if purified, it has amazing medical powers that may prolong a person's life. It has been effectively employed in several Ayurvedic formulations with its essential phyto-chemical components after adequate purification to treat a variety of illnesses. To validate its promise, more phytochemical, analytical, and clinical research are required.

CONFLICT OF INTEREST -NIL

SOURCE OF SUPPORT -NONE

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