

**A LITERARY REVIEW ON PHARMACOLOGICAL ACTIVITY,
TOXICOLOGICAL EFFECTS AND THERAPEUTIC USES OF
KUCHALA FORM VARIOUS SYSTEMS OF MEDICINES INCLUDING
AYURVEDA**

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ABSTRACT

Kuchala (strychnous nuxvomica Linn) is one of the poisonous plant explained in Ayurveda text under Upavisha. It is a Sthavara Vanaspatik visha(Upavisha), and phala visha (beeja visha). Strychnine is a popular traditional drug used from ancient times. Acharya Charaka stated that, an acute poison can be used as a drug, if it is administered with proper idea i.e making firm diagnosis, deciding ideal dose and in other hand even a drug can be act as poison, if it is not administered properly. According to Ayurveda and Modern science, Kuchala is a known vegetable poison and used in many pharmaceutical preparations of Ayurveda and other systems of medicine. Strychnine is a main

contain of kuchala which was first used medically in 1540, and continued to be used in many stimulants, Tonics and cathartics. The medicinal preparations of Kuchala which stated in Ayurveda are Agnitundirasa, Laxmivilasarasa, Shulnirmulanarasa, Suptivaatarirasa, Vishatinduka etc. This review article is a sincere attempt to summarize the information concerning about poisonous drug Kuchala (strychnous nuxvomica Linn) described in Indian system of medicine in respect to its literary, pharmacological activity, toxicological effects, and therapeutic uses in various systems of medicines including Ayurveda.

KEYWORDS: Sthavara Vanaspatik visha, strychnous nuxvomica, phala visha, Agnitundirasa.

INTRODUCTION

Kuchala is one of the poisonous herb explained in Ayurveda text, which is used in various classical formulations of Ayurveda with great therapeutic significance. Acharyacharka has described unconditionally that, even a strong poisons can become the best drug, if it is used after proper detoxification (shodhana), in proper therapeutic dose and formulation. In other hand a good drug may produce serious adverse effects or may be harmful or may cause death, if it is not used for proper person in proper dose.^[1] According to Rasratnasamucchaya Upavisha are eleven in number.^[2] According to Ayurveda, The group of drugs which are less toxic in nature and not so lethal but yield some toxic symptoms on administration and having less toxic potency are called as Upavisha.^[3] However Kuchala is included or explained in the 'Upavisha varga' (sub poisonous group), it's seeds are used in different formulations after proper Shodhan sanskar (processing of purification) to treat the various types of diseases. The main content of Kuchala is Strychnine and it is popular in traditional medicine from ancient period. Nuxvomica was introduced in Europe in the sixteenth century, but was not used in medicine. This alkaloid strychnine has been in use as a rodenticide at that time. It is also used for killing wandering dogs hence it is called as dog buttons, and it is manly used as poison in dogs, cats, crows etc. Strychnine was first used medically in 1540 and continued to be used in many stimulants Tonics and cathartics until as recently as the 1960s.^[4] The seeds are mainly used as Aphrodisiac, Appetizer, Anti-periodic, Digestive, Purgative, and Stimulant. It's also used in Anemia, Asthma, Bronchitis, and Intermittent and malarial fever. Ayurveda has successfully used kuchala and its preparations after proper purification to treat number of diseases. The medicinal preparations of Kuchala which stated in Ayurveda are Agnitundirasa, Laxmivilasarasa, Shulnirmulanarasa, Suptivaatarirasa, Vishatinduka etc.^[5]

SCIENTIFIC CLASSIFICATION OF KUCHALA^[6]

Kingdom	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
(unranked):	Asterids
Order:	Gentianales
Family:	Loganiaceae (Karaskara Kula)
Botanical Name:	Strychnous nuxvomica
Genus:	Strychnos
Species:	S. nuxvomica

VERNACULAR NAMES^[7]

- **Hindi Name:** Kuchala

- **English Name:** Nuxvomica
- **Telugu Name:** Mushini Ginjalu, Mushti Vittulu
- **Bengali Name:** Kunchila Marathi Name -Kajara
- **Gujarati Name:** Jherkuchala, Zerkochala
- **Tamil Name:** Yettikottai
- **Malayalam Name:** Kaajjeel
- **Arabian Name:** Ajaraki, Habbul Gurav
- **Parsi Name:** Kuchula, Phuloosemaahi.

SANSKRIT SYNONYMS^[8]

Kuchelaka, kuchel, Kuchila, Kuchil, Vishatinduk, Tindu, Tinduk, Vishatinduk, Karaskara, Ramyafala, Kupaak, Vishamushtika, Vishamushti, Kaalkuta.

CLASSIFICATION OF KUCHALA

The classification of kuchala is as below:

a. Ayurveda

It is a Sthavara Vanaspatik vish Upavisha,^[9] and phala visha (beeja visha).^[10]

b. Modern medicine

It is a Neurotoxin spinal excitant poison.^[11]

DISTRIBUTION^[12]

It is found throughout tropical India up to an altitude of 360 m, in Uttar Pradesh, Bihar, Orissa, Coromandel Coast, Andhra Pradesh and Karnataka. It is most common in the forests along the western coasts.

PLANT DESCRIPTION^[13]

The Plant of kuchala is dense, hard white and close-grained. The branches are irregular and are covered with a smooth ashen bark. The young shoots are deep green color with a shiny coat. The leaves have an opposite arrangement, short stalked, are oval shaped, also have shiny coat and are smooth on both sides. The leaves are about 4 inches (10cm) long and 3 inches (7.6cm) wide. The flowers are small with a pale green color with a funnel shape. They bloom in the cold season with a smooth and have a foul smell. 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. The seeds are removed from the fruit when ripe. They are then cleaned, dried and sorted. The seeds have the shape of flattened disk completely covered with hairs radiating from the centre of the sides. This gives the seeds very characteristics 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. The plant is native to south East Asia and Australia normally in tropical and subtropical areas.

MAJOR CHEMICAL CONSTITUENTS^[14]

- Brucine
- Strychnine
- Vomisine
- Kajine and Novocain(N-methyl pseudobrucine)
- Strychnine and Isostrychnine
- Cuchiloside
- Loganic acids

AYURVEDA VIEW OF KUCHALA

In Bruhtrayi (Charaka Samhita, Sushrut Samhita and Vagbhata Samhita are the sole of Ayurveda), there is no description of kuchala. Dhanvantari Nighantu also had not explained the kuchala. But Shodhala has stated it as Visha Tinduk and included it in karveeradi varga,^[15] and Bhavamishra defined it as Kakatinduka or Kupilu.^[16] Kaideva Nighantu stated a drug Vishamusti, which may be considered as nuxvomica.^[17] Rajanighantu has explained the Kuchala in Prabhadradi varga and also stated its five types.^[18] In ethanomedicine other species of the same genus are in vogue in Telangana (a state in India). These species are used in the name of different kinds of 'Mushini'. In modern era, due to its poisonous nature, Nuxvomica was very unenthusiastically introduced into the European pharmacopoeias.

AYURVEDIC PROPERTIES OF KUCHALA^[19]

RASAPANCHAKA

- Rasa:** Katu Tikta
- Guna:** Rruksha, Laghu, Teekshna
- Veerya:** Ushna
- Vipaka:** Katu.

- e. **Karma:** Shothahara, Puthihara, Vedanasthapana, Uttejaka, Nadibalya, Deepana, Pachana, Grahi, Shoolprashamana, Hridyottejaka, Kaphaghna, Kasahara, Vajikarna, Balya, Katupaustika, Kushthaghna, Kandughana, Swedapnayana.

DOSHAGHANATA

Kaphavatshamak.^[20] Kaphapittanashanam.^[21]

ROGGHNATA^[22]

Sandhivata, Amavata, Vrana, Kushatha, Nadishoola, Ardhangha, Gatibhransha, Gyanabhransha, Peshiposha, Kampa, Badhirya, Ardita, Pakshaghata, Andria, Amadya, Amashyastha, Amadosha, Grahani, Udarshoola, Arsha, Krimi, Raktavikara, Vatarakta, Hridyashaithilaya, Hridayodara, Kasa, Phuphusshotha, Dhvajabhangha, Sheeghrapatana, Daurbalya, Kushtha, Kandu, Atisweda, Vishamajwara, Visuchika.

USES OF KUPILU^[23]

- Hanti Meda – lowers cholesterol, useful in obesity
- Krumihara – useful in intestinal worm infestation
- Shvasahara – useful in asthma and wheezing
- Gulmahara – useful in abdominal tumor, bloating
- Arshohara – useful in hemorrhoids
- Mushikavishahara – useful in rat bite
- Vishtambhi – causes constipation
- Rochana – improves taste, useful in anorexia
- Agnikrut – improves digestion strength
- Grahi – absorbent, useful in diarrhea
- Kushtahara – useful in skin disorders
- Pramehajit – useful in urinary disorders, diabetes
- Madakrut – causes intoxication Kanthamayahara – useful in diseases of throat

KUPILU SHODHANA (DETOXIFICATION / PURIFICATION METHOD)^[24]

1. Fry Kuchala seeds with ghee in a pan on slow flame till it's outer covering become led-yellow coloured. Take these seeds and remove the outer skin of seeds and grind the hot pulp immediately. This shodhana process is useful in emergency use of Kuchala.

2. Wrap Kuchala seeds in a cloth, keep it in Dolayantra with cow's milk, and boil it for 3 hrs. After 3 hrs remove the seeds, grind it in iron Kharal, and use the churna (powder). Skin of seeds is removed. It is boiled with milk for 7 days, dried, then it is fried in ghee and powdered.

Medicinal Dose: 1/2 to 1 Gunja.^[25]

AYURVEDIC PREPARATIONS OF KUCHALA^[26]

- Navjeevan Rasa
- Agnitundi rasa
- Laxmivilas Rasa
- Shoolanirmulan Rasa
- Suptivatari Rasa
- Saramaha Vishapaha Yoga
- Vishatinduk Taila (For External use).

MODERN VIEW OF KUCHALA^[27]

Strychnine was first used medically in 1540 and continued to be used in many stimulants, tonics and cathartics until as recently as the 1960s.^[28] Kuchala was recognized in America (1830) before it was official in England, although long before this date it was a dispensatory drug. In 1799, however, it was official in the pharmacopeia borussica, and in two other continental European pharmacopeias. The dominating constituents of nuxvomica is a complex compound which in natural form, is an invaluable remedy, by means of chemical reagents it can be split into parts, embracing two intensely poisonous alkaloid products, a glucosidal and acids. These alkaloids are Strychnine, Brucine, and perhaps Igasurine (yet in doubt). The main acid is Igasuric acid, while the glycoside is named loganin. These are all colorless bodies, the alkaloids being very bitter, and energetically poisonous, Brucine being a poison similar to strychnine, acting with less violence and more slowly, but not less surely, than strychnine.

Strychnine: $C_{21}H_{22}N_2O_2$ this violently poisonous alkaloid is crystalline, slightly soluble in cold water the solution being alkaline and bitter. Strychnine is said to be the bitterest substance in the world. The taste is detectable even in a dilution of 1/100,000 or more. It dissolves in 7 with parts of chloroform and 150 parts of 90% alcohol. Strychnine is a terrible titanic poison, affecting the cerebro-spinal system, but it kills without producing marked

anatomical changes, the muscles and nerves being scarcely altered, although brain and spinal cord may be congested, stomach and limbs intensely congested, right side of heart gorged (sometimes empty) and the lungs congested, the fatal dose of strychnine is as low as ½ grain. Indeed, it is recorded that 1/16 grain killed a two year old child in four hours, while ½ grain killed a man in twenty minutes.

Brucine: this related alkaloid is also a product of chemical action on nuxvomica. It is known to chemists as dimethoxylstrychnine.

Brucine: $C_{22}H_{26}N_2O_4$ is very bitter feebly soluble in cold alcohol. It differs in reaction from strychnine in that strong Sulphuric or Nitric acid strikes with it blood – red color, whereas with strychnine no coloration appears. Brucine is a poison which has the physiological, but in markedly less degree. Authorities differ, some considering it one sixteenth; others from one – fortieth to one fiftieth less energetic than strychnine as convulsant. The antidotes and treatment for poisoning by Brucine are the same as for strychnine.

PHARMACEUTICAL PREPARATIONS

The alkaloids are sometimes prescribed in solution and have long, made into pill, tablet, or pellet form of the solutions, half solution of strychnine is an old preparation occasionally used at present.

TINCTURE OF NUXVOMICA

This preparation was among the first official preparation of Kuchala. It is made today by dissolving 20 grams of dried extract of nuxvomica in enough mixture of alcohol 3 volumes, volume to make 1000 cubic centimeters. This is perhaps the best known drug store preparation of nuxvomica and needs no special comment.

MODE OF ACTION^[29]

Strychnine stimulates all parts of the CNS and particularly the anterior horn cells of spinal cord causing greatly increased reflex excitability. Normal inhibition of motor cell stimulation is lost so that any slight stimulus such noise, light, or air breeze causes violent generalized muscle spasms. Pharmacological Activities.^[30] Anti HIV, Hepatoprotective, Anticholestatic, Ant lipid Peroxidative property, Antiulcer, Insecticidal, CNS stimulant and Strychnine showed remarkable negative chronotropic activity on frog isolated heart and guinea pig atria and activity retained in vivo also (open chest dog). Strychnine (50mg/kg) when injected

subcutaneously increased levels of acetylcholine in spinal cord and sustained convulsions in frog for 4 hr. Isostrychnine N- oxide and isobrucinne N- oxide showed the most potent cytotoxicity to tumour cell lines of K562, HELA & HEP-2.

PART USED^[31]

Seed is the most used part of this herb. Rarely, root bark is also used. It should be purified before using for medicinal purposes.

DOSAGE^[32]

Seed powder: A possible fatal dose is ½ gm [below 33 mg].

TOXIC SYMPTOMS^[33]

- Bitter taste
- Twitching and stiffness of muscles of face and neck
- Convulsions- initially clonic i.e. intermittent and then tonic i.e. sustained.
- Any stimulus like movements of patient, noise, touch, light or water immediately produces convulsions.
- Muscles became rigid and stiff, so that body is thrown in to the form of arch
- Synosis
- Blood stained froth at nose and mouth
- Eyes :-prominent and staring, with dilated pupils
- Mind remains clear till end
- Death is painful

DIAGNOSIS OF POISONING^[34]

- TLC gives reliable qualitative results on gastric aspirate, urine, blood or tissues.
- Best specimens are urine and gastric aspirates
- HPTLC provides accurate quantitative data.
- Blood levels in the range of 0.1 to 0.3 mg/100ml are generally lethal.

POST MORTEM APPEARANCE

- Rigid attitudes characteristic of the clinical state may persist for a long time after death.^[35]
- There may be oozing and hemorrhages are usually present in muscles.
- As in death following any violent muscular activity, the lymph in thoracic duct is bloody.

- The spasm of the muscles interferes with respiration and causes death from asphyxia.
- Early onset and disappearance of rigor mortis.
- Postmortem calorificity
- Dilated pupils.

FORENSIC SIGNIFICANCE OF PLANT^[36]

- Strychnine has been uncommonly employed in murder owing to various obvious reasons like bitter taste, dramatic nature of symptoms-that will always arouse suspicion of foul play, and easy delectability in body fluids and tissues.
- Accidental poisoning can result in children who chew on the seeds out of curiosity while playing or foraging in the countryside.
- Previously, therapeutic misadventures used to be fairly common when strychnine was an approved constituent of various over-the-counter tonics and cathartics.
- Accidental poisoning can also result from inadvertent consumption of strychnine-containing rodenticide.
- Owing to the agonizing nature of death, strychnine is rarely employed in suicide.

ACTION AND USES^[37]

The root is bitter, tonic, febrifuge and useful in cholera, intermittent fever and bites of venomous reptiles. The leaves are applied as poultice in the treatment of chronic wounds and ulcers and leaf decoction is useful in paralytic complaints. The pulp of the ripe fruit is used in treating paralytic affections of palms and foot. The seeds are bitter, nerving, tonic, Alexiteric, Aphrodisiac, Appetizer, Ant periodic, Antihelminthic, Emetic, Digestive, Purgative, Diabetes, Colic, Intermittent And Malarial Fever, Insomnia, Cardio spasms, Skin Diseases, Nerve Debility, Dyspepsia, Diarrhea, Dysentery, Hysteria, Mental Emotions, Epilepsy, Chronic Constipations, Gout, Chronic Rheumatism, Hydrophobia, Spermatorrhoea, Opium or Lead poisoning, Paralysis and weakness of limbs. The wood is used in Dysentery, Dyspepsia and Fevers. Strychnous nuxvomica is also used in homeopathy.^[38] It is said in Homeopathy "if you do not know what should be prescribed, then give Nux Vomica." It is often used as an antidote for over drugging. Nux Vomica is generally prescribed for males who are thin, irritable and lose temper by slight provocation. Also, for those who do a good deal of mental work, study a lot or handle business affairs and lead indoor life. Because of mental strain, such people often seek the help of stimulants, such as coffee, liquor, or use sedatives like opium or any other cannabis preparation. People, who take rich food, attend parties and

generally overindulge themselves until late at night, often have irregular bowel movements (or have constipation). They often take laxatives like Hajmola, liver tonics, etc. Nuxvomica soothes and calms overexcited nervous system and improves digestion and bowel movement. It increases Appetite, vigor and gives potency to males who have ruined themselves by excessive use of stimulants. That is why it is called the medicine of "bigrey Nawab (spoilt men). It may be taken in low potency of 6 or 30 (in case of irritable, overexcited persons), and above 200 or more potency in case of habitually constipated and hard drinkers. It is one of the best remedy for mania-a-potu (acute alcoholism).Nux Vomica of 6 and 30 potency should be taken once a day before going to sleep at night. If it is 200 potency then it should be taken once a week. If it is still higher, then once a fortnight.^[39]

DISCUSSION

Kuchala is a well known spinal poison to modern science. It is used in Ayurvedic pharmacopeia from ancient period. Ayurveda texts like Rasatarangini, Rasratnasamucchaya, Raj-Nighantu, and Bhavprakasha mentioned detail description of the plant, basic properties, therapeutic uses, medicinal preparations. Some Ayurveda texts like Bruhat- Trayi (3 basic granthas of Ayurveda i.e. Charaka Samhita, Sushrut Samhita and Vagbhata Samhita) and Dhanvantari Nighantu did not mention Kuchala. Even in Kalpasthana Sushruta described types of visha according to adhisthana (a part of plant were poison resides), among it he includes fala visha (poisonous fruits), but he didn't mention in it. Due to some properties like Ashukaritwa, Ushna, Teekshna vish dravya get spread rapidly in the body. So for the quick action of medicines many Ayurvedic formulations contain these vishadravyas like Kuchala as their ingredient. By utilizing these properties of vishadravyas medicines can be made more effective. So we found that many Rasashastra based texts are having description of poisonous drugs like Kuchala in detail. Rastarangini stated the detoxification process of Kuchala, so that purified Kuchala can get used in medicinal formulations. Modern toxicology includes it in a deadly poison. It is categorized as Neurotoxin spinal excitant poison. Medico legally this plant is important too. Homicidal Death due to Kuchala is uncommon because of bitter taste, dramatic symptoms and easy detectability in body fluids and tissues. Accidental poisoning is common among children. Homeopathy also mentions many therapeutic uses of Kuchala. In homeopathic material medica Nuxvomica is mentioned as laxative, Digestive, Increasing vigor and vitality in male and also useful in alcoholism.

CONCLUSION

Kuchala (strychnous nuxvomica Linn) is one of the deadly poisons known to mankind. Though it is poison, it is important part of Ayurvedic and Homeopathy pharmacopeia. It is a basic ingredient of many ayurveda formulations. Due to properties like Ashukaritwa, Ushna, Teekshna vish dravya like Kuchala get spread rapidly in the body. So for the quick action they are used in medicinal formulations of Indian system of medicine and other systems.

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