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The role of alkaloids-strychnine & brucine of *Strychnos nux* vomica as a wonderful medicine for many clinical conditions through homoeopathic preparations

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Abstract

The plant 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, antialcoholic, 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. In the future, more efforts should be required on *in vitro* and *In vivo* studies and also on clinical trials to confirm clinical efficacy and to determine the active constituent(s) and mode of actions involved in each activity of nux vomica. Moreover, nux vomica is extremely toxic and this is attributed to the presence of alkaloids, mainly strychnine and brucine. Therefore, more attention should also be paid to minimize its toxic potential through advanced detoxification processes without altering the therapeutic potential.' Through this review, the authors are intended to integrate traditional ethno medicinal knowledge and modern scientific findings about nux vomica in order to understand its phytochemical, therapeutic potential as well as toxicity and future perspective [01].

Keywords: *S. nux vomica*, phytoconstituents, pharmacology, clinical studies, alkaloids, strychnine and brucine

Introduction

A famous saying says: No house hold should be without a little homoeopathic medicine chest for common ailments, and no homoeopathic medicine chest should be without Nux Vomica.

Nux Vomica is the king of our polychrest remedies and its domain is vast. It extends from pole to pole and it encompasses a perplexity of character that is truly astounding.

Full Name: Nux Vomica [2].

Common Names: Strychnos Nux Vomica [3], Poison nut (English), Kuchla (Hindi) [2], Kuchila (Bengal), Kraehenaugen (German), Noix Vomique (French) [04].

Synonyms: Nux Vomica officinarum, Quaker buttons [2].

Source: Vegetable Kingdom [5].

Botanical Name: Strychnos Nux - Vomica (linn.) [6].

Family: Loganiaceae [6].

Habitat: It is a native of East Indies and is also found in the forests of Sri Lanka and on the Malabar coasts of India [5], Cochin [7], Burma, China, Thailand and Australia [2]. West Indies and South America [8].

It also grows in dry deciduous forests of Western Ghats and Himalayas [6].

Proved By: Dr. Christian Friedrich Samuel Hahnemann in 1805 [5]. Introduced by Hahnemann and proved upon himself, his son Frederick, Stapf, Wahle and Flaeming. Later provings by Robinson, Berridge and Wilson, with high potencies [9].

Parts Used: Seeds [2].

Preparation: Tincture is prepared from finely pulverized seeds [9].

Mother tincture	**Drug strength 1/10**
Nux Vomica in moderately coarse powder	100 g
Purified Water	200 ml
Strong Alcohol	824 ml

To make one thousand milliliters of the tincture [6].

Ten grains of Nux Vomica seed, finely triturated in a warm mortar, are macerated with 1000 drops of alcohol, without heat, for a week, to make a tincture. Of this, one drop is

raised to the decillion - fold potency through 29 other diluting phials, each filled to three quarters with alcohol, by means of two succussions given to each phial after the dilution is made. The same medicine is prepared in a simpler and almost more powerful and uniform manner, by taking one grain of the powdered Nux Vomica seed, and treating it like other dry medicinal substances, by triturating it thrice with 100 grains of milk sugar up to the million - fold powder attenuation. One grain of this is dissolved in 100 drops of diluted alcohol, and the dilution and dynamization is brought further, by means of 26 more phials filled three quarters full of good alcohol, up to the decillion - fold potency. One small sugar - globule, 300 of which weigh a grain, moistened with this last dilution, serves as a dose [10].

Potency: First to thirtieth potency and higher [11].

Duration of action: 15 to 21 days [12].

Administration: Nux Vomica acts best when given at night, during repose of mind and body [13].

Thermal Relation: Patient is very chilly [05].

Miasm: Psoric miasm [14].

Diathesis: Scrofulous and haemorrhagic diathesis [02].

Temperament: Bilious, sanguine, irritable, impatient temperament [15], nervous, spiteful, malicious [05], zealous fiery temperament [11].

Fatal Dose: Fifteen to fifty mg [16]; one crushed seed [15].

Fatal Period: One to two hours [15].

Active Principle: Strychnine, Brucine [2].

Strychnine occurs as colourless, odourless, rhombic prisms, having an intensely bitter taste. The bark contains only Brucine. The fruit pulp has very low strychnine content. Brucine is allied to strychnine in composition and action. Strychnine is 10 to 20 times more poisonous than brucine [16].

History

Strychnine, derived from Nux Vomica, was first used in medicine by the Arabians who described about it in 1540. In sixteenth century, in Germany it was used as a rat poison. To some extent it was used medicinally in Europe, as a tonic in the eighteenth century, but its use extended considerably following the introduction of Nux Vomica through Hahnemann's proving published in 1805.

Subsequently, allopathic physicians used strychnine for paralytic conditions. At present there are no recognized medicinal applications for strychnine in orthodox medicine. Although highly poisonous, strychnine which is extracted from the seeds of the Strychnos Nux Vomica tree, was used as an antidote to the plague during the middle ages [2].

It is used in India in cases of intermittent fever and snake bite [17]. A decoction of the leaves is used externally in rheumatism [18]. Strychnine is used as a respiratory stimulant, as a rodenticide and for killing stray dogs [16].

The word "Nux Vomica" has been taken from Latin 'Nux' meaning Nut and "Vomicine" from 'Vemere' meaning vomiting because of the peculiarity of the drug.

Nux Vomica is supposed to owe its activity to two alkaloids, Strycnia and Brucea; but it is found in practice that the action of Nux Vomica on the organism is not identical with that of either of these substances. Nux Vomica is very bitter, and Strychnia is so intensely bitter. Strychnine when given orally or parenterally in animals, produces *convulsions characterized by tonic extension of the body and opisthotonos*. Death occurs as a result of asphyxia after seizures. Strychnine has no place in therapeutics in allopathy.

Nux Vomica is the greatest of polychrests, because the bulk of its symptoms correspond in similarity with those of the commonest and most frequent of diseases. It is frequently the first remedy, *indicated after much dosing, establishing a sort of equilibrium of forces and counteracting chronic effects*.

Nux Vomica is pre - eminently the remedy for many of the conditions incident to modern life. It is a remedy in ailments of literary persons who lead a sedentary life. This is a remedy suitable for people of every age and sex.

Nux Vomica is *the best remedy to commence treatment of cases that have been drugged by different pathies especially after much dosing with allopathic drugs*. It is useful in those over drugged by tea, coffee, and wine, and for people over drugged by old school. When "all medicines disagree" Nux Vomica will often cure the morbid sensitiveness and other troubles with it.

Nux Vomica being a constitutional remedy acts at the constitutional level. It is a remedy used widely in both acute and chronic conditions.

Description

Strychnos Nux Vomica is a moderate sized tree [17] but sometimes attaining 10 metres height, often armed with short axillary spines. Bark thin, grey, smooth, or rough with lenticles. Young shoots polished, deep green. Leaves 7 - 15 cm long, petioles 6 - 12 mm long [6]. A cluster of greenish - white flowers of the tree are followed by apple sized fruits [2]. The fruit is round, hard, slightly rough, glossy - orange, 4 to 5 cm wide [16], with fine silky hairs radiating from center [06] and it contains jelly like white or pale yellow pulp [16], which contains pale button like seeds [2], about the size of a half-penny, ash - grey in colour, covered with fine silky hairs [17].

The seeds are flat, circular discs or slightly convex on one side, concave on the other, two and half cm in diameter, six mm in thickness [16]. The seeds are intensely bitter, but the pulp is innocuous and is said to eaten by birds [17].

The seeds of Nux Vomica contained in the ripe fruit are poisonous. They are very hard, tough and difficult to pulverize [16]. *The wood of the tree is also very bitter* [17]. *All parts of the tree are toxic* [16].

Toxicological Effect

When taken in very small doses, Nux Vomica is said to derange the digestion to augment the secretion of stomach and mouth and of liver and pancreas [19]. *If swallowed uncrushed, the seeds of Nux Vomica have no poisonous action, as they are not dissolved in the gastrointestinal tract, and are passed entire in the faeces.* When crushed seeds are taken, the symptoms are delayed for an hour or more. *If the*

alkaloid is swallowed, the symptoms occur very rapidly, usually within five to fifteen minutes. Bitter taste in the mouth, sense of uneasiness and restlessness, feeling of suffocation and fear, and difficulty in swallowing occurs [16]. *Nux vomica is an energetic poison, exerting its influence chiefly upon the cerebro-spinal system; it is supposed to affect the spinal cord principally, because the division of this cord does not prevent its poisonous influence.*

In poisonous doses, Nux Vomica produces violent tetanic convulsions, without impairing the functions of the brain, with asphyxia and death.

When given in doses sufficiently large to influence the system, a sensation of heaviness is experienced, the spirits become depressed, the limbs tremble, and a slight rigidity or stiffness comes on when attempting to move [20].

The convulsions are preceded by such prodromal symptoms as increased acuity of perception, increased rigidity of muscles, and muscular twitching. Convulsions are produced due to direct action on the reflex centres of spinal cord and affect all the muscles at a time. During the convulsions, the face is cyanosed and has anxious look, eyes are staring, eyeballs prominent and pupils are dilated. The duration of convulsion varies from half to two minutes.

In between the convulsions the muscles are completely relaxed, and the patient looks well though somewhat exhausted, and the breathing is resumed. Consciousness is not lost and the mind remains clear till death. *The suffering during the spasm is severe, and the patient is conscious of impending danger of death* [16].

It disposes to frequent urination, and when given in larger doses, causes retention of urine; first by producing spasm of the neck of the bladder, and ultimately loss of power in the muscular coat of the bladder. It excites uterine contraction and promotes the menstrual flow [19].

In fatal cases, the convulsions rapidly succeed one another, and increase in severity and in duration, and death usually occurs after four to five convulsions. The patient cannot breathe because the diaphragm and thoracic muscles are fully contracted. Hypoxia causes medullary paralysis and death [16]. Death results, either from asthenia or asphyxia [07].

In non - fatal cases the intervals between the convulsions become longer and the spasm less, until these entirely stop within twelve to twenty - four hours, and recovery takes place in a day or two [16].

Post - mortem Appearances

Rigor mortis appears early but is not necessarily prolonged. There may be signs of asphyxia. Extravasated blood may be found in the muscles [16]. The lungs are hyperaemic, usually with small infarction; but these are sometimes absent. In a few cases, fluid exudation has been found in the pericardial and pleural sacs [21].

Haemorrhages are sometimes found under the peritoneal coat of the stomach. The mucosa of the stomach and duodenum may show patches of ecchymoses or congestion [16]. Hemorrhagic erosions are occasionally found in the stomach and intestines [21]. The liver, kidneys, brain and spinal cord are congested [16]. In the abdominal glands, we find the usual venous engorgement consequent on death from acute asphyxia. Sometimes the urinary bladder is strongly contracted.

If crushed Nux vomica has been taken, we find the remains of it in the stomach and intestines. Nux Vomica adheres strongly to the mucous membrane; this is partly owing to its pointed fragments, and partly to the fine hairs covering its surface, which are characteristic of Nux Vomica.

The condition to the brain and spinal marrow is by no means characteristic. Exudations and actual hemorrhages are found in the lateral ventricles; but these are not necessarily connected with the action of the Strychnia. Nothing characteristic has been found in the spinal marrow [21].

The Circumstances of Poisoning

It is sometimes used for homicide in the form of alkaloid, or as powdered Nux Vomica seeds, in spite of bitter taste. Suicide is rare because of the painful death. Accidental deaths are more common, due to an overdose of medicinal preparation, or the poison being given by mistake, or in children by eating the seeds. Sometimes the seeds are used for killing the cattle, and as arrow poison. Sometimes it is taken as an aphrodisiac [16].

Physiological Actions

Spinal cord

1. Tetanic convulsion.
2. Asphyxia.

Motor nerves

1. Exhaustion.
2. Paralysis.

Sensory nerves

Hyperaesthesia.

Nose

Smelling power increased.

Eyes

Contraction of pupils.

Circulation

1. Vasomotor spasms.
2. Increased arterial B.P.

Heart

Paresis of inhibitory nerves.

Stomach

1. Increased appetite.
2. Acid vomiting.
3. Gastralgia.

Intestine

1. Constipation.
2. Haemorrhoids.

Urinary bladder

1. Paralysis of muscular coat.
2. Incontinence of urine.

Male sexual system

1. Impotent.
2. Increased sexual desire [2].

Patho-Physiology

Nux Vomica acts pre - eminently up to the spinal cord, including the motor and sensory centers at the base of the brain, affecting chiefly that portion of the spinal tract which

presides over reflex functions. The condition produced is one of excessive irritation and excitability, giving rise to incoherent muscular action, which, on the extreme constitutes violent tetanic contractions, and which, finally may end in entire cessation of muscular movement, paralysis.

These tetanic convulsions affect particularly the limbs and trunk; the limbs being rigidly flexed, and the body arched as in opisthotonos, the respiratory muscles rigidly contracted, rendering breathing laborious, even to asphyxia, which at the same time there are present spasmodic conditions of the face, jaws throat, oesophagus and of the intestinal and urinary tracts [22].

The motor nerve cells of the spinal cord, cardiac ganglia, respiratory and vasomotor centers in the medulla are stimulated. The reflex excitability is increased. The respirations are quickened and deepened; the action of the heart is increased and the blood pressure increased. The senses are all rendered more acute [8].

The most pronounced physiological effect of Nux Vomica is spasm of all muscle fiber, voluntary and involuntary, characterized by hyper aesthesia of the general nervous system [22].

In addition to this remarkable action upon the muscular system, Nux Vomica affects profoundly the organs and functions of nutrition. The secretions being altered, the function perverted and the organic substance changed, giving rise to a long train of symptoms; presenting accurate pictures of gastric hepatic and intestinal affections [7].

In small doses this agent is a stomach tonic, increasing the vascularity of the gastric mucous membrane, and increasing the gastric juice, as well as the biliary and pancreatic secretion. If continued over a long period it deranges digestion. It stimulates the peristalsis of the intestines and renders them irregular [8].

Upon the alimentary canal, "Nux Vomica has caused inflammation of the stomach and small intestines, but this sort of inflammation seems to be incidental to a complete disorganization of the nervous life of the organs, rather than the result of a temporary depression of the nervous energy. Inflammations of this kind seem always to be attended with convulsive paroxysms." - Prof. Hempel.

"Nux Vomica does not diminish the action of the intestine; it rather increases it, but at the same time renders it inharmonious and spasmodic which is a hindrance therefore, and not a help to evacuation. This is the reason why constipation which is characteristic of Nux Vomica is accompanied by frequent, ineffectual desire for stool, the action of the intestine being irregular and spasmodic and the constipation is the result of irregularity, and not from inaction. - Dr. C. Dunham [20].

The same character of irritation which in the mucous membrane of the alimentary tract gives rise to dyspeptic symptoms and aids in the reproduction of constipation also produces in the respiratory sphere a dry catarrhal condition, giving obstruction in the nasal passages and dry cough. Nux Vomica also affects prominently the genito-urinary sphere, producing at first an increased activity of these organs, followed by depression and relaxation [7].

It acts on the entire gastro - intestinal tract and on the genito-urinary organs; it affects the vaso-motor nerves with the resulting well defined paroxysms of chill fever and sweat [22]. The desire to urinate is increased. It excites uterine contractions, promotes menstruation, and excites the sexual organs [8]. Upon the sexual organs, both male and female, Nux Vomica has a powerful influence. It first excites their action, which is soon followed by depression [20].

Animal Study

One of the study conducted by Razzaq, A., Hussain, G., Rasul, A. *et al.* [23] indicates that Strychnos Nux-vomica seeds have enhanced the rate of recovery of both sensory and motor functions. It has also helped restore the muscle mass, which attenuates the total oxidant status and also enhances the total anti-oxidant capacity of the biological system. The treated animals were manifested an enhanced glucose tolerance aptitude and augmented granulocyte and platelet counts. Improved oxidant control, enhanced glucose sensitivity and amended granulocyte and platelet counts would contribute to the advantageous effects of Strychnos nux-vomica, and need further in-depth studies for deciphering possible mechanisms and identification of active constituent(s) responsible for these effects.

The Conclusion of the Study was that the possible reasons behind the effect of functional recovery promoting effects following a mechanical injury to the Sciatic nerve by Strychnos nux-vomica seed can be reduced oxidative stress and improved glycaemic control. A Further detailed investigations can unravel this mystery [23].

Conclusion

The Strychnine & Brucine of Nux vomica as mentioned, though a highly poisonous substance has its clinical efficacy from head to foot and is being used widely by homoeopathic physicians around the globe for various clinical conditions. That is the beauty of Homoeopathic preparation by the process of potentisation where a poisonous substance can be turned into useful medicine.

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