

A review of Dhatura as poison and Kamala Patra as Antidote

Abstract:

Dhatura plant has been noted for intoxicating, narcotic properties, they produce temporary insensibility (stupefying effects) in ordinary doses.

Dhatura (*Datura metel*) is cerebrototoxic, Deliriant poison which is also classified as *Upavisha* in *Ayurveda*.

In *Ayurvedic* literature according to *Basavrajeyam* under the heading of *Vish-Prativishani*, *Chincha Rasa* and *Kamal Patra churna* has been described to be possessing antidote action which may act by some way to counter toxicity of *Dhatura*.

It is necessary to verify the efficacy of these antidotes on scientific parameters so that it can be useful in emergencies.

Keywords:

Ayurveda, *Dhatura*, *Kamal Patra churna*, antidote

Introduction:

Agada Tantra^[1] is one of the incredible branches of indigenous science derived from the *Ayurveda*. In ancient era this science was considered as the one of the advanced faculty worldwide.

The branch of *Ayurveda* which deals with the toxicity of various snakes, spiders, insects, rats etc. animals and its treatments. The word 'Gad' means poison and the antidote used is called as 'Agada'.

According to modern sciences, Toxicology^[2] is the science which deals with the study of poison with reference to sources properties, mode of action symptoms which they product lethal dose, nature of fatal results, treatment of their detection estimation & autopsy findings.

Dhatura^[3] (*Datura metel*) is cerebrototoxic, deliriant poison which is also classified as *Upavisha* in *Ayurveda*. It has been used as medicine, narcotics and poison since long ago. Medicinally it is useful internally as well as externally.

Dhatura^[4] is used as antispasmodic in asthma, whooping cough, rheumatic swelling of the joints, lumbago, sciatica, neuralgia, painful tumors, notes, glandular inflammations such as mumps etc. and many more conditions.

Due to gastric irritation vomiting often occurs immediately after taking the crushed seeds. A bitter taste, dryness of mouth and throat, burning pain in the stomach dysphagia, headache and difficulty in talking are the first symptoms that are complained of. These are followed by giddiness, staggering gait, in co-ordination of the muscles peculiar flushed appearance of the face, dry hot skin with a rise in temperature, photophobia, and dilated pupils with loss of accommodation for near vision, red & injected conjunctivae, urinary retention & drowsiness.

Sometimes, a scarlatinal rash of exofoliation of the skin is seen over the most of body and the temperature is raised very high. The pulse is full and bounding but later becomes weak, irregular and intermittent. The patient now becomes restless markedly excited and delirious. Delirium is a pear character. He is silent or mutters indistinct and inaudible words but usually he is noisy, tries to run away from his bed, picks at the bed clothes tries to pull imaginary threads from the tip at his fingers and is subject to dreadful hallucinations of sight & hearing sensorium is clouded.

In fatal cases drowsiness passes into stupor convulsions and coma. Death occurs usually from respiratory failure. In some cases insensibility occurs almost immediately after the poison is administered either in solution, or in very fine powder.

Various poisons have been described in *Ayurveda* along with their antidotes. These antidotes are readily available in the nature. Mode of action of these antidotes is not clearly mentioned in texts.

In *Ayurvedic* literature, *Chincha Rasa* and *Kamal Patra churna* has been described to be possessing antidote action which may act by some way to counter toxicity of *Dhatura*.

Kamal (Nilumbo nucifera) is a beautiful aquatic plant with wide range of medicinal usage. It is *Madhura Tikta Rasatmak* and *Shita Virya* hence reduces *Pitta Dosha*.

Review of Literature:

In *Ashtanga Ayurveda*, *Agadtantra* has significant importance. In *Sushruta samhita* ^[5] Called as *Agadtantra*, in *Charaka samhita* ^[6] it is called as *Danshtra Chikitsa*, in *Harita samhita* *Vishtantra* and in *Kautilya Arthashastra* *Jangali*.

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Agadtantra ^[7] word made up of three different words and *Agad* means which destroys *visha*.

In Modern Medicine *Agadtantra* is named as Toxicology.

Toxicology is the science dealing with properties, actions, toxicity, fatal dose, detection and estimation of the results of toxicological analysis and treatment of poisons. Forensic toxicology deals with the medical and legal aspects of the harmful effects of chemicals on human beings.

Visha (poison)-

The Substance immediately after entering into the body causes the vitiation of healthy *Dhatus* or killing of the healthy person is defined as *Visha*.

According to Modern-

A substance which when administered, inhaled or ingested is capable of acting deleteriously on the human body.

A poison is commonly defined as a substance which when administered, inhaled or swallowed is capable of acting deleteriously on the body. ^[4]

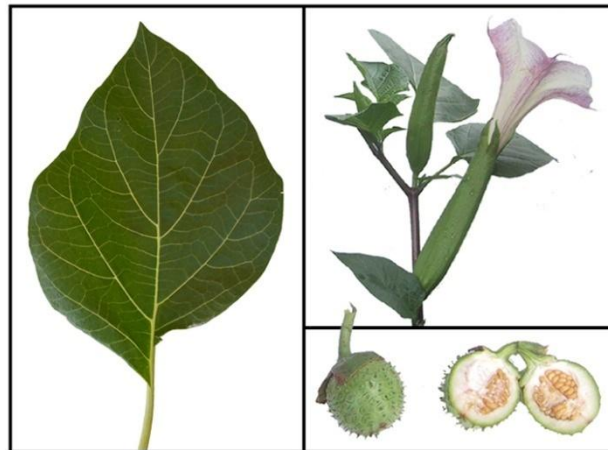
Any substance which injected, inhaled or absorbed or when applied to injected or developed within the body may cause damage to structure or disturbance of function. (American medical Dictionary)

Ayurvedic Review:

Dhatura:

Dhatura is classified in *Upavisha Varga*. It has five types viz. *Sweta*, *Nila*, *Krishna*, *Lohita*, and *Pita*. *Krishna* or black *Dhatura* is considered as best amongst all.

Fig 1: Dhatura



Classification:

According to *Ayurveda- Upavisha* ^[8]

According to Modern Science- Vegetable Neurotoxic, Cerebral Deliriant Poison, Deliriant poison ^[2]

Introduction:

Dhatura is morphologically classified as a *Kshupa* (shrub), widely found all over India. Fruits have thorns over it. It is classified according to the colour of the flowers. All the varieties of it possess same properties but *Krishna Dhatura* is considered more effective. Leaves, Flowers, roots, seeds are used for medicinal purpose.

Types -

According to *Raja Nighantu* ^[9] it is classified in 5 types according to flowers.

1. *Shweta*(White)
2. *Nila* (Blue)
3. *Krishna*(Black)
4. *Rakta*(Red)
5. *Pita*(Yellow)

Special Properties:^[10]

- a. It is *Shwasa Vyadhi Nashak* and *Kapha Shoshaka*. Effective in *Unmada*, *Akshepaka*, *Netrabhishyanda*, *Karna Roga*, *Vedana*, *Arbuda*, *Lasika Granthi Shotha*, dental carries, *Amavata*, Mastitis by external application, useful in dog bite, mumps and *Prasuti Jwara*, in convulsions due to *Visarpa*, *Jwara*, useful in cysts, lymphanginitis, etc. by external and internal use.
- b. Dose:

Therapeutic Dose:

Shuddha Dhatura Seed Powder –30 – 60 mg

Powder of *Dhatura* Leaves –60 – 180 mg

Fatal Dose:

100 to 120 crushed Seeds 1.20 to 1.50 gm

Sign and Symptoms of Toxicity:

Table 1: Sign and Symptoms of Toxicity

Sr. No.	Signs / Symptoms	Sr. No.	Signs / Symptoms
1.	Yellowness of body	2.	Tremors
3.	Salivation	4.	<i>Mada</i>
5.	Vomiting	6.	<i>Unmada</i>
7.	Confusion	8.	Bitterness of mouth
9.	Dryness of mouth and throat	10.	Difficulty in deglutition
11.	Sluggish Speech	12.	Pharyngitis
13.	Redness of Face	14.	Dilatation of pupils
15.	Photophobia	16.	Irregular and slow pulse
17.	Hypertension	18.	Slow breathing
19.	Delirium	20.	Drowsiness
21.	Convulsions	22.	Death due to asphyxia.

Treatment:-

- *Vamana* with the help of *Yastimadu* and milk should be given after that milk with sugar should be given to drink.
- Purgative drugs should be given in later stages.
- *Samudraphal* and *Gomutra*, *Erand Mula*, *Vacha* powder and curd, decoction of *Karpas* seeds, milk and sugar should be given in *Dhaturo* poisoning.
- *Vasavrajyam* mentioned *Chincha* and *Kamal* as an antidote of *Dhaturo*.

Formulations- [10, 11, 12]

Kanakasav, *Pralapantak Ras*, *Unmadgajankush Ras*, *Kanaksunder Ras*, *Laxmivilas Ras*, *Unmatta Ras*, *Mahajwarankush Ras*, *Brihatkanaksunder Ras*, *Tribhuvan Kirti Ras*, *Sutshekhar Ras*, *Kanak Prabha Vati Ras*, *Granthishothnivarika Varti*, *Dhattur Tail*

MODERN REVIEW:**Habitat:**

It is a native Mexico, found growing in western Himalayas, the hilly regions of the western parts of Deccan peninsula and a few other places in India. These plants are found growing commonly in waste places throughout India, Kashmir to Malabar.

Datura metel is a genus of poisonous herbs shrubs or small trees distributed throughout the tropical and warm temperate regions of the world, reaching up to height of 3 – 4 ft.

The whole plant – leaves, seeds and roots, dried leaves and the dried ripe seeds and fruit.

Constituents (According to Indian Materia Medica) [13]

Leaves contain a poisonous alkaloid – daturine mucilage, albumin and ash 17% which contains potassium nitrate 25%, seeds contain the active principles daturine, resin mucilage, proteids, malic acid, scopolamine and ash 3%.

Therapeutic use:

Dhaturo is useful internally as well as externally. The leaves, flowers, seeds & roots have great medicinal value. The paste of its roots mashed in cow's urine or the juice of leaves is applied externally to alleviate edema and pain in sciatica, mumps, lumbago neuralgia etc.

- The mustard oil medicated with the pulp of *Dhaturo* seed is used in the cracked feet.
- In alopecia the juice of leaves is rubbed on the affected area of the skin.
- The oil of seeds is effective in scabies.
- The pessary of the pulp of *Dhaturo* effectively reduces the pains in hemorrhoids.

- Seeds are used to treat dandruff and lice.
- Internally, *Datura* dries up the mucous secretions in the respiratory tract and is a bronchodilator as well. Hence it is beneficial in bronchial asthma and cough.
- In rabid dog bites the mixture of roots of *Bohervia diffusa* and *Datura* in 12:1 proportion is given along with milk.
- *Datura* is beneficial in fever to relieve the sensation of cold and chills, Diarrhea and dysentery.
- The leaves made into cigarettes are smoked to relieve asthmatic attacks.
- Leaves are also used in treatment of Parkinsonism.
- *Datura* is administered in form of pills, tablets tinctures and extracts
- *Datura* in ointment form containing lanolin yellow wax and petroleum is employed in the treatment of hemorrhoids.
- The leaves are applied boils sores and fish bite and the juice of the flower are used for earache.

9 D's of *Datura*-

The important symptoms and signs can be summarized under 9 Ds (i.e. *Datura* symptoms) as follows.

1. Dryness of the mouth & throat.
2. Difficulty in talking
3. Dysphasia.
4. Dilatation of cutaneous blood vessels
5. Dilatation of pupils
6. Dry hot skin
7. Drunken gait
8. Delirium
9. Drowsiness

Treatment:

- Wash out stomach repeatedly with a solution of potassium permanganate or tannic acid.
- Wash out the lower bowel frequently by giving purgatives.
- Inj. Physostigmine half mg. I.V. or I.M. (2 hourly intervals). In many cases single dose is sufficient.

- Pilocarpine nitrate 5mg. or neostigmine may make the patient more comfortable, but it does not antagonize the central action of *Dhatura* on the brain.
- Morphine is to be avoided, as it has a depressant action on the respiratory centre.
- Delirium can be controlled by short acting barbiturates & bromides.
- Administration of ether by inhalation is considered more beneficial.
- Chloral hydrate or paraldehyde in moderate doses is useful for marked excitement.
- Tepid water sponging is good for the raised temperature and dry skin.
- Stimulants, such as caffeine, should be given and artificial respiration; oxygen inhalation should be started when necessary.
- A large warm enema may be given with advantage to the patient.
- Darken the room for marked photophobia.

Drug Review:

Fig 2: Kamal



Kamal (*Nelumbo nucifera*):^[14]

Botanical classification:

Kingdom: Plantae

Division: Magnoliophyta.

Class : Magnoliopsida.

Order : Proteales.

Family : Nymphaeaceae.

Genus : Nelumbo.

Species : *Nucifera*.

Description:

The roots of *Nelumbo nucifera* are planted in the soil of the pond or river bottom, while the leaves float on top of the water surface. The flowers are usually found on thick stems rising several centimeters above the water. The plant normally grows up to a height of about 150 cm and a horizontal spread of up to 3 meters, but some unverified reports place the height as high as over 5 meters. The leaves may be as large as 60 cm in diameter, while the showy flowers can be up to 20 cm in diameter.

Researchers report that the lotus has the remarkable ability to regulate the temperature of its flowers to within a narrow range just as humans and other warm blooded animals do. The traditional Sacred Lotus is distantly related to *Nymphaea caerulea*, and possesses similar chemistry. Both *Nymphaea caerulea* and *Nelumbo nucifera* contain the alkaloids nuciferine and aporphine.

Habitat and Distribution:

Since it is an aquatic plant, grows in the mud of shallow ponds (water) lagoons, marshes, to flooded fields in damp conditions. It is found throughout India and is native to parts of the Middle East, Asia, and Australia.

Propagation:

It is propagated by seeds and rhizomes in muddy water.

Pharmacognostic Features:

A large good looking aquatic herb (*kshupa*) growing up to a height of 19 feet, leaves are shiny, roundish having a diameter of 1 to 3 feet in diameter; flowers are big, single, white to pink in colour, solitary having diameter of 4 to 10 inch and flower stalk is 3 to 6 feet in length; Stamens are many ripe carpels 10 mm long, ovoid glabrous; Seeds are ½ inch long, round and dark brown in colour; Rhizomes firmly anchored in the mud beneath the water surface, pocketed with air tunnels.

Parts used –

Whole plant

Properties -

Plant – astringent, Bitter, Sweet, Cooling, emollient Diuretic, antifungal, Antipyretic and cardio tonic

Stem– astringent, cooling, fragrant, diuretic and anti helmenthic

Roots- bitter cooling emollient and diuretic

Leaves-bitter, cooling, and diuretic and

Flowers- sweet, astringent refrigerant and cardio tonic

Stamens- cooling, diuretic, tonic, depurative and aphrodisiac.

Chemical Constituent-

Nuciferine 10-nonacosanol, β and γ sitosterol, nelumboside, glucose, palmitic acid and chlorophylls lupeol, α -amyrin, lutein, arginine,neferine, catechol, nuciferin, myristic acid, lenoleic acid, nelumbine quecitring, oxoushinsunine.

Underground stem contains: Moisture 83.80%, Protein 2.70%, Fats 0.11%, Starch 9.25%, Sucrose 0.41%, and Aspirin 2%.

Pharmacological activities-

Effects on gastrointestinal system ^[15]- The Methanolic extract of Nelumbo nucifera a shows significant inhibitor, activity against castor oil induced deduced diarrhea & PGF, induced entero polling in rats. It also shows significant reduction of gastro intestinal motility in rats.

Effects on CNS ^[16]- Nuciferine & Atherosperminine alkaloid shows divergent psychopharmacological effect. Nuciferine is known to cause dopamine receptor blockage while atherosperminine shows diphenyl hydantoin is the only activity common to both of the compound.

Anti-inflammatory ^[17], **Analgesic & Antipyretic activity** ^[18]- Nelumbo nucifera rhizomes are known to have potent & anti inflammatory activity.

Hypoglycemic Activity ^[19] - Methanolic extract of the rhizomes has been found to possess significant hypoglycemic activity on streptozotocin induced diabetic rats.

Miscellaneous activities- Nelumbo nucifera is used in piles as demulcent, beneficial in Dysentery & chronic dyspepsia. It is also used as Diuretic.

Clinical and Experimental Studies-

It shows Anti- diabetic Activity ^[20], Anti- oxidant activity ^[21] and Anti –Inflammatory Activity ^[22-25]

Contraindication –

No contraindications with Lotus are documented.

Toxicity –

No toxic effects have been reported.

Drug interactions –

No drug interactions are reported.

Discussion:

Dhatura is used as in asthma, whooping cough, rheumatic swelling of the joints lumbago, sciatica, neuralgia, painful tumors, nodes, glandular inflammations such as mumps etc. and many more conditions.

This plant has been noted for intoxicating, narcotic properties, they produce temporary insensibility (stupefying effects) in ordinary doses.

Constituents - Main chemical constituent of *Dhatura* is *Dhaturaine* which includes hyoscine, hyoscyamine and atropine. All these are Alkaloids. Alkaloids are Complex substances with nitrogenous base and consist in all the plants. Generally alkaloids converted into salts when combines with acids.

Mechanism of Action: They block the acetyl choline receptors and thus produce sympathomimetic or parasympatholytic actions (anti cholinergic actions). *Dhatura* leaves contain toxic alkaloid dhaturine, mucilage, albumin and ash 17 p.c. with potassium niatrate 25%. *Dhatura* seeds consists dhaturine, resine, mucilage proteins, malic acid, scopolamine and ash 3 p.c. the ratio of hyoscyamine and hyoscine is 2:1. It also consist Atropine. Atropine stimulates central nervous system specially motor area which is responsible for body incardination but the over dosing of Atropine causes restlessness, Confusion, irrelevant talk. *Dhatura* is consists around 10 such alkaloids.

According to *Ayurvedic* references and antidote properties of *Kamal Patra* can be discussed as follows:

1. *Kamal* is *Madhura Rasatmaka, Madhura Vipaki and Sheeta Virya* hence it may useful to prevent hyperpyrexia, dyspepsia, dryness of mouth.
2. *Kamal* has *Vishaghna* property and it is useful against vegetative poisoning.
3. It is useful against vomiting as *Charaka* stated it in *Chhardinigrahana Gana* so it gets used in *Dhatura* poisoning.
4. *Kamal* has *Rasayana* and *Medhya* property and is used in various CNS related disorders therefore it can be used in Various CNS disorders due to *Dhatura* intoxication.

5. *Kamal* is very effective in haemostasis hence can be useful in haematemesis due to intoxication due to *Dhatura*.

On the basis of analytical study, antidote properties of *Kamal Patra* can be discussed as follows:

1. Flavonoids (Vit p and Citrin) in *Kamal* improves blood vessels tone hence it is useful in hypotension and inflammation. Therefore it may prevent irregular pulse rate and irregularity in B.P. due to *Dhatura* toxicity.
2. Flavonoids like neferine, liensinine acts on central nervous system and its disorders. Hence it may prevent CNS symptoms like delirium, giddiness, hyperthermia due to *Dhatura* toxicity.
3. *Kamal Patra* is also useful to reduce blood lipids and fatty liver disorders. It also contains the lotus alkaloids with hypotensive effect.
4. Sterols in *Kamal Patra* has characteristics Antipyretic property hence Hyperthermia in *Dhatura* toxicity can be prevented.
5. Vitamins C in *Kamal Patra* is antioxidant which improves circulation hence it may prevent cardiac failure due to *Dhatura* toxicity.
6. As well as *Kamal Patra* contain antioxidant flavonoids QC-3-Glc and QC-3-Cln which also improves antioxidant properties.
7. Carbohydrate improves blood glucose level by which the body energy gets increases .Therefore it may helps to prevent weakness, fatigue due to intoxication.

Conclusion:

Dhatura plant possesses wide range of utility viz. medicine, narcotics, poison and antidote in medical sciences. *Dhatura* is neurotoxic cerebral deliriant poison which is also classified as *Upavisha* in *Ayurveda* with '9 Ds' toxic effects. The active principle is dhaturine containing hyoscine, hyocymine and atropine. It blocks the acetyl choline receptors and thus produces sympathomimetic or **parasympatholytic actions (anti cholinergic actions).**

According to Ayurvedic literatures and also on the basis of analytical study *Kamal Patra* shows antidote properties like -

Hyperthermia caused due to toxicity gets significantly reduced; Duration of appearance of convulsions gets increased; Duration of dilatation of pupil gets significantly increased.

Thus from above study we can conclude that *Kamal Patra* can resist toxic effects of *Datura* up to some extent.

NOTE:

The study highlights the efficacy of "ayurveda" which is an ancient tradition, used in India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

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