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### A Critical Review on *Datura Upavisha* and Its Toxicity

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#### ABSTRACT

As far as Ayurvedic literature is concerned *upavisha* are the group of drugs which were less poisonous in nature and also not harmful but it can cause several toxic prodrome on consumption or administration. *Datura* (*Datura metel*. Linn) is a well-known poisonous plant in Indian system of medicine. It is included in *Upavisha* by ayurveda texts. In modern view *datura* is a deliriant type of cerebral poison. . Every parts of *Datura* plant contains highly toxic alkaloids in dangerous levels and may even cause death if it is consumed by humans or other animals. Seeds are the most toxic part, contains hyoscine, hyoscyamine and atropine alkaloids. In authentic books of Keraliya vishachikitsa like Kriyakoumudi reference of prathyoushada (antidote) for *datura visha* is available. This review article includes the overall information about the poisonous plant *Datura*, i.e. both ayurvedic and modern view of *datura*, in its Toxicological aspect, Medicolegal aspect, therapeutic uses and treatment of *Datura* poisoning etc.

#### KEYWORDS

*Datura*, *Datura metel*, *Ayurvedic view*, *Modern view*, *Toxicity*



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## INTRODUCTION

Ancient scholars of Ayurveda has classified poisonous drugs into two types i.e. *Sthavara* (plant origin) and *Jangama* (animal origin) *visha*. *Sthavara visha* is again classified into *mahavisha* and *upavisha*<sup>1</sup>. Among the *mahavishas* only the *Vatsanabha* (*Aconitum ferox*) is using for medicinal purpose now. *Upavishas* are the group of drugs which were less poisonous in nature and also not harmful but it can cause several toxic prodrome on consumption or administration<sup>2</sup>. Depending on number of *upavishas* different views are there in Ayurveda. Mainly *upavishas* include *Vishatintuka* (*Strychnosnux-vomica* Linn), *Ahiphena* (*papaver somniferum*) *Jayapala* (*Croton tiglium* Linn), *Dhattura bija* (*Datura metel* Linn.), *Vijaya* (*Cannabis sativa* Linn.), *Gunja* (*Abrus precatorius* Linn.), *Bhallataka* (*Semecarpus anacardium* Linn.f.) *Arka* (*Calotropis gigantea* Linn.) *Snuhi ksheera* (*Euphorbia ligularia* Roxb.), *Langali* (*Gloriosa superba* Linn), *Karaveera* (*Nerium oleander* Linn)<sup>3</sup>. Ayurveda also states that sometimes strong poisons serve as the best medicine but used only after proper *Shodhana* (Detoxification), provided in a proper therapeutic dose and formulation. On the contrary a good medicine may affect

adversely unless it is used for proper person with proper dose<sup>4</sup>.

*Datura* is well known and commonly used drug for treating various ailments and it is an ingredient in most of the formulations in Ayurveda which is in practical use now. It is commonly known as ‘devil’s trumpet’ and it was first described by Linnaeus in 1753. In some places it is prohibited to buy or sell or cultivate *Datura* plants. The main chemical composition of *Datura* are tropane alkaloids hyoscyne, hyoscyamine and atropine alkaloids<sup>5</sup>. This review article is a sincere attempt to synopsise the information concerning about poisonous drug *Datura* (*Datura metel* Linn) described in Indian system of medicine.

## Scientific Classification<sup>6</sup>

Table 1

Kingdom	Plantae
Clade	Angiosperms
Clade	Eudicots
Clade	Asterids
Order	Solanales
Family	Solanaceae
Subfamily	Solanoidae
Tribe	Datureae
Genus	<i>Datura</i>

**Botanical Name**-*Datura metel* Linn

**Family** - Solanaceae

**Vernacular Names<sup>7</sup>**

Hindi – *Datura*

English- Thorn Apple, Jimson Weed

Malayalam- Ummam

Kannada- Unmathi

Marati- Dhatra

Gujarati- Dhaturo

Tulu- Umbe

*Tamil- Emanamam*

### Sanskrit Synonyms of *Datura*

*Dattura, Dhoortha, Dhusthura, Unmatha, Kanakahvaya, Devatha, Kithava, Thoori, Mahamehi, Shivapriya, Maathula, Madana*<sup>8</sup>, *Kanaka, shata, shivapriya, Mahamohi*<sup>9</sup>

### **Bheda (variety) of *Datura***<sup>10</sup>

There are two main varieties, *Rajadatura* and *Krishna Datura*

Depending on colour of flowers -*sita, nila, Krishna, lohitha, pita*

### **Classification**

Ayurveda: *upavisha*<sup>11</sup>

Modern medicine: under deliriant type of cerebral poison<sup>12</sup>

### **Habit and Habitat**

A sub glabrous spreading herb, sometimes shrubby. Common in waste places throughout India and occasionally in gardens<sup>13</sup>.

### **Plant description**

It is an herb, pubescent. Leaves are large, entire sinuate or toothed bar unequal. Flowers are erect, whitish purple, calyx long tubular, 5-toothed at apex, corolla long tubular to funnel shaped. Fruits are capsule globose or ellipsoid spinous 4-valved or irregularly breaking up, seeds are compressed rugose and brown<sup>14</sup>.

### **Major chemical constituent**

*Datura* contains mainly tropane alkaloids. Scopolamine, hyocyamine, hyosine

Daturadiol,  $\beta$ -sitosterol, Daturanalone, fastusinine<sup>15</sup>



Fig 1 (*Datura* flower)



Fig 2 (*Datura* fruit & seeds)

### **Part used**

Root, fruit, seed, flower, leaf<sup>15</sup>

### **Ayurvedic view of *Datura***

In *Charaka Samhitha* Acharya Charaka delineated *Datura* in the context of *visha chikitsa* and in *kushta chikitsa*, he described thrice in the name *kanaka*<sup>16</sup>. *Susrutacharya* and *Vagbhatacharya* mentioned it as *Datura* in the context of *alarkavisha*<sup>17-18</sup>. In *Haritha samhitha*, it has been mentioned in the context of *vataja netra roga chikitsa* as an ingredient in an *anjanayoga*<sup>19</sup>.while moving through

*nighantu kala* in *Dhanvantari nighantu* and *Sodhala nighantu* it included under *karaveeradi varga*<sup>20-21</sup>, and *Madanapala nighantu* quoted under *abhayadi varga*<sup>22</sup>, while *Bhavamisra* described it under *guduchyadi varga*<sup>23</sup>.

**Table 2:** Ayurvedic properties

	<i>Rasa</i>	<i>guna</i>	<i>veerya</i>	<i>vipaka</i>	<i>prabhava</i>	<i>doshaharakarma</i>
<i>Dhanwantari Nighantu</i> <sup>20</sup>	<i>Katu</i>	-	<i>Ushna</i>	-	<i>Jwarahara</i>	-
<i>Sodhala Nighantu</i> <sup>21</sup>	-	-	-	-	-	<i>Pittakara</i>
<i>Madanapala Nighantu</i> <sup>22</sup>	-	<i>Guru</i>	<i>Ushna</i>	-	-	<i>Kaphahara</i>
<i>Bhava prakasha</i> <sup>23</sup>	<i>Kashaya, madhura, tiktha</i>	<i>guru</i>	<i>Ushna</i>	-	-	<i>Kaphahara, vatahara</i>
<i>Raja nighantu</i> <sup>24</sup>	<i>Katu</i>	-	<i>Ushna</i>	-	-	-
<i>Kaiyadeva Nighantu</i> <sup>25</sup>	<i>Kashaya, madhura, tiktha</i>	<i>Guru</i>	-	-	-	<i>Kaphahara</i>
<i>Nighantu Adarsa</i> <sup>26</sup>	<i>Katu</i>	-	<i>Ushna</i>	<i>Katu</i>	<i>Jwaragna, madakari</i>	<i>Kaphavatashamaka</i>
<i>Priya Nighantu</i> <sup>27</sup>	<i>Tiktha</i>	-	<i>Ushna</i>	-	-	-

*krimigna, shothahara, kanduhara, swasa prashamana, karnashoola nibarhana, vedanahara*<sup>28</sup>

### Therapeutic uses

*Alarka -Datura* and *sweta punarnava* combination is very effective remedy<sup>29</sup>

*Krimi*-Juice of *Datura* leaves mixed with Mercury or juice of heated leaves singly destroys ticks and lice on local application<sup>30</sup>

*Pitakamaya*-Juice of *madukaparni* and paste of *Datura* root destroys the boils<sup>30</sup>.

### Maatra (therapeutic dose) of Datura

### Ayurvedic properties

The ayurvedic properties of *Datura* in ayurveda according to different Acharya's are explained in Table 2.

### Karma and Rogagnatha

*Jwaranashana, twakdoshashamana,*

*Maatra* of Purified *Datura beeja choorna* is ¼ ratti (30.37mg) to ½ ratti (60.75mg) and purified *Datura patra choorna* is ½ ratti to 1½ ratti (182.25 mg)<sup>31</sup>.

### Shodhana of Datura

*First method*- *Datura* seeds are tied in a *pottali*. This *pottali* is heated with cow milk in a *dolayantra* for three hours. Then *pottali* is opened and *Datura* seeds are washed with hot water. These pure *Datura* seeds are then used in the formulations.

*Second Method*- New *Datura* seeds are heated in cow urine with the help of *dolayantra* and dried in the sun. These

seeds are powdered & filtered through cloth. Then it is used for therapeutic purpose<sup>31</sup>.

### ***Datura visha lakshana***

A person if poisoned by Datura, his visual perceptions would all become yellowish (*sarvam pashyathi peetakam*) and also he would develop symptoms like *kampa* (tremors), *laala* (excessive salivation), *mada* (intoxicated), *chardi* (vomiting), *smruthibhramsha* (amnesia) and *bhrama* (giddiness)<sup>32</sup>.

### **Ayurvedic treatment for Datura poisoning**

Cow's milk with sugar can be given two times a day for treating Datura<sup>32</sup>.

### **Ayurvedic antidotes for *Datura visha***

- *Changeri swarasa* internally
- Administration of milk and sugar in deliriant condition
- Chandana mixed with tender coconut water for internal administration
- *Haridra choorna* with *karpasa patra swarasa* (*Gossypium herbaceum* Linn.) and administer internally
- *Mrunaala* (stalk of lotus) *kwatha* or *swarasa*<sup>33</sup>

### ***Vishista yogas* (Ayurvedic formulations) of Datura**

*Kanakasava*, *Sutashekhara rasa*, *Mahavishagarbhataila*, *Unmatta rasa*<sup>34</sup>

### **Modern view**

### **Toxic symptoms:**

Summarised in the classical phrase: “*blind as a bat, hot as a hare, dry as a bone, red as a beetroot, and mad as a wet hen*”.

The important manifestations can be better remembered as a series of D's

- Dryness of mouth, thirst, slurred speech
- Dysphagia
- Dilated pupils
- Diplopia
- Dry hot skin, with flushing, hyperpyrexia
- Drunken gait (ataxia), hyperreflexia, convulsions
- Delirium with hallucinations, agitation, amnesia, incoherence
- Dysuria, urinary retention, bladder distension
- Death, preceded by tachycardia, arrhythmias, coma, and respiratory depression<sup>35</sup>

**Toxic part:** All parts especially seeds

### **Fatal dose**

The fatal dose is about 50-100 Datura seeds, or about 10-100mg of atropine, however recovery has been recorded with 1000 mg of atropine<sup>36</sup>.

### **Fatal period**

In the majority of fatal cases death usually occurs within 24 hrs.

### **Diagnosis**

- Even minute traces of atropine in blood can be detected by GC-MS (Gas chromatography –mass spectrometry). However, there is little or no correlation between dose of atropine, plasma concentration and observed clinical effects
- Neutrophil leucocytosis is often encountered
- Dilated pupils-if the pupils do not constrict within 15-30 minutes after instillation of 2-3 drops of 1% pilocarpine, it is indicative of atropine or anticholinergic poisoning
- Cat's eye test-instillation of a few drops of the patient's urine into the eyes of a cat results in rapid mydriasis<sup>37</sup>.

#### **Treatment:**

- Treat the patient in a quiet and dark environment. Treat respiratory failure with endotracheal intubation and assisted ventilation. Tidal volume should be at least 10 to 15 ml/kg. Monitor ECG, pulse, and temperature continuously .Gut decontamination-gastric lavage (after intubation), activated charcoal. Dialysis and haemoperfusion do not appear to be effective. Catheterise bladder. Administer IV fluids keeping a close watch on intake and output and renal function. Agitation can be controlled with judicious use of diazepam. Do not use phenothiazine s or antihistamines, since they can aggravate

anticholinergic effects. Hyperthermia can be managed by hydration and cooling measures.

- *Antidote-* physostigmine is the antidote of choice, should be administered if the indications like, coma, arrhythmias, hallucinations, severe hypertension, convulsions, are present. The adult dose is 2mg IV, slowly repeated if required in 20 minutes. Do not give it as a continuous infusion. Physostigmine is an effective but dangerous antidote and can give rise to convulsions, systole, hypotension, and hyper salivation and Brady arrhythmias if administered without caution.
- *Precaution-*In the treatment of Datura poisoning, certain drugs such as antihistamines, phenothiazine, tricyclics, quinidine, disopyramide, procainamide, and morphine should be avoided.<sup>37</sup>.

#### **Post Mortem Appearance**

The Datura seeds or their fragments may be found in stomach and intestine. It is therefore necessary to make a careful search for the vomited matter, stomach contents and faeces. The oesophagus, stomach and duodenum and other internal organs are mostly congested. In rare cases mucous membrane of stomach may be found slightly inflamed<sup>38</sup>.

#### **Medico legal importance**

*Accidental poisoning*- Mistaken identity, involving capsicum seeds for aging children in the countryside chewing on the seeds out of curiosity, therapeutic misadventures, overenthusiastic use of atropine as an antidote for organophosphate or carbonate poisoning.

*Suicidal poisoning*-Owing to easy acceptability, *Datura* is not infrequently reported in suicidal ingestions, especially in rural parts of India

*Homicidal*-There have been rare instances of murder being accomplished with one or the other belladonna alkaloids

*Stupefaction*-It is a process of making a victim debilitated suddenly by divulging him to a deliriant poison such as *Datura* in order to ease robbery or rape<sup>39</sup>.

## CONCLUSION

*Datura* is included one among the *upavisha* by *laghutrayees*, except *sharangadhara samhitha*. In Ayurvedic literatures, *Datura* is described as a useful remedy for various diseases like *jwara*, *kushta*, *krimi*, *visha*. For the preparation of many Ayurvedic formulations like *Kanakasava*, *Sootashekhara rasa*, *mahavishagarbha taila* *Datura* is used as one of the ingredient. Improper or inadequate *shodhana* and *Datura* in high dose, can give rise to toxic problems like

dryness of mouth, excessive thirst, nausea, vomiting, giddiness. The most toxic part of *Datura* is seeds in modern concept it is a deliriant type of cerebral poison and the main toxic principles are hyoscyamine, hyoscine, and atropine. So for getting rapid outcome in ayurvedic treatments we can use *Datura* like *upavishas* in ayurvedic formulations.



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