MEDICINAL AND TOXICOLOGICAL ASPECTS OF *DHATURA*: A REVIEW

Anita Sahu¹, S.R. Inchulkar², Yuvraj Kaushik³

¹Post Graduate Scholar, Department of Agad Tantra Evum Vidhi Vaidyak, Govt. Ayurved College, Raipur, Chhattisgarh, India
²Professor, Department of Agad Tantra Evum Vidhi Vaidyak, Govt. Ayurved College, Raipur, Chhattisgarh, India
³Lecturer, Department of Agad Tantra Evum Vidhi Vaidyak, Govt. Ayurved College, Raipur, Chhattisgarh, India

Corresponding Author: aniwhat@gmail.com

https://doi.org/10.46607/iamj.4508102020
(Published online: October 2020)
Open Access
© International Ayurvedic Medical Journal, India 2020
Article Received: 29/09/2020 - Peer Reviewed: 02/10/2020 - Accepted for Publication: 04/10/2020

ABSTRACT

*Dhatura* is a toxic shrub and also a medicinal plant. *Ayurvedic* literature mentions the use of poisonous plants in the treatment of various human ailments. *Dhatura* is one of the *Upvisha*. It is a wildly growing plant from the Solanaceae family, used in many *Ayurvedic* formulations. This plant has contributed various pharmacological actions in the scientific field of Indian systems of medicine like analgesic, anti-inflammatory, anti-asthmatic, hypoglycemic, anti-rheumatoid, and wound healing activities. It contains a variety of toxic tropane alkaloids such as atropine, hyoscyamine, scopolamine, etc. every part of the plant is toxic, but the highest number of alkaloids is contained in the seed. *Dhatura* poisoning is common in India. The administration of improper amounts of *Dhatura* affects the central nervous system with symptoms such as dysphagia, dementia, confusion, convulsions, delirium, and hallucination. However, death by *Dhatura* poisoning is rare, recovery may take several days. Therefore, understanding the possible medicinal and toxicological effects of *Dhatura* is needed.

**Keywords**: *Dhatura*, *Ayurvedic*, medicinal plant, toxic effect, pharmacological action
INTRODUCTION

_Dhatura_ is a perennial wild plant grown all over the country especially in wasteland. It is a small coarse shrub with an unpleasant smell, belongs to the Solanaceae family. Etymologically the word _Dhatura_ is derived from a Sanskrit word “Dhatur”. Other common name for _Dhatura_ is thorn apple, jimson weed, hell’s bell, and devil’s trumpet. It comes under the _UpvishaVarga_ in Ayurveda. In modern medicine, it is classified under deliriant type of cerebral poison. The plant contains a variety of toxic tropane alkaloids such as atropine, hyoscyamine, scopolamine, etc. which are responsible for both the medicinal and hallucinogenic properties, as well as toxic in a higher dose. Considering this, the plant has been grouped under schedule E-1of Drug and Cosmetics Act – 1940¹. In Ayurveda, _Dhatura_ is described as a useful remedy for various human ailments including asthma, cough, fever, inflammations, wound, edema, neuralgia, insanity, myalgia, hyperacidity, and dysmenorrhea. _Dhatura_ poisoning is common in India, the seeds being usually employed mainly as a stupefying poison prior to robbery, kidnapping and rape. It is sometimes known as roadside poison. Accidental poisoning is commonly occurring when children and adults eat the raw fruit or seeds mistaking them for edible fruits or capsicum seeds. The administration of improper amounts of _Dhatura_ affects the central nervous system with symptoms such as dysphagia, dementia, confusion, convulsions, delirium, and hallucination. However, death by _Dhatura_ poisoning is rare, recovery may take several days. As this plant is responsible for both medicinal and toxic effects on human beings, so it is necessary to use it after appropriate knowledge.

**Objective:** The present review article summarizes the medicinal importance, toxic effects, therapeutic doses, antidotes and medico-legal aspects of _Dhatura._

**Methodology:** Material is collected from the classical _Ayurvedic_ literatures, modern medical books and research journals.

**Taxonomic Classification**

**Kingdom:** Planate; **Division:** Mangoliophyta; **Subdivision:** Angiospermae; **Class:** Mangoliospida; **Subclass:** Asterids; **Order:** Solanales; **Family:** Solanaceae; **Genus:** Datura

_Ayurvedic Classification², 3, 4, 5, 6, 7_

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Nighantu Name</th>
<th>Varga</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raj Nighantu</td>
<td>Karviradi</td>
</tr>
<tr>
<td>2</td>
<td>Madanpal Nighantu</td>
<td>Abhayadi</td>
</tr>
<tr>
<td>3</td>
<td>Kaiyadev Nighantu</td>
<td>Aoushadhi</td>
</tr>
<tr>
<td>4</td>
<td>Bhavprakash Nighantu</td>
<td>Guduchyadi</td>
</tr>
<tr>
<td>5</td>
<td>Dhanvantari Nighantu</td>
<td>Karviradi</td>
</tr>
<tr>
<td>6</td>
<td>Shaligram Nighantu</td>
<td>Guduchyadi</td>
</tr>
</tbody>
</table>

_Table 1: Ayurvedic classification of Dhatura according to different Nighantu_

<table>
<thead>
<tr>
<th>Language Name</th>
<th>Synonyms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindi</td>
<td>Sada Dhatura</td>
</tr>
<tr>
<td>English</td>
<td>Thorn-Apple</td>
</tr>
<tr>
<td>Telugu</td>
<td>Ummetta</td>
</tr>
<tr>
<td>Tamil</td>
<td>Ummattai, Umate</td>
</tr>
<tr>
<td>Bengali</td>
<td>Dhatura, Dhotra</td>
</tr>
<tr>
<td>Kannada</td>
<td>Unmatta</td>
</tr>
<tr>
<td>Gujarati</td>
<td>Dhatura, Dhaturo</td>
</tr>
<tr>
<td>Marathi</td>
<td>Dhotra, Dhatura</td>
</tr>
<tr>
<td>Bihari</td>
<td>Khumuk</td>
</tr>
<tr>
<td>Kashmir</td>
<td>Dather</td>
</tr>
</tbody>
</table>

_Table 2: Vernacular Name⁸_
Classical Name: Dhattura, Dhuttura, Dhustura, Dhurta, kitava, kanaka, unmatta, matula, shivpriya, Dhurta, Devata, Kitava, Toori, Mahamohi, Kanakahvaya etc.

Table 3: Possible meaning of synonyms of Dhatura

<table>
<thead>
<tr>
<th>Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhattura</td>
<td>It destroys vitiated Doshas and Dhatus by its Ushna Guna</td>
</tr>
<tr>
<td>Unmatta</td>
<td>The drug that produces delirium</td>
</tr>
<tr>
<td>Kanaka/Kanakahva</td>
<td>The drug with synonyms of gold</td>
</tr>
<tr>
<td>Kitava</td>
<td>People who consume will behave idiotic</td>
</tr>
<tr>
<td>Madana</td>
<td>That paralysis the function of the body parts</td>
</tr>
<tr>
<td>Shivapriya</td>
<td>Favorite of lord Shiva</td>
</tr>
<tr>
<td>Dhurta</td>
<td>Drug causing giddiness and palpitation (with its delirient effect)</td>
</tr>
<tr>
<td>Matula</td>
<td>No other drug is equal to its therapeutic effects or in other words there is no comparison of its efficacy with other drugs</td>
</tr>
</tbody>
</table>

Types There are 5 types based on color of flowers.

Botanical Description
Dhatura is a messy smelling, erect, annual, freely branching herb that forms a shrub up to 60 to 150 cm (3 to 5 ft) tall.
Root: cylindrical with lateral branches, brown coloured, rough splintery.
Stem: Dichotomously branched, cylindrical, blackish-dark to purple colour, internode very short.

Leaf: 6 to 11 cm long, 2 to 8 cm broad, alternately arranged with pointed margin, dark green colour.
Flower: The flowers are trumpet or bell shaped.
Fruit: Capsule, Spherical with soft spines and contains 50 to 100 light brown reniform seed.
Seed: Light brown, reniform, compressed, flattened, 0.4 to 0.5 cm long, and 0.4 cm wide, foveate, surface finely pitted, yellowish brown colour and resembling chilly seeds.
Distribution: In India, Dhatura plants are abundant and grow wild throughout the country.

Ayurvedic Properties

Table 4: Showing Ayurvedic properties of Dhatura

<table>
<thead>
<tr>
<th>Property</th>
<th>Rasa</th>
<th>Guna</th>
<th>Veerya</th>
<th>Vipaka</th>
<th>Prabhava</th>
<th>Doshaghnata</th>
<th>Rogaghanta</th>
<th>Karma</th>
</tr>
</thead>
</table>

Rasa
Guna
Veerya
Vipaka
Prabhava
Doshaghnata
Rogaghanta
Karma
Table 5: Chemical Constituents of *Dhatura*

<table>
<thead>
<tr>
<th>Therapeutic Parts</th>
<th>3α, 6β-Ditigloyloxytrone, 3α, 6β-Ditigloyloxytropan-7β-ol, tigloidine, aphydoscine, hyosine, 3α-tigloyloxytropane, norhyosine, metelodine, hyoscyamine, cuscohygrine and tropine.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root</td>
<td>β - sitosterol, scopolamine and fastusine.</td>
</tr>
<tr>
<td>Pericarp</td>
<td>Scopolamine and mixture of two unidentified alkaloids.</td>
</tr>
<tr>
<td>Leaves</td>
<td>Hyoscyamine and hyoscyamine.</td>
</tr>
<tr>
<td>Flower, leaves, aerial parts and roots</td>
<td>21, 24R-epoxy-27-methoxy-1-oxo witha-2, 5-dienolide and hyoscyamine.</td>
</tr>
<tr>
<td>Fresh aerial parts</td>
<td>Daturanalone and datrudiol.</td>
</tr>
<tr>
<td>Seed</td>
<td>Scopolamine, atropine, fastuine, fastusidine, daturanalone and fastusic acid.</td>
</tr>
<tr>
<td>Seed oil</td>
<td>4α-methylsterols-31-norlanost-9(11) enol, 31-norcycloartenol, cycloequalenol, 31-norlanost-8-enol, 31 nolanosterol; obtusifoliol, 4α-methyl cholesta-8-enol, lophenol and citrostadienol.</td>
</tr>
</tbody>
</table>

**Traditional Uses**

*Dhatura* is useful in asthma, cough, fever, inflammations, oedema, neuralgia, insanity, myalgia, hyperacidity, duodenal ulcer, renal colic, calculi, and dysmenorrhoea. The whole plant is of medicinal importance, but especially roots are used for bites of rabid dogs. Leaf is useful in inflammations and piles. Leaf juice is applied externally for lice and skin disease. Leaves in form of poultice are used in lumbago, sciatica, neuralgia, mumps, and painful swellings. Seeds are aphrodisiac and used in toothache, earache, gastric disorders, and are good to treat dandruff and lice.

**Mode of Action**

- Atropine and hyoscyne block the acetylcholine receptor and produces sympathomimetic or parasympatholytic action.
- It stimulates the central nervous system in early phase, but later CNS depression occurs, especially of the respiratory center.
- Vagolytic action resulting in stimulation of the heart.

**Pharmacological Effects**

Researches revealed that *Dhatura* shows various types of activities such as Analgesic, anti-pyretic, anti-inflammatory, anti-viral, anti-cancer, and anti-ulcer, anti-stress, immunomodulatory activity, antimicrobial, anti-fungal activity, hypoglycemic effect, and wound healing effect.

**Common Formulations**

- Kankasawa, Ekangyira Rasa, Puspadhanwa Rasa, Tribhuvana Kirti Rasa, Laghu Vishgarbha Taila, Visatinduka Taila, Dhattura Tail.

**Toxicological Profile**

**Type of Poison:**

- Ayurveda: Shavara Vanaspatik Visha, Upavisha
- Modern: Cerebral Deliriant Poison

**Fatal Dose**

- About 60 to 100 *Datura* seeds.
- Usually 60 to 75 mg of atropine.

**Fatal Period** 24 hours

**Clinical (Toxic) Features**

- Summarized in the classic phrase: *blind as a bat, hot as a hen, dry as a bone, red as a beet and mad as a wet hen*.
- The important manifestation of *Dhatura* poisoning can be summarized as 9Ds:
  1. Dryness of mouth, thirst, slurred speech.
  2. Dysphagia.
  3. Dilated pupils.
  4. Diplopia.
  5. Dry hot skin with flushing, hyperpyrexia.
  6. Drunken gait (ataxia), hyperpyrexia, convulsions.
  7. Delirium with hallucinations, agitation, amnesia, incoherence.
  8. Dysuria, Urinary retention, bladder distension.
  9. Death preceded by tachycardia, arrhythmias, coma and respiratory depression.

**Treatment Principle**

- Monitoring of pulse, respiration and body temperature, Stomach washes by...
KMnO4 or 4 - 5% tannic acid, hystostigmine 1-4 mg i.v./i.m. (repeated, if necessary at intervals of 1-2 hrs.) 0r Neostigmine (2.5 mg i.v. every 3 hrs.), Pilocarpine 5mg s.c.

Ayurvedic Antidote: Cow milk with sugar, juice of *Vrntaka* fruit in a dose of one *pul*, *Karpasasthi Pushpa Kwath*, *Nimbu Swarasa*, *Jiraka*.

Post- Mortem Appearance: Not characteristic, Dilated pupil, Sign of asphyxia, General signs of poisoning, Seeds or their fragments may be detected in the stomach and small intestines. It resists putrefaction and may be found even in a decomposed body.

Medico-Legal Aspects:
1. Accidental: a) Therapeutic misadventure due to quackery.
   b) Ingestion of seed by children.
   c) Over enthusiastic use of atropine as an antidote for organophosphate or carbamate poisoning.
2. Suicide: Mostly reported from rural areas.
4. Stupefaction: Used as stupefying agent for theft, robbery, rape or kidnapping. The powdered seeds are mixed with food, tea, drink.

DISCUSSION

The plant of *Dhatura* grows abundantly throughout India and easily accessible. Traditionally *Dhatura* has been used for mystic, religious purposes and as herbal medicine. In *Ayurvedic* literature, *Dhatura* is described as a useful remedy for various ailments like *Asthma, Jwara, Kustha, Alarka-visha, Amlapitta*, and *Krimi*. It can be used both locally and through oral administration. For the preparation of many *Ayurvedic* formulations like *Tribhuvana Kirti Rasa*, *Sootshekhara Rasa*, *Kanakasava*, *Mahavishagarbha Taila* *Dhatura* is used as one of the ingredients. In modern, many previous reviews revealed that the plant shows various type of activities such as analgesic, anti-inflammatory, anti-cancer, anti-viral, anti-bacterial, antipyretic, anti-spasmodic, neurologic and wound healing that may be due to the presence of the different active components like alkaloids, tannins, saponins, steroids, flavonoids, and glycosides. It is a powerful deliriant and hallucinogen. The main toxic alkaloids are atropine, hyoscyamine, and scopolamine. The administration of improper or higher amounts of *Dhatura* produces toxic effects such as dryness of mouth, thirst, nausea, vomiting, dysphagia, dementia, confusion, hallucination, and convulsion; often resulting in hospitalization and death. Although *Dhatura* is toxic in nature but after purification and when used in therapeutic doses, it has been potential to treat many diseases.

CONCLUSION

There are plenty of descriptions available in *Ayurvedic* literatures about *Dhatura*. It has many therapeutic and a few toxic effects. Despite being toxic, it can be converted into a powerful medicine to treat many diseases by proper use. Hence in the present review indicated of multiple uses of *Dhatura* in clinical condition as well as its toxicity.

REFERENCES

4. Priyavat Sharma, Kaiyadev Nighantu (Pathyapathyavibodhaka), Chaukhambha Orientalia Varanasi, Reprint Ed. 2016, P.632
5. Vishvanath Diwedi, Bhavprakash Nighantu, Reprint Ed. 2015, P.174-175
6. Prof. Priyavat Sharma, Dhanvantari Nighantu, Chaukhambha Orientalia Varanasi, Reprint Ed. 2016, Ch. 4, Karviradi Varga, 4/6-7, P.122
7. Lala Shaligramji Vaishya, Shaligram Nighantu, Guduchyadi Varga, P.309-312
8. P.C. Sharma, Database on Medicinal Plants Used in Ayurveda, Volume 2, C CCRAS, New Delhi2005, Pg. 200
11. P.C. Sharma, Database on Medicinal Plants Used in Ayurveda, Volume 2, CCRAS, New Delhi2005, Pg. 201
12. (P.C. Sharma, Database on Medicinal Plants Used in Ayurveda, Volume 2, CCRAS, New Delhi2005, Pg. 200)
14. P.C. Sharma, Database on Medicinal Plants Used in Ayurveda, Volume 2, CCRAS, New Delhi2005, Pg. 201
17. V. V. Pillay, Modern Medical Toxicology, Jaypee Brothers Medical Publisher(P) Ltd, Edition - 4th, 2013, Ch. 15, Pg.209
20. Dr. Sharad Porte, Agada Tantra VishaChikitsaVijana, 1st Ed.2016 Ch. 12, P.162
21. Dr. K.S. Narayan Reddy, The Essential of Forensic Medicine & Toxicology, 34th Ed. 2017, Jaypee The Health Science Publisher New Delhi, Ch.32, P.557

Source of Support: Nil
Conflict of Interest: None Declared