THE AMAZING THERAPEUTIC PROPERTIES OF DHATURA: A SHORT REVIEW

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ABSTRACT

Plants have always played a major role in the treatment of human traumas and diseases worldwide. Dhatura is a widespread annual plant from the Solanaceae family. The species of Dhatura can be found throughout the world. The plant grows in sandy flats, plains, areas up to 2, 500 feet above sea level. Dhatura is one of the widely well known folkloric medicinal herb. Dhatura is a plant with both poisonous and medicinal properties and has been proven to have great pharmacological potential with a great utility and usage as folkloric medicine. In Ayurvedic text it is established as a poisonous plant but having good therapeutic properties after Shodhana process. After Shodhana process its poisonous properties are diminished but therapeutic properties get improved. So in most of the Ayurvedic preparations we use the Shudha Dhatura, Shudha vatsanabha, Shudha Bhanga etc. There are so many generic preparations available in old text to treat various diseases like sanity, gastric ulcer, fever, rhiitis, Bronchial asthma, seizures etc., having Dhatura as a main constituent. The phytochemical investigations showed the presence of saponins, tannins, steroids, alkaloids, flavonoids, phenols and glycosides. Atropine and scopolamine are competitive antagonists of muscarinic cholinergic receptors and are central nervous system depressants. This paper presents an exclusive review work on the traditional uses, Ayurvedic purification process, phytochemical, pharmacological actions of Dhatura.

INTRODUCTION

Dhatura is commonly known as thorn apple, jimson weed, locoweed and devil’s weed. It is a member of the Solanaceae family. Commonly found species of Dhatura are D.stramonium, D.fastuosa, D.atroxa and D.metel. Dhatura is a poisonous herbal plant, also known as Kanaka in Ayurvedic samhitas and has been commonly used in Ayurvedic pharmacopoeia.

The plant is described under the “Upavisa Vargas” of Rastarangani1, and Rasratna Samuchya2 etc., but in Sushrut samhita it is included in Shavara phala visha. It has been used successfully in the management of several diseases after proper Shodhana process. The species of Dhatura can be found throughout the world. The plant grows in sandy flats, plains, areas up to 2, 500 feet above sea level.3

Vernacular Names4,5

<table>
<thead>
<tr>
<th>Arabic</th>
<th>Assamese</th>
<th>English</th>
<th>Farsi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datur</td>
<td>Dhatura</td>
<td>White Thorn apple</td>
<td>Tatur</td>
</tr>
</tbody>
</table>

Gujrati : Dhanturo
Hindi : Dhatura
Kannada : Ummatti, Madagonaki, Dhathura
Malayalam : Umman, Ummatt, Ummattu
Marathi : Dhotra
Oriya : Dudura
Punjabi : Dhatura
Tamil : Ummattai
Telugu : Tella-ummetta
Urdu : Dhatura

Sanskrit Synonyms: Kanaka, Matul, Shivpriya, Kantakphala, Shivashekar and its fruit is called Matulputral.

Guna-dharma (pharmacognostical properties):

The “Vrhatti” of Ayurveda, only indicates the plant in some of its Yogas besides going into its pharmacognostical properties but various Nighantas of medieval and modern era described Dhatura’s detailed pharmacognostical properties as well.
Table 1: Showing Guna-dharma of Dhatura as mentioned in Nighantu [10],[16-21]

<table>
<thead>
<tr>
<th>Nighantu</th>
<th>Rasa</th>
<th>Guna</th>
<th>Virya</th>
<th>Vipaka</th>
<th>Prabhava</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhavaprakash Nighantu</td>
<td>Kashaya, Madhura, Tikta</td>
<td>Guru</td>
<td>Usna</td>
<td>Katu</td>
<td>-</td>
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<tr>
<td>Kaidev Nighantu</td>
<td>Kashaya, Madhura, Tikta</td>
<td>Guru, Tikshana</td>
<td>Usna</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Raj Nighantu</td>
<td>Katu</td>
<td>-</td>
<td>Usna</td>
<td>Katu</td>
<td>-</td>
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<tr>
<td>Dhanvantri Nighantu</td>
<td>Katu</td>
<td>-</td>
<td>Usna</td>
<td>Katu</td>
<td>Jwaraghn</td>
</tr>
<tr>
<td>Nighantu Adarsh</td>
<td>Katu</td>
<td>-</td>
<td>Usna</td>
<td>Katu</td>
<td>Jwaraghn, Madakari</td>
</tr>
<tr>
<td>Ras trangini</td>
<td>Katu</td>
<td>-</td>
<td>Usna</td>
<td>Katu</td>
<td>Jwaranashan (Visheshat)</td>
</tr>
<tr>
<td>Priya Nighantu</td>
<td>Tikta</td>
<td>-</td>
<td>Usna</td>
<td>-</td>
<td>Madakari</td>
</tr>
<tr>
<td>Dravyaguna hastamalak</td>
<td>Kashaya, Madhura, Tikta, Katu</td>
<td>Guru, Tikshana</td>
<td>Usna</td>
<td>Katu</td>
<td>-</td>
</tr>
<tr>
<td>Dravyaguna vigyan</td>
<td>Tikta, Katu</td>
<td>Laghu, Ruksha, Vyavayi, Vikashi</td>
<td>Usna</td>
<td>Katu</td>
<td>Madaka</td>
</tr>
</tbody>
</table>

Therapeutic properties

Acharya sushruta described Dhatura in five different Yogas indicated in Alarkvisha, Karan-roga and Visarpa-nadi roga.

While Acharya Vagbhatta indicates it in Yogas of Alarkvisha as well as Khalitya, Harita: in Arsha, Cakardutta: in Unnmada, Vipadika, Stan-pida and Nadu-roga; Nighantu also mentions range of indications which are as follow.

Table 2: Show indications of Dhatura as mentioned in Nighantu [3] [10],[16-21]

<table>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fever</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>+</td>
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<tr>
<td>2.</td>
<td>Leprosy</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<td>+</td>
<td>+</td>
<td>-</td>
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<tr>
<td>3.</td>
<td>Anti-Lice</td>
<td>+</td>
<td>-</td>
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<tr>
<td>4.</td>
<td>Scables</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<tr>
<td>5.</td>
<td>Anti- helmintic</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
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<tr>
<td>6.</td>
<td>Anti-toxin</td>
<td>+</td>
<td>-</td>
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<td>-</td>
<td>+</td>
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<tr>
<td>7.</td>
<td>Anti-inflammatory</td>
<td>-</td>
<td>-</td>
<td>+</td>
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<td>8.</td>
<td>Skin disease</td>
<td>-</td>
<td>+</td>
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<td>+</td>
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<td>+</td>
<td>-</td>
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<tr>
<td>9.</td>
<td>Gout</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
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<tr>
<td>10.</td>
<td>Pain killer</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
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<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11.</td>
<td>Asthma</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12.</td>
<td>Rabies</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
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<tr>
<td>13.</td>
<td>Measles</td>
<td>-</td>
<td>-</td>
<td>+</td>
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<td>14.</td>
<td>Cholera</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<td>+</td>
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<tr>
<td>15.</td>
<td>Syphilis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>+</td>
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<tr>
<td>16.</td>
<td>Tuberculosis</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>+</td>
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<tr>
<td>17.</td>
<td>LBS</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>18.</td>
<td>Rheumatoid Arthritis</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
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</tr>
</tbody>
</table>

B.N.: Bhavaprakash Nighantu, R.N.: Raj Nighantu, R.T.: Ras trangini,
P.N.: Priya Nighantu, D.N.: Dhanvantri Nighantu, K.N.: Kaidev Nighantu,
M.N.: Madhav nidan, R.R.S.-Ras rattan samuchya
**Morphology**

*D. stramonium* is a foul-smelling, erect, annual, freely branching herb that forms a bush up to 2 to 5 ft tall.

Its root is long, thick, fibrous and white. Its stem is stout, erect, leafy, smooth, and pale yellow-green. The stem forks off repeatedly into branches and each fork forms a leaf and a single, erect flower.

The leaves are about 8–20 cm long, smooth, toothed, soft, and irregularly undulated. The upper surface of the leaves is a darker green, and the bottom is a light green. *D. stramonium* generally flowers throughout the summer. The fragrant flowers are trumpet-shaped, white to creamy or violet, and 6–9 cm long, and grow on short stems from either the axils of the leaves or the places where the branches fork. The calyx is long and tubular, swollen at the bottom, and sharply angled, surmounted by five sharp teeth. The corolla, which is folded and only partially open, is white, funnel-shaped, and has prominent ribs.

Its egg-shaped seed capsule is 3–8 cm in diameter and either covered with spines or bald. At maturity, it splits into four chambers, each with dozens of small, black seeds.[6]

**Phytochemistry**

Main constituents of *Dhatura* are a large number of tropane alkaloids (hyoscyamine, hyosine, litorine, acetoxytropine, valtropine, fastusine) and a number of withanolides and various trigloyl esters of tropane and pseudotropane. Calystegines the nortropane alkaloids with glycides inhibitory activity have also been found in various *Dhatura* species. The root contains higher amount of atropine compared to the other parts. The aerial parts usually accumulate relatively higher amounts of scopolamine and relatively lower amounts of atropine as compared to the root of the plant.[7]

**Uses of Dhatura**

*Dhatura* is internally used in relieving the spasm of asthma. It is also used in the treatment of Parkinsonism and Haemorrhoids. Its leaves, applied after roasting, are useful in relieving pain. The bitter narcotic plant relieves pain and encourages the healing process. Externally, the plant is used as a poultice in treating fistulas, abscesses, wounds and severe neuralgia. Traces of scopolamine are also found in the plant, which is a potent cholinergic-blocking hallucinogen that has been used to calm schizoid patients. Its leaves, containing hyoscyamine and atropine, can be used as an immensely powerful mind-altering drug. The seeds of *Dhatura* are analgesic, anti-helminthic and anti-inflammatory and as such, they are used in the treatment of stomach and intestinal pain that results from worm infestation, toothache, and fever from inflammations. The juice of its fruit is applied to the scalp, to treat dandruff and falling hair.[8]

Its leaves are found useful to treat headache. The vapour of *Dhatura* leaves infusion is used to relieve arthritis such as rheumatism and gout. Its leaves are also used to treat heart problems like palpitations and hypertension. *Dhatura* leaves juice is used to treat earache. Boils can also be overcome by applying *Dhatura* leaves as poultice.[9]

**Method of Shodhana (purification) of Dhatura seed**

As we know that *Dhatura* is a poisonous herb but this is used frequently in Ayurvedic preparations for a long time. In Ayurveda we have a process called *Shodhan* which is able to makes poisons to use in medicines.

For the *Shodhan* of *Dhatura*, First of all the seeds are subjected in a *Dolayantra* (hanging the drug in liquid while boiling) containing sufficient cow milk for 3 h. The level of the milk must be above the level of the *Pottali* (cloth bag in which seeds are hanging) and this level must be maintained throughout the *Swedana* process. Then they are washed with hot water. The seeds are used after removing the seed coat.[10]

**Ayurvedic preparations of Dhatura**

- Unmad gajankush ras[10]
- Sutshekhar ras[15]
- Kankasava[15]
- Pralapantak ras[10]
- Laxmivillas ras (nardiya) [15]
- Sannipat bhairav ras[15]
- Granthishtohnivarika varti[10]

**Researches and studies**

**Anti-bacterial Activity**

The leaves extract of *Datura stramonium* exhibits antibacterial activity. The antibacterial activity against the micro-organism strains of *Salmonella typhii*, *Pseudomonas aeruginosa*, *Proteus vulgaris* in the alcoholic extract of the leaves *D. stramonium* was found to be most efficient and moderately effective against *Klebsiella pneumonia*, *Staphylococcus-aureus* and *Escherica coli*. The different concentrations of the alcoholic extracts of *D. stramonium* was proved to be effective and concentration dependant antimicrobial activity against Gram positive and Gram negative bacteria tested.[11]

**Anti-asthmatic activity**

It has anti-cholinergic properties which are highly useful in treating the asthma and chronic obstructive pulmonary disease (COPD). Its atropine is classified as competitive non-selective antagonist of muscarinic cholinergic receptors. Scopolamine is also a competitive non-selective inhibitor, mimicking Ach at the neural synapses and depressing the central nervous system. It is an antagonist of muscarinic M1, M2 and M3 receptors in airways. Anti-cholinergic treatment is
directed towards muscarinic receptors within the lung by blocking muscarinic receptors on airway smooth muscle and submucosal gland cells and by inhibiting increased tone.\[^7\]

**Hypoglycemic activity**

The seeds of *D.metal* were examined for hypoglycaemic and antihyperglycaemic activities in normal wistar albino rats and diabetic rats. Seed powder of *D.metal* having blood glucose lowering effect in normoglycemic and in alloxan -induced hyperglycaemic rats.\[^{12}\]

**Anticancer activity**

A study done by Ahmad et al on variety of human cancer cells derived from breast (MDA-MB231), head and neck (FaDu), and lung (A549) and were exposed for 24 and 48 hours to *Dhatura* aqueous leaf extract and clonogenic cell survival as well as parameters indicative of oxidative stress were assayed. Exposure of these cells to the extract for 48 hours showed that all cancer cell lines were sensitive to cell killing induced by *Dhatura* aqueous leaf extract exposure with some variability (p<0.05).\[^{13}\]

**Antioxidant activity**

The aqueous extracts of leaf, stem bark and roots of *D.metal* showed phytochemical and antioxidant activities. The aqueous extracts of the plant showed antioxidant activities of between 49. 30-23.82% and can consider the plant as natural antioxidants.\[^{14}\]

**Anti-gout effects**

*D.metal* was assayed for xanthine oxidase inhibitory activity which is using for gout treatment. The methanolic extract of *D.metal* have more than 50% xanthine oxidase inhibitory activity (in vitro) which was comparable with the standard anti-gout drug allopurinol Showing 93.21% inhibition at 100g/ml concentration. The methanolic extract of *D.metal* was also found effective in hypo-uricaemic activity (in vivo) against potassium oxonate-induced hyper-uricaemia in mice. \[^{7}\]

**DISCUSSION**

As we seen above that *Dhatura* have many properties like Hypoglycemic, Anti cancer, Antioxidant, Anti-asthmatic, Anti-bacterial, Anti-gout established by recent researchers. These all properties have close resemblance with therapeutic properties explained in old text like *Shwashara* (Anti-asthmatic), *Updanshara*, *Visuchika hara*, *Jvarahara*, *Yakshmahara* (Anti-bacterial), *Kantikara*, *Varnakara*, *Vishahara* (Antioxidant), *Vatarrakthahar* (anti-gout). Above discussion shows that the old sages have very good knowledge about its pharmacological properties.

**CONCLUSION**

From the beginning of human race, the plants are being employed by the people for their therapeutic uses and still we tend to have faith in their disease curing properties. Though *Dhatura* is taken into account as a toxic plant, it has been used for thousands of years in Ayurvedic medication after purification. It also possesses antioxidant, anti-cancerous, Anti-asthmatic, Anti-bacterial and Hypoglycemic properties. It is additionally used in Parkinsonism, Haemorrhoids, dandruff and falling hair. It is found very effective in arthritis such as rheumatism and gout due to its pain relieving properties. However, only a few works has been done on this plant and there is a large scope of investigation for researchers to explore its potential in the field of medicinal research and pharmaceutical sciences.

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