Datura- A Devil Weed Or Angel’s Trumpet.

Review Article by:

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**Datura Inoxia- A Devil weed or Angel’s Trumpet**

Abstract

*Datura* is a mystery Plant. It belongs to family *Solanaceae*. There are many important species of genus Datura. Despite of many reports about being toxic, it's still debated for its medicinal properties. The genus *Datura* has a vast history from early time through World War till modern times.

Since long time, *Datura* has been used as a folk medicine in many ancient cultures and even used today. The ethnobotanical information predicts its useful drug value. This plant is well known for its hallucinogenic property. Heiser states that *Datura* is genus of contrast-from smelly weeds to lovely ornamentals".  38

Analyzing the chemical profile of *Datura*, it is reported to be rich in alkaloids. These alkaloids are member of Tropane. Important tropines are Atropine, Scopolamine and Hyoscyamine. The highest in percentage of atropine in *D.inoxia* is found in its seeds. 39

*Datura* can cause various complications. Some of its effects are systemic. The primary and alarming sign of toxicity with *D.inoxia* is mydriasis i.e. the change in pupil centration 40,41. Atropine also has the hallucination effect. It blocks the action of acetylcholine at its receptors.

*Datura inoxia* foliage is also harmful for grazing animals or animals that feed on the seeds. *Datura inoxia* has an anticholinergic property. This property is due to presence of Scopolamine 18. Interestingly, there are beetles and some bees that survive on *Datura* and they have established certain biochemical mechanisms to defend themselves against the plants intoxicating chemicals.
The bioactivity profiling of *Datura* revealed that it has antibacterial activities against *Escherichia coli*, *Bacillus subtilis*, *Vibrio cholera*, *Staphylococcus aurous*, *Enterobacter aerogenes*, *Agrobacterium tumefaciens*, and *Klebsiella pneumonia* 27. This mystery plants is also tested for anti cancerous activity and it turns out that it has anticancerous potential against cervical cancer HeLa cells32. *Datura inoxia* leaves are recently reported to contain a novel compound called dinoxin B (12,21-dihydroxy-1-oxowitha- 2,5,24-trienolide-27-O-β-D-glucopyranoside, 1). This compound was found effective against the breast cancer cell lines and can be used in new cancer chemotherapies 3.

*Datura* is also reported to have antimicrobial, anti-inflammatory, antifungal and herbicidal activities. This plant has been used in folk medicines and is still used in some parts of the world. It’s used in wound healing, as analgesic in broken bones condition and also for skin diseases. There have been studies indicating the spiritual attachment of various tribes and culture with the plant. Shamanisms were the most important and most studied where shamans drank Datura to mediate connection with the sacred and get supernatural powers.
1. Introduction:

Human have relied on plants not only for shelter, food and living but also for medical purposes for long. Plants have always played a vital role in human life. Plants are not only main source of oxygen and food but also source of secondary metabolites.

1.1.1 Secondary Metabolites:

Vascular plants contain produce the primary metabolites which are essential for life and function of the plant. Along with primary metabolites, they also produce enormous variety of other chemical compounds called Secondary metabolites. These chemical compounds are different from primary compounds and they vary from species to species. Secondary metabolites provide specific color, taste and smell to particular plants. Plants utilize secondary metabolites in there defense mechanisms. Alkaloids, Flavonoids, etc. are few of the important secondary metabolites.

1.2 Datura Species:

*Datura* is well known for decades. Its known to be an important poisonous plant. This genus belongs to family Solanaceae. And they have been in use since long.

**Scientific Classification:**

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**Important Species of Genus Datura:**

- *Datura. fastuosa*
- *Datura. ferox*
- *Datura. inoxia*
- *Datura. metel*
- *Datura. quercifolia,*
- *Datura. stramonium*
1.1.2 **Plant Description:**

1.1.3 **Datura Stromonium:**

*Datura* is wild growing plant. *Datura Stromonium* is an annual herbaceous plant with light hairs. Plant has forked branching system. Stem is erect and slightly yellow. Leaves are broad, simple, dentate and stalked. Flower is usually attractive colors of purple or white and is gamopetalous forming a shape of funnel. Seeds are black in color. Fruits are large with thorns and hence called Thorn apple in English.¹

![Fig1: Datura Stromonium.](image1)

1.2.2 **Datura inoxia:**

This plant is known as Angels trumpet. The plant is shrubby and annual. Leaves are ovate and margins are wavy. Flowers are creamy or slight pink in color. The corolla is fused to form a funnel shape flowers. Fruit have the thorny appearance. ¹

![Fig 2: Datura inoxia.](image2)
1.3 Distribution:

*Datura* genus is found in tropical and warm temperate regions of the World. Mostly present in United States, New Mexico to Europe, Asia and Africa. *D. Stromonium* is cultivated in Germany, France, Hungary and South America.\(^4\)

*Datura* is known to have seven important species of which *Datura stromonium*, *Datura inoxia* and *Datura fastuosa* is well studied and have been of attention to many people. Word *Datura* is originated from Hindi word Dhatura (thorn apple) and it dates back to 1662. *Datura* has been reported to have alkaloids and other secondary metabolites. These alkaloids are abundant in seeds and flowers. The presence of these alkaloids make *Datura* has toxic and hallucinogenic. These properties of the plant have impeded its use in modern medicine.

Surprisingly this plant has a vast history of being used in folk medicines. *Datura* has many medicinal properties, which are evident from the use in folk remedies. It has been also used for committing suicide or poisoning.

1.4 *Datura* Phytochemicals:

*Datura* is rich in secondary metabolites and the major and most important phytochemical is Tropine alkaloid. Hyoscyamine, Atropine and Scopolamine are the active and most studied Alkaloid in *Datura*. Minor alkaloids isolated include aposcopolamine, tigloidin, apoatropin, scopolamine N-oxide 17-20, hyoscyamine N-oxide ad 7-hydroxyhyoscyamine. Scopolamine and Hyoscyamine production varies in different part of the plant. Stem, young leaves and stems have maximum of alkaloids at young stage.\(^1\)
Other than Alkaloids, Tannins, Saponins, Flavonoids are also present in different concentration in *Datura* species.

![Chemical Structures](image1)

**Fig. 3. Structures of Scopolamine and Atropine.**

1.5 **How does it Work:**

Atropine and scopolamine are competitive antagonistic of muscarinic cholinergic receptor and central nervous system depressant.¹

Scopolamine structurally resemble to the Neurotransmitter acetylcholine. Scopolamine acts by blocking the muscarinic Acetylcholine receptors and is thus classified as an anticholinergic. Muscarinic acetylcholine receptors have vital function in regulation of various functions of central and peripheral nervous system.

Over dose of scopolamine impair the cognitive activities. Due to wide spread of acetylcholine in brain, scopolamine impact different brain functions.⁶

1.6 **Effects of Scopolamine:**

1.6.1 **Stimulus judgment:**

Scopolamine inactivates the muscarinic receptors, which impair the function of f
judgment and discrimination. Administration of scopolamine can impair the discrimination of sounds sequence and visual judgments.  

1.6.2 Antidepressant:

Some studies indicate that these muscarinic receptors have relation with depression. Scopolamine can work, as an effective antidepressant and patient feel relieved for some time.  

1.6.3 Learning and memory

Different studies have been carried out to check the effect of scopolamine of the learning ability and memorization. Some studies demonstrate that scopolamine when block the muscarinic receptor, it affect the encoding capability new short-term memory of brain. Some cases reported the impairment in recognition of objects.

In conclusion scopolamine affect the retrieval of memories and new words. Scopolamine not only effects this encoding but it also affects the working memory of a person. Along all these affects of scopolamine, scopolamine may work in reduction of anxiety, fear and may reduce the concentration. Scopolamine may also cause less attention, low motor activity.  

1.7 Surprising History Highlights:

_Datura_ species have been used for decades. Many tribes and regions around the world have some spiritual and religious attachment with the plant.

1.7.1 _Datura_ Cults and the Chumash

Chumash are the Native American people who are known to live in Central and Southeast of California. They are considered as first people. _Datura_ has been an integral part of Chumash culture for long.
The Chumash people resorted to the use of *Datura*. *Datura* plant was used to mediate contact with loved one who was dead. It was also considered sacred among the population. The people had to abide many rules and regulation before using *Datura*. The major restriction was that *Datura* was not supposed to be consumed before puberty. People also drank the decoction made with *Datura* to seek for supernatural helpers.

Among the Gabrielliono, Luiseno, the young people will take it as part of puberty ritual. Women were prohibited to consume *Datura*. 

While in Yokuts and Mono, there was a drinking ritual of *Datura* held every spring. Among these tribes, there were no gender restrictions. Among Mohave, Yuma and Cahuilla, they had no specific ceremony for drinking. But they took the plant for luck in gambling.

*Datura* was considered sacred and used to establish contact with the supernatural guardian; the Atiswin. Use of *Datura* to foresee their future or communicate with the spirits of dead was very common among the people. Chumash considered *Datura* important in treatment in various ailments and wound healing. Being sacred, it was also considered to contour the ill omen. One interesting fact about the tribe was drinking *Datura* in groups as collective prayers against various epidemics.

Many myths are associated with drinking of *Datura* among Chumash. For instant; a women was suppose to drink *Datura* during childbirth as it give them courage. If consumes by a men, it makes them brave and courageous. Not only people believed these myths but they also follow the restrictions for *Datura* drinking. It was supposed to be consumed only by a person who was pure so that supernatural powers can help then. One had to eat less and abstain from sex way before taking *Datura*. These restrictions
depended on how much power an individual seeks. A person seeking shamanistic power
had to follow these rules and regulations for long.

1.7.2 Preparation:

Specialist called Ventureno Chumash Alsukayi - a person who specialized in
making the plant in-toxic, prepared *Datura* decoction. In Ventura, the *Datura* specialists
has to be five old man who administered the drinker and inquired about his vision and
then interpreted the images and objects the drinker saw. Person consuming *Datura* has to
be administered by the specialist but in case of emergency or person taking it for bravery
for second time, the decoction can be made by mother or other relative. Usually the
decoction was made from the roots of the plant. The specialist would beg permission of
the *Datura* plant to have one of its roots. He would then cut a root and cover the plant.
According to people, they the specialist knew before which root to cut. *Datura* decoction
was made in cold water after mashing the roots with great skill. The specialists would
then calculate for the soil, the age of plant and size of the root to make an intoxic
preparation. People of Chumash were aware of the fact that *Datura* can cause death.
And the drinker was held responsible for all consequences including death. It was
believed that person who dies of drinking *Datura* must have violated one of the rules of
consuming *Datura*. According to their belief, that person did made his way to Spirit
World but did not find way back to the World. 7. *Datura* among Chumash was taken also
as treatment for various diseases, healing of wounds and as anesthetic in case of broken
bones. 7
1.7.3.  *Datura and Shamanistic Powers:*

Shamanistic powers are the powers of spirits and one who seek power had to take *Datura* many times. *Datura* was consumed in many cases before any ritual or ceremony. For example shamans would consume *Datura* before snake dance ceremony. So that the they could protect the participants from the snakebites. A bad (malevolent) shaman used the powers against people to harm or kill their enemies. Even other evils such as draught or epidemics were also attributed to evil shamans.

1.7.3.1 Shamanism:

Interest in Shamanism has been increasing day by day in modern era. Many anthropologists are interested and curious about Shamanism. Different studies have been carried to study basic structure of shamanism and find useful insight to shamanic practice. Shamanism is defines as; religious system where the shamans intermediates between the supernatural and humans.

Practitioners can be divided into Priest and Shamans. Priests are the full time specialists. They are representative if God or Goddess and mediate ways to contact the sacred. The shamans are not full time specialists. The main difference between Priest and Shaman is that Priest does not practice the altered state of consciousness (ASC) while the Shamans use ASC to make contact with sacred and supernatural entities. The Shamans would transform to spiritual creatures through rituals that would cause altered state of consciousness (ASC). And this state precisely is called Shamanic State of consciousness (SSC). The shamans transform to supernatural creatures to ensure success or benefit people. The evil shamans may use the powers to destroy other, or kill enemies. To get The Shamanic state of consciousness, the Shaman used to drink *Datura.* It also
required sleep deprivation, fasting, chanting, drumming and extreme pain along with the consumption of *Datura* 12. The people who consumed *Datura* reported that people would look like ghost 13. This reason behind this is proven by medical studies today that the extra intoxication from the plants blocks the receptors for color and so individual only see white, black or yellow.

*Datura* and many other plants such as opium, cannabis etc. have been used in shamanism and Pagan Culture. They have also been part of Sufis, Hindu, Tibetan, Greek and Hellenistic cultures. 14

![Fig 4. Mothmen from Pottery Mound holding *Datura* capsules.](image)

**1.7.2 Luiseno and *Datura* Spirits:**

Luiseno were the Native Americans who inhabited Southern California in 16th Century. The tribes have spiritual attachment to *Datura* and it was considered sacred. Boys in this tribe would consume *Datura* to enter their religious lives. They called *Datura* mixture as Toloache, which is a Spanish word for *Datura*. The boys would gather among fire. They were given power of Shamanism. 16
1.7.3  *Datura* in Indian Tradition:

There are many plants that are not commercially useful but are still considered important in Indian traditions. These plants are associated to various religious myths. These plants are considered vital part of worship. Many plants are considered sacred as people consider that they have resemblance to God or Goddess or any divine status. Many people in India use different plants for cure of diseases encounter evil eye and some of them are offered at temples and considered auspicious. Among these plants *Datura Fastuosa* is one important plant. The flowers of this plant are offered at temple of Shiva. Shiva (Yoges-Varsha) is worshipped on 13th day of moon in January and it’s the time they offer the flowers of *Datura* as a part of religious ritual. One reason for using *Datura* in worship according to Vamana Purana is that, *Datura* arose from the chest of Shiva. 

1.8  *Datura* As a Devil Weed:

*Datura* is given a name of Devil weed. The main reason is the poisonous and toxic nature of the plant. These reason behind these characteristic is the presence of alkaloids basically Tropane. *Datura* overdose ingestion can result in anticholinergic poisoning and can lead to dead of the person.

Intoxication of *Datura* is similar to anticholinergic delirium. It may cause hyperthermia, bizarre violent behavior and painful photophobia. Tropane alkaloid is mixture of Atropine and Scopolamine. Scopolamine is used as analgesic and muscle relaxant. There have been many cases in which people were affected by consumption of
**Datura.** In Botswana, there was report of many people hospitalized and the reason was their consumption of *Datura* with sorghum by mistake.\(^{19}\)

Many other cases indicated anticholinergic syndromes have been reported due to *Datura* intoxication. Seven people admitted in two different hospitals suffered from anticholinergic syndrome in Athens. The symptoms were aggressiveness, hallucination, mydriasis and dry mouth and skin. These patient consumed *Datura*, which was accidently collected with *Amaranthus blitum*, a salad in Eastern Europe. Both the plants flower the same time.\(^{18}\)

1.9 **Ethno botanical uses of *Datura*:**

Although *Datura* have many reports of being toxic and also has a status of weed in South Africa \(^{21}\). Yet this plant has its medicinal properties. And these are the properties that cannot be denied. For decades it has been used in traditional medicines to cure illness and wounding. It works as anesthetic in case of broken bones. *Datura* also has a role in treatment of asthma. Other medicinal uses include treatment of abscesses, gout and boil \(^{20}\). Many native tribes in amazon, Bolivia, Columbia America used *Datura* as sacred plant and used in shamanism\(^ {22}\). Shamans used *Datura* for mind altering \(^ {10}\). *Datura* is also used for headache or pain in eye if applied externally on forehead and eyes. \(^ {23}\)

*Datura Stromonium* leaves are reported to cure bronchial asthma in Narendra Nagar Block, Uttarkhan \(^ {24}\). In India *Datura Stromonium* leaves are used in many folk remedies. Leaves extracts are used in Sinus infection and bark is used for burns and ulcers. *Datura* is important in the way that it is a weed. There is evidence that weeds are more active in producing secondary metabolites and thus have more medicinal properties. Juice from *Datura* is applied on scalp for treatment of dandruff and hair fall. It’s also used to treat
insomnia. While the whole plant is active but seeds are more active in secondary metabolites. Scopolamine present in *Datura* is also used to relax schizoid patients. The growing plants also act as repellant of insects for other neighboring plants. *D. Stromonium* is also reported as anthelmintic and antiparasitic in Marche, Lathium and Abruzzu.

1.10 Pharmacological Activities:

1.10.1 Anti tumor Activity:

Recently, a new compound has been isolated from *Datura inoxia*. The new isolated compound is named D. inoxin B. This compound along with its aglycone reported to have cytotoxicity toward MCF-7 human breast Cancer cell lines. Not only is *Datura* also reported to have antitumor activity against Crown gall causing agent; *Agrobacterium tumefaciens*. Extract from *Datura inoxia* show apoptosis in human Colon adenocarcinoma and larynx cancer cell lines. A dose of 0.05 to 0.10 g is used to cure cancer. Methanolic extract from aerial parts of *D. fastuosa* that were tested to proliferative activity toward human colorectal carcinoma (HCT-116) cell line. A compound in *D. fastuosa* called nonglycosidic compound show higher antiproferative activity in HCT-116 cells.

1.10.2 Antimicrobial and Anti bacterial Activity:

Many reports have indicated that *Datura* has antimicrobial properties. *Datura inoxia* is reported to have antioxidant properties. This species also exhibit strong antimicrobial properties to *Staphylococcus aureus, Bacillus subtilis, Vibrio cholera, Klebsiella pneumonia, Enterobacter aerogenes, Agrobacterium tumefaciens* and
Escherichia coli. Methanol extracts of D.Stomonium and D.inoxia is affective against Gram-positive bacteria in dose dependent manner. 1

1.10.3 Antiasthematic Activity:

Datura fastuosa is also used as sedative in India. Leaves and seeds are anesthetic, antispasmodic, anodyne, antiasthmatic and also used in treatment of epilepsy heart diseases, fever, diarrhea, hysteria and skin treatment. In China, it’s used for asthma treatment. People in Vietnam also use Datur inoxia for antiasthmatic purpose. The muscarinic receptors are blocked by Atropine and scopolamine. This dilates bronchial smooth muscles and help in asthmatic attack. D.stromonium was reported to be used in cigarettes that help treat asthma. These cigarettes if used by pregnant women can affect the fetus permanently 29.

1.10.4 Antifungal Activity:

D.stromonium along with Calotropis, Gigantean, cow manure and A.indica extracts show Antifungal activity to Fusarium mangifereae 24. Various reports about Datura indicate its strong antifungal activity. Datura extracts were also found affective against Aspergillus niger, Penicillium expansum, Fusarium oxysporum, Pythium ultimum, Trichoderma harzianum and Rhizoctonia solani 30.

1.10.5 Anti-inflammatory and Repellent activities:

Some medicinal uses of the plant are anti-inflammatory. Its also use to treat dental and skin diseases. It’s considered effective for toothache 4. The extract of D.stromonium leaves and seed are reported to act as repellent and oviposition deterrent against spider mites. Under laboratory conditions the extracts cause 98% and 25% mortality after 48h
31. The ethanolic extracts from *Datura* reported to have strong anti-inflammatory affect to carrageenan induced paw edema in rats \(^3\)\(^2\).

**1.10.6 Herbicidal Activity:**

Extract from *D.fastuosa* reported to showed high herbicidal activity against Parthenium, which is a noxious weed. Both aqueous and methanol extracts suppressed Parthenium growth and germination remarkably. \(^3\)\(^3\)

**1.10.7 Hypoglycemic activity:**

*Datura fastuosa* seeds evaluated for hypoglycemic activity indicated that there was significant decrease in blood sugar with doses of 25, 50 and 5mg/kg body weight of diabetic rats. The experiment showed that use of *Datura* showed control in diabetes and it might be good to study to validate this promising use of *Datura* and develop phytomedicine for diabetes. \(^3\)\(^4\)

**1.10.8 Other Activities:**

There are many other phytochemical properties of genus *Datura* reported. The leaves of *Datura stromonium* are inhaled as snuff for divining in South Africa \(^3\)\(^5\). *Datura fastuosa* is also reported to be used in Africa in Tsonga Girls initiation schools and believed to help spiritual contact \(^3\)\(^6\). Seeds and roots of *Datura* have, antipyretic, antidiarrheal properties and is also used in insanity and fever \(^3\)\(^7\).

2. **Conclusion:**

*Datura* species have been used since ancient times. This review provides the important information about history, religious aspect, ethno-botanical uses and phytochemicals of the specie. In the early Native American period and old culture,
*Datura* has been shown to be a vital part in all cultures. It was not only used in folk remedies but people had their spiritual and religious attachment with the plant. The various tribes seem to have a very important and sacred place for *Datura*. The point of interest is that people in past used it for number of ailments. There have been studies regarding various photochemical studies of the plant in modern era. And it’s indicated that it has various important anti microbial, anti tumor activities. Based on various phytochemical activities of the specie, it can be considered for phtyomedicine and alternate therapies. There is a need of photochemical profiling of the plant. The modern technology can be helpful in exploiting various prospect of the plant. Beside many important properties, the detrimental and poisonous effects of the specie cannot be overlooked. Therefore the risk ratio/benefit ration should always be considered.
References


