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## *Datura stramonium*, a potential toxic plant

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**Abstract**

Reports in media about food poisoning are not rare. In Greece such a case in Athens newspaper Kathimerini refers to seven people hospitalized with anticholinergic toxidrome, after having eaten *Amaranthus blitum* (Greek salad blita) mixed up with *Datura stramonium*, Solanaceae, accidentally harvested along with blita in the cultivation field.

*Datura stramonium* (Thorn Apple, jimson weed, devil's snare), native to North America is found today wild and as a weed in all the world's warm regions, in rural and urban areas and its toxic components are tropane alkaloids atropine, hyoscyamine, and scopolamine.

It was used in traditional medicine as analgesic and anaesthetic while broken Bones were set. In the 18th and 19th century as convulsive- spasmodic, and anti- asthmatic respectively.

It has also been used voluntarily by teenagers for its hallucinogenic effect.

Many case reports in literature alert public and authorities about the need to prevent *Datura* toxicity.

**Keywords:** *Datura stramonium*, anticholinergic toxidrome, hallucinogenic effect

**Introduction**

There are often worldwide reports in press and media about food poisoning due to accidental ingestion of toxic plants in everyday life.

According to the Athens Greek newspaper Kathimerini of 18/5/2006 seven people in Greece were hospitalized (some of them in ICU) after having consumed a salad of *Amaranthus blitum*. The Greeks call the *Amaranthus blitum* var. *silvestre*, *vlita* (Modern Greek: βλίτα), and eat the leaves and the tender shoots cooked in steam or boiled and then served with olive oil, lemon and salt. The authorities discovered the toxic plant *Datura stramonium* harvested among the normally cultivated blita in a field, in Megara region west to Athens and sold in supermarkets. The patients recovered due to prompt medical treatment. preserve this knowledge. Furthermore, most ethnobotanical studies are focused on professional traditional practitioners and ignore the knowledge of ordinary people in the locality.



**Fig 1:** *Amaranthus blitum*



**Fig 2:** *Datura stramonium*

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*Datura stramonium* is a wild-growing plant of the Solanaceae family, widely distributed as a weed and easily accessible in rural and urban areas.

Several reports in the literature have shown that accidental food contamination or deliberate *Datura* ingestion, as hallucinogenic, can cause severe poisoning.

## Materials and Methods

Current literature on *Datura stramonium* anticholinergic toxicity, properties and uses is reviewed

## Results

### Case reports on *Datura stramonium* toxicity

#### Accidental *Datura* ingestion

Taha SA and Mahdi AH 1984 report three cases of *Datura* ingestion by children in ignorance of its toxicity in Saudi Arabia. Due to the special susceptibility of children to atropine toxicity and the relatively small lethal dose (less than or equal to 10 mg), treatment with the specific antidote, physostigmine salicylate, is emphasized for all but the mildest cases, in addition to any symptomatic treatment that might be needed [1].

Ertekin *et al.* 2005, reported that fulminant hepatitis and rhabdomyolysis occurred in an 8-year-old child who ate *Datura* leaves. The patient's hepatic enzyme levels also increased, but they returned to normal ten days later [2].

Al-Shaikh AM *et al.* report a case of acute *Datura stramonium* intoxication in a 6-year-old boy from Saudi Arabia, who presented with restlessness, hallucinations and mydriasis 8 hours after ingesting the seeds of *Datura* plant. Children have a special susceptibility to atropine toxicity; even small amount may produce central nervous system manifestations [3].

In 2007, Diker *et al.* reported two patients in coma intoxication following *Datura* seed tea ingestion. The CPK levels of one of them reached 6694 U/L and he developed fatal metabolic acidosis [4].

In 2008 Wiebe *et al.* reported that delirium developed in four patients due to *Datura stramonium* poisoning. Rhabdomyolysis occurred in two of them but they recovered with suitable treatment [5].

J. Russel *et al.* reported 2010 six members of the same family, who ate homemade stew containing *Datura*, with anticholinergic toxidrome (confused, laughing, vomiting, dizzy, thirsty and hallucinated). Approximately 1 hour later, another relative arrived at the home discovered them, called emergency medical services, and all six were transported to the hospital by ambulance. All patients fully recovered [6].

Krenzelok 2010 refers to *Datura* "gardeners eye" and "cornpickers eye," syndrome. When the sap or dried plant material enters the eye directly, mydriasis, most commonly unilateral and cycloplegia are sudden in onset and often profound frightening to the victim and to the clinician, suggestive of significant cerebral pathology due to the high concentrations of belladonna alkaloids in the entire plant [7].

Bouziri A. *et al.* reported in 2011 an unusual case of *Datura* intoxication occurring in a geophagous young child in Tunisia after accidental ingestion of the plant due to the underlying geophagia facilitating the occurrence of poisoning [8].

In a 2012 study with 19 patients in Iran, where the plant's name is Tatoore, children were poisoned more commonly than teenagers and poisoning in adults was rare. All of the children ingested the plant accidentally. The most presenting symptom was irritability and the most common sign was sinus tachycardia. Most of the symptoms were controlled by parenteral benzodiazepines [9].

Şanlıdağ B *et al.* report accidental poisonings commonly seen among children who are more prone to the toxic effects of atropine; ingestion of even a small amount can cause serious central nervous system symptoms. As in a child

presented to the Pediatric Emergency Department with aggression, agitation, delirium, and visual hallucinations [10]. Disel *et al.* reported a family who had three of its members poisoned after eating a traditional meal "dolma" made of *datura* flowers. None had fatal complications and all were discharged healthy [11].

#### *Datura stramonium* deliberate abuse

Recreational use of *Datura* to induce an anticholinergic delirium has been most frequently reported among adolescents and young adults. Plant parts can be brewed as a tea or chewed, and seed pods, commonly known as "pods" or "thorn apples," can be eaten. Teenagers ingest the roots, seeds or the entire plant to obtain its hallucinogenic and euphoric effects [12, 13].

Guharoy SR *et al.* 1991 report 4 cases of jimson weed intoxication due to ingestion and inhalation (smoking) of jimson weed [14].

Dewitt MS *et al.* 1997 review the cases of nine teenagers who were treated in hospitals after abuse of jimson weed, in the Kanawha Valley West Virginia where *Datura* has been used as a home remedy since colonial times [15].

Tiongson J *et al.* 1998 paper is a case report summarizing 11 cases of patients, ages 13-21 years, who presented to emergency department following oral ingestion of large quantities of Jimson Weed pods and seeds [16].

Honey BL *et al.* 2009 present a study according to which during six years, sixty-three individuals in Oklahoma have been hospitalized for jimson weed intoxication although under a state law passed in 2004, in Oklahoma it is illegal to grow this plant [17].

David Vearrier and Michael I Greenberg report 2010 a case of altered mental status in a 22-year-old man following the ingestion of vodka and seeds of *Datura stramonium*. After his acute intoxication resolved, the patient reported that he learned about the recreational use of *Datura* on the Internet and subsequently purchased *Datura stramonium* seeds from an online vendor [18].

Tranca *et al.* 2017, reported the case of a 22 year old male in Romania who was admitted to the Emergency Room in coma, after voluntarily consuming *Datura stramonium*, 2 hours earlier. The patient presented with fever, tachycardia, and urinary retention. Rapid sequence induction and intubation was performed immediately, with sedation and assisted-control mechanical ventilation, after being transferred to the Intensive Care Unit. The patient received activated charcoal, in repeated doses, external and internal cooling was applied, and an infusion of neostigmine was started. The biological assessment revealed rhabdomyolysis and prevention of renal failure was initiated. The patient was extubated 36 hours later and transferred to the Psychiatric ward for further assessment and care [19].

#### *Datura* intoxication and treatment

Treatment is aimed at removing plant material from the gastrointestinal tract, keeping the patient safe and reversing severe anticholinergic sequelae [20].

When the symptoms are mild gastric lavage leaving active charcoal in the stomach afterwards will suffice. In case of severe symptoms treatment with physostigmine is indicated [21].

The onset of symptoms generally occurs around 30 to 60 minutes after ingesting the herb. *Datura* intoxication typically produce hallucination, hyperthermia, tachycardia,

urinary retention, and severe mydriasis with resultant painful photophobia that can last several days [22].

Pronounced amnesia is another commonly reported effect. These symptoms generally last from 24 to 48 hours, but have been reported in some cases to last as long as 2 weeks [23].

In severe cases, intravenous physostigmine can be administered as an antidote in anticholinergic poisoning.

### ***Datura stramonium* Solanaceae, plant characteristics**

#### **Plant properties**

*Datura stramonium* (Thorn Apple, jimson weed, devil's snare), is a plant in the nightshade family native to North America. Today it grows wild in all the world's warm and moderate regions, along roadsides and at dung-rich livestock enclosures. In Europe, it is found as a weed in garbage dumps and wastelands, and is toxic to animals consuming it [22, 24, 25].

The genus name is derived from the plant's Sanskrit name, *dhatūra*, 'white thorn-apple'. *Stramonium* is from Greek στράχνος "nightshade" and μανιακός "mad". In the United States, the plant is called "jimsonweed", or more rarely "Jamestown weed" deriving from the town of Jamestown, Virginia, where English soldiers consumed it while attempting to suppress Bacon's Rebellion and spent 11 days in altered mental states [26, 27].

*D. stramonium* generally flowers throughout the summer. The fragrant flowers are trumpet-shaped, white to creamy or violet and open at night.

The egg-shaped seed capsule at maturity, splits into four chambers, each with dozens of small, black seeds [25].

The seeds can lie dormant underground for years and germinate when the soil is disturbed. The Royal Horticultural Society has advised worried gardeners to dig it up or have it otherwise removed, while wearing gloves to handle it [28].

The American artist Georgia O'Keeffe (1887-1986) painted jimson weed, which grew wild around her New Mexico house. In 2014 one such painting sold for \$44 million, a record price for a female artist's work [29, 30].

### ***Datura stramonium* tropane alkaloids content and toxicity**

All parts of *Datura* plants contain dangerous levels of the tropane alkaloids atropine, hyoscyamine, and scopolamine, which are classified as deliriant, or anticholinergics. It has been abused worldwide for hundreds of years because of its hallucinogenic properties.

The risk of fatal overdose is high among uninformed users, and many hospitalizations occur [22, 31].

The amount of toxins varies widely from plant to plant and a given plant's toxicity depends on its age, and the local weather conditions [32].

Additionally, within a given plant, toxin concentration varies by part and even from leaf to leaf. When the plant is younger, the ratio of scopolamine to atropine is about 3:1; after flowering, this ratio is reversed, with the amount of scopolamine continuing to decrease as the plant gets older [33].

The approximate fatal dose for adult humans is >10 mg atropine or >2–4 mg scopolamine [34].

### ***Datura stramonium* ethno medical uses**

*D. stramonium* has been used in traditional medicine for

curing various human ailments as wounds, inflammation, rheumatism, sciatica, bruises and swellings, asthma and bronchitis.

Ethno medicinally, the frequent recreational abuse of *D. stramonium* has resulted in toxic syndromes. *D. stramonium*, in the form of paste or solution to relieve the local pain, may not have a deleterious effect [35].

The Zuni people once used *datura* as an analgesic to render patients unconscious while broken bones were set. The Chinese also used it as a form of anesthesia during surgery [36, 37].

William Lewis reported in the late 18th century that the juice of Thornapple could be made into "a very powerful remedy in various convulsive and spasmodic disorders, epilepsy and mania," and was also "found to give ease in external inflammations and haemorrhoids."

Henry Hyde Salter discusses *D. stramonium* as a treatment for asthma in his 19th-century work *On Asthma: its Pathology and Treatment* [38].

### **Discussion and Conclusion**

The many reports concerning *Datura stramonium* toxicity show that the potential of such an incident is not so rare. Younger persons, who consume the plant for recreational purposes know that it leads to the desired delirium, but they have not realized the health risks associated to this abuse. Other age groups, who accidentally ingest parts of the plant as a food ingredient, can't imagine the danger to be poisoned and this is especially important for children who are a particularly sensitive case.

The difficulties for prompt diagnosis are associated with the altered mental status and the variable presentations of affected persons.

Health-care providers and public health officials should be aware that jimsonweed poisoning can occur among many age groups.

As it is reported in the present article, in some countries the authorities pronounced the cultivation of *Datura* illegal.

People also should be informed and warned about the toxic effects of this plant.

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