

Pharmacological Review on Datura Stramonium L

Navale Dnyaneshwari¹, KandhareKomal², Chavhan Aniket³, Awari Shubham⁴,
Chaugule Sahil⁵, Gadge Shubham⁶

Students, Samarth Institute of Pharmacy, Belhe, Maharashtra, India^{1,2,3,4,5}

Department of Pharmacology, Samarth Institute of Pharmacy, Belhe, Maharashtra, India⁶

Abstract: *Daturastramonium L.*, a wild-growing plant of the Solanaceae family, is widely distributed and easily accessible. It contains a variety of toxic tropane alkaloids such as atropine, hyoscamine, and scopolamine. In Eastern medicine, especially in Ayurvedic medicine, *D. stramonium* has been used for curing various human ailments, including ulcers, wounds, inflammation, rheumatism and gout, sciatica, bruises and swellings, fever, asthma and bronchitis, and toothache. Antifungal activity, antioxidant activity, anti-cancer, antiviral, Antiperspirant, analgesic effect, hypoglycemic effect are the various activities of datura. In this review we are trying to brief introducing pharmacognostic review on the plant and its pharmacological activities by various in vitro as well as in vivo screening activities.

Keywords: Pharmacological activities, Phytochemical substances, Pharmacognostic characterization.

I. INTRODUCTION

Datura is a genus of plants belonging to the Solanaceae family (Angiospermaedicotiledon). Other plants belonging to this family include: mandrake (*Mandragora officinarum*), belladonna (*Atropa belladonna*), henbane (*oryamusniger*) and tobacco (*Nicotianatabacum*). Some other members of the family are edible fruits such as: tomato (*lycopersiconesculentum*), pepper (*Capsicum annum*) and potato (*Solanum tuberosum*)^[1]. The Datura genus however is comprised of four species- *DaturaInoxia*, *Daturametel*, *Daturaarborea* and *Daturastramonium*-policy recommendation for the prevention of similar cases. all of which possess potent, toxic, anticholinergic properties^[2]. *Daturastramonium* (DS) is a hallucinogenic plant that has been called numerous names, in various parts of the world such as: Jimson's weed, Angel's Trumpet, Angel's Tear, Thorn Apple etc.^[3]



Fig 1: Flowers of Datura



Fig 1: Leaves of Datura

Scientific Classification:

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Clade	Asterids
Order	Solanales
Family	Solanaceae
Sub Family	Solanoideae
Tribe	Datureae

Genus	Datura L.
Species	DaturaFerox L.

II. PHARMACOGNOSTIC EVALUSATION OF PLANT:

Description

2.1 Macroscopical Characters

Datura Metal

1. Leaves

- (i) Sub glabrous spreading herb with cylindrical stem.
- (ii) Shape single triangular ovate.
- (iii) Base unequal
- (iv) Margin toothed.

2. Flower

- (i) Solitary, funnel shaped large and tubular, 7.5 to 9 cm length.
- (ii) Corolla 15 to 18 cm length, 10-12.5 cm across at the mout.

3. Fruit

Sub-globose capsule covered with short and blunt spines, 2.5 to 3.2 cm diameter nodding or sub erect.

4. Metel var. Fastuosa

While many characters of this plant are similar to those of D. metel the stem, branches, main veins of leaves and also flowers are violet or purple coloured. Double- flowered and triple flowered forms (outer corolla 5 teeth and inner corolla 6-10 teeth) also occur, through not so common.

D. Innoxia:

It also resembles D. metal but can be distinguished by the presence of dense pubescence, ovate leaves with cordate base, 10 toothed corolla and long weak spines on the capsular fruit.^[4]

2.2 Microscopical characters:

Lamina

a) Upper Epidermis

They are single layered, cells rectangular with cuticularized outer walls. Trichomes, both covering and glandular are seen. Covering trichomes are uniseriate, multicellular, warty and blunt at the apex. Glandular trichomes are made up to a stalk of one cell and a 2 to 4 celled glandular head.

b) Mesophyll

It is differentiated into palisade and spongy parenchyma.

c) Palisade

It is a single layered, compact and cells radially elongated

d) Spongy Parenchyma

They are many layered, loosely arranged with intercellular spaces. Sphaeraphides, microsphenoidal crystals and vascular strands are found in the upper layers of spongy parenchyma.

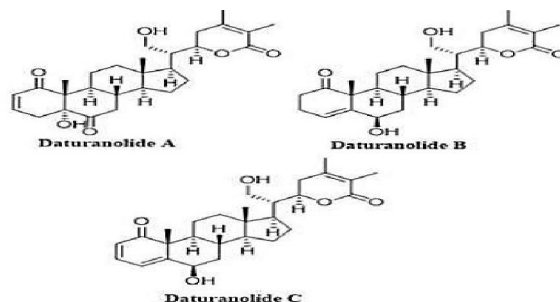
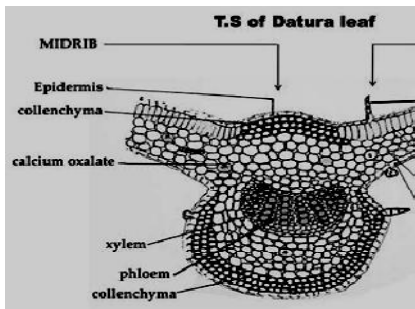
e) Lower Epidermis

It is identical to upper epidermis. Stomata and numerous trichomes are seen on the lower epidermis.

f) Midrib

The epidermis layers of lamina are continuous in the midrib region also. Strips of collenchymas appear below the upper and above the lower epidermis. This is followed by cortical parenchyma containing prisms of calcium oxalate and microsphenoidal crystals. Embedded in the central region of the cortical parenchyma is a bicollateral bundle.^[5]

T.S of datura Leaf: Chemical constituents:



Chemical constituents

1. Tropane alkaloids-

1. Hyoscyamine & Scopolamine (hyoscine)
2. Fastudine and fastunine,
3. Fastusic acid, allantoin.
4. Ascorbic acid, etc.^[8,9]

III. PHARMACOLOGICAL ACTIVITY

1. Anticancer Effect

Worked against cancer cell of breast (specially MCF-7 cell line) through MTT assay with methanolic extract of leaves and stem of Datura spp. and compared it with vero line, resulted that leaf extract expressed higher anticancer property against MCF-7 cell and vero cell line as compared to stem extract^[6]. Cancer inhibiting effect on head, neck (FaDu), Breast (MDA-MB231), lung (A549) cancer cell line in in vitro condition by Daturastramonium leaf- aqueous extract (1mg/mL) for 24 & 48 hrs. respectively anticipated that plant parts possesses toxicity against living cells with increasing GSSG and agitating oxidative stress as well as considered changed quantity of enzyme which expresses redox sensitivity.^[10]

2. Anti-Insect Effect

Datura strontium seed extract among ethanol, chloroform, and acetone has strong insecticidal efficacy than methanol and n-hexane^[8]. The insecticidal repellency properties of Chromolaenaodorata, Sennasiamea, Andrographispaniculata, Vernoniaamygdalina, Daturastramonium against Callosobruchus maculates indicated C. maculatus egg laying capacity effectively reduced by Sennasiamea as compared to other plants.^[14,15]

3. Antimicrobial Effect

Worked on review of many medicinal plants of Bulgaria including Daturastramonium explained their antimicrobial, antioxidant, anti-inflammatory activity^[10]. Aerial part (mainly stem and bark) of Daturastramoniums aqueous and ethanolic extract opposite to Eschericia coli, Salmonella typhi, Staphylococcus aureus, Klebsiella pneumonia, Shigella and Neisseria gonorrhoea revealed that ethanol extract of the plant contains higher antimicrobial potential than aqueous extract but not in Neisseria and only Staphylococcus aureus displayed action to aqueous extract.^[11]

4. Antioxidant Effect

Investigation of anticancer activity by methanolic seed extract of Daturastramonium through DPPH radical scavenging, ABTS+ radical cation, Nitric oxide radical, Ferric reducing power assay and gained values as 35.26, 10.50, and 49.36

[13]. On behalf of in vitro study of highest free radical scavenging effect DS showed the $6.7 \pm 0.1 \mu\text{g/ml}$ inhibitory concentration value.^[13]

5. Nematicidal Effect

Whole plant of *Daturastramonium* has noxious property and because of that aqueous leaf extract of plant stated strong nematicidal activities.^[17]

6. Antifungal Effect

Many medicinal plant together with *Daturastramonium* acquired antifungal effect.^[14] Fermented or boiled mixture of *Azadirachta indica* (Neem), *Calotropis gigantea*, *Daturastramonium*, and cow fertilizer with methanol & water decoction (70/30 v/v) of *Azadirachta indica* (Neem), *Calotropis gigantea* and *Daturastramonium* beside fungi *Fusarium mangiferae* contains efficient antifungal effect.^[14]

7. Larvicidal and Repellent Effect

Daturastramonium leaves extract with ethanol for controlling the larva of *Culex quinquefasciatus*, *Anopheles stephensi*, *Aedes aegypti*, exhibited the Lethal dose values as 86.25, 16.07, 6.25 ppm and they also possess the repellency effect of above three insects and provided the values 2.73, 71.66, 117.7 in min. at 1% concentration.^[18]

8. Analgesic Effect

The analgesic property by intraperitoneally administration of alcoholic seed extract of *Daturastramonium* in severe but short and continual pain, through the hot plate test and formalin test, point out that pain was condensed dose dependently with ED values = 25 and 50 mg/kg.^[20]

9. Antifeedant Effect

Leaves and seed extract of *Daturastramonium* L. (Solanaceae) respond against *Tribolium castaneum* for the reason that, insect depicted different mortality rate at different time exposure.^[19]

10. Antiasthmatic Effect

With mild airway obstruction, *Daturastramonium* extract worked as good bronchodilator for asthmatic patients. *Daturastramonium* plant has various phytochemical including atropine, scopolamine and hyoscyamine. Scopolamine & atropine manifested anticholinergic properties and responsible for the blocking of M2 receptor of submucosal gland cell and smooth muscles of air pathway, In an observation when pregnant women took *Daturastramonium* for asthma treatment, with the constant releasing of acetylcholine, nicotinic receptor could desensitize finally result displayed in as damage fetus.^[19,20]

11. Antiperspirant Effect

Cholinergic compound esters exhibited effectual antiperspirant activity and Scopolamine; hydrobromide also rendered this potential with the higher skin incisive property.^[17]

IV. CONCLUSION

Since ancient time plants used as for food, shelter, fiber, tan, gum, oil, latex etc. Plants are rich source of nutrients, antioxidants, vitamins, carbohydrates, proteins, because of that they also contributed immuno-modulatory effect. From the above information we concluded that *Daturastramonium* with its medicinal properties exploited for cancer, rheumatism, ear pain, head ache, wound, burn, stress, depression, insomnia, asthma, boils, and inflammation. Whole plant with secondary metabolites (Phytochemicals) such as alkaloids, flavonoids, tannins, saponins manifested anticancer, antioxidant, antifungal, antibacterial, anti-inflammatory, larvicidal, repellent, analgesic, nematicidal properties, the alleopathic property of essential oil of *Daturastramonium* against five crops also reported. This Plant with the adequate quantity exhibits pharmacological effect and prepared as herbal or botanical drugs by pharmaceutical industries for many diseases, but not used in native form because of its lethal effect, furthermore from this plant, plant based biopesticides also have been made to control the harmful effect from the conventional pesticides.

V. ACKNOWLEDGMENT

We thank and gratitude to Trustee of Samarth Rural Educational Institute's and team of Samarth Institute of Pharmacy, Belhe, Pune with their valuable guidance and support.

REFERENCES

- [1]. Kirtikar JD, Basu BD. Indian medicinal plants. Allahabad: Lalit Mohan Basu; 1994. pp. 1229–1231.
- [2]. Das S, Kumar P, Basu SP. Review article on phytoconstituents and therapeutic potentials of *Daturastramonium* linn. J Drug Del Therap. 2012;2(3):4–7.
- [3]. Parashuram M. Isolation of 11,12,13,17-Tetrahydroxy-(Hydroxymethyl)-10-Nitrodotriacontahydrospiro[Indeno[5,6-A] Hexacene-2,2'-Pyran]=3,6(1H,18bh) Dione and its spectroscopic characterization and biological activities of bimetals from seeds of *Daturastramonium*. Asian J Bioch Pharm Res. 2011;3(1):501–506.
- [4]. Shagal MH, Modibbo UU, Liman AB. Pharmacological justification for the ethnomedical use of *Daturastramonium* stem-bark extract in treatment of diseases caused by some pathogenic bacteria. Int Res Pharm Pharmacol. 2012;2(1):16–19.
- [5]. Oseni OA, Olarinoye CO, Amoo IA. Studies on chemical compositions and functional properties of thorn apple (*Daturastramonium* L) Solanaceae. Afric J Food Sci. 2011;5(2):40–44.
- [6]. Devi MR, Meenakshi B, Paul SB, Sharma GD. Neurotoxic and medicinal properties of *Daturastramonium* L.-Review. BiolEnvir Sci. 2011;7(1):139–144.
- [7]. Nadkarni KM, Nadkarni AK. Indian material medica. Bombay: Popular Prakashan; 1996. p. 435.
- [8]. Jarald E, Edwin S. Textbook of pharmacognosy and phytochemisctry. 1st ed. New Dehli: CBS Publisher and Distributors; 2007. p. 224.
- [9]. Gupta DP. The herb, habitat, morphology and pharmacognosy of most important popular Indian medicinal plant. 1st ed. Madhya Pradesh: Printwell Offset Publisher; 2008. p. 185.
- [10]. Gary I, Stafford A, Anna K, Jager B, Johannes VS. Activity of traditional South African sedative and potentially CNS-acting plants in the GABA-benzodiazepine receptor assay. J Ethnopharm. 2005;100:210–215.
- [11]. Pandey M, Debnath M, Gupta M, Chikara SK. Phytomedicine: An ancient approach turning into future potential source of therapeutics. J PharmacognPhytother. 2011;3(3):27–37.
- [12]. Paolo MG. Traditional antihelmintic, antiparasitic and repellent uses of plants in Central Italy. J Ethnopharm. 2001;68(1–3):183–192.
- [13]. Ertekin V, Selimoglu MA, Altinkaynak SA. Combination of unusual presentations of *Daturastramonium* intoxication in a child: Rhabdomyolysis and fulminant hepatitis. J Emerg Med. 2005;28:227–228.
- [14]. Ivancheva S, Nikolova M, Tsvetkova R. Pharmacological activities and biologically active compounds of Bulgarian medicinal plants. In: Inperato F, editor. Phytochemisry: Advances in research. Kerala: Signpost; 2006. pp. 87–103.
- [15]. Strahil B, Rawia Z, Tsvetelina D. Alkaloid patterns in some varieties of *Daturastramonium*. Fitoterapia. 2006;77(3):179–182.
- [16]. Bansa A, Adeyemo S. Phytochemical screening and antimicrobial assessment of *Abutilon mauritianum*, *Bacopamonnifera* and *Daturastramonium*. Biokem. 2006;18(1):39–44.
- [17]. Pretorius E, Marx J. *Daturastramonium* in asthma treatment and possible effects on prenatal development. Environ Toxicol Pharm. 2006;21(3):331–337.
- [18]. Taha SA, Mahdi AW. *Datura* intoxication in Riyadh. Trans R Soc Trop Med Hgy. 1984;78:134–135.
- [19]. Diker D, Markovitz D, Rothman M, Sendovski U. Coma as a presenting sign of *Daturastramonium* seed tea poisoning. Eur J Int Med. 2007;18(4):336–338.
- [20]. Boumba A, Mitselou A, Vougiouklakis T. Fatal poisoning from ingestion of *Daturastramonium* seeds. Vet Human Toxicol. 2005;46:81–82.