IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

A REVIEW ON PHARMACOGNOSY, PHYTOCHEMISTRY AND PHARMACOLOGICAL ACTIVITY OF DATURA INNOXIA PLANT

Thejashree[1],Punya Prakash[1], Geethanjali[1],Sivakumar[2] ,Shiju[2],Kodivel[2], Chiranth gowda[2]

Department of pharmacognosy RGUHS university,Karnataka593101,INDIA

ABSTRACT:

Datura innoxia 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, Datura. innoxia 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. A few previous studies have reported on the pharmacological effects of Datura innoxia however, complete information regarding the pharmacology, toxicity, ethnobotany and phytochemistry remains unclear. Ethnomedicinally, the frequent recreational abuse of Datura innoxia has resulted in toxic syndromes. Datura innoxia in the form of paste or solution to relieve the local pain, may not have a deleterious effect; however, oral and systemic administration may lead to severe anticholinergic symptoms. For this reason, it is very important for individuals, mainly young people, to be aware of the toxic nature and potential risks associated with the use of this plant. This comprehensive review of Datura innoxia includes information on botany, phytochemistry, pharmacology, toxicology and ethnomedicinal uses.

KEYWORDS

Datura innoxia, Jimsonweed, Phytochemistry, Ethnopharmacology Traditional uses, Pharmacology.

INTRODUCTION

Plants have been widely used in the treatment of human traumas and diseases. The demand for medicinal plant is increasing constantly due to growing recognition of natural product. Herbal medicine is an important part of both traditional and modern system of medicine[1]. Dartura innoxia is a annual plant from the Solanaceae family. It is widely well known medicinal herb. It is a wild growing flowering plant and was investigated as a local source for tropane alkaloids which contain methylated nitrogen atom and include anticholinergic drugs atropine and scopolamine from ancient civilization it was traditionally used for religious visionary purposes through out world. An extract made from the leaves is taken orally for the treatment of asthma and sinus infections, and stripped bark are applied externally to treat swellings, burns and ulcers The incidence of Datura innoxia poisoning is sporadic with a cluster of poisoning cases in the 1990s and 2000s, the United States media reported some cases occurring mostly among adolescents and young adults dying or becoming seriously ill from ingesting. Some medicinal uses of the plant are its anti-inflammatory property of all parts of the plant, stimulation of the central nervous system, respiratory decongestion, treatment of dental and skin infections, alopecia and in the treatment of toothache. It is a hallucinogenic plant that causes serious poisoning. Consumption of any part of the plant may result in a severe anticholinergic reaction that may lead to toxicity and occasionally cause diagnostic difficulties. Cases of poisoning have been reported after eating the berries. Death may occur from heart failure after ingesting 125 seeds, because the seeds contain the highest concentration and has a rapid onset of action, thus may be potentially useful as an alternative to atropine for the treatment of the muscarinic symptoms of organophosphate toxicity and some of central anticholinergic effects. The wide distribution, the strong toxicity and the potential for occurrence in foodstuffs are responsible for the numerous incidents in humans[2]. Datura genus distributes over tropical and warm temperate regions of the world. About ten species of Datura are found, of which Datura anoxia and D. innoxia are most important drug plants. Datura has long been known as a medicinal plant and as a plant hallucinogen all over the world. Pre-historic use of Datura in medicinal and ceremonial rituals could be observed in aboriginal in Indian sub-continent[3]. The therapeutic activities of most plants are due to the presence of one or more of such components like alkaloids, tannins, saponins and cardiac glycosides. The phytochemical screening revealed the presence of saponins, tannins, steroids, alkaloids, flavonoids, phenols and glycosides[4]. Atropine and scopolamine are competitive antagonists of muscarinic cholinergic receptors and are central nervous system depressants. All parts of the plant are toxic, but the highest amount of alkaloids is contained in the ripe seeds[4,5]. Many cases of accidental poisoning by Datura innoxia have been reported when these plants were eaten accidentally[6].

MORPHOLOGY

Datura innoxia is an annual plant . The stem is herbaceous, branched and glabrous or only lightly hairy. By cultivation the plant reaches a height of about one meter[23-24]. The branching stems are spreading, leafy, stout, erect, smooth and pale yellowish green in color, branching repeatedly in a forked manner. Leaves are hairy,

big, simple dentate, oval glabrous, apposite veins of leaves are pale black, stalked, 4-6 inch long, ovate and pale green. The upper surface is dark and grayish-green, generally smooth, the under surface paler, and when dried, minutely wrinkled . Datura innoxia bears funnel shaped, white or purple coloured flowers, with 5 stamens and superior ovary . The average length of flower is about 3 inches. The calyx is long, tubular and somewhat a swollen below and very sharply five angled surmounted by five sharp teeth. Corolla is funnel shaped. Stem stalk is pale blue or greenish white. Seeds are black, kidney shape and flat[25-26]. Fruits are as large as walnuts and full of thorns (hence the English name "thorn apple") . The plant is strong narcotic, but has a peculiar action on the human which renders it very valuable as medicines. The whole plant is poisonous and the seeds are the most active; neither dying nor boiling destroys the poisonous properties. The symptoms of acute Jimsonweed poisoning included dryness of the mouth and extreme thirst, dryness of the skin, pupil dilate ion, impaired vision, urinary retention, rapid heartbeat, confusion, restlessness, hallucinations, and loss of consciousness[2].

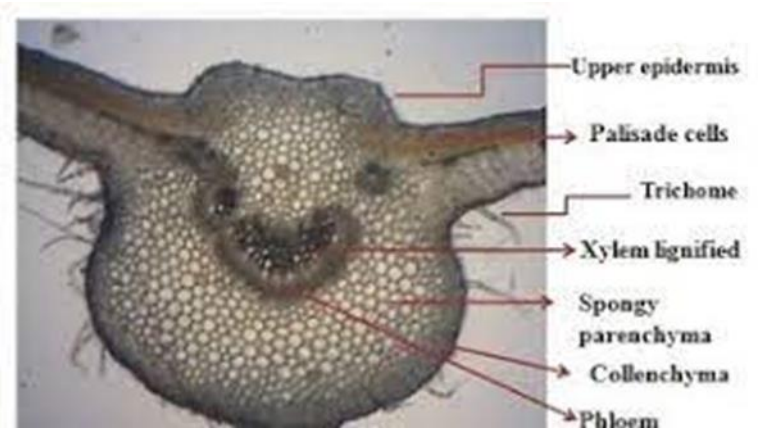
CLASSES OF ANTHELMENTIC ACTIVITY: Anthelmintic are separated into classes on the basis of similar chemical structure and mode of action. There are only a few main classes and each is briefly discussed in turn below. For the most part, information on the physiological and pharmacological actions of anthelmintic has © 2023 IJNRD | Volume 8, Issue 10 October 2023 | ISSN: 2456-4184 | IJNRD.ORG IJNRD2310280 International Journal of Novel Research and Development (www.ijnrd.org) c743 been obtained from studies on the large parasitic nematode A. suum. C. elegans, on the other hand, has been valuable in defining molecular targets.

1. Piperazine Piperazine was first used as an anthelmintic in the 1950s and it is still the active constituent of over the counter remedies for thread worm infection in children. Its mode of action has primarily been studied in A. suum. . There is surprisingly no literature on its action in C. elegans though there is no indication that it acts differently from its effects in A. suum. In A. suum it acts as a weak GABA mimetic and causes a flaccid, reversible paralysis of body wall muscle.

2. Benzimidazoles The first of this class, thiabendazole, was discovered in 1961 and subsequently a number of further benzimidazoles were introduced as broad spectrum anthelmintic. There is an extensive literature on these compounds reporting a number of different biochemical effects.

3. LEVAMISOLE, PYRANTEL AND MORENTEL These anthelmintic are nicotinic receptor agonists (Aceves et al., 1970; Aubry et al., 1970) and elicit spastic muscle paralysis due to prolonged activation of the excitatory nicotinic acetylcholine (nACh) receptors on body wall muscle. Their precise mode of action has been carefully studied at the single-channel level on the body wall muscle preparation .

Transverse section



ASH VALUE :

DEFINITION;

- Ash value are helpful in determining the quality and purity of crude drug, especially in powder form. The residue after incineration is the ash content of the drug.
- The object of ashing crude drug is to remove the trace of organic matter which may be interferes in an analytical determination.
- Inorganic salts of carbonates, phosphates silicates of sodium, potassium, calcium and magnesium is known as ash content.
- **CLASSIFICATION:**

Types of ash value:

1. Total ash value
2. Acid insoluble ash value
3. Sulphate ash value
4. Water soluble ash value

Determination of total ash: -1gm of powdered drug was taken in a tarred silica crucible. The powder was then incinerated gradually by increasing the heat until free from carbon and kept for cooling. It was then kept in a desiccators , ash was weighed

and % total ash was calculated with reference to the air dried sample.Determination of acid insoluble ash: -

The total ash obtained after the above procedure was boiled for 5 min with 25ml of dilute hydrochloric acid. It was filtered and the insoluble ash matters was collected on an ash less filter paper, washed with hot water, ignite in tarred crucible, cooled and kept in a desiccators. The residue was weighed and the acid insoluble ash of bark of Sesbania Sesban was calculated with reference to the air dried drug.

Total ash value: Total ash is a measure of the mineral oxide content of activated carbon on a weight basis. It is mainly used for detecting low grade products, excess of sandy, earthy matter with drug. Total ash method is used to measure the total amount of material remaining after incineration.

Procedure:

Weigh accurately about 3 gms of the powder drug in a tared silica crucible

↓

Heat at 45°C until free from carbon

↓

Cool and weigh

%Total ash = Weight of ash/ weight of sample X 100

Weigh the ash and calculate the ⁒ of the total ash with reference to the air dried sample.

Calculation:

$$\% \text{ Ash value} = \frac{w2-w1}{Ws} \times 100$$

$$= \frac{41.15-41.02}{2.00} \times 100$$

$$= \frac{0.13}{2.00} \times 100$$

Report

The total ash value of sample (Datura Innoxia leaves) was found to be **6.5%w/w**

EXTRACTIVE VALUE

Determination of Extractive values:

These are useful for the evaluation of a crude drug. Gives an idea about the nature of the chemical constituents

present in the crude drug. Useful for the estimation of constituents extracted with the solvent used for extraction.

Employed for material for which as yet no suitable chemical or biologicalassayexists. IMPORTANCE:

Extractive valves are primarily useful for determination of exhausted or adulterer drugs. The extractive valves of the crude drugs determine the quality as well as purity of the drugs. Thus, alcohol and water soluble extractive valves were determined.

EXTRACTION:

Extraction, as the term is used pharmaceutically, involves the separation of medicinally active portions of plant or animal tissue from the inactive or inert components by using selective solvents in standard extraction procedure.

METHOD OF EXTRAcTION

Maceration:

In this process solid ingredients are placed in stoppered container with the whole of the solvent

Then allowed to stand for a period of at least 3 days (3-7 days) with frequent agitation, until soluble matter is dissolved.

This mixture is then stained through sieves/nets,

The marceration is pressed and the combined liquids clarified (cleaned by filtration) or by decantation, after standing.

Process of maceration

Plant material (crushed powder)

↓

Placed in closed vessel

↓

Whole of the selected solvent is added

↓

Allowed stand for 7 days shaking occasionally

↓

Liquid strained off

↓

Solid residue (marc) pressed

↓

Strained and expressed- evaporation & concentration.

Factors affecting maceration:

Solid or solvent ratio: Yield decreased with constant quantity of solvent and increasing proportion of drug material.

Dissolution from disintegration cells : particle size

Steeping and swelling of plant material : capillary dilation and increase in diffusion rate

Diffusion from intact plant cell: solvent must be able to solubilize substances.

Temperature: increased solubility (diffusion coefficient), and decreased viscosity.

P^H value : influence selectivity of extraction(qualitative & quantitative).

Calculation:

$$\text{Extraction Value} = \frac{W1}{W2} \text{ X } 100$$

W_1 = Weight of extraction residue obtained solvent removal

W_2 = Weight of leaf powder taken

Extraction Value of leaves = $\frac{3g}{50g}$ x 100 = 6%

Extraction Value of flower = $\frac{1g}{25g}$ x 100 =0.04%

Extraction Value of seeds = $\frac{3g}{50g}$ x 100 =6%

Report :

Extraction Value of Datura innoxia was found to be **6%**

PHYTOCHEMICAL SCREENING

THEORY: The process of detection of various constitutent in a plant extract is known as phytochemical screening. ➢ Plants contains numerous chemical constituents that are responsible for eliciting various physiological and therapeutic response.

✓ IMPORTANCE: Phytochemical screening helps in expanding the classification of plants based on their chemistry.

✓ It helps in the discovery of new therapeutic agents and in the production of semisynthetic derivatives.

✓ It helps in understanding the herbal drug and their preparation.

✓ Phytochemical screening helps to prove the claim of Ayurvedic and other folkloric remedies.

Test for Alkaloids (Meyer's Test): The extract of Datura metel was evaporated to dryness and the residue was heated on a boiling water bath with 2%Hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Meyer's reagent The samples were then observed for the presence of turbidity or yellow precipitation

Test for Terpenoids: 4mg of extract was treated with 0.5ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid

Test for Flavanoids: 4mg of extract solution was treated with 1.5ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5-6 drops of concentrated hydrochloric acid was added and red colour was observed for flavanoids and orange colour for flavones

Test for Carbohydrates: Treat the test solution with few drops of alcoholic alpha-napthol. Add 0.2ml of Concentrated Sulphuric acid slowly through the sides of the test tube, a purple to violet color ring appears at the junction

Test for Tannins: To 0.5 ml of extract solution, 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for gallic tannins and green black for catecholic tannins

Test for Saponins: About 2 g of the powdered sample was boiled in 20 ml of distilled water in a water bath and filtered. 10ml of the filtrate was mixed with 5ml of distilled water and shaken vigorously. Persistent froth indicated the presence of saponins

Test for Steroids: 4 mg of extract was treated with 0.5ml of acetic anhydride and 0.5ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids

S. No	Test	Result
1	Alkaloids	+
2	Glycosides	-
3	Tripenoid and steroid	+
4	Flavonoid	+
5	Reducing sugars	-
6	Triterpenes	+
7	Phenolic compounds	+
8	Tannins	+

Report: The phytochemical screening of extract was carried out and results relevant that Datura innoxia shows the presence of alkaloids, flavonoids, tannippns, saponins and terpenoids.

CHROMATOGRAPHY

Chromatography is the general name given by which two or more compounds in a mixture are physically separated by distributing between two phases ; A stationary phase which can be a solid or liquid supported on a solid and a mobile phase , either a gas or a liquid which flows continuously around the stationary phase.

Chromatography is used in the separation and purification of smaller quantities whereas distillation and recrystallization is used for large scale separation and purification;

THIN LAYER CHROMATOGRAPHY

INTRODUCTION:

TLC is a type of planar chromatography. Researches routinely use it in the field of phytochemical, biochemistry, and so fourth to identify the components in a compound mixture, like alkaloids, phospholids, and amino acid.

PRINCIPLE:

Similar to other chromatographic methods, thin layer chromatography is also based on the principle of separation

1. The separation depends on the relative affinity of compounds towards the stationary and the mobile phase.

2. The compound under the influence of the mobile phase (driven by capillary action) travel over the surface of the stationery phase . During this movement , the compounds with higher affinity to stationery phase travel slowly while the others travel faster. Thus, the separation of components in the mixture is achieved .

Principle: Anthelmintics are group of antiparasitic drugs that expel parasitic worms helminths and other internal parasites from the body by either stunning or killing them and without causing significant damage to the host. They may also be called vermifuges or vermicides.

Chemical: Distilled water.

Materials: Petri dishes, Measuring cylinder, Beaker, Stop watch.

Procedure: ➢ Indian earth worms are collected approximately it will be 2-3cm long and washed with water or normal saline.

➢ The earth worms are divided into nine groups of 2-3 earth worms in each group.

➢ The methanol and aqueous extract (25,50,100mg/ml) each extract is dissolved in normal saline and final volume is adjusted to 100ml.

➢ The extract and standard drugs were freshly prepared before starting of the experiments.

➢ The extract of different concentration and standard solution were poured in different petridishes.

➢ Observation were made for time taken to paralyze and time taken to death

Earthworm :

SL. NO	DRUG	CONCENTRATION	TIME OF PARALYSIS IN MINUTES	TIME OF DEATH IN MINUTE
1	Standard (albendazole)	25mg/ml	36min	48min
		50mg/ml	26min	35min
		100mg/ml	18min	27min
2	Aqueous (leaves)	25mg/ml	54 min	62min
		50mg/ml	46min	53min
		100mg/ml	37min	45min
3	Aqueous (seed)	25mg/ml	48min	59min
		50mg/ml	35min	46min
		100mg/ml	28min	37min
4	Aqueous (flower)	25mg/ml	69min	77min
		50mg/ml	63min	70min
		100mg/ml	52min	65min

Datura.innoxia.leaves

Datura seed

Datura innoxia flower

Conclusion: The monograph analysis of Datura Innoxia was studied because of its potential medicinal benefit of plant which is evergreen since time immemorial Datura was the plant was used for different elements because of presence of efficient chemical present in which many traditional uses of this plant is not yet studied scientifically. This plant was shown to be a toxic against intestinal worm which was practiced by traditional people, many ethano medicinal report was suggested, datura was a good anthelminthic activity. On the basis of this information an attempt is made to prove scientifically for anthelminthic activity of datura. Here we collected a different parts of Datura innoxia was collected such as leaf, flower and seed were separately extracted and screened for anthelminthic activity by using earthworm. Based on that report, the seed extract of datura has shown potent anthelminthic activity where it is paralysed for 28min and died at 37min compared to flower and leaf which is showing the paralysis of 52 min and 37min and died at 65minand 45min. Respectively when compared to standard was shown the paralysis at 18min and death at 27min at a concentration of 100mg/ml. Hence it is concluded that the aqueous seed extract of datura has the highest potency towards killing worms in the intestinal. So it is recommended for further formulation in different dosage form and its evaluation.

REFERENCES

1. Kalase VL, Jadhav VD. Pharmacognostical Evaluation of Leaf of Holigarna grahamii (Wight) Kurz: An Endemic Plant to Western Ghats. Asian J Pharm Clin Res. 2013;6 (2):105-8.

2. Wagner WL, Herbst DR, Lorence DH. Flora of the Hawaiian Islands website. Washington DC, USA: Smithsonian Institution. 2014. Retrieved fromttp:// botany.si.edu/pacificislandbiodiversity/hawaiianflora/index.htm

3. Adewole SO, Caxton-Martins EA. Morphological changes and hypoglycemic effects of Annona muricata linn. (annonaceae) leaf aqueous extract on pancreatic β-cells of streptozotocin-treated diabetic rats. African Journal of Biomedical Research. 2006;9

(3).4. Vaghora B, Shukla V. Impact of different phytochemical classes and Ayurvedic plants in battle against cancer. International Journal of Pharma Sciences and Research, 2016;7(10):406-18.

5. Anonymous. Retrieved from http://www.ayurvedavignan.com/2011/08/annonamuricata.html

6. Coria-Téllez AV, Montalvo-Gónzalez E, Yahia EM, Obledo-Vázquez EN. Annona muricata: A comprehensive review on its traditional medicinal uses, phytochemicals, pharmacological activities, mechanisms of action and toxicity. Arabian Journal of Chemistry. 2018;11(5):662-91.

7. Alexander T, Parker D. The best of growing edge. Volume 1. Corvallis, Oregon: New Moon Publishing, Inc., 1994; 88.

8. Mat-Salleh K, Latif A. Tumbuhan Ubatan Malaysia. Bangi, Selangor: Pusat Pengurusan Penyelidikan Universiti Kebangsaan Malaysia. 2002;96-

9. Li TS. Vegetables and fruits: nutritional and therapeutic values. CRC Press; 2008.

10. Rady I, Bloch MB, Chamcheu RC, Banang Mbeumi S, Anwar MR, Mohamed H, et al. Anticancer properties of Graviola (Annona muricata): a comprehensive mechanistic review. Oxidative medicine and cellular longevity. 2018;2018.

11. Gavamukulya Y, Wamunyokoli F, El-Shemy HA. Annona muricata: Is the natural therapy to most disease conditions including cancer growing in our backyard? A systematic review of its research history and future prospects. Asian Pacific journal of tropical medicine. 2017;10(9):835-48.

12. Negi A, Ghildiyal P, Suyal J, Dobhal K, Semwal A. Pharmacognostical studies and preliminary phytochemical investigation on the bark of bauhinia variegata (Caesalpiniaceaea). International Journal of Research in AYUSH and Pharmaceutical Sciences. 2017:155-61.

13. Patil SG, Wagh AS, Pawara RC, Ambore SM. Standard tools for evaluation of herbal drugs: an overview. The Pharma Innovation. 2013;2(9).

14. British Pharmacopoeia Commission, General Medical Council (Great Britain), Great Britain. Medicines Commission. British pharmacopoeia. Her Majesty's Stationery Office; 2001;2:A229-30.

15. Mahitha B, Archana P, Ebrahimzadeh MH, Srikanth K, Rajinikanth M, Ramaswamy N. In vitro antioxidant and pharmacognostic studies of leaf extracts of cajanus cajan (l.) millsp. Indian Journal of Pharmaceutical Sciences. 2015;77(2):170.

16. Chumbhale DS, Upasani CD. Pharmacognostic standardization of stems of Thespesia lampas (Cav.) Dalz & Gibs. Asian Pacific Journal of Tropical Biomedicine. 2012;2(5):357.