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PHARMACOGNOTIC AND PHYTOCHEMICAL ANALYSIS OF *DATURA* *STRAMONIUM* L. LEAVES

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ABSTRACT

Datura stramonium Linn. (Solanaceae) is a well-known medicinal plant commonly used in phytomedicine to cure diseases and heal injuries. *D. stramonium* L. (DS) is a wild-growing plant widely distributed and easily accessible. It contains a variety of toxic anticholinergic alkaloids such as atropine, hyoscamine, and scopolamine. Voluntary or accidental ingestion can produce severe anticholinergic poisoning. Phytochemical analysis of *Datura stramonium* was due to the presence of phytochemical compounds like alkaloids, tripenoid, steroids, flavonoid, triterpenes, phenolic compounds and tannins. This present study an exclusive review work on the phytochemicals activities and also encourages cultivation of the highly valuable plant in large scale to increase the economic status of the cultivators and provide a support to use of the plant in traditional medicine.

INTRODUCTION

Medicinal plants are used for the ailment of several microbial and non-microbial originated diseases due to their valuable effects in health care. The affordability, reliability, availability and low toxicity of medicinal plants in therapeutic use has made them popular and acceptable by all religions for implementation in medical health care all over the world. Plants are indeed the first material used in alternative medicine type of remedy against many diseases. Several plants have therapeutic and pharmaceutical effects, for antimicrobial, antioxidant, anti-infectious and antitumour activities (Akroum & Akroum). *Datura stramonium* L (DS-Family: Solanaceae) is a hallucinogenic plant widely found in urban and rural areas. The medicinal plant *D.stramonium* is often used as an analgesic plant in folklore medicine in the “Old world”. The plant has also been used as a narcotic and local anesthetic drug in many societies (Kurzbaum & Chang). It consists of dried leaves contain 0.25 % of alkaloids of stramonium. It is indigenous to Caspian region and in United States, South America, France, Germany and Hungary. *Datura stramonium* is an erect annual herb forming a bush up to 1.5 m tall. The leaves are soft, irregularly undulate and toothed. The flowers are trumpet-shaped, white to creamy or violet and 6 to 9 cm long [Stace, Clive]. The main active constituents of plant are atropine, hyoscyamine and scopolamine. It is used as a aphrodisiac, medicinal, psychotropic, sacred and antispasmodic (Kulkarni, S.K., 2005). The alkaloid content of *D. stramonium* has been emphasized by the phytochemical investigators dealing with the biochemical composition of various parts of the plant. Atropine, hyoscyamine and scopolamine (hyoscyne) are the tropane alkaloids of all species of the genus *Datura* and their concentrations showed variations depending on species and on the part of the plant (Checke and Shull, 1985). Duke (1992a) presented data on concentration of total alkaloids in leaves and flowers of *D. metel* (Hindu datura), *D. stramonium* (Jimson weed) and *D. innoxia* (Thorn apple). The emphasis on tropane alkaloids is due to their importance in pharmaceutical industry. Proteins, fats, fatty acids, reducing sugars, oxalates, nitrates and tannin are among the chemical entities that have been described in the plant (Duke, 1985; Hussein, 1985). Chlorogenic acid, an antihistaminic, an allantoin, an immunostimulant (Duke, 1992b), Lectin agglutinin, a glycoprotein (Russel et al., 1997; Pla, 2003), gamma amino-butyric acid, a hypotensive and neuro-inhibitor (Friedman and Levin, 1989), are within the list of the active ingredients present in *D. stramonium*. In this study, we have carried out the preliminary study of phytochemical activities of the leaf *Datura stramonium*.

MATERIALS AND METHODS

Collection and Drying of plant materials

Mature leaves of *Datura stramonium* were collected from the near ponds, river bridge, Ladapuram village, Perambalur district, Tamil Nadu, India. The leaves of *D. stramonium* were washed thoroughly three times with water and once with distilled water.

Drying and Size Reduction of Plant:

The whole plant material of *Datura stramonium* (leaves) was subjected to shade drying for about 10 weeks. The dried plant material was further crushed to powder and the powder was passed through the mesh 60 and the powdered samples were hermetically sealed in separate polythene bags until the time of extraction and further analysis.

Determination of Fluorescence Character:

Fluorescence characters of powdered plant material with different chemical reagents were determined under ordinary and ultraviolet light (Chase and Pratt, 1949).

Determination of Physicochemical Parameters:

The dried plant material was subjected for determination of physicochemical parameters such as total ash value, acid insoluble ash value, water soluble ash value, moisture content, foreign organic matter, crude fibre (Raghunathan, 1976), alcohol soluble extractive and water soluble extractive (Usha and Sharma, 1984).

Extraction of Powdered Plant Material:

40 g of powdered leaves *D. stramonium* were extracted successively with 200 ml of ethanol and methanol at 56-60°C hexane and ethyl acetate at 40-50°C in Soxhlet extractor until the extract was clear. The extracts were evaporated to dryness and the resulting pasty form extracts were stored in a refrigerator at 4°C for future use (Chessbrough, 2000).

Preliminary Photochemical Analysis:

Phytochemical tests were done to find the presence of the active chemical constituents such as alkaloid, glycosides, terpenoids and steroids, flavonoids, reducing sugars, triterpenes, phenolic compounds and tannins by the following procedure.

Test for Alkaloids (Meyer's Test)

The extract of *D. stramonium* leaves 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 (Siddiq and Ali, 1997). The samples were then observed for the presence of turbidity or yellow precipitation (Evans, 2002).

Test for Glycoside

To the solution of the extract in Glacial acetic acid, few drops of Ferric chloride and Concentrated sulphuric acid are added, and observed for reddish brown colouration at the junction of two layers and the bluish green colour in the upper layer (Siddiq and Ali, 1997).

Test for Tripenoid and Steroid

4 mg of extract was treated with 0.5 ml 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 and green bluish colour for steroids (Siddiq and Ali, 1997).

Test for Flavonoid

4 mg of extract solution was treated with 1.5 ml 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 flavonoids and orange colour for flavones (Siddiq and Ali, 1997).

Test for Reducing sugars

To 0.5 ml of extract solution, 1 ml of water and 5-8 drops of Fehling's solution was added at hot and observed for brick red precipitate.

Test for Triterpenes

300 mg of extract was mixed with 5 ml of chloroform and warmed at 80°C for 30 minutes. Few drops of concentrated sulphuric acid was added and mixed well and observed for red colour formation.

Test for Phenolic Compounds (Ferric chloride test)

300 mg of extract was diluted in 5 ml of distilled water and filtered. To the filtrate, 5% Ferric chloride was added and observed for dark green colour formation.

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 (Iyengar, 1995).

RESULTS AND DISCUSSION

The beneficial medicinal effects of plant materials typically result from the secondary products present in the plant although, it is usually not attributed to a single compound but a combination of the metabolites. The medicinal actions of plants are unique to a particular plant species or group, consistent with the concept that the combination of secondary

products in a particular plant is taxonomically distinct. The screening of plants usually involves several approach; ethno botanical approach is one of the common methods that are employed in choosing the plant for pharmacological study (Parekh *et al.*, 2005).

Fluorescence analysis of day and UV light, plant provides proper authenticity for the quality raw material. *Datura stramonium* leaves was collected from perambalur district and powdered using mechanical blender. Resulted power showed light green, brown, green colour and reddish brown etc., (Table-1).

Physiochemical data of the plant powder also provide specific nature of the *Datura stramonium* leaves plant powder. Results of physiochemical parameter revealed that the plant powder did not have any of the foreign matter. Ash content of the powder material is directly proportional to the quantity of foreign matter present in the given sample. Total ash value, acid insoluble ash value, of water soluble ash value were within the limit of ayurvedic pharacopeia of India. *D.stramonium* leaves exhibited $6.4 \pm 0.85\%$ total ash, $4.2 \pm 0.54\%$ water soluble ash and $2.2 \pm 0.46\%$ acid soluble ash (Table -2).

Navaratnarajah and Sashikesh (2011) were reported that moisture content of *Datura metel* was 76.69 ± 0.12 . The carbon content as a measure of ash was 6.62 ± 0.23 . The mean organic matter was 11.61 ± 0.09 . Calcium, magnesium, iron and phosphate contents were $(4.28 \pm 0.05) \times 10^4$, $(3.86 \pm 0.009) \times 10^4$, $(2.33 \pm 0.007) \times 10^4$ and $(4.65 \pm 0.06) \times 10^4$ ppm respectively.

Table (1) - Fluorescence analysis of drug powder:

S.No	Treatment	Datura	
		Day light	UV light
1	Drug Powder	Light Green	Light Green
2	Drug powder + aq.1N NaOH	Reddish browm	Dark Brown
3	Drug powder + alc.1N NaOH	Brown	Dark Brown
4	Drug powder + 1N HCl	Green	Green
5	Drug powder + 50% H ₂ SO ₄	Brown	Dark green

Table (2) - Physico chemical constants:

S. No	Parameters	Value % W/W
1.	Foreign Matter	1.8 ± 0.56
2.	Loss on drying	2.58 ± 0.28
3.	Total Ash Content	6.4 ± 0.85
4.	Water soluble Ash	4.2 ± 0.54
5.	Acid insoluble Ash	2.2 ± 0.46

Where n=3 (The experiments were repeated for 3 times)

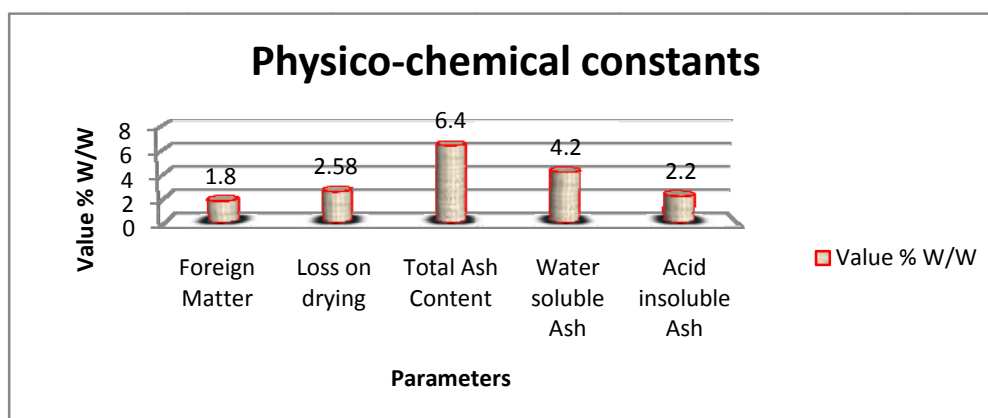
John De Britto and Herin Sheeba Gracelin, (2011) investigated the phytochemicals present in leaves, stem, flowers and fruits of *Datura stramonium* which have some medicinal applications. Phytochemical analysis gave positive results for steroids, triterpinoids, reducing

sugars, alkaloids, phenolic compounds, flavonoids and tannins. The stem and fruits extracts did not show marked antibacterial activity. The phytochemical compounds of *Datura stramonium* extract were analyzed in the present study and the results were showed in Table-3. The phytochemical analysis of *Datura stramonium* showed the presence of alkaloids, steroids, flavonoid, quinine, Coumarins compounds and saponins.

Table (3) - Behaviour of Drug powder with various chemical reagents

S.No	Test for	Observation
1	Saponin	Present
2	Tannin	Absent
3	Sterol	Present
4	Terpene	Absent
5	Flavonoid	Present
6	Coumarins	Present
7	Quinone	Present
8	Lignin	Absent
9	Alkaloid	Present

Figure (1) – Physicochemical nature of *Datura stramonium* leaves



CONCLUSION

The findings of the present investigation suggests that the organic solvent extraction was suitable to identify the various compounds of medicinal plants and they supported by many investigation. The present study justifies the claimed uses of leaves in the traditional system of medicine to treat various infectious diseases caused by the microbes. This study also encourages cultivation of the highly valuable plant in large scale to increase the economic status of the cultivators in the country. The obtained results may provide a support to use of the plant in traditional medicine. Based on this further chemical and pharmacological investigations can be done to isolate and identify minor chemical constituents in the seeds and to screen other potential bioactivities may be recommended.

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