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Phytochemical investigation of leaves of *Datura stramonium*

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Abstract

Datura stramonium widely spread all over the world, increasing under a wide range of climatic conditions and has been used as a medicinal herb in traditional Ayurvedic medicine as antipyretic agents, also or the treatment of inflammation, ulcer, diabetic, asthma. The aim of the study was designed to evaluate the chemical composition of different fractions found from *Datura stramonium*. Phytochemistry activity of *Datura stramonium* (Green leaf) were undertaken with standard methods. The leaf sample after being screening for phytochemicals, contained tannins, saponins, flavonoids, alkaloids, steroids, phenolic compounds, proteins at different concentration and seed contain excessive number of proteins and carbohydrates along with the secondary metabolites.

Keywords: *Datura stramonium*, phytochemistry, antipyretic agents, screening

Introduction

Plants have always played a major role in the treatment of human traumas and diseases worldwide. The demand for medicinal plant is increasing in both developed and developing countries due to growing recognition of natural product. Herbal medicine is an important part of both traditional and modern system of medicines¹. *Datura stramonium* (D. stramonium) is a widespread annual plant from the Solanaceae family. It is one of the widely well-known folklore medicinal herb. It is a wild growing flowering plant and was investigated as a local source for tropane alkaloids which contain a methylated nitrogen atom (N-CH₃) and include the anti-cholinergic drugs atropine, and scopolamine. The god lord Shiva was known to smoke Cannabis and Datura. People still provide the small thorn apple during festivals and special days as offerings in Shiva icons at temples. 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.

In ancient times, herbs and plants that grew in the environment were used in the treatment of various diseases. In different diseases, parts of plants are used in the treatment for life. Near about 80% plant species compounds are used as medicine [WHO, 1993]^[22]. In India, 45,000 plant species are officially recorded and 7500 medicinal plant species growing in its 16 agro-climatic zones under 63.7 million hectares of forest coverage [H. Tag, 2007].

It also shows medicinal activities by primary and secondary metabolites. When a plant shows medicinal properties it will be categorized into medicinal plant. Primary metabolites are directly involved into metabolic activities while secondary metabolites are supporting part means they do not involve directly but their presence is compulsory. Medicinal plants are used in the treatment of different types of diseases as asthma, diabetes, cancer etc.

Datura stramonium L. belongs to the solanaceae family. It has been applied as an analgesic plant in Iranian folk medicine [Zargari A., 1989].

It has been used as a narcotic and local anesthetic drug. Dhatura is an annual herb and forming a bush up to 1.5m tall. The flowers are white to creamy or violet and length is 6-9 cm long [Stace, Clive, 1997]^[19].

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Taxonomical classification

Kingdom – Plantae
Division – Magnoliophyta
Class – Magnoliopsida
Order – Solanales
Family – Solanaceae
Genus – <i>Datura</i>
Species – <i>Stramonium</i>

Botanical Description

Plant appearance: *D. stramonium* is an annual plant. The stem is herbaceous, branched and glorious or only lightly hairy. By cultivation the plant reaches a height of about one meter (Gupta DP. 2008) [6]. The branching stems are spreading, leafy, stout, erect, and smooth and pale yellowish green in colour, branching repeatedly in a forked manner. Leaves are hairy, big, simple dentate, oval glorious, apposite veins of leaves are pale black, stalked, 4-6 inch long, ovate and pale green. The upper surface is dark and greyish-green, generally smooth, the under surface paler, and when dried, minutely wrinkled.

D. stramonium 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. 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 drying nor boiling destroys the poisonous properties (Nadkarni KM 1996) [15]. 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 (Das S. *et al.* 2012) [5]. This plant has contributed various pharmacological actions in the scientific field of Indian systems of medicines like analgesic and antiasthmatic activities (Sass J E. 1940) [18]. The present paper presents an exclusive research work on the anatomical studies of this plant.

Distribution

The species of *Datura* can be found throughout the world. The plant grows in sandy flats, plains, areas up to 2,500 feet above sea level. The origin of *Datura stramonium* is disputed. The Sanskrit dhatura and the Hindustani dhatur formed the basis of the general name, the origin of Jimson weed could be Asiatic. Some sources report a probable Central American origin, due to *Datura*'s habitation of most temperate and Subtropical parts of the world. It is indigenous to India and grows abundantly throughout the Himalayas from Kashmir to Sikkim. In Manipur, it is grown as a wild plant and distributed throughout the hills and

valleys. In Manipur, it is generally grown in April – October 11.

Material and methodology**Collection of plant material**

Datura stramonium. L. is found all over the world. I had collected the leaves from the near locality of my college, dpg degree college sec 34 gurgaon.

Preparation of plant extract

Leaf and seed samples (50 g each) were extracted separately with 100 ml absolute methanol and 80% methanol using an orbital shaker. The extracts were separated from solids by filtering through filter paper. The residues were extracted and the extracts were collected. The solvent was removed under vacuum at 45 °C, using a rotary vacuum evaporator and stored at 4 °C till further analysis.

Qualitative phytochemical investigation**(a) Test for Alkaloids**

Wagner's Test: Few drops of Wagner's reagent were added into 2 to 3 ml extract. Formation of reddish brown precipitate indicates the presence of alkaloids [Kokate C. K. *et al.*; 2001] [11].

(b) Test for Flavonoids

Pew's Tests: Zinc powder was added into 2-3 ml. extract, followed by drop wise addition of con. HCl. Formation of purple red or cherry colour indicates the presence of flavonoids [Peach K., Tracey MV. 1956] [16].

(c) Test for glycosides

Concentrate H₂SO₄ Test: 2ml. glacial acetic acid, one drop of 5% FeCl₃ and conc. H₂SO₄ were added into 5ml extract, the appearance of brown ring indicates the presence of glycosides [Khandewal K.R., 2008].

(d) Test for Saponins

Foam Test: The extract was diluted with 20 ml of distilled water and was shaken in a graduated cylinder for 15 minutes. A 1 cm. layer of foam, indicates the presence of saponins [Kokate C. K. *et al.*; 2001] [11].

(e) Test for sterols

Salkowski's Test: 2ml chloroform and 2 ml concentrated H₂SO₄ were added to the 2 ml extract and shook well. The layer of red chloroform and acid shows greenish yellow fluorescence. It indicates the presence of sterols [Kokate C. K. *et al.*; 2001] [11].

(f) Test for Tannins

Gelatin Test: Gelatin (gelatin dissolves in warm water immediately) solution was added into the extract. Formation of white precipitate indicates the presence of tannins [Treare GE, Evans WC. 1985] [21]

Result and Discussion

The plant leaves were powdered and subjected to cold percolation with methanol, and distilled water for 48 hours. The results of the phytochemical screening of leaves extract of *Datura stramonium* were present. Different types of secondary metabolites such as glycosides, saponins, sterols and tannins were presented. *Datura stramonium* L. is very

effective compared to other part because most parts of secondary metabolites are present.

Phytoconstituents	Leaf
Alkaloids Wagner's test	+
Flavonoids Pew's test	-
Glycosides Concentrate H ₂ SO ₄ test	+
Saponins Foam test	+
Sterols Salkowski test	+
Tannins Gelatin test	+

Conclusion

Datura stramonium L has different types of medicinal properties. Medicinal properties depend on different types of secondary metabolites that have been presented in my phytochemical secondary metabolites study. These secondary metabolites were glycosides, saponin, lignin, phenol, sterols and tannins. Flavonoids are absent in this type of plant. These secondary metabolites have anti-bacterial, anti-viral, anti-fever, anti-diabetes, anti-cancerous activities etc. Therefore, it can involve in medicinal plant categories.

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