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**Research Article**

# MORPHO-ANATOMICAL AND PHYSICOCHEMICAL STUDIES OF DRIED SEEDS OF *DATURA FASTUOSA* LINN.

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**ABSTRACT**
In the present study, dried seeds of *Datura fastuosa* Linn. (Solanaceae), a rich source of tropane alkaloids, has been explored for morpho-anatomical and physicochemical studies. *Datura fastuosa* seeds has been investigated for its pharmacognostic study along with its preliminary phytochemical screening because in Ayurveda, the seeds of this plant are reported to possess a wide range of medicinal activity. The dried seeds of the plant has been standardized on the basis of organoleptic, microscopic, physico-chemical characteristics etc.
**KEYWORDS:** *Datura fastuosa,* evaluation, microscopy, physicochemical.

## INTRODUCTION

*Datura fastuosa* is also known as devil's trumpet, angel's trumpet, thorn apple, Indian apple, *Datura metel*, and pomme epineuse. It is an annual herb that grows four to five feet tall. The flowers are violet on the outside but whitish on the inside. The fruit is a spiny capsule of 1.25 inches in diameter. The seeds have the highest alkaloid content compared to the flowers, stem, immature fruits and leaves. The fruits and seeds are medicinally important and the plant is widely used in phytomedicine to treat diseases such as asthma, cough, convulsion and insanity.

The leaves and seeds are used in herbal medicine as anesthetic, antispasmodic, antitussive, bronchodilator and as hallucinogenic, anodyne, anti-asthmatic. The plant finds useful in the treatment of diarrhea, skin diseases, epilepsy, hysteria, rheumatic pains, hemorrhoids, painful menstruation, skin ulcers, wounds and burns.[1,2]

## MATERIALS AND METHODS

The seeds of *D. fastuosa* were collected from Khari Baoli market, New Delhi, India. The seeds were authenticated at Indian Agriculture Research Institute (NISCAIR) Pusa Road, New Delhi, by Dr. H.B.Singh, Head, Raw material Herbarium and Museum Division, NISCAIR, New Delhi.

### Chemicals and reagents

Methanol, ethanol, sodium hydroxide, wagnar reagent, mayer reagent, dragendorff's reagent, hager reagent, iodine solution, lead aceate, $FeCl_3$, ninhydrine reagent, conc.$H_2SO_4$, glacial acetic acid, alpha naphthol, toluene etc. All the chemicals and reagents used were of AR grade from CDH, LOBACHEMIE and RANKEM companies.

## PHARMACOGNOSTIC INVESTIGATION

### Organoleptic evaluation of *D.fastuosa* seeds

The seeds of *D.fastuosa* were observed and reported for their size**,** color, odour, taste, shape, surface characteristics etc.

### Microscopic studies

The microscopy of intact as well as powdered seeds of *D.fastuosa* was performed using a projection microscope fitted with CCD camera (Micron optic microscope, IS:4381, ISI, Model- TMC- III )

## PHYSICAL EVALUATION

### Determination of crude fibre content by Dutch method

Dried seeds of *D. fastuosa (2g)* were weighed in a beaker and 50 ml of 10% v/v nitric acid was added. Then it was heated to boil with constant stirring and filtered through buchner funnel. Washings were given to the residue with boiling water and transferred to a beaker. Then added 50 ml of 2.5 % v/v sodium hydroxide solution and heated to boil for 30 s, stirred constantly. Filtered and washed with hot water, and for quantitative determination, the residue was transferred in a clean and dried crucible. The residue was weighed and percentage crude fibre was determined.[12]

### Determination of ash value

### Total ash

Total ash was determined as per WHO guidelines. In brief, 2 gm of dried powdered seeds were placed in silica crucible in a uniform layer and ignited by gradually increasing temperature to 500-600° C. The ash so obtained was cooled and weighed and allowed to cool in

desiccator for 30 min. The content of total ash was calculated in mg per g of air dried material.

**Water - soluble ash**

To the total ash containing silica crucible, added 25 ml of water and boiled for 5 min. collected the insoluble matter in a sintered-glass crucible or on an ash less filter paper. Washed with hot water and ignited for 15 min. at a temperature not exceeding 450° C. Substracted the weight of this residue in mg per g of air dried material.

**Determination of extractable matter**

The extraction of *D. fastuosa* dried seeds was carried out for determination of extractable matter by using two methods, i.e. hot extraction method and cold maceration technique, as per the procedure mentioned in the WHO guideline. Finally, calculated the content of extractable matter in mg per g of air dried material.

**Determination of water and volatile matter**

Determination of moisture content was carried out by azeotropic method, also known as toluene distillation method, and loss on drying method i.e. gravimetric determination, as per the procedure mentioned in the WHO guidelines.

**Determination of volatile oils, swelling index and foaming index**

These parameters were performed as per official methods given in the WHO guidelines.

**Preparation of extracts**

The hydroalcoholic and methanolic extracts of *D.fastuosa* were prepared by hot extraction method as follows:

**Hydroalcoholic Extract**

The coarsely powdered dried seeds of *D.fastuosa* were extracted with hydro-alcoholic solution (1:1) by continuous extraction method using soxhlet apparatus. The hydro-alcoholic extract was concentrated to a dry mass using rotary evaporator, dried in lyophilizer and then finally kept in a dessicator for further use. A brownish black colored powder was obtained.

**Methanolic Extract**

The coarsely powdered dried seeds of *D.fastuosa* were extracted with methanol by continuous extraction method using soxhlet apparatus. The methanolic extract was concentrated to a dry mass by using rotary evaporator, dried in lyophilizer and then finally kept in a dessicator. A black colored powder was obtained.

## RESULTS AND DISCUSSION

**Organoleptic evaluation of *D.fastuosa* seeds**

In organoleptic evaluation of *D.fastuosa*, the colour of the seeds was found to be black and kidney shaped with bitter and acrid taste. The average size of the seed was 0.45 cm in length and 0.4 cm in width.

**Microscopic studies**

Microscopy of intact as well as powder of *D.fastuosa* seeds was performed successfully by using a projection microscope fitted with CCD camera (micron optic microscope, IS:4381, ISI, Model- TMC- III, S.No.- 40605) . Various photographs were taken as shown in figures 2-6. Seeds showed an outline with bulges at 3 places, single layered epidermis with elongated cells; seed coat consists of thick-walled, lignified, sclerenchymatous cells, forming club shaped structure, followed by 3 to 5 layered, more or less tangentially elongated, parenchymatous cells; endosperm composed of polygonal, thin-walled, parenchymatous cells filled with aleurone grains and abundant oil gloubles, embryo more or less curved.[3]

**Physicochemical evaluation of *D.fastuosa* seeds**

Ash value of a drug gives an idea of the earthy matter or the inorganic composition and other impurities present along with the drug. The percentage of total ash in dried seeds of *D.fastuosa* was found to be 94.4% w/w. Extractive values are primarily useful for the determination of exhausted or adulterated drugs. The water soluble and alcohol soluble extractive values have also been determined and results are tabulated in table 1. The preliminary phytochemical investigation was performed on methanolic and hydroalcoholic extract of *D.fastuosa* and the observations are stated in table 2. The fluorescence analysis was also performed on dried powder, methanolic and hydroalcoholic extracts of *D.fastuosa* and results are represented in table 3 and 4.

## CONCLUSION

In the present investigation of morpho-anatomical and physio-chemical studies of dried seeds of *Datura fastuosa* Linn., the pharmacognostic parameters are being reported for the first time and could be a very useful criteria for identification and standardization of a crude drug as well as its methanolic and hydroalcoholic extract. The results produced in the present study are helpful in the preparation of the crude drug's monograph and for evaluation and identification from different species of *Datura.*

**REFERENCES**


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**Table 1. Physical evaluation parameters of dried seeds of *D.fastuosa***

| S.No. | Parameter | Value |
|---|---|---|
| 1. | Ash value<br>Total ash<br>Water soluble ash | <br>5.6 % w/w<br>4.5% w/w |
| 2. | Water soluble extractive | 26.35mg/gm |
| 3. | Foaming index | 18.18 |
| 4. | Swelling index | 2.6 ml/g |
| 5. | Moisture content | 1.4 ml |
| 6. | Crude fibre content | 17.5% w/w |
| 7. | Loss on drying | 390 mg |

**Table 2. Preliminary phytochemical study of methanolic and hydroalcoholic extacts of *D.fastuosa* seed**

| **Constituents** | **Observation** | |
|---|---|---|
| | **Methanolic extract** | **Hydroalcoholic extract** |
| Alkaloids | + | + |
| Saponins | - | - |
| Tannins | + | - |
| Cardiac glycosides | + | + |
| Anthraquinones | - | - |
| Cyanogenetic | - | - |
| Flavonoids | - | + |
| Carbohydrates | + | + |
| Amino acid | + | + |
| Phenolic compounds | + | + |

Key: +: present, - : absent

**Table 3: Fluorescence analysis of dried seeds powder of *D.fastuosa* seed**

| **S.No.** | **Treatment** | **Normal light** | **UV light at 254 nm** | **UV light at 366 nm** |
|---|---|---|---|---|
| 1. | Dry powder | Dark brown | Brownish black | Fluorescent green |
| 2. | Powder + 5% NaOH | Yellowish brown | Brown | Yellow |
| 3. | Powder + 5% KOH | Brown | Dark brown | Yellowish green |
| 4. | Powder + 5% $feCl_3$ | Yellow | Dark brown | Greenish brown |
| 5. | Powder + conc. $H_2SO_4$ | Orange brown | Brownish purple | Fluorescent green |
| 6. | Powder + dil $NH_3$ | Green | Pale yellow | Yellow |
| 7. | Powder + conc HCL | Brown | Dark brown | Greenish brown |
| 8. | Powder + conc. $HNO_3$ | Orange brown | Blackish purple | Brownish black |
| 9. | Powder + Iodine $sol^n$ | Orange | Brown | Dark brown |
| 10. | Powder + 5% HCL | Light yellow | Sky blue | Greenish blue |
| 11. | Powder + 5% $H_2SO_4$ | Yellowish brown | Sky blue | Greenish blue |
| 12. | Powder + dil $HNO_3$ | Yellow | Sky blue | Greenish blue |
| 13. | Powder + $Na_2CO_3$ | Green | Light yellow | Yellow |
| 14. | Powder + alc. KOH | Light yellow | Light green | Pale yellow |
| 15. | Powder + $NH_4OH$ | Light green | Greenish yellow | Fluorescent green |
| 16. | Powder + 1% $KMno_4$ | Purple | Brown | Dark brown |
| 17 | Powder + $AgNo_3$ | Pale yellow | Sky blue | Greenish blue |

**Table 4: Fluorescence analysis of methanolic and hydroalcoholic extracts of *D.fastuosa* seed.**

| S. No. | Treatment | Normal light | | UV at 254 nm | | UV at 366 nm | |
|---|---|---|---|---|---|---|---|
| | | M E | H E | M E | H E | M E | H E |
| 1 | Dry powder | Black | Dark brown | Brownish black | Brownish black | Fluorescent green | Brown |
| 2 | P+5% NaOH | Brown | Reddish brown | Black | Dark brown | Green | Brown |
| 3 | P+5%KOH | Brown | Brown | Dark brown | Dark brown | Yellowish green | Blackish brown |
| 4 | P+5% $FeCl_3$ | Yellow | Yellowih brown | Purplish brown | Brownish purple | Dark brown | Greenish purple |
| 5 | P+5% $H_2SO_4$ | Orange brown | Orange brown | Dark brown | Brownish purple | Green | Yellowish green |
| 6 | P +dil $NH_3$ | Brown | Blackish brown | Sky blue | Fluorescent green | Light sky blue | Light green |
| 7 | P+conc. $H_2SO_4$ | Light Brown | Black | Purple | Purple | Blakish Green | Light violet |
| 8 | P+conc. HCl | Dark brown | Reddish brown | Reddish brown | Dark brown | Greenish brown | Brown |
| 9 | P+conc. $HNO_3$ | Orange brown | Orange yellow | Purplish brown | Brownish purple | Greenish brown | Brownish green |
| 10 | P+$I_2$ sol. | Light brown | Black | Blue | Light blue | Light blue | Light blue |
| 11 | P+5%HCl | No color | Brownish black | Blue | Blue | Light blue | Light blue |
| 12 | P+5%dil. $HNO_3$ | Blackish brown | Black | Dark blue | Blue | Blue | Light blue |
| 13 | P+5% $Na_2CO_3$ | Brown | Yellowish brown | Dark Sky blue | Bluish green | Sky blue | Light green |
| 14 | P+alc. KOH | Brown | Brown | Yellowish green | Greenish brown | Sky blue | Light green |
| 15 | P + $NH_4OH$ | Greenish brown | Light brown | Sky blue | Light green | Light sky blue | Light green |
| 16 | P+1% $KMnO_4$ | Purple | Pinkish Purple | Purplish brown | Brown | Dark purple | Dark purple |
| 17 | P+$AgNO_3$ | Dark brown | Black | Brown | Black | Green | Bluish brown |

P= powder, ME= methanolic extract, HE= hydroalcoholic extract

**Fig. 1. *Datura fastuosa* Linn. Seeds**

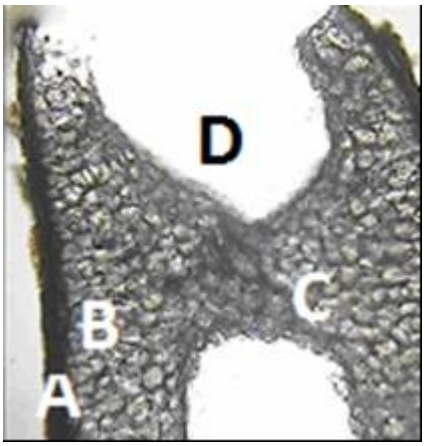


**Fig. 2. 'A' represents epidermis consisting of single layer polygonal tabular cells, 'B' represents sclerenchymatous layer, 'C' represents endosperm consisting of polyhedral cellulosic pernchyma and 'D' represents cavity of seed.**

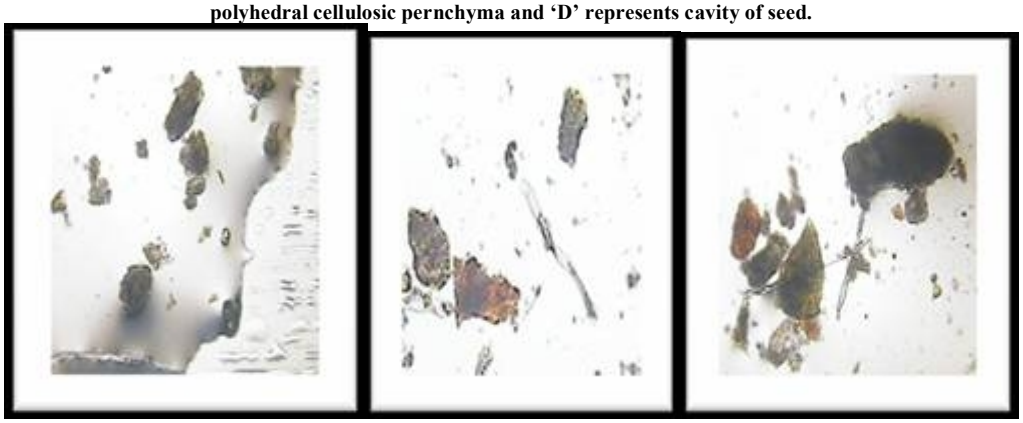

**Fig. 3.Pigments** **Fig. 4. Mucilagenous cells** **Fig.5. Trichome**

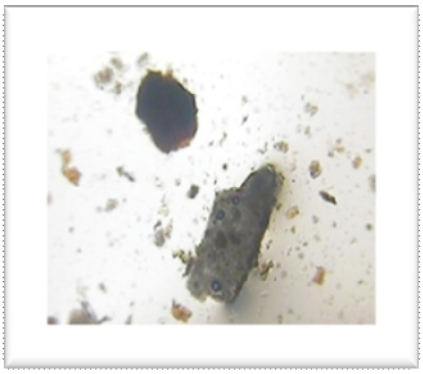

**Fig. 6. Endosperm cells**

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