



Research Article

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EFFECT OF *DATURA METEL* (DHATURA) SEEDS IN EXPERIMENTALLY INDUCED DIARRHOEA

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ABSTRACT

To evaluate the anti-diarrhoeal activity of methanolic extract of seeds of *Datura metel* on experimental-induced diarrhoea. Anti-diarrhoeal activity of seeds of *Datura metel* at the doses of 100 mg/kg and 200 mg/kg was evaluated using castor oil induced diarrhoea model in rats, magnesium sulphate induced diarrhoea model in rats and gastrointestinal motility by charcoal meal in mice. Preliminary phytochemical analysis of methanolic extract of seeds of *Datura metel* showed the presence of steroids, tannins, flavonoids and alkaloids. Methanolic extract of seeds of *Datura metel* at the doses of 100 and 200 mg/kg significantly delayed the onset time of first defecation, decreased the number and weight of faeces as compared to control group. The mean distance travelled by charcoal meal showed a significant reduction in the movement of charcoal. These results suggest that anti-diarrhoeal activity of methanolic extract of seeds of *Datura metel* may be due to its anti-secretory and antimotility effect. These effects may be due to the presence of different phytochemicals and could be used for the treatment of diarrhoea.

Keywords: Diarrhoea, *Datura metel*, Antimotility

INTRODUCTION

Diarrhoea is the most common gastrointestinal disorder in clinical practice¹. Diarrhoea occurs when the intestinal contents rapidly transit through the small intestine, enzymatic digestion of foodstuffs and absorption of fluid and nutrients decreased or secretion of the fluid into the GIT tract increased². Diarrhoea caused by infection with bacterial, fungal and viral agents. Diarrhoea also caused by medications such as antibiotics³. Diarrhoeal disease is leading cause of morbidity worldwide and represents a leading cause of childhood death in the developing world⁴.

There are available various drug treatments for diarrhoea, examples are loperamide, bismuth subsalicylate, Diphenoxylate and many other drugs, but these drugs have side effects like abdominal discomfort, dry mouth, nausea, constipation⁵. Therefore, herbal therapies should be considered because herbal plants have natural origin and possess lesser side effects than the conventional drugs and thus are safer to use. It should be necessary and important to identify and evaluate commonly available natural or herbal drugs as a better alternative for the treatment of diarrhoea.

Datura metel Linn. or *Datura alba*⁶ is a perennial herbaceous plant, belonging to family Solanaceae. The name *Datura* comes from the early Sanskrit *Dhustura*⁷. It is commonly known as *datura* in Hindi, White Thorn Apple in English. The seeds contain alkaloids, tannins, cardiac glycosides, flavonoids and carbohydrates⁸. Traditionally, seeds of *Datura metel* are used to treat skin rashes, ulcers, bronchitis, jaundice and diabetes. The plant *Datura metel* Linn is distributed throughout India in waste place and along roadsides and widely cultivated and naturalized in tropic. It is native to Asia and Africa⁹. Anti-diabetic¹⁰, anti-fertility¹¹, insecticidal¹² activities of *Datura metel* seeds extract are reported in literature. Traditionally, *Datura metel* seeds have anti-diarrhoeal effect¹³ but it has not been scientifically proved. Hence, we investigated the anti-diarrhoeal activity of *Datura*

metel seeds extract against in-vivo animal models using experimental rats.

MATERIALS AND METHODS

Procurement of plant material

Seeds of *Datura metel* was procured from Shekhawati herbs, churu, Rajasthan and authenticated by Dr. H.B. Singh, Chief Scientist & Head, Raw Materials Herbarium & Museum, National Institute of Science Communication and Information Resources (NISCAIR), New Delhi, India. A voucher specimen has been deposited at the NISCAIR Herbarium (NISCAIR/RHMD/ Consult-2002-13/2171/181 dated January 01, 2013).

Preparation of seed extract

Extraction was done with Soxhlet apparatus using 89g of powdered *Datura metel* seeds. Firstly, *Datura metel* seeds extracted with petroleum ether to remove fatty materials, and then the marc obtained was again extracted with methanol. The solvent was completely removed under reduced pressure till the semi solid mass was obtained. A dark reddish-brown semi solid extract was obtained with a yield of 3.5%. The extract was stored in desiccator and a weighed amount was suspended in distilled water using 1% gum acacia as suspending agent prior to administration. The extract was administered orally at doses of 100 and 200 mg/kg. The doses were selected based on previous acute oral toxicity study.

Phytochemical testing

Preliminary phytochemical screening of methanolic extract of *Datura metel* seeds was done to test the presence of the active chemical constituents such as flavonoids, tannins, saponins, alkaloids and phenolic compounds¹⁴.

Castor oil induced diarrhoea model

This method, described by Shoba and Thomas (2001)¹⁵. Rats fasted for 18hrs were randomly allocated to four groups of five animals in each group. Group I received 1% gum acacia p.o. at a dose of 5ml/kg BW. Group II received standard anti-diarrhoeal drug loperamide at a dose of 3mg/kg p.o. Group III and IV received the methanolic extract of *Datura metel* seeds at the doses of 100 and 200 mg/kg p.o. After 60 min 1 ml of castor oil administered to each animal orally but diarrhoea not induced, then 10ml/kg castor oil administered to each animal orally, diarrhoea induced. Each animal placed in separate cage with filter paper, filter paper changed every hour and observed diarrhoea in each hr for 4 hr. The following parameters were then observed-onset of diarrhoea, consistency of diarrhoea, number of faeces, and weight of faecal output for 4 hr. Anti-diarrhoeal activity was determined in terms of percentage of protection of faecal matter, which was calculated by following formula¹⁶.

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Magnesium sulphate induced diarrhoea model

Animals and treatment was similar to castor oil induced diarrhoea model. After 60 min of drug treatment, the animal in each group received magnesium sulphate (2g/kg) orally, but diarrhoea was not induced in control group, so the dose of magnesium sulphate increased to 4g/kg airtremely and again failed to induce diarrhoea. Then dose was increased to 8g/kg and it induced diarrhoea and again the following parameters were observed for 4 hr: consistency of diarrhoea, number of faeces, and weight of faecal output for 4 hr¹⁶.

Gastrointestinal motility by charcoal meal

The method of Yegnanarayan and Shrotri (1982)¹⁷ was used. Mice were divided in to four groups, and each group consists of five animals. Group I received 5ml/kg of vehicle (1% gum acacia) p.o. and served as control group. Group II received atropine sulphate at a dose of 5mg/kg i.p. Group III and IV received methanolic extract of *Datura metel* seeds at the doses of

100mg/kg and 200mg/kg orally. After a pre-treatment period of 45 min, activated charcoal (10%) suspended in gum acacia (0.6%) was administered to all the mice at the dose of 25ml/kg orally. After 15 min of charcoal administration, all the mice were sacrificed with overdose of anaesthetic ether. The intestinal part from pyloric sphincter to caecum was removed and total length was measured in cm. The distance travelled by charcoal was measured in cm and expressed as the percent of the total length of the intestine. Percentage of inhibition was calculated by following the formula¹⁶.

RESULTS

Phytochemical analysis

Preliminary phytochemical screening of methanolic extract of seeds of *Datura metel* has shown the presence of various active constituents like alkaloids, tropane alkaloids, flavonoids, tannins, steroids.

Castor oil induced diarrhoea

In the castor oil induced diarrhoeal method, the methanolic extract of seeds of *Datura metel* at the doses of 100mg/kg and 200mg/kg produced a marked anti diarrhoeal effect in the rats, as shown in table 1.

Magnesium sulphate induced diarrhoea

In the magnesium sulphate induced diarrhoeal method, the methanolic extract of seeds of *Datura metel* at the doses of 100mg/kg and 200mg/kg produced a marked anti diarrhoeal effect in the rats, as shown in table 2.

Gastrointestinal motility by charcoal meal

The methanolic extract of *Datura metel* at the doses of 100mg/kg and 200g/kg decreased significantly the propulsion of charcoal meal through the gastrointestinal tract when compared with control group as shown in table 3.

Table 1: Effect of methanolic extract of *Datura metel* seeds on castor oil induced diarrhoea model in rats (n=5)

Groups	Treatment	Dose mg/kg	Onset of first defecation (min)	Number of feces	Weight of feces (gm)	% of protection
Group I	Vehicle	-	23.6±2.2	7.8±0.59	6.48±0.24	-
Group II	Loperamide	3	238±2.0***	0.2±0.2***	0.22±0.23***	97.36
Group III	<i>Datura metel</i> seeds.	100	139±18.4***	4.4±0.24***	3.4±0.16***	43.59
Group IV		200	70.4±5.30*	2.6±0.24***	1.18±0.15***	66.6

Values are presented as mean ± SEM. ***P < 0.001, **P < 0.01, *P < 0.05, NS: Non-Significant Group II, III, IV compared to castor oil control (group I).

Table 2: Effect of methanolic extract of *Datura metel* seeds on magnesium sulphate induced diarrhoea model in rats (n=5)

Groups	Treatment	Dose mg/kg	Onset of first defecation (min)	Number of feces	Weight of feces (gm)	% of protection
Group I	Vehicle	-	25.2±2.4	11.2±0.59	4.08±0.06	-
Group II	Loperamide	3	236±4.0***	0.6±0.60***	0.196±0.19***	94.64
Group III	<i>Datura metel</i> seeds	100	149.6±11.03***	4.8±0.37***	2.39±0.10***	57
Group IV		200	165.6±7.11***	3.2±0.2***	1.39±0.05***	71

Values are presented as mean ± SEM, ***P < 0.001, **P < 0.01, *P < 0.05, NS: Non-Significant Group II, III, IV compared to magnesium sulphate control (group I).

Table 3: Effect of methanolic extract of *Datura metel* seeds on the distance travelled by charcoal in charcoal meal test in mice (n=5)

Groups	Treatment	Dose mg/kg	Distance travelled (% mean±SEM)	% of inhibition
Group I	Vehicle	-	82.4±3.5	-
Group II	Atropine sulphate	5	42±2.2***	57.57
Group III	<i>Datura metel</i> seeds	100	63.06±1.04***	38.38
Group IV		200	52.86±1.1***	47

Values are presented as mean ± SEM, ***P <0.001, **P<0.01, *P<0.05, NS: Non-Significant, Group II, III, IV compared to control group (group I)

DISCUSSION

Diarrhoea is a major cause of mortality in infants and children in developing countries¹⁷. The present study reported the protective effect of methanolic extract of *Datura metel* seeds on various diarrhoea induced models such as castor oil and magnesium sulphate induced diarrhoea in rats and gastrointestinal motility by charcoal meal in mice.

Castor oil induced diarrhoea by ricinoleic acid which is the main active constituent of castor oil that causes diarrhea¹⁸. In this study, the methanolic extract of *Datura metel* seeds reduced castor oil induced diarrhoea which may either be due to its inhibitory action on ricinoleic acid synthesis. Magnesium sulphate induces diarrhoea by osmotic imbalance preventing reabsorption of water ions, leading to increase in the volume of the intestinal content¹⁹. The methanolic extract of *Datura metel* seeds may have increased the absorption of water and electrolyte from the gastrointestinal tract. Charcoal meal test in mice is a method used to study the effect of the drugs on the peristalsis movement²⁰. The extract at the doses of 100 and 200mg/kg suppressed the propulsion of charcoal meal in dose dependent manner or significantly (p<0.001).

CONCLUSION

In conclusion, the results obtained in the present study suggest that *Datura metel* seed extract have beneficial effect in controlling the diarrhoea in experimental rats and mice. The anti-diarrhoeal property of *Datura metel* seeds may be due to its antisecretory and antimotility effect which may be due to the presence of different phytochemicals

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