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Antispasmodic effect of *Cyperus Rotundus* L. (Cyperaceae) in diarrhoea

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ABSTRACT

Cyperus rotundus L. (Cyperaceae) is used as an active ingredient of most of the ayurvedic antidiarrhoeal formulations. A study was undertaken to evaluate the effectiveness of *Cyperus rotundus* as a antispasmodic in diarrhoea. An aqueous extract of tubers of *Cyperus rotundus* (ACR) was tested for its antidiarrhoeal and antispasmodic activity. Antidiarrhoeal effect of ACR was evaluated in castor oil induced diarrhea in mice and antispasmodic effect was evaluated by charcoal meal test in mice at a dose of 125, 250, 500 mg/kg. The % inhibition of diarrhoea was 30.36 %, 37.90 %, 45.45 % and 92.45 % for ACR 125, 250, 500 mg/kg (po) and Loperamide 2 mg/kg dose (po) respectively. ACR 125, 250, 500 mg/kg (po) and Atropine Sulphate 2 mg/kg dose (po) produced 24.35 %, 31.48 %, 36.75 % and 55.94 % inhibition of intestinal transit respectively. These results indicate that ACR produces its antidiarrhoeal effect through decreasing intestinal secretions and antispasmodic effect by inhibiting the intestinal motility.

Key words: *Cyperus rotundus*, antidiarrhoeal, antispasmodic, intestinal transit.

INTRODUCTION

Diarrhoea is a common gastrointestinal disorder characterized by an increase in stool frequency and a change in stool consistency. [1] It remains one of the major health threats to populations in the tropical and subtropical poor countries. In developing countries, the majority of people living in rural areas almost exclusively use traditional medicines in treating all sorts of diseases including diarrhoea. [2] Due to these facts, the World Health Organization (WHO) incorporates studies of traditional medicinal practice in its diarrhoeal disease control program. [3]

Cyperus rotundus L. (Cyperaceae) is a perennial plant, commonly known as nut grass and locally as Musta, is said to possess antidiarrhoeal, anti-inflammatory and antipyretic activities. [4] It is also a home remedy for indigestion, disorders of stomach and irritation of bowel. The tubers are used in Ayurvedic medicine and have been mentioned in ancient texts for various ailments. [5] The aim of the present paper is to study the antispasmodic and antidiarrhoeal effect of the *Cyperus rotundus*.

MATERIALS AND METHODS

Drugs

i) Castor oil (refined pure) – Paras Chemical Industries, ii) Activated Charcoal – E. Merck, iii) Atropine sulphate – Sigma chemicals Ltd.

Plant material and preparation of the extract

Tubers of *Cyperus rotundus* L. (family Cyperaceae) were purchased from local market. The botanical identification of the fruits was done by Dr. Dhabe, Herbarium incharge Department of Botany, Dr. Babasaheb Ambedkar

Marathwada University, Aurangabad (M.S.), India, where a voucher specimen has been deposited. The dried tubers were coarsely powdered. The powdered tubers (200 gm) were taken in a round bottom flask and was extracted with water for 48 hr at room temperature. After 48 hr, the solution was filtered and the filtrate was concentrated in a rotary evaporator and the last trace was removed in vacuum. The various concentrations of the aqueous extract of *Cyperus rotundus* (ACR) were given 0.1 ml orally. [6]

Animals

“Swiss albino mice” of either sex, weighing; 20 – 25 gm obtained from VIPER, Pune (India), were used for the experiments. They were kept in standard environmental condition, fed standard food and water ad libitum. All experiments were performed after an overnight fast. The Institutional Animal Ethical Committee of Government College of Pharmacy, Aurangabad, Maharashtra, India (GCPA/IAEC/2011/235, 11/03/2011), approved the study.

Experimental procedure for antidiarrhoeal activity

Acute toxicity

ACR was studied for acute oral toxicity as per revised OECD guidelines number 423. ACR was devoid of any toxicity up to 2000 mg/kg in albino mice by oral route. Hence for further studies doses of 125 to 500 mg/kg of ACR was used. [7]

Castor oil induced diarrhea

The animals were divided in to control, positive and test groups containing six in each group. Each mouse was kept for observation under a glass funnel, the floor of which was lined with blotting paper and observed for 4 h. Diarrhoea was induced by administering 0.2 ml. of castor oil orally to mice. The control group received only distilled water (10 ml/kg, po); the positive control group received Loperamide (2 mg/kg, po); test group received ACR at doses of 125, 250, 500 mg/kg, po, body weight 30 min before the administration of castor oil. During an observation period of 4 h, the parameters observed were: onset of diarrhoea, total number of faecal output, and number of wet faeces. [8, 9]

Gastrointestinal motility by charcoal meal

The animals were divided in to control, positive and test groups of six mice each. Each animal was given orally 0.2 ml of charcoal meal (3% charcoal in 5 % gum acacia). The test groups received the ACR at doses of 125, 250, 500 mg/kg, po, body weight immediately after charcoal meal administration. The positive control group received Atropine sulphate (5 mg/kg, po), while the control group received distilled water (10 ml/kg, po). After 30 min., the animals were sacrificed and the movement of charcoal from pylorus to caecum was measured. The peristaltic index, which is the distance travelled by charcoal meal to the total length of small intestine expressed in terms of percentage. [10, 11]

Statistics

The results of all experiments were reported as mean \pm S.E.M. Statistical analysis was carried out using Student's 't'-test. A level of significance of $P < 0.05$ was regarded as statistically significant.

RESULTS

Effect of ACR on castor oil induced diarrhoea

In the course of observation for 4 h. after castor oil administration, all the mice in control group produced copious diarrhoea. Pretreatment of mice with the different doses of ACR caused a significant dose dependent decrease in the frequency of purging (reduction of number of wet stools and total no of stools). ACR showed 30.36 %, 37.90 %, 45.45 % inhibition of diarrhoea at doses of 125 mg/kg, 250 mg/kg and 500 mg/kg while Loperamide at dose of 2 mg/kg showed 92.45 % inhibition of diarrhoea as shown in Table 1.

Table1: Effect of ACR on castor oil induced diarrhoea in mice

Group	Dose (mg/kg)	Onset of diarrhoea (min)	Total numbers of stools	Number of wet stools	% Inhibition
Control		53 \pm 2.11	13.33 \pm 0.33	11.00 \pm 0.36	
ACR	125	67 \pm 2.15	9.16 \pm 0.30	7.66 \pm 0.42	30.36
ACR	250	79 \pm 3.27	8.50 \pm 0.42	6.83 \pm 0.47	37.90
ACR	500	93 \pm 3.58	7.00 \pm 0.36	6.00 \pm 0.36	45.45
Loperamide	2	223 \pm 5.16	1.00 \pm 0.25	0.83 \pm 0.16	92.45

Values are mean \pm standard error of mean. Each value represents average of six determinations. $P < 0.05$ vs. control, student's 't' test.

Effect of ACR on small intestinal transit

The results revealed that ACR inhibited the gastrointestinal transit of charcoal in mice by 24.35 %, 31.48 % and 36.75 % at doses of 125 mg/kg, 250 mg/kg and 500 mg/kg respectively while Atropine sulphate at dose of 5 mg/kg showed 55.94 % inhibition of gastrointestinal transit as shown in Table 2.

Table 2: Effect of ACR on castor oil induced intestinal transit in mice

Group	Dose (mg/kg)	% Intestinal transit	% Inhibition
Normal		73.3±1.60	
Control		81.33±2.13	
ACR	125	55.47±2.34	24.35
ACR	250	50.24±2.18	31.48
ACR	500	46.36±1.74	36.75
Atropine sulphate	5	32.29 ± 1.02	55.94

Values are mean ± standard error of mean. Each value represents average of six determinations. $P < 0.05$ vs. control, student's 't' test.

DISCUSSION

Castor oil is an effective laxative. It decreases fluid absorption, increases secretion in the small intestine and colon, and affects smooth muscle contractility in the intestine. [12] Several mechanisms have been previously proposed to induce the diarrhoeal effect of castor oil. However, it is well documented that castor oil produces diarrhoea due to its most active component ricinoleic acid by a hypersecretory response. [13] As ACR has inhibited the castor oil induced diarrhoea, it can be assumed that its antidiarrhoeal action was exerted by antisecretory mechanism.

Gastrointestinal motility describes the contraction of the muscles that mix and propel contents in the gastrointestinal tract. [14] Charcoal meal test in mice is a method used to study the effect of drugs on the motility of intestine. [15] ACR was found to be the inhibitor of intestinal motility, showing its antispasmodic effect.

CONCLUSION

These results revealed that *Cyperus rotundus* L. has produced its antidiarrhoeal effect through decreasing intestinal secretions and antispasmodic effect by inhibiting the intestinal motility.

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