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# STUDIES ON ANTIDIARRHOEAL ACTIVITY OF LEAVES OF *AMORPHOPHALLUS PAEONIIFOLIUS* IN EXPERIMENTAL ANIMALS

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## ABSTRACT

Acute diarrhoea is one of the principal causes of death in the infants, particularly in developing countries. An array of medicinal plants with anti-diarrhoeal properties has been widely used by the traditional practitioners; however, the efficacy of many of these anti-diarrhoeal conventional medicines has not been scientifically evaluated. Hence the present study was under taken to explore anti-diarrhoeal activity of *Amorphophallus paeoniifolius* leaves. Swiss Albino rats of either sex weighing 150-180 g were used for study and anti-diarrhoeal activity was evaluated by castor oil-induced Diarrhoea model. The ethanolic extract of the *A. paeoniifolius* leaves, at the doses of 100, 200 and 400 mg/kg, reduced the total number of faeces as well as diarrhoeic faeces in a dose dependent manner and the results were statistically significant ($p < 0.05$). The investigated may be exploited for wide range of diarrhoeal stages and further studies are needed to completely understand the mechanism of anti-diarrhoeal action of *A. paeoniifolius* leaves.

**INTRODUCTION:** In developing countries, the conventional people living in rural areas almost solely use traditional medicines in treating all sorts of ailment including diarrhoea. Acute diarrhoeal disease is one of the principal grounds of death in the infants, particularly in emaciated area [1]. It thus becomes imperative to identify and assess commonly existing natural drugs as substitute to currently existing anti-diarrhoeal drugs having various adverse effects [2]. Several studies have assessed the efficacy of some herbal medicines containing different constituents in treating diarrhoea [3, 4]. An array of medicinal plants with anti-diarrhoeal properties has been widely used by the traditional practitioners; however, the efficacy of many of these antidiarrhoeal conventional medicines has not been scientifically evaluated.

*Amorphophallus* species, belonging to the family *Araceae*, are perennial herbaceous plants, adapted to the shady and mountainous areas and mainly distributed over Southeast Asia and Africa [5]. The plant *Amorphophallus paeoniifolius* (Dennst.) Nicolson is an indigenous, deciduous, tuberous herb grown and cultivated as vegetable throughout India. The plant is widely distributed in Bangladesh, India and Africa [6]. The plant is widely used in folk medicine for acute rheumatism, tumors, lung swelling, asthma, vomiting and abdominal pain. It is a traditional medicinal plant with a large subterranean corm with high value in vitiated condition of Vata, Kapha [7], in treatment of aras (piles), haemophilic conditions, skin diseases, obesity, intestinal worms [8], restorative in dyspepsia, debility [9, 10], as an ingredient of medicines for cholera.

The seeds are externally used as an irritant in treating rheumatic swelling, while the roots are used as an ammenagogue and used in opthalmia and applied to boils [11]. The plant is important source of flavonoids [12], protein, carbohydrate, calcium, iron, phosphorous and vitamin A, B, C [13]. Although literature indicates that all the parts of the plant belief one or the other medicinal values, yet there is no scientific report available in support of the antidiarrhoeal activity of ***Amorphophallus paeoniifolius*** leaves. Hence the present study was under taken to explore antidiarrhoeal activity of *A. paeoniifolius* leaves, using castor oil-induced diarrhoea model.

**MATERIALS AND METHODS:**

**Plant resources and preparation of crude drug:** The whole plant of *A. paeoniifolius* was collected from lands of Bhopal (M.P.), in month of Sep-Oct 2009 and got authenticated by Dr. Pradeep Tiwari, Department of Botany, Dr. Hari Singh Gour Vishwavidhyalaya, Sagar. The voucher specimens of these plants were preserved in the herbarium of the Pharmacognosy department of this institution (Voucher specimen no: -001/A).

The leaves of plant were collected, thoroughly washed with water to remove adherent impurities, shade dried and made to a fine powder using a laboratory ball mill and defatted with petroleum ether. The defatted material was subjected to exhaustive soxhelation with ethanol as solvent. Later solvent was evaporated below 50°C temperature. The ethanolic extract of leaves of *Amorphophallus paeoniifolius* (ExAP) was filtered, concentrated and was explored for antidiarrhoeal activity.

**Animals:** Swiss Albino rats of either sex weighing 150-180 g were used for castor oil-induced anti-diarrhoeal activity. The animals were kept at 27 ± 2°C, relative humidity 55-65% and light and dark cycles of 12 and 12 h, respectively, for 1 week before and during the experiments. All animals were fed standard animal feed and water *ad libitum* before the experiments. All the experiments were performed in the morning for the care of the laboratory animals and the ethical

guidelines for the investigation of experimental pain in conscious animals.

**Antidiarrhoeal activity study by castor oil-induced Diarrhoea:** The method [14], described by Shoba and Thomas was followed for this study. All animals were screened initially by giving 0.5 ml of castor oil and only those showing diarrhoea were selected for the final experiments.

**Doses:** The doses of 100, 200 and 400 mg/kg were prepared in normal saline.

**Groups:** Each animal of every experimental group (consisted of six animals) was housed in separate cages, the floor of which was lined with blotting paper. The floor lining was changed every hour. The animals were divided into control, positive control and test groups.

Group 1 served as control and received saline at the dose of 10 ml/kg, i.p.

Group 2 served as positive control and received loperamide at the dose of 3 mg/kg orally.

Group 3, 4, and 5 served as test groups and received ExAP at the dose of 100, 200 and 400 mg/kg respectively i.p. 30 minutes before castor oil administration.

Diarrhoea was induced by oral administration of 0.5 ml castor oil to rats. During an observation period of 4 h, the total number of faecal output and the number of diarrhoeic faeces excreted by the animals were recorded. The number of both wet and dry diarrhoeal droppings were counted every hour for a period of 4 hour mean of the stools passed by the treated groups were compared with that of the control group [15].

**Statistical analysis:** The data are expressed as the mean±SEM, n=6. The difference among the means has been analyzed by one-way ANOVA. A value of $p < 0.05$ was considered as statistically significant.

**RESULTS:** The diarrhoea was clinically apparent in all the animals of control group, (for the next 4 hour) 30 min after administration of castor oil. This was markedly reduced (88% inhibition) by the oral administration of Loperamide (positive control), 3 mg/kg (**Table 1**). Again remarkable reduction in the number of defaecation as well as diarrhoeic faeces over 4 hours was achieved in treated group with ExAP, which was found to be dose dependent. The 100 mg/kg, i.p. dose of the extract showed 46% percentage inhibition in defecation. The percentage inhibition in defecation was 56% and 69% at the dose of 200 and 400mg/kg respectively, which was statistically significant ($p<0.05$). Among the different doses, the 200 and 400mg/kg, exhibited prominent antidiarrhoeal activity. Both the doses reduced the total number of faeces as well as total number of wet faeces in test animals. But the effect was prominent at 400mg/kg, i.p. dose of extract.

**TABLE 1: ANTIDIARRHOEAL ACTIVITY OF *A. PAEONIIFOLIUS***

| Groups | Dose | Faecal Output | | |
|---|---|---|---|---|
| | | Total no of faecal output during 4 hour | Total no of wet faeces during 4 hour | % Inhibition |
| Group 1 ( Saline) | 10 ml/kg, i.p. | 13.6± 2.4 | 10.8±1.8 | - |
| Group 2 ( Loperamide) | 3 mg/kg, orally | 1.8±0.43* | 1.2±0.41* | 88 |
| Group 3 (EAP) | 100 mg/kg, i.p. | 7.4± 0.818* | 5.8± 0.47* | 46 |
| Group 4 (EAP) | 200 mg/kg, i.p. | 6.2± 0.93* | 4.8±0.53* | 56 |
| Group 5 (EAP) | 400 mg/kg, i.p. | 4.8±0.62* | 3.4±0.77* | 69 |

Values are Mean±SEM, n=6; * $p<0.05$ Significant Vs Control

**DISCUSSIONS:** The results of the present study showed that the ethanolic extract of *A. paeoniifolius* leaves exhibited a statistically significant reduction in the severity and frequency of diarrhoea produced by castor oil, which indicates to wide range of usefulness of this plant in secretory and functional diarrhoeas. The selection of Castor-oil induced diarrhoeal model in present investigation has its own justice i.e., this model involves the mechanism of autocoids and prostaglandins which have been implicated in causation of diarrhoeas in men [16, 17].

The liberation of ricinoleic acid from castor oil results in irritation and inflammation of the intestinal mucosa, leading to release of prostaglandins, which stimulate motility and secretion [18].

**CONCLUSION:** The remarkable anti-diarrhoeal effect of *A. paeoniifolius* leaf extract against castor oil- induced diarrhoea model attests to its utility in a wide range of acute diarrhoeal states. On the basis of these findings, it can be assumed that leaves of *A. paeoniifolius* could be a potential source for novel 'lead' discovery for antidiarrhoeal drug development.

Although the investigated plant may be useful in a wide range of diarrhoeal states; further studies are needed to completely understand the mechanism of anti-diarrhoeal action of *A. paeoniifolius* leaves.

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**REFERENCES:**

1. Syder JD and Merson MH: The magnitude of the global problems of acute diarrhoeal disease a review of active surveillance data. Bulletin of the World Health Organization 1982; 60: 605-613.
2. Hardman J G, Limbird LE (Eds): Goodman and Gilman's The Pharmacological Basis of Therapeutics. MacGraw Hill, New York, Tenth Edition, 1992: 914-931.
3. Offiah VN and Chikwender UA: Antidiarrhoeal effects of Ocimum gratissimum leaf extract in experimental animals. Journal of Ethanopharmacology 1999; 68:327-330.
4. Mukherjee PK, Saha K, Murugesan T, Mandal SC, Pal M and Saha BP: Screening of antidiarrhoeal profile of some plant extracts of a specific region of West Bengal, India. Journal of Ethnopharmacology 1998; 60:85-89.
5. Gandawijaja D, Idris S, Nasution P, Nyman LP and Arditti J: *Amorphophallus titanum* Becc: an historical review and some recent observations. Ann. Bot. 1983; 51: 269-278.
6. Anonymous, the Wealth of India- Raw Material: A. CSIR, New Delhi, Vol. I, 2003: 233 – 234.
7. Prajapati ND, Purohit SS, Sharma AK, Kumar T: A Hand Book of Medicinal Plant – A Complete Source Book. Jodhpur, 2004: 41.
8. Siraj VV, Balachandran I: Ayurvedic Drugs and Their Plant Sources. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1994: 457 – 459.
9. Kirtikar KR, Basu BD: Indian Medicinal Plants, International Book Distributors, Dehradun, Edition 2, Vol. IV, 1987: 609.
10. Nadkarni KM, Nadkarni AK: Indian Material Medica. Popular Prakashan, Mumbai, Edition 3, Vol. I, 2000: 94.
11. Kapoor LD: Ayurvedic Medicinal Plants. Replika Press Pvt. Ltd., India, Edition 1, 2005: 25.
12. Shilpi JA, Ray RK, Sarder SJ and Vddin SJ: Fitotheria 2005; 76:367.
13. Hetterscheid WLA: Preliminary Taxonomy and morphology of *Amorphophallus blume ex Decaisne (Araceae),* Proc Moscow Aroid Conference, 1994; 35-48.
14. Shoba FG and Thomas M: Study of antidiarrhoeal activity of four Medicinal plants in castor oil induced diarrhoea. Journal of Ethnopharmacology 2001; 76: 73–76.
15. Awouters F, Niemegeers CJE, Lenaerts FM and Janseen PAJ: Delay of castor oil diarhoea in rats; a new way to evaluate inhibitors of prostaglandin bio-synthesis. Journal of Pharmacy Pharmacology 1978; 30:41-45.
16. Horton EW, Main IHM, Thampson CJ and Wright PM: Effects of orally administered, PGE on gastric secretion and gastrointestinal motility in man Gut, 1968; 9: 655-658.
17. Geenbargena NJ, Arwanitakis C, Hurwitz A and Azarnoff DL: Drug Development of Gastrointestinal Disorders.Churchill Livingstone, New York, 1978: 155-156.
18. Pierce NF, Carpenter CCJ, Elliot HZ and Greenough WB: Effects of prostaglandins, theophylline and Cholera exotoxin upon transmucosal water and electrolyte movement in canine jejunum Gastroenterology, 1971; 60: 22-32.