

ANTIDIARRHEAL ACTIVITY OF METHANOLIC EXTRACT OF LEAVES OF *SOLANUM PUBESCENS* AND *GYMNOSPORIA EMERGINATA*

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ABSTRACT

The methanolic leaf extract of *Solanum pubescens* and *Gymnosporia emerginata* showed significant antidiarrheal activity on castor oil induced diarrheal model in rats. These results obtained revealed that the leaf extracts possess pharmacological activity against diarrhea and may possibly explain the use of the plants in traditional medicine.

Keywords: Atropine, Antidiarrheal, *Solanum pubescens* and *Gymnosporia emerginata*.

INTRODUCTION

In developing countries, the majority of people living in rural areas almost exclusively use traditional medicines in treating all sorts of disease including diarrhea. There are large number of epidemiological and experimental evidence pertaining to worldwide acute-diarrheal disease, which is one of the principal causes of death in the infants, particularly in malnourished and which is of critical importance in developing countries¹. It thus becomes important to identify and evaluate commonly available natural drugs as alternative to currently used anti-diarrheal drugs, which are not completely free from adverse effects².

Several studies have evaluated the effectiveness of some traditional medicines in treating diarrhea in all different continents³. India has a great environmental and biological diversity compared with the rest of the world. A range of medicinal plants with anti-diarrheal properties has been widely used by the traditional healers; however, the effectiveness of many of these anti-diarrheal traditional medicines has not been scientifically evaluated.

Solanum pubescens was commonly used in India by tribal people for the treatment of liver disorders, diarrheal diseases and cancer disorders. It is commonly called as pajarito. *Gymnosporia emerginata* are used for analgesic. The present study was carried out in rats with methanolic leaf extracts of *Solanum pubescens* and *Gymnosporia emerginata*. The purpose of the present study was to find out the antidiarrheal activity of methanolic extract of *Solanum pubescens* and *Gymnosporia emerginata* in experimentally induced acute diarrhea in rats.

MATERIALS AND METHODS

Plant material

Fresh leaves of *Solanum pubescens* (Solanaceae) and *Gymnosporia emerginata* (Celastraceae) collected from Tirupathi S.V. University; the plant was identified confirmed and authenticated by comparing with an authentic specimen by a botanist Dr. Madhavachetty. K., A voucher specimen has been deposited at S.V. University Tirupathi, India.

Dried, coarsely powdered of *Solanum pubescens* and *Gymnosporia emerginata* leaves (500g) was repeatedly extracted with methanol. The extract was concentrated under vacuum and the residue was used in the experiments. The dried plant extracts were freshly re-dissolved in normal saline and given to adult albino rats fed a standard animal diet.

Animals

Male albino rats weighing 150-180g were used for castor oil induced anti-diarrheal activity. The animals were acclimatized to room temperature ($28 \pm 5^\circ\text{C}$) with relative humidity of $55 \pm 5\%$ in a standard wire meshed plastic cages for 4 to 5 days prior to commencement of the experiment. All animals were fed standard animal feed and tap water ad libitum before the experiments. The animals were maintained as per the norms of CPCSEA (TRRCP - 0153/dated 11/08/2010) and cleared by CPCSEA and institutional ethics committee (Teegala Ram Reddy College of Pharmacy) each experimental group consisted of six animals housed in separate cages.

Castor oil induced diarrhea

Rats were divided into four groups of six animals each, diarrhea was induced by administering 1ml of castor oil orally to rats Group-I served as control (2ml / kg, i.p. saline), Group-II received atropine (3mg / kg, i.p.) served as standard and Group-III received (300 mg / kg, i.p.) of *Solanum pubescens* and Group-IV received (300mg / kg, i.p.) of *Gymnosporia emerginata* 1hour before castor oil administration. The animals were housed individually in a metal cage lined with white paper. Fecal output was assessed by collecting the fecal material for 8hours after drug administration, and the total weight in each group was recorded. The percentage protection was calculated as follows⁴.

$$\frac{\text{Total weight of stool in control animal} - \text{Total weight of stool in drug treated animal}}{\text{Total weight of stool in control animals}}$$

Statistical analysis

The experimental results are represented as mean \pm SEM (Standard error of the mean). ANOVA test was used for the evaluation of data and *** $p < 0.001$ and ** $p < 0.02$ accepted as significant.

RESULT

Castor oil induced diarrhea

30 min after administration of castor oil the diarrhea was clinically apparent in all the animals of control group, for the next 8 hours was markedly reduced by the intra-peritoneal injection of atropine, 3 mg / kg (57.67) (Table-1). A similar marked reduction in the number of defecations over 8 hours was achieved with *Solanum pubescens* with dose of 300mg / kg i.p. and *Gymnosporia emerginata* 300mg / kg i.p. dose of the extract did not affect the severity and onset of diarrhea.

Table 1: Effect of *Solanum pubescens* and *Gymnosporia emerginata* extract on castor oil induced diarrhea in rats.

S.No.	Treatment	Castor oil induced diarrhea		
		Frequency of defecation (times / 8hr)	Total weight of wet stools mg for 8h	% inhibition
1	Control-Castor oil(1ml/p.o)+ saline (2ml/kg,i.p)	9.66 ± 1.42	3.19 ± 6.2	-
2	Standard- Castor oil + Atropine (3mg/kg, i.p)	2.5 ± 5.248	1.35 ± 0.27***	57.6
3	Castor oil+ M.E <i>Solanum pubescens</i> (300mg/kg, i.p)	3.5 ± 0.32	1.37 ± 0.29***	57.05
4	Castor oil+ M.E <i>Gymnosporia emerginata</i> (300mg/kg, i.p)	2.96 ± 0.516	2.12 ± 0.31**	33.54

Values are expressed as mean ± SEM from the experiments. **p<0.02, ***p<0.001 when compared with Castor oil ± saline treated group.

DISCUSSION AND CONCLUSION

Diarrhea results from an imbalance between the absorptive and secretory mechanisms in the intestinal tract, resulting in an excess loss of fluid in the feces. In some diarrheas, the secretory component predominates, while other diarrheas are characterized by hypermotility. The use of castor oil induced diarrhea model in our study is logical because the autocoids and prostaglandins are involved these have been implicated in the causation of diarrheas in man⁵. The liberation of ricinoleic acid from castor oil results in irritation and inflammation of intestinal mucosa, leading to release of prostaglandins, which stimulates motility and secretion⁶. The results of the present study showed that the extract of *Solanum pubescens* and *Gymnosporia emerginata* produced a statistically significant reduction in the severity and frequency of diarrhea produced by castor oil. It is also noted that the extract significantly inhibited castor oil induced intestinal fluid accumulation and the volume of intestinal content, dose dependently more than Atropine. The extracts significantly reduced the castor oil induced diarrhea in rats. In this study, atropine produced a significant reduction in the number of stools possibly due to its anti-cholinergic effect⁷. Castor oil is also reported to induce diarrhea by increasing the volume of intestinal content by prevention of the reabsorption of water. The liberation of ricinoleic acid results in irritation and inflammation of intestinal mucosa, leading to release of prostaglandins which results in stimulation of secretion. Thereby prevents the reabsorption of NaCl and H₂O⁸.

The antidiarrheal activity of the extract may also be due to the presence of denature proteins forming protein tannates. Protein tannates make the intestinal mucosa more resistant and reduce secretion⁹. The secretory diarrhea is associated with an activation of Cl⁻ channels, causing Cl⁻ efflux from the cell, the efflux of Cl⁻ results in massive secretion of water into the intestinal lumen and profuse watery diarrhea¹⁰.

The extract may inhibit the secretion of water into the lumen by reverting this mechanism.

Anti-dysentric and antidiarrheal properties of medicinal plants were found to be due to tannins, alkaloids, saponins, flavonoids, sterols and/or triterpene and reducing sugar¹¹. The phytochemical analysis of the extracts revealed the presence of triterpenoids and may mediate the antidiarrheal property of *Solanum pubescens* and *Gymnosporia emerginata* extracts. The extract resulted in a marked reduction in the number of diarrhea stools. This signifies the usefulness of this model and the clinical effect of the extract.

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