



FIRST REPORT ON LAXATIVE ACTIVITY OF *CUCUMIS SATIVUS*

Swapnil Sharma¹, Sachdev Yadav¹, Gyanendra Singh², Dr. Sarvesh Paliwal¹, Dr. Jaya Dwivedi³

1. Assistant Professor, Department of Pharmacy, Banasthali University, Rajasthan, India.
2. Apex institute of Pharmacy, Sitapura, Jaipur, Rajasthan, India.
3. Associate Professor, Department of Chemistry, Banasthali University, Rajasthan, India.

*Corresponding author's E-mail: swapnilsharma1978@gmail.com

Accepted on: 25-11-2011; Finalized on: 25-01-2012.

ABSTRACT

The study was aimed to assess the possible laxative effect of aqueous fruit pulp extract of *CUCUMIS SATIVUS* in Wistar albino rats. Acute toxicity of the extract was determined as per OECD guidelines. For evaluation of laxative potential of extract rats were divided in 5 groups of 6 animals each, first group as control, second group served as standard (sodium picosulfate) while group 3, 4 and 5 were treated with fruit pulp aqueous fruit pulp extract of *CUCUMIS SATIVUS* at doses of 250, 500 and 1000mg/kg body weight (b.w.), per os respectively. The laxative activity was determined based on the weight of the faeces matter. Acute toxicity study revealed that the extract did not show any toxicity upto 4000mg/kg so 250mg/kg and 500 mg/kg, 1000mg/kg dose was selected for pharmacological evaluation. Phytochemicals screening of the extract revealed the presence of flavonoids, tannins, polyphenols, sterols and polyterpenes. The aqueous fruit pulp extract of *CUCUMIS SATIVUS* administered orally at three different doses produced significant laxative activity and reduced loperamide induced constipation in dose dependant manner. The effect of the extract at 500 and 1000 mg/kg (p.o.) was similar to that of reference drug sodium picosulfate (5 mg/kg, p.o.). The same doses of the extract (500 and 1000 mg/kg, p.o.) produced a significant increase ($p < 0.01$) of intestinal transit in comparison with castor oil (2 ml) ($p < 0.01$). The results showed that the aqueous fruit pulp extract of *CUCUMIS SATIVUS* has a significant laxative activity.

Keywords: Laxative, Loperamide, Constipation, Gastro intestinal motility, Intestinal transit.

INTRODUCTION

Constipation also known as costiveness refers to bowel movements that are infrequent and/or hard to pass.¹ Constipation is a symptom with many causes. These causes are of two types: obstructed defecation and colonic slow transit (or hypomobility). About 50% of patients evaluated for constipation at tertiary referral hospitals have obstructed defecation. This type of constipation has mechanical and functional causes. Causes of colonic slow transit constipation include diet, hormones, side effects of medications, and heavy metal toxicity.² Cucumber (*CUCUMIS SATIVUS*) Cucurbitaceae is an excellent source of vitamin C, K, A, B6 & folic acid. It also contains 96 percent of water, pantothenic acid, magnesium, phosphorus, potassium, copper and manganese. The oil in the cucumber contains 22.3% linoleic acid, 58.5% oleic acid, 6.8% palmitic acid and 3.7% stearic acid.³ Traditionally *CUCUMIS SATIVUS* is used to treat high and low blood pressure, to cool and soothe irritated skin in patients with sunburn and to provide fragrance in perfumes. Its juice reduces heartburn, soothes acid stomach and gastritis.⁴

MATERIALS AND METHODS

Preparation of the crude extract

Fresh Cucumber (*CUCUMIS SATIVUS*) Family Cucurbitaceae was purchased from the commercial market of Jaipur (Rajasthan, India) and botanical authentication was carried out at the Department of Botany, University of Rajasthan (voucher specimen no. RUBL20687). Fresh fruit pulp was homogenized and dried

under shade and thus mass obtained was powdered, weighed and subjected to the evaluation for its laxative potential. The yield was found to be 36% (wt/wt).

Animals

Male Swiss albino mice, weighing 20–25 g, and Wistar albino rats, weighing 120-150 g, were used for acute toxicity study and evaluation of pharmacological studies. Animals were housed in standard environmental conditions and fed with standard rodent diet and water. The Institutional Animals Ethics Committee of PBRI Reg No. 1283/C/09/CPCSEA (Pinnacle Biomedical Research Institute, Bhopal M.P.) approved all the experimental protocols.

Acute toxicity studies in mice

The test was carried out as suggested by Ganapaty *et al.*,⁵ following OECD guidelines. Swiss albino rat of either sex weighing between 25–30g were divided into ten groups comprising six animals each. The control group received normal saline (2 ml/kg, p.o.). The other groups received 100, 200, 300, 600, 800, 1000, 2000, 3000 and 4000 mg/kg of the test extract respectively. Immediately after dosing, the animals were observed continuously for the first 4 hours for any behavioral changes. Thereafter, they were then kept under observation up to 14 days after drug administration to find out the mortality if any.

Laxative activity test in rats

The method of Capasso *et al.*,⁶ was followed for this activity. Rats fasted for 12 h before the experiment were placed individually in cages lined with clean filter paper.



Rats were divided in five groups with the first group acting as the control and administered saline (5 mL/kg, p. o.) that acted as the negative control. The second group received sodium picosulfate (5 mg/kg, p.o), this served as the positive control. The third, fourth and fifth groups received 250, 500 and 1000 mg/kg per os of the *CUCUMIS SATIVUS* aqueous fruit pulp extract. The faeces production (total number of normal as well as wet faeces) in all five groups was monitored for 16 h.

Laxative activity on loperamide induced constipation in rats

This study was carried out, as earlier described by Takahura *et al.*,⁷ Rats were placed individually in cages lined with clean filter paper, allowed to fast for 18 hours and divided into five groups of five animals each. The first group received normal saline (5 mL/kg, p.o) and served as a control. The second group received per os the standard drug sodium picosulfate (5 mg/kg). The aqueous fruit pulp extract of *CUCUMIS SATIVUS* (250, 500, and 1000 mg/kg, p.o.) was administered per os to the last three groups of rats. After 1 h, all the animals received Loperamide (5 mg/kg, p.o.) by gavage. The faeces production (total number of normal as well as wet faeces) in all five groups was monitored for 8 h.

Gastrointestinal motility tests in rats

The method of Mascolo *et al.*,⁸ was used. Rats were divided into different groups of five rats each and fasted for 18 hours before the experiment. Three of the groups were then treated orally with three increasing doses (250, 500 and 1000 mg/kg) of the aqueous fruit pulp extract of *CUCUMIS SATIVUS* serving as the test groups. One group served as blank or negative control treated with saline (5 mL/kg, p.o.) and the remaining group was administered castor oil (2 mL/rat, p.o.), a laxative agent, as the positive control. After 30 min, the animals were given 1 mL of freshly prepared charcoal meal (distilled water suspension containing 10% gum acacia, 10% vegetable charcoal). Following 30 min of charcoal administration, the rats were sacrificed by cervical dislocation and the abdomen immediately cut open, to excise the whole small intestine (pylorus region to caecum). The length of the small intestine and the distance between the pylorus region and the front of the charcoal meal was measured for obtaining the charcoal transportation or percentage.

RESULTS AND DISCUSSION

Phytochemical screening

Phytochemical analysis of the crude fruit pulp extract of *CUCUMIS SATIVUS* was performed qualitatively for the presence of Carbohydrates, proteins, amino acids, steroids, glycosides, flavonoids, tannins and polyphenols.

Effect of the aqueous fruit pulp extract of *C. sativus* on Laxative activity

In this study, the different doses of the extract showed dose dependant increase in fecal output of rats when compared to the control group (table 1). There was no

significant difference between the extract at the dose of 250 mg/kg (p.o.) and control group. The effects of *C. sativus* at doses of 500 and 1000 mg/kg (p.o.) increased significantly fecal output of rats compared to control group ($p < 0.05-0.01$). The effect of the extract at the doses of 500 & 1000 mg/kg (p.o.) was comparable to that of the standard drug sodium picosulfate (5 mg/kg, p.o.).

Table 1: Laxative activity of aqueous extract of *C. sativus* in rats

Group (Treatment)	Dose mg/kg	Faeces out put (g)	
		0-8h	8 h-16 h
Control (Saline)	5 mL/kg	1.862 ± 0.34	0.946 ± 0.12
Sodium picosulfate	5 mg/kg	5.522 ± 0.16**	5.190 ± 0.11**
<i>C. sativus</i>	250 mg/kg	2.190 ± 0.27	1.92 ± 0.22
<i>C. sativus</i>	500 mg/kg	2.635 ± 0.32*	2.203 ± 0.67*
<i>C. sativus</i>	1000 mg/kg	4.617 ± 0.59**	4.029 ± 0.92**

Values are expressed as mean ± S.E.M (n = 5); * $p < 0.05$ compared to control group; and ** $p < 0.01$ compared to control group.

Effect of the aqueous fruit pulp extract of *C. sativus* on loperamide induced constipation in rats

In the loperamide-induced constipation, the aqueous fruit pulp extract of *C. sativus* at the doses of 500 and 1000 mg/kg (p.o.), increased the total number of faeces in a dose dependent manner, and the results were statistically significant ($p < 0.05-0.01$) (Table 2). There was no significant effect with the dose of 250 mg/kg (p.o.) of the extract compared with control. The reduction of the loperamide induced constipation at 400 mg/kg (p.o.) of plant extract treatment was found to be almost comparable with that of treatment by 5 mg/kg of sodium picosulfate.

Table 2: Effect of *C. sativus* aqueous extract on loperamide induced constipation in rat.

Group (Treatment)	Dose mg/kg	Weight of faeces (g)
Control	5 mL/kg	0.938 ± 0.45
Sodium picosulfate	5 mg/kg	3.84 ± 0.62**
<i>C. sativus</i>	250 mg/kg	1.102 ± 0.33
<i>C. sativus</i>	500 mg/kg	1.826 ± 0.42*
<i>C. sativus</i>	1000 mg/kg	3.990 ± 0.45**

Values are expressed as mean ± S.E.M (n = 5); * $p < 0.05$ compared to control group; and ** $p < 0.01$ compared to control group.

Effect of the aqueous fruit pulp extract of *C. sativus* on gastrointestinal motility

The results of gastrointestinal motility test were reported in Table 3. The aqueous fruit pulp extract of *C. sativus* increased propulsion of the charcoal meal through the gastrointestinal tract in a concentration dependant manner. No significant effect was observed at the dose of 250 mg/kg of the aqueous fruit pulp extract of *C. sativus*, but the doses of 500 mg/kg and 1000 mg/kg (p.o.) of the extract produced a significant increase in the propulsion of charcoal meal compared to control group (normal saline, 5 mL/kg, p.o.) ($p < 0.01$). Castor oil (2 ml/rat, p.o.) produced greater gastrointestinal motility effect than the moderate dose of 500 mg/kg highest dose of the extract (1000 mg/kg, p.o.) used.



Table 3: Effects of *C. sativus* aqueous extract on gastrointestinal motility in rats.

Group (Treatment)	Dose mg/kg	Percentage of distance (%)
Control (Saline)	5 mL/kg	68.78 ± 4.64
Castor oil	5 ml/rat	93.71 ± 2.74***
<i>C. sativus</i>	250 mg/kg	71.64 ± 2.48
<i>C. sativus</i>	500 mg/kg	78.77 ± 2.34**
<i>C. sativus</i>	1000 mg/kg	85.41 ± 2.11**

Values are expressed as mean ± S.E.M (n = 5); ** p < 0.01 compared to control group; and ***p < 0.001 compared to control group.

In present study, aqueous fruit pulp extract of *C. sativus* exhibited a significant laxative activities in the models tested. Castor oil induces diarrhoea due to active ingredient, ricinoleic acid, which is liberated as a resulting action of lipases on castor oil. This stimulates peristaltic activity in the small intestine, leading to changes in the electrolyte permeability of the intestinal mucosa. It also stimulates the release of endogenous prostaglandins.⁹⁻¹⁰ Stimulators of prostaglandin synthesis are known to promote defecation induced with castor oil.¹¹ The observation suggests that the aqueous fruit pulp extract of *C. sativus* may be due to stimulation of prostaglandin synthesis. The extract exhibited also a significant stimulation of the small intestine propulsive movement & the effect was comparable to that of the standard drug, castor oil used in the study. Adverse effects associated with use of castor oil are intestinal blockage, appendicitis, abdominal pain or cramping, nausea, bloating, vomiting, inflamed bowels or fecal impaction¹³ etc. that can be overcome, possibly by replacing it with *C. sativus* for treatment of constipation.

CONCLUSION

The administration of aqueous fruit pulp extract of *C. sativus* to the constipated rats was effective in influencing increased defecation frequency, fecal volume and motility of the colon. These are indications of the laxative property of the plant extract. The presence of glycosides, flavonoids, polyphenols and terpenoids found to be responsible for laxative activities in plants.¹² Phytochemical screening of the extract of *C. sativus* revealed the presence of carbohydrates, proteins, amino acids, steroids, glycosides, flavonoids, tannins and these constituents may be responsible for the laxative activity of *C. sativus*.

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