



## EVALUATION OF ANTI-DIARRHOEAL EFFECT OF CURCUMIN

## Physiology

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## ABSTRACT

Turmeric has been used in traditional medicine as household remedy for various diseases including biliary diseases, cough, hepatic diseases, wound healing and diarrhea etc. Curcumin is the active salt present in turmeric. This study was carried out to provide scientific basis for the use of curcumin in diarrhea and to compare it with standard medicine i.e. Loperamide. The albino rats were divided into five groups of six animals in each group. Group I (control) received vehicular fluid. Group II (positive control) received standard drug for diarrhea i.e. loperamide at the dose of 2mg/kg body weight. Group III, IV and V were administered curcumin intragastrically by the naso-gastric tube, in the dose of 500mg/kg, 750mg/kg and 1 gm/kg body weight respectively, suspended in normal saline. After one hour of above treatment, 1 ml of castor oil was given intragastrically to all the overnight-fasted animals to induce diarrhea. Each animal was housed separately and observed for time of onset and number of diarrheal episode for 4 hours. The data was analyzed by using SPSS 11. Remarkable anti-diarrheal effect of curcumin against castor oil induced diarrhea was observed in dose dependent manner. From the present study, we can draw a conclusion that, Curcumin have significant anti-diarrheal effect. It may be used as an adjuvant for the treatment of diarrhea, and irritable bowel syndrome.

## KEYWORDS

Curcumin, Anti-diarrheal, Diarrhea Albino Rat

## BACKGROUND

India has a rich history of using plants for medicinal purposes. Worldwide interest in natural products as preventive and therapeutic agents has led to a greater appreciation of the rich heritage of traditional system of medicine. Turmeric (*Curcuma longa* L) is a medicinal plant extensively used in Ayurveda, Unani and Siddha medicine as home remedy for various diseases. *Curcuma longa* L, botanically related to ginger family, is perennial plant having a short stem with pyriform rhizomes. Curcumin, the main yellow bioactive component of turmeric has been shown to have a wide spectrum of biological actions. Apart from its daily use in the kitchen as condiment and spice, Turmeric has been used in allergy, cough, fever, biliary disease, liver diseases, wound healing, diarrhoea and inflammatory conditions of joints<sup>[1-9]</sup>. Curcumin is the active salt present in turmeric. However, no scientific work has been reported yet in support of the anti-diarrhoeal activity of Curcumin. Henceforth, this study was carried out to provide scientific basis for the use of curcumin in diarrhea.

## OBJECTIVE

The objective of this study was to evaluate the anti-diarrheal effect of curcumin and to compare it with standard medicine i.e. Loperamide.

## MATERIALS AND METHODS

This study was conducted in Dept. of Physiology of SGT Medical College, Hospital and Research Institute, Gurgaon after getting approval from Institutional Animal Ethics Committee.

## EXPERIMENTAL ANIMALS

Albino rats of wistar strain, weighing 130–170 gm, of either sex, raised under standard laboratory conditions were obtained from Indian Veterinary Research Institute, Izat Nagar, Bareilly, Uttar Pradesh. The animals were housed in polycarbonate cages of size 35 cm × 23 cm × 16 cm. Four rats per cage were kept. The animals were fed cooked food ad libitum with free access to water. All experiments in rats were carried out in accordance with the recommendation of guidelines for care and use of laboratory animals approved by Institutional Animal Ethics Committee

## DRUGS

## CURCUMIN

The *Curcuma longa* commonly known as turmeric, a perennial herb, contain an active component known as Curcumin (diferuloyl

methane), a polyphenol. Curcumin was obtained in the form of capsule containing 500 mg of curcumin from INDSAFF, Batala. The yellow-pigmented fraction of turmeric contains curcuminoids, which are chemically related to its principal ingredient, curcumin. The major curcuminoids present in turmeric are demethoxycurcumin (curcumin II), bisdemethoxy-curcumin (curcumin III), and the recently identified cyclocurcumin. The major components of commercial curcumin are curcumin I (77%), curcumin II (17%), and curcumin III (3%) (12).

## LOPERAMIDE

Loperamide (Imodium) was procured from open market. This medicine is used to decrease frequency of diarrhoea. This drug is a medication used to treatment of a number of diarrhea. This includes diarrhea due to traveler's diarrhea, irritable bowel syndrome etc<sup>[10]</sup>.

## ANTIDIARRHOEL STUDY

The albino rats were divided into five groups of six animals in each group. Group I (control) received vehicular fluid. Group II (positive control) received standard drug for diarrhea i.e. loperamide at the dose of 2mg/kg body weight. Group III, IV and V were administered curcumin intragastrically by the naso-gastric tube, in the dose of 500mg/kg, 750mg/kg and 1 gm/kg body weight respectively, suspended in normal saline.

After one hour of above treatment, 1 ml of castor oil was given intragastrically to all the overnight-fasted animals to induce diarrhea. Each animal was housed separately and observed for time of onset and number of diarrheal episode for 4 hours.

## STATISTICAL ANALYSIS

The data was analyzed by using SPSS 11. The data of number of stools was expressed as mean ± standard error of mean (SEM). One-way ANOVA test was applied followed by Dunnet's multiple comparisons. We compared the results with the control group. P values <0.05 were considered to be statistically significant.

## RESULT

Remarkable anti-diarrheal effect of curcumin against castor oil induced diarrhea was observed in dose dependent manner.

Treatments	Onset of diarrhea (min.)	Total no. of diarrheal episodes
Group I (Normal saline 10 ml)	58 ± 2.89	32 ± 1.86

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<b>Group II (loperamide 2mg/kg)</b>	<b>162 ± 3.10**</b>	<b>3.62 ± 1.10***</b>
<b>Group III (Curcumin 500 mg/Kg)</b>	<b>118 ± 2.68*</b>	<b>18 ± 1.29*</b>
<b>Group IV (750 mg/kg)</b>	<b>130 ± 2.32**</b>	<b>10 ± 1.08**</b>
<b>Group V (1 gm/kg)</b>	<b>144 ± 2.66 **</b>	<b>7 ± 1.89**</b>

N=6 \*P<0.05, \*\*P<0.01, \*\*\*P<0.001 as compared with control group

## DISCUSSION

In the present study curcumin was found to have significant anti-diarrhoeal effect. We in our other study found that curcumin have an inhibitory effect on intestinal motility<sup>[11]</sup>. The decrease in intestinal motility can be related to its calcium antagonist action and inhibition of prostaglandin secretion. Srinivasan found that curcumin have spasmolytic activity<sup>[12]</sup>. Huang et al found that sodium curcumin antagonized the contractions of guinea pig ileum nicotine-induced contraction on isolated guinea pig ileum<sup>[13]</sup>. Makhoulouf found that contraction of all smooth muscles, including those of gastrointestinal tract, absolutely depends on the presence of Ca<sup>2+</sup><sup>[14]</sup>. Agonists-induced contraction may be related to the release of intracellular Ca<sup>2+</sup> from the sarcoplasmic stores in addition to its influx mainly through L-type Ca<sup>2+</sup> channels from extracellular fluid. Smooth muscle contraction can be abolished by antispasmodic drugs through the inhibition of Ca<sup>2+</sup> and its entry or release into the cell. Gilani et al found that crude extract of turmeric relaxed potassium induced contraction in isolated rabbit jejunum. This relaxation was through blockage of Ca<sup>2+</sup> influx<sup>[15]</sup>. Godfraind et al concluded that a substance which can inhibit K<sup>+</sup> induced contraction is considered to be a calcium channel blocker. Thus, inhibition of high K<sup>+</sup> induced contraction of rabbit jejunum by turmeric extract may reflect the restricted Ca<sup>2+</sup> entry via VDCs<sup>[16]</sup>. Gnanasekar N, Perianayagam J.B., demonstrated that sodium salt of curcumin significantly inhibit castor oil induced diarrhea<sup>[17]</sup>. It is well known that castor oil produces diarrhoea due to its most active constituent ricinoleic acid which causes irritation and inflammation of the intestinal mucosa. This leads to release of prostaglandins resulting in stimulation of secretion<sup>[18]</sup>. Curcumin since is known to decrease prostaglandin synthesis<sup>[19]</sup>. Hence It may be quiet possible that anti-diarrhoeal activity of curcumin may be due to inhibition of prostaglandin synthesis and its calcium antagonist effect.

## CONCLUSION

From the present study, we can draw a conclusion that, Curcumin have significant anti-diarrheal effect. It may be used as an adjuvant for the treatment of diarrhea, and irritable bowel syndrome. Further studies will be conducted to find out exact mechanism of its anti-diarrheal effect.

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