

**ANTIDIARROHEAL ACTIVITY OF THE WHOLE PLANT OF
*TINOSPORA CORDIFOLIA***

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ABSTRACT

Tinospora cordifolia (Family *Menispermaceae*) is commonly known as Amrita (Guduchi, Giloya). It is widely used by tribals for the treatment of various infectious diseases. The aim of the present study was to determine the antidiarrheal activity of methanolic extracts of the whole plant of *Tinospora cordifolia*. The castor- oil induced diarrhea model were used for the study. Animals were divided into different groups control, standard, and test group after IAEC approval. Final results of different groups were compared (results of the extract (200 mg/kg, 400 mg/kg) with that of standard drug (Lopramide 3 mg/kg). On the basis of experimental data obtained, it was observed that the whole plant extract at the dose of 200mg/kg and 400mg/kg showed significant antidiarrheal activity and the activity was found to

be maximum at 400mg dose extract. It means that the effect was found to vary in a dose dependent way. The result suggests that the methanolic extract from the whole plant of *Tinospora cordifolia* exhibited significant dose dependant antidiarrheal activity.

KEY WORDS: *Tinospora cordifolia*, Lopramide, Antidiarrheal, Castor- oil.

INTRODUCTION

Tinospora cordifolia is a deciduous climbing shrub indigenous to the tropical Indian subcontinent, belonging to the family Menispermaceae.^[1] It is also known as Guduchi in Sanskrit or Giloy. It is a glabrous climbing shrub, is widely used in folk and Ayurvedic system of medicine in India since ancient times.^[2] The whole plant is used for therapeutic purpose. It is reported that the plant is bitter, but nontoxic and also has the ability to scavenge free radicals. It is a genetically diverse, large, deciduous climbing shrub with greenish yellow typical flowers, found at high altitude.^[3] In racemes or racemose panicles, the male flowers are clustered and female are solitary. The flowering season expands over summers and winters.^[4] A variety of constituents used for drug preparation have been isolated from the plant. They belong to different classes such as alkaloids, diterpenoids lactones, glycosides, steroids, sesquiterpenoids, phenolics, aliphatic compounds, and polysaccharides. The alkaloids tinosporin, tinosporic acid, and tinosporol rich in protein, calcium, and phosphorus have been identified in leaves. Its remarkable and notable medicinal properties such as antidiabetic, antiperiodic, antispasmodic, antimalarial, antiinflammatory, antiarthritic, antioxidant, antiallergic, antistress, antileprotic, hepatoprotective, immunomodulatory, blood purification, and antineoplastic activities are well documented. A variety of active components derived from the plant like alkaloids, steroids, diterpenoid lactones, aliphatics, and glycosides have been isolated from the different parts of the plant body, including root, stem, and whole plant. Recently, the plant is of great interest to researchers across the globe because of its reported medicinal properties like anti-diabetic, anti-periodic, anti-spasmodic, anti-inflammatory, anti-arthritis, anti-oxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immunomodulatory and anti-neoplastic activities.^[5]

MATERIALS AND METHODS

Selection of plant part and authentication

The whole plant parts of *Tinospora cordifolia* (family- Menispermaceae) was collected from NIET college campus and were authenticated by Pusa Institute of Agriculture, New Delhi. The herbarium is preserved in our laboratory for future reference.

Preparation of extract

Soxhlet extraction is only required where the desired compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent. If the desired compound has a high solubility in a solvent then a simple filtration can be used to separate the compound from the

insoluble substance. The advantage of this system is that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled. The powdered whole plant material of *Tinospora cordifolia* was placed in a thimble and extracted with 70% methanol in a Soxhlet apparatus for 70-72 hrs. Solvents were removed in water bath. The residue (extract) of respective plant material was stored at 4°C until used. The extract yield (% w/w) from the plant material was recorded as 13.2%.^[11]

Experimental animals

Wistar albino rats of either sex weighing between 125-250 gm were used for the study. They were obtained from the Central Animal House of NIET, Greater Noida. They were housed in propylene cages at 25± 2 °C with 12 hrs light and 12 hrs dark cycle. All the animals were fed with standard feed and water *ad libitum*. All the animals were maintained under standard laboratory condition. The study protocol was approved by the Institutional Animals Ethics Committee (IACE) (Reg. No. is NIET/IACE/2011/26).

Drugs and doses

Standard drug: Loperamide (3 mg/kg), the drug is dissolved in 10 ml distilled water and the drug is given to the rats according to the body weight.

Normal saline solution: 0.9% w/v, the NaCl is dissolved in 100 ml of distilled water and the saline is given to the rats according to body weight.

Test drug: The extract was made suspension in the distilled water. Two doses of the extract were selected 200mg/kg bodyweight and 400mg/kg bodyweight.

Castor oil: 1ml of castor oil was given to each rat to induce diarrhoea. All the drug, extract, normal saline solution and castor oil were given to the rats by oral route.^[11]

METHODOLOGY

Castor oil induced diarrhea model

Albino rats of either sex (200-250g) were divided into four groups of six animals each. They were fasted for 24 hours prior to the test, but allowed free access to water.

Group 1 Received control: Normal saline (0.9% w/v)

Group 2 Received standard drug (Loperamide 3mg/kg).

Group 3 Received dose of the extract (200mg/kg)

Group 4 Received dose of the extract (400mg/kg)

All doses were administered orally. The animals were then housed singly in cages lined with transparent paper. One hour after pre-treatment with the extract, the animals were challenged with 1 ml of castor oil orally. Stools were collected on nonwetting paper sheets of uniform weight up to 24 hours after administration of the castor oil. Every 15 min during the first 8 h, urine was drained off by gravity, and the net stool weight, termed early diarrhea excretion, was recorded. The diarrhea-free period is defined as the time in minutes between castor oil administration and the occurrence of the first diarrheal output. The acute diarrheal phase is the time between the first and the last diarrhea output of the 8-hour observation period. Stools occurring between 8 and 24 hours after castor oil administration are called late diarrhoeal excretion.^[12]

Statistic analysis

Multiple comparison of mean were carried out by one way analysis of variance (ANOVA), A probability level of less than 5% was considered significant.

RESULT AND DISCUSSION

Effect of methanolic extract of the whole plant extract of *Tinospora cordifolia* on castor oil induced diarrhea



Fig1: A picture of Soxhlet apparatus during an extraction

The effect of the whole plant was studied on control of diarrhoea by castor oil induced diarrhoea model.

Table 1: Effect of methanolic extract of the whole plant of *Tinospora cordifolia* on castor oil induced diarrhea.

Treatment group	Dose (mg/kg)	No of animals	Total weight of defecations (gm)	% inhibition
Control	-	6	2.95±0.15**	-----
Standard (Lopramide)	3	6	0	100
Methanolic extract(Test A)	200	6	1.77±0.01**	40
Methanolic extract (Test B)	400	6	1.22±0.18**	60

** = $p < 0.01$ = Very significant

Table 2: A table between total weight of wet stools and different groups.

No of animal	Groups			
	Control	Standard	Test A	Test B
Animal 1	3.092	0	1.793	1.202
Animal 2	2.965	0	2.18	1.659
Animal 3	3.503	0	1.919	1.403
Animal 4	3.057	0	1.416	1.015
Animal 5	3.158	0	1.458	1.001
Animal 6	1.946	0	1.88	1.074



Fig 2: A picture of Wistar albino rats which is kept in the cages

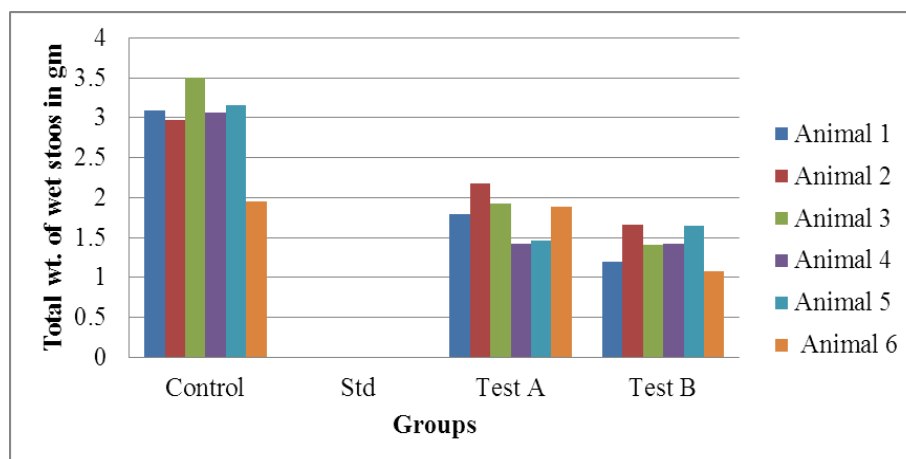


Fig 3: A graph between total weight of wet stools and different groups.

The effect of the plant extract was studied on castor oil induced diarrhoea model. In these test healthy albino rats of either sex (200-250g) were divided into four groups of six animals each. They were fasted for 24h prior to the test, but allowed free access to water.

Group 1 Received control: Normal saline (0.9% w/v)

Group 2 Received standard drug (Lopramide 3mg/kg).

Group 3 Received dose of the extract (200mg/kg)

Group 4 Received dose of the extract (400mg/kg)

All doses were administered orally. The animals were then housed singly in cages lined with transparent paper. One hour after pre-treatment with the extract, the animals were challenged with 1 ml of castor oil orally. Stools were collected on non wetting paper sheets of uniform weight up to 6 h after administration of the castor oil. Every 15min during the first 8 h, urine was drained off by gravity, and the net stool weight, termed early diarrhoeal excretion, was recorded. The diarrhoea-free period is defined as the time in minutes between castor oil administration and the occurrence of the first diarrhoeal output. The acute diarrhoeal phase is the time between the first and the last diarrhoeal output of the 8-h observation period. Stools occurring between 8 and 24 h after castor oil administration are called late diarrhoeal excretion. Multiple comparison of mean were carried out by one way analysis of variance (ANOVA), A probability level of less than 5% was considered significant.

The mean weight of wet stools of control group was found to be high as 2.954 while in standard group it was completely inhibited at a dose of 3mg/kg of standard drug Lopramide. In test group A and B the mean weight of wet stools was found to be 1.77 & 1.22 respectively. P value for all was found to be < 0.01. Thus it was observed that the whole plant extract was having a highly significant antidiarrhoeal effect as evident from the P-value.

From the experimental data obtained from Table 1&2, it was observed that the whole plant extract at the dose of 200mg/kg and 400mg/kg showed significant antidiarrhoeal activity and the activity was found to be maximum at 400mg dose extract. It means that the effect was found to be vary in a dose dependent way.

CONCLUSION

Tinospora cordifolia commonly known as Giloy or Guduchi is a well known plant used in traditional system of Indian medicine. This is widely used in the treatment of dysentery,

leprosy, jaundice, cutaneous rashes and impotency. Therefore, to justify the traditional uses of plant we have scientifically screened the whole plant of *Tinospora cordifolia* for its antidiarrheal and antimicrobial potentiality.

The extract was also found to show potent antidiarrheal activity at a dose of 200 and 400mg/kg body weight. The activity was compared with standard drug loperamide. Palmatine was isolated from *Phellodendron amurense*^[6,7] and it was claimed to have antidiarrhoeal. As the same palmatine was reported to be isolated from *Tinospora cordifolia* as reported.^[8,9] We can claim the antidiarrheal action of same plant may be probably due to palmatine. It was also reported by Saeed^[10] that berberine causes antidiarrhoeal activity. Therefore we can claim that the antidiarrhoeal activity of plant is due to the synergistic effect of berberine and palmatine.

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