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Research Article

ANTIDIARRHOEAL ACTIVITY OF *DICHROSTACHYS CINEREA* (L.) WIGHT & ARN

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ABSTRACT

*Dichrostachys cinerea (*L.) Wight & Arn belongs to Mimosaceae, is commonly known as "Vidathalai' in Tamil. Earlier folklore claims reveals that the plant is used in diarrhoea and dysentery. The whole plant has been used for antidiarrhoeal activity in Indian traditional medicine. So the leaf, stem bark and root of the plant were screened separately for their antidiarrhoeal activity by castor oil induced model and small intestinal transit model. In the present study vaccum dried ethanolic extract of leaf, bark and root of the plant were used at two dose level (200 mg / kg and 400 mg / kg p.o). All the extracts showed significant antidiarrhoeal activity by both the tested models. Hence the present study supports the traditional claim of *Dichrostachys cinerea (*L.) Wight & Arn as an antidiarrhoeal drug in the Indian System of Medicine.

Keywords : *Dichrostachys cinerea*, Antidiarrhoeal activity, Castor oil, Intestinal transit

INTRODUCTION

The people in developing countries are very prone to suffer from diarrhoea, especially children, which eventually lead to malnutrition. The World Health Organization launched a diarrhoeal disease control program in order to eradicate this problem. The programme includes studies on traditional medicinal practices together with the evaluation of health education and prevention approaches[1]. Herbal remedies are preferred for a number of ailments in recent years. Organizations like World Health Organization (WHO) and United Nations Children's Fund (UNICEF) are very much interested in herbs to be used for the treatment of childhood diarrhoea.

It thus becomes important to identify and evaluate commonly available natural drugs as an alternative to currently used antidiarrhoeal drugs, which are not completely free from adverse effects. *Dichrostschys cinerea(L.*) Wight & Arn belonging to the family Mimosaceae is used in Indian traditional medicine as antidiarrhoeal drug. The plant is thorny shrub found almost throughout India. It is commonly distributed in all arid zone of India in dry regions. It is called "viddathalai" in Tamil and "veeratharu" in Ayurveda[2,3]Tender shoots are used in inflammatory condition, diarrhoea, arthritis and as analgesic[4].The plant is used in piles, ,dysentery, leucorrhoea, gonorrhea, eczema and eye diseases[5]. So in the present study the vaccum dried ethanolic extract of leaf (EDCL), stem bark (EDCB), and roots (EDCR) of *Dichrostachys cinerea* were evaluated for their antidiarrhoeal activity by castor oil induced diarrhoea and study on small intestinal transit method.

MATERIALS AND MEHODS

Plant material

The plant, *Dichrostachys cinerea* was collected from Padappai, Tamilnadu, South India and it was authenticated by Dr.P.Jayaraman, Director , Plant Anatomy Research Center, Chennai. A voucher specimen of the plant was deposited at the herbarium in the department of Pharmacognosy for reference.

Preparation of extract

Air dried coarsely powdered leaf, stem bark and root were extracted separately with ethanol 70% v/v by cold maceration for seven days at room temperature. The extract was filtered and distilled at low temperature (55-60ºC) and finally dried using rotary vaccum flash evaporator to yield ethanolic extract of *Dichrostachys cinerea* leaf (EDCL), ethanolic extract of *Dichrostachys cinerea* stembark (EDCB) and ethanolic extract of *Dichrostachys cinerea* root (EDCR). EDCL, EDCB and EDCR were made into fine suspension with 1% w/v aqueous CMC as the suspending agent and used for present pharmacological Study.

Animal selection

For acute toxicity studies, *Wistar albino* mice of either sex weighing between 25-30g were selected and healthy adult male Wistar albino rats weighing between 150-200g were selected for the antidiarrhoeal activity. The animals were acclimatized to standard laboratory conditions (temperature 25±2˚C) and maintained on 12hours light; 12hours dark cycle. They were fed with standard animal feed (Hindustan Lever Limited) and water *ad libitum*. The animal care and experimental protocols were in accordance with Institutional Animal Ethical Committee (IAEC)

Acute toxicity study

The acute oral toxicity study was carried out as per the 423 guideline set by Organisation for Economic Co-operation and Development. The ethanolic extract was administered at the dose level of 2000mg/kg. One tenth of the median lethal dose (LD_{50}) was taken as an effective

Antidiarrhoeal activity

Castor oil induced diarrhoea

The antidiarrhoeal activity of EDCL, EDCB and EDCR were studied by castor oil induced diarrhoea method[6]. The *wistar albino* rats of either sex were divided into eight groups of six each and were treated as per the following regimen.

Group I : 1%w/v CMC vehicle control (10 ml/kg, p.o)

Group II : Loperamide (5 mg/kg, p.o.)

Group III : EDCL (200 mg/kg, p.o)

Group IV : EDCL (400 mg/kg, p.o)

Group V : EDCB (200 mg/kg, p.o)

Group VI : EDCB (400 mg/kg, p.o)

Group VII : EDCR (200 mg/kg, p.o)

Group VIII: EDCR (400 mg/kg, p.o)

Animals in each group received castor oil at dose level of 10ml/kg body weight by oral route after 30 min of drug administration. The animals were placed separately in cages with filter paper, which was changed every hour. All the animals were observed for defaecation upto 4 hrs. The frequency of defaecation and number of diarrhoeal faeces excreted in the recorded time were scored and compared with control group. The results were expressed in percentage of inhibition [7].

Small intestinal transit

The *wistar albino* rats of either sex were divided into eight groups of six animals each and were treated as per the following regimen.

Group I :1%w/v CMC vehicle control (10 ml/kg, p.o)

Group II : Loperamide (5 mg/kg, p.o)

Group III : EDCL (200 mg/kg, p.o)

Group IV : EDCL (400 mg/kg , p.o)

Group V : EDCB (200 mg/kg , p.o)

Group VI : EDCB (400 mg/kg, p.o)

Group VII : EDCR (200 mg/kg ,p.o)

Group VIII: EDCR (400 mg/kg, p.o.)

Half an hour after treatment, individual animals were administered orally with 1ml of charcoal meal (3% deactivated charcoal in 10% aqueous tragacanth). Half an hour after charcoal meal rats were sacrificed and intestinal distance moved by charcoal meal from pylorus to caecum was measured and expressed as percentage of the distance moved [8].

Statistical analysis

The results were statistically analyzed using one-way analysis of variance (ANOVA) followed by Dunnet's "t"test

RESULTS AND DISCUSSION

Castor oil induced model

In the present investigation, anti-diarrhoeal activity was evaluated by castor oil induced diarrhoeal model and small intestinal motility test. It was observed that all the extracts EDCL, EDCB and EDCR at both dose levels significantly reduced number of defaecation and wet faecal matter in comparison to control. All the tested extracts showed dose dependent effect. The percentage inhibition of EDCL, EDCB and EDCR at higher dose level 400 mg/kg was found to be 72.41%, 46.87% and 66.02% respectively. Results were compared with that of standard drug loperamide Table-1.

Table 1: Antidiarrhoeal effect of EDCL, EDCB and EDCR on castor oil induced diarrhoea in rat

Group	Drug and dose	Number of defaecation in 4hrs	Number of wet faeces in 4hrs	Percentage inhibition of wet faeces
I	1%w/v CMC (10 ml/kg) vehicle control	10.83 ± 0.307	7.83 ± 0.401	0
II	Loperamide 5mg/kg	1.66 ± 0.210 **	1.01 ± 0.258**	87.23
III	EDCL 200 mg/kg	6.50 ± 0.223**	5.33 ± 0.21*	31.93
IV	EDCL 400 mg/kg	3.83 ± -0.307**	2.16 ± 0.401**	72.41
V	EDCB 200 mg/kg	7.33 ± 0.333*	5.50 ± 0.562*	29.76
VI	EDCB 400 mg/kg	5.20 ± 0.477**	4.16 ± 0.307**	46.87
VII	EDCR 200 mg/kg	6.01 ± 0.4*	5.16 ± 0.542**	34.09
VIII	EDCR 400 mg/kg	3.0 ± 0.258**	2.66 ± 0.333**	66.02

EDCL- Ethanolic extract of *D. cinerea* leaf; EDCB- Ethanolic extract of *D. cinerea* stembark; EDCR- Ethanolic extract of *D. cinerea* root

Values are expressed as Mean ± SEM, n = 6 each group

** P < 0.01, *P<0.05 compared to vehicle control.

Table 2: Antidiarrhoeal activity Of EDCL, EDCB and EDCR on small intestinal transit Model

Group	Drug and dose	% movement of charcoal meal
I	1% w/v CMC (10 ml/kg vehicle control)	72.0 ± 2.28
II	Loperamide 5mg/kg	13.1 ± 0.716**
III	EDCL 200 mg/kg	43 4 ± 3.83**
IV	EDCL 400 mg/kg	21.1 ± 1.88**
V	EDCB 200 mg/kg	43.9 ± 7.08**
VI	EDCB 400 mg/kg	22.0 ± 3.58**
VII	EDCR 200 mg/kg	54.2 ± 4.79*
VIII	EDCR 400 mg /kg	23.1 ± 2.38**

EDCL- Ethanolic extract of *D. cinerea* leaf; EDCB- Ethanolic extract of *D. cinerea* stembark; EDCR- Ethanolic extract of *D. cinerea* root.

Values are expressed as mean ± SEM, n = 6 in each group

** P < 0.01, * P< 0.05 compared to vehicle control

Small intestinal transit model

All the test extracts EDCL, EDCB and EDCR and standard Loperamide (5 mg/kg) significantly decreased the movement of the charcoal meal through the gastro intestinal transit when compared with the vehicle control. Though all extracts significantly reduced the percentage movement of charcoal meal, it was found to be more with EDCL at 400mg/kg. The results of present study also showed that activity is dose related. The results are shown in Table-2.

Earlier literature review shows that the plant *D.cinerea* has traditional claims against diarrhoea and used as astringent.[9,10] Hence in the present study EDCL, EDCB and EDCR were screened for antidiarrhoeal activity by castor oil induced method and small intestinal transit model. The anionic surfactant castor oil executes diarrhoeal action through its metabolite ricinoleate. It is stool wetting and softening agent altering the intestinal permeability by increasing the water and electrolyte secretion[11]. Its secretion is also associated with stimulation of release of endogenous prostaglandin. The castor oil model therefore incorporates both secretary and motility diarrhoea.

The EDCL, EDCB and EDCR at the dose of 200 mg/kg and 400 mg/kg exhibited significant anti-diarrhoeal activity against castor oil induced diarrhoea and reduction of intestinal transit. As leaf, stembark and root of the plant *D.cinerea* showed the presence of tannins, which by forming protein tannate cause an astringent action and may result in anti-diarrhoeal activity.

Earlier studies reported that the root, leaf and stembark of the plant exhibited significant anti-bacterial activity.[12, 13] This may also be responsible for the antidiarrhoeal activity.However the anti-

diarrhoeal activity and reduction of small intestinal transit was significant with all the tested extracts. When we carried out quanlitative chemical test we found that tannin was present which may be responsible for its activity.

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