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Anti-inflammatory and analgesic activity of *Capparis zeylanica* Linn.

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ABSTRACT

The present work was undertaken to explore the analgesic and anti-inflammatory activity of *Capparis zeylanica* Linn. (Capparidaceae) methanolic extract of whole plant. Analgesic activity was performed by using hot plate and tail immersion methods. Anti-inflammatory effect was analyzed by carrageenan induced paw edema method. A dose of 250 mg/kg and 500 mg/kg *C. zeylanica* methanolic extract showed significant Analgesic effects {(Hot plate, 7.57±1.17), (Tail immersion, 5.55±0.66)} and {(Hot plate, 7.97±1.33), (Tail immersion, 6.50±1.17)} respectively. Anti-inflammatory effect of 500 mg/kg methanolic extract showed higher percentage of inhibition (21.42%) at 180 min in comparison to 250 mg/kg (18.5%) followed by standard Diclofenac sodium (22.28%).

KEYWORDS

Capparis zeylanica;
Analgesic;
Anti-inflammatory;
Hot plate;
Tail immersion.

INTRODUCTION

Geographically our country is situated in the tropical zone and on account of her size, India is the home of the variety of environments, from high snow capped mountains to tropical range forest from hot-cold desert to lush and fertile plains and valleys, so also the mangroves and seashores. This environmental difference has promoted a great variety of various habitats for India's rich source of flora and fauna.

Capparis zeylanica Linn. (Capparidaceae) is commonly known as Indian caper, is a climbing shrub found throughout India and has been used as a 'Rasayana' drug in the traditional Ayurvedic system of medicine. 'Rasayana' plants are particularly recommended for the treatment of immune disorders (Wagner). In Northern India, the leaves are widely used as counter-irritant, febrifuge and as a cataplasm in swellings, boils and piles[1-3]. The various species of genus *Capparis* are useful in the treatment of cough, asthma, inflammation, fevers, cholera and also useful as poultice in gout and rheumatism[4-6].

This work was aimed to evaluate analgesic and anti-inflammatory activity of *Capparis zeylanica* Linn., whole plant methanolic extract.

MATERIAL AND METHODS

Plant collection

The plant was collected from the local area of Barpali (Dist-Bargarh, Orissa) between the months of Oct-Nov. The plant was authenticated by Botanical Survey of India, Howrah, Kolkata (ref letter no. CNH/I-I (5)/2009/ Tech.II/35).

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Extraction of the plant material and sample preparation

The dried and ground plant material (2 kg) was macerated with solvent methanol (5 liters), at room temperature for 3 days. Then the extract was filtered and concentrated with a rotary evaporator and was subsequently defatted (Ahmed *et al*., 1991) to get the dried extract. The extracts were suspended in solution of 2% gum acacia.[14]

Drugs and chemicals

All the Chemicals & Reagents used were research grade and purchased from Merck, Himedia, Lobachemie, Qualinems.

Experimental animal

Adult male and female wistar albino rats were used for the study. Animals were maintained under standard condition and had free access to feed and water *ad libitium*. Before the study, animals were fasted for at least 12 hours.

EVALUATION OF ANALGESIC ACTIVITY OF *CAPPARIS ZEYLANICA*

Hot plate method: Central analgesic activity was evaluated using hot plate method. The animals were habituated twice to hot plate in advance. For testing, the rats were placed individually on the hot plate maintained at 55 ± 1^0 C. The time that elapsed until the occurrence of either a hind paw licking or jump-off the surface was recorded as the basal reaction time. The rats of either sex were divided in to four groups of 4 rats each. Group-I served as control and received only vehicle 2% gum acacia (2 ml/kg) in normal saline. Group-II received Pentazocin (30 mg/kg) Group-III and Group-IV received the extract in 2% gum acacia in normal saline intra-peritoneal at a dose of 250 mg/kg and 500 mg/kg methanolic extract of *C. zeylanica* respectively. The experiment was terminated 20 sec after their placement on the hot plate to avoid damage to the paws. The readings were taken at 0, 30, 60 & 90 min after administration of extract, control & standard.

Tail immersion method: Prior to the analgesic experiments, the animals were screened for the sensitivity test by immersing the tail of the mice gently in hot water maintained at 55^0C-55.5^0 C. The animals that lifted the tail from the hot water with in 5 second were selected for the study. The selected rats were then divided in to four groups of 4 rats each. Group-III and Group-IV received the extract in 2% gum acacia in normal saline intra-peritoneal at a dose of 250 mg/kg and 500 mg/kg respectively. Group-II received Pentazocin (30 mg/kg) and group-I received 2% gum acacia (2 ml/kg) in normal saline in similar manner. After administration of the test drugs, the reaction time was measured at 0, 30, 60& 90 minutes.[7-10]

EVALUATION OF ANTI-INFLAMMATORY ACTIVITY OF *CAPPARIS ZEYLANICA*

Carrageenan induced rat paw edema: The anti-inflammatory properties were investigated by using the carrageenan induced paw edema method. The rats were divided in to 4 groups, each group consist of 4 animals. Gum acacia (2%) was used as a vehicle for suspending the extracts as well as standard anti-inflammatory drug Diclofenac sodium. The group-I served as control and received only vehicle (2 % gum acacia in normal saline), the group-II received standard drug Diclofenac sodium (100 mg/kg I.P.). Group-III and group- IV were treated with methanolic extract of *Capparis zeylanica* orally at the dose of 250 mg/kg and 500 mg/kg I.P. respectively. After 30 min of sample treatment, acute inflammation was produced by sub planar injection of 0.1 ml of 1% carrageenan in normal saline in the right hind paw of rat. Paw edema and was measured by wrapping a piece of cotton thread round the paw and measuring the circumference with a meter role. The measurement was done at 0 min, 15 min, 30 min, 60 min, 120 min &180 min after carrageenan injection. The inhibition activity was calculated according to the following formula[11-13].

$$\text{Percentage inhibition} = \frac{(C_{t-}C_0)\,\text{control} - (C_{t-}C_0)\,\text{treatment}}{(C_{t-}C_0)\,\text{control}} \times 100$$

STATISTICAL ANALYSIS

All experimental data are expressed as mean ± SEM. Statistical analysis were carried out by using one way ANOVA. The level of significance was calculated

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by Dunett's t-test using Graph Pad Prism version 3.00 for windows. Graph Pad Software, San Diego California USA. The values at P< 0.05 were considered as significant.

RESULTS

The finding showed basal reaction time of hot plate analgesic activity, 250 mg/kg & 500 mg/kg found significant increase as compared to control group and followed by standard Pentazocin. The basal reaction time of 250 mg/kg (7.57±1.17) was found nearer to standard drug (11.27±0.51) at 90 min. of drug administration, while test 500 mg/kg basal reaction time was found 7.97±0.42. The data showed 500 mg/kg reduce pain similar to 250 mg/kg dose (TABLE 1).

TABLE 1 : Hot plate method results of methanolic extract of *C. zeylanica*

Minutes	CONTROL (2% gum acacia 2 ml/kg)	STANDARD (Pentazocin 30 mg/kg)	TD-1 250mg/kg	TD-2 500mg/kg
30	2.47±0.55*	7.42±0.39*	7.12±1.72*	6.97±1.93*
60	3.77±0.46	8.80±0.39**	6.99±1.36*	7.92±0.42*
90	3.87 ±0.54	11.27±0.51**	7.57±1.17*	7.97±1.33*

Each value represents the mean ± S.E.M., n = 4, **P<0.01, *P<0.05 compared with control, Dunnett's t-test after analysis of variance.

The results of basal reaction time of tail immersion analgesic activity, 250 mg/kg & 500 mg/kg found significant increases as compared to control group. The basal reaction time of 500 mg/kg (6.50±1.17) was found higher than 250 mg/kg (5.55±0.66). (TABLE 2)

TABLE 2 : Tail immersion method results of methanolic extract of *C. zeylanica*

Minutes	CONTROL (2% gum acacia 2ml/kg)	STANDARD (Pentazocin 30 mg/kg)	TD-1 250mg/kg	TD-2 500mg/kg
30	2.42±0.51	4.58±0.72*	3.42±0.12	4.67±0.60*
60	3.02±0.48	8.05±0.15**	4.15±0.48	6.32±1.25*
90	3.00±0.50	11.30±0.52**	5.55±0.66	6.50±1.17*

Each value represents the mean ± S.E.M., n = 4, **P<0.01, *P<0.05 compared with control, Dunnett's t-test after analysis of variance.

In gum acacia treated rats (control group) carrageenan induced a progressive swelling of the rat paw that reached a maximum (3.50±0.09) in 120 and 180 minutes (TABLE 3). The extract (250-500 mg/kg) produced a dose dependent inhibition of edema development, the effect increasing over the 180 min time period (TABLE 3).

TABLE 3 : Anti-inflammatory result of methanolic extract of *C. zeylanica*

Minutes	CONTROL (2%gum acacia) 2 ml/kg	STANDARD (Diclofenac sodium) 100 mg/kg	TD-1 250mg/kg	TD-2 500mg/kg
15	3.15±0.06	3.05±0.04** [10.81 %]	3.12±0.08 [0.95 %]	3.05±0.01* [2.76 %]
30	3.37±0.17	2.77± 0.47* [12.06 %]	3.30± 0.12 [2.07 %]	3.27±0.08 [2.96 %]
60	3.42±0.90	2.82±0.11* [16.32 %]	3.20± 0.04 [6.43 %]	3.12±0.07* [8.77 %]
120	3.50±0.09	2.92± 0.06** [16.57 %]	3.25±0.11 [7.14 %]	3.12±0.07* [10.85 %]
180	3.50±0.09	2.72±0.07** [22.28 %]	2.85± 0.06** [18.5 %]	2.75± 0.06** [21.42 %]

Each value represents the mean ± S.E.M., n = 4, **P<0.01, *P<0.05 compared with control, Dunnett's t-test after analysis of variance.

The higher effect on the methanolic extract was observed at the dose of 500 mg/kg. At this dose level peak inhibitory effect (21.28%) was elicited at 180 min after the injection of carrageenan, as compared to Diclofenac sodium (22.42%) and 250 mg/kg dose (18.5%). At the 120 min mark, where swelling reached a peak, measurement of paw edema in respect of the extract at dose of 250, 500 mg/kg were 3.25 ±0.11 and 3.12 ± 0.07cm (vs. 3.50 ±0.09 for control) corresponding to 7.14 % and 10.85 % inhibition respectively.

DISCUSSIONS

The analgesic activity of *Capparis zeylanica* is due to the suppressing the formation of pain substances in the peripheral tissues, where sterols and triterpenes in methanolic extracts might suppress the formation of prostaglandins. Some sterols and flavonoids are known to inhibit prostaglandin synthesis. Since prostaglandins are involved in pain perception and are inhibit by flavonoids or sterols, it could suggest that reduced availability of prostaglandin by flavonoids or sterols might be responsible for its analgesic activity[1,7,8].

Results obtained in this study suggest that methanolic extract of *C. zeylanica* possess significant anti-inflam-

matory activity. Carrageenan oedema consists of three distinct phases; an initial release of histamine and 5-HT, a second phase mediated by kinins and finally a third phase, the mediator of which is suspected to be prostaglandin. Pretreatment of rats with the extract inhibited carrageenan induced paw odema. It indicates that the extract effectively block the release of histamine and 5-HT. These findings suggest a possible inhibition of cyclooxygenase synthesis with an effect on histamine and 5-HT release. As phytochemical analysis showed presence of flavonoid, saponin and glycoside they might suppress the release of histamine and 5-HT and act as anti-inflammatory agent[8-13].

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