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EVALUATION OF ANTI-INFLAMMATORY ACTIVITY OF SEA GREEN ALGAE OF *CHAETOMORPHA ANTENNINA*

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ABSTRACT

The objective of this study was to evaluate the anti-inflammatory activity of methanolic extract of *Chaetomorpha antennina. Chaetomorpha antennina* is green algal species found in the sea. The anti-inflammatory activity was evaluated by using carrageenan induced hind paw edema model. The methanolic extract of *Chaetomorpha antennina* at the doses of 50, 100 and 200 mg/kg b.w., produced dose dependent significant reduction ($p<0.05–0.001$) in carrageenan-induced rat maximal paw edema by 62.21 ± 1.65, 67.23 ± 0.57, 69.96 ± 0.74 compare to the standard drug Diclofenac sodium at dose 50mg/kg reduced edema by 72.41 ± 1.49 respectively and the total (AUC) paw edema by 65.18± 1.01, 69.42 ± 2.93 and 72.82 ± 2.15 compare to Diclofenac sodium at dose 50mg/kg reduced total (AUC) paw edema by 75.35 ± 2.87 respectively. The results suggested that the *Chaetomorpha antennina* possessing *in vivo* anti-inflammatory activity.

Key words: *Chaetomorpha antennina*, carrageenan, anti-inflammatory activity, Diclofenac sodium.

INTRODUCTION

Seaweeds are of rich nutritive value as they contain high levels of vitamins and carotenoids. Marine algae are rich in polyphenols which constitute an extremely heterogenous group of molecules providing a wide range of potential biological activity.[1] The occurrence of organic compounds from marine organisms that have been reported to possess antiviral activities. Metabolites from microorganisms is a rapidly growing field due atleast in part to the suspicion that a number of metabolite obtained from algae and invertebrates may be

produced by associated microbes. Studies are concerned with bacteria and fungi isolated from seawater, sediments, algae, fish and mainly from invertebrates such as sponges, molluscs, tunicates, coelenterates and crustaceans. Several researchers have made attempts to identify organisms producing bioactive substances and met with success.[2,3]

There are reports that seaweeds are also rich source of antioxidant compounds.[4,5] Many marine natural products that contain antioxidants are known to have anti-inflammatory effects.[6-8] *Chaetomorpha antennina* scientifically has been reported for antibacterial activity[9,10] and Radical scavenging activity.[11] The present study aimed to investigate the anti-inflammatory activity of *chaetomorpha antennina* using in vivo experimental model.

MATERIALS AND METHODS

Algae collection:

C. antennina were collected in coastal areas of Visakhapatnam, Andhra Pradesh. They are soaked in tap water for an hour and rinsed with sterile water to remove any unwanted animal debris and sand particles. Shade dried for 15days and cut into small pieces and made into powder. Crude extract were prepared by methanol using soxhlet extraction for 6hours and it was concentrated under reduced pressure by using rotary vacuum evaporator and finally dried in a desicator.

Animal

Adult albino wistar male rats weighing between 175-200 g were used for the study (supplied by B.N.Gosh and Co., Calcutta). The experimental protocol has been approved by the Institutional Animal Ethics Committee and by the Animal Regulatory Body of the Government (Reg.No:516/01/a/CPCSEA).

Acute toxicity studies

For toxicity studies, the partial purified extract of *C. antennina* was suspended in saline containing 1% propylene glycol administered single oral dose (1000mg/kg) to five groups of ten rats. Animals were observed individually at least once during the first 30min after dosing, periodically during the first 24hrs (with special attention during the first 4hr) and daily thereafter for a period of 14 days. Once daily cage side observations included changes in skin and fur, eyes and mucous membrane (nasal) and also respiratory rate, circulatory (heart rate and blood pressure), autonomic (salivation, lacrimation, perspiration, piloerection, urinary

incontinence, and defecation) and central nervous system (ptosis, drowsiness, gait, tremors and convulsion) changes. Mortality, if any, was determined over a period of 2 weeks.[12]

Anti-inflammatory activity

The rats were divided into five groups (each contains 6) as follows: Group -I received drug vehicle 1% sodium CMC. Group –II received standard drug Diclofenac at the dose of 50 mg/kg. Group- III, IV and V received methanolic extract of *C. antennina* at the doses of 50, 100 and 200 mg/kg respectively. Two hours after these administrations, each rat received in its right hind paw sub plantar injection of 0.1 mL of saline and 0.1 mL of 1% carrageenan suspension to the left hind paw. The paw thickness of each rat paws was measured by using Zeitlin's apparatus[13] before and at 1, 2, 3, 4, 5 and 6 hrs after carrageenan injection. Paw thickness was measured by subtracting the initial thickness from the obtained value at every hour after carrageenan injection.

The percentage inhibition of paw oedema was calculated by using formula-

% Increase in paw thickness = (Yt-Y0/Y0) x 100 …(1)

Yt = Paw thickness at time t (1, 2, 3, 4, 5 and 6 hr) after injection and

Y0 = Paw thickness at 0 hr (before injection)

Data were expressed in terms of mean values ± S. E. M.

Statistical analysis

All values were expressed as mean ± S. E. M. The differences were compared using one way analysis of variable (ANOVA) followed by Dunnett's t-test and un-paired students t-tests. P-values (*p< 0.05, **p<0.01, ***p<0.001) were considered to be significant.[14]

RESULTS AND DISCUSSION

Acute toxicity study

In LD50 studies, it was found that the animals were safe up to a maximum dose of 1000 mg/kg body weight. There were no changes in normal behavior pattern with any signs and symptoms of toxicity and mortality were observed. The biological evaluation was carried out at doses of 50, 100 and 200 mg/kg body weight.

C.antennina methanol extracts produced significant reduction in paw thickness at all the treated doses (50, 100 and 200 mg/kg) which are comparable with that of standard drug Diclofenac (50 mg/kg). The effect produced by the extracts is dose dependent. The results were given in Table-1 and Figure-1.

Table 1: Percentage inhibition of carrageenan induced paw oedema in rats by treatment with the methanol extract of *C.antennina*.

Treatment	Percentage inhibition of the maximal paw oedema during 6hrs.	Percentage inhibition of total AUC paw oedema during 6hrs.
Group I	0.0 ± 2.14	0.0 ± 3.25
Group II	72.41 ± 1.49***	75.35 ± 2.87 ***
Group III	62.21 ± 1.65***	65.18± 1.01***
Group IV	67.23 ± 0.57***	69.42 ± 2.93***
Group V	69.96 ± 0.74***	72.82 ± 2.15***

Data represent mean±S.E.M. (standard error mean*) (n = 6). *p < 0.05; **p< 0.01; ***p < 0.001*.

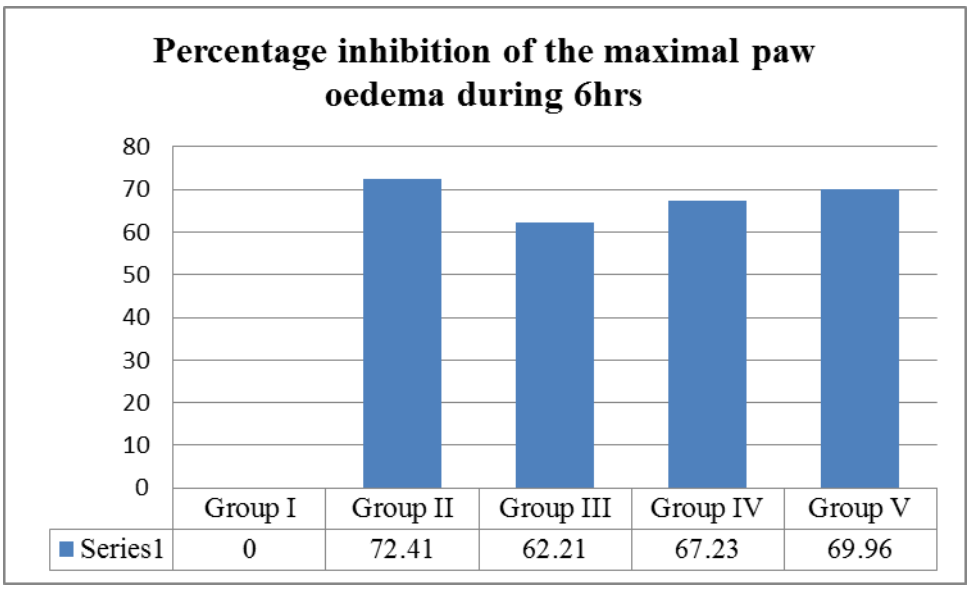

Figure 1: Percentage inhibition of carrageenan induced paw oedema in rats by treatment with the methanol extract of *C.antennina*.

There was significant and dose dependent anti-inflammatory activity of methanol extracts in the acute Carrageenan-induced rat paw oedema model. Orally administered doses of 50, 100 and 200 mg/kg of methanol (62.21 ± 1.65, 67.23 ± 0.57, 69.96 ± 0.74) extracts of *C.antennina* produced significant reduction in paw oedema, as compared to diclofenac (standard) (72.41 ± 1.49) 50 mg/kg. methanolic extracts produced significant reduction of paw oedema at 200 mg/kg p. o. Carrageenan, when injected locally into the rat paw, produced a severe inflammatory action, which was discernible within 30 min.[15] The development of oedema induced by carrageenan corresponds to the events in the acute phase of inflammation, mediated by histamine, prostaglandins and bradykinins produced under an effect of cycloxygenase.[16]

The anti-inflammatory effect is demonstrated by its inhibitory effect of Carrageenan induced paw edema. Subcutaneous injection of carrageenan into the rat paw produces plasma extravasation and the inflammation is characterized by increased tissue water and plasma metabolism of arachidonic acid by both cyclooxygenase and lipoxygenase enzyme pathway.[17] There are biphasic effects in carrageenan induced edema. The first phase begins immediately after injection and diminishes in 1 hour and the second phase begins after 1 hour. It is suggested that the early hyperemia of carrageenan induced edema results from the release of histamine and serotonin.[18] On the other hand, the delayed phase of carrageenan induced edema results mainly from the potentiating effect of prostoglandins on mediator release, especially of bradykinin.

CONCLUSION

The present study revealed that the algae *C.antennina* possesses a significant anti-inflammatory activity in carrageenan induced inflammation. Further studies are needed to isolate the active constituents, elucidate structure and mechanism of action of the isolated compounds.

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