

Evaluation of Antiinflammatory Activity of Whole Plant of *Caralluma umbellata* Haw. (Apocynaceae) In Albino Rats

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Abstract: Vascular tissues respond as an inflammation to adverse stimuli like pathogens, bruised cells or an irritant. An inflammation manifests itself as redness, swollen joints, pain at joints, stiff joints and impaired joints. Currently inflammation is treated by NSAIDs. However, drugs used to treat inflammation can potentially lead to enhanced risks of blood clotting which in turn can end up fatal heart attacks or strokes. This scenario has hence necessitated a search for alternate drugs derived from medicinal plants. Their chemical diversity also make them rich and possible sources of drugs without accompanying adverse side effect. Therefore a study in this direction will be both rewarding and unfulfilling. The objective of this study was to evaluate the antiinflammatory activity from the ethanol extract of whole plant of *Caralluma umbellata* in carrageenan induced paw edema in Wistar Albino rats. This study was compared to a positive control drug, indomethacin. The ethanol extract was given in a concentration of 200 and 400 mg/kg body weight. Ethanol extract of *C. umbellata* whole plant with a concentration of 400 mg/kg b.w. showed maximum (85.44%) inhibition on carrageenan induced rat paw edema at 3rd hour. The effect was significantly ($p < 0.001$) higher than that of the standard drug indomethacin (84.78%). From the result, it can be concluded that the antiinflammatory activity of *C.umbellata* ethanol extract of whole plant may be due to the presence of secondary metabolites in the extract.

Keywords: antiinflammatory, *C. umbellata*, carrageenan, paw edema, indomethacin.

INTRODUCTION

Inflammation is a composite biological response in which vascular tissues responds to dangerous stimuli such as irritations, pathogens and damaged cells [1]. Inflammation or phlogosis is a pathophysiological retort of living tissues to injuries that directs to the local accumulation of plasmatic fluid and blood cells, which involves a compound sequence of biochemical events closely associated to the pathogenesis of various diseases such as rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, acute gout, migraine [2]. Inflammation is a response due to a damage repair process through mediators where the injurious stimuli are removed and the healing process gets initiated. Despite the growth of medical science, the antiinflammatory drugs existing are a cause of concern due to their moderate to severe side effects such as gastric lesions caused by non-steroidal antiinflammatory drugs (NSAID), tolerance and dependence induced by opiates [3]. Many herbal preparations are being prescribed widely for the treatment of inflammatory conditions [4]. Inflammatory diseases are becoming common in aging society throughout the world. Recent studies specify that the

mediators and cellular effectors of inflammation are essential constituents of the local environment of tumours [5]. Various herbal medicines derived from plant extracts are being used in the treatment of a wide variety of clinical diseases, though relatively little knowledge about their mechanisms of action is known [6]. Natural products in general and medicinal plants in particular, are believed to be an important source of new chemical substances with potential therapeutic efficacy [7].

Medicinal plants have constantly been screened for various pharmacological activities. This is due to the fact that medicinal plants contain biologically active compounds with less unwanted effects [8]. They offer an alternative source for primary health care particularly in rural communities. Several plants have shown potential for antiinflammatory activities. Thus medicinal plants contain a wide variety of chemicals that can present a source for the discovery of novel antiinflammatory agents.

The Genus *Caralluma* was called as 'cactus plant' belongs to the family Apocynaceae. It is a

succulent, perennial herb, grow to a height of 1 to 10 ft and grow in different regions of India. The species of *Caralluma* originate in India are edible and form a part of traditional medicinal system of country [9]. *Caralluma* sp. include many bioactive principles, particularly glycosides. The glycosides from *Caralluma* fit in to pregnane group, these pregnane glycosides and other phytoconstituents have been accounted for various biological activities viz., inflammation, rheumatism, diabetes, leprosy, antipyretic, anti helminthetic activities [10]. *C. umbellata* has dominant medicinal properties found in Southern India and is used for indigestion and kidney stone [11,12]. The current investigation was therefore aimed at evaluating the *in vivo* antiinflammatory potentials of whole plant of ethanol extract of *C.umbellata*. The plant was screened for phytochemicals and the degree of inhibition of paw-edema in carrageenan-induced inflammation in wistar Albino rats was investigated.

MATERIALS AND METHODS

Plant material

The whole plant of *Caralluma umbellata* Haw. was freshly collected from Parvathipuram, Kanyakumari District, Tamil Nadu. The plant specimen was identified and authenticated in Botanical Survey of India, Southern Circle, Coimbatore, and Tamil Nadu. A confirm specimen was left in Ethnopharmacology division, Research Department of Botany, V.O. Chidambaram College, Tuticorin, Tamil Nadu.

Preparation of plant extract for anti inflammatory activity

The whole plant of *C. umbellata* was shade dried and broken up to powder in a Wiley mill. Hundred grams of whole plant powder was bundled in a Soxhlet apparatus and extracted with ethanol. The ethanol extract was pondered in a rotary evaporator. The concentrated ethanol extract was utilized for preliminary phytochemical screening and anti inflammatory doings.

Animals

Adult Wistar albino rats of either sex (150-200g) were used for the present investigation. Animals were housed under standard environmental conditions at temperature (25±20C) and light and dark (12:12 h). Rats were fed with standard pellet diet (Goldmohur brand, MS Hindustan lever Ltd., Mumbai, India) and water *ad libitum*. The study was carried out as per IAEC approval no. 1012/ C06/ CPSEA- Corres- 2008-2009.

Acute toxicity study

Acute oral toxicity was executed by following OECD-423 guidelines (acute toxic class method), albino rats (n=6) of either sex selected by random sampling were utilized for acute toxicity study. The animals were kept fasting for overnight and provided

only with water, after which the extracts were administrated orally at 5mg/kg body weight by gastric intubations and observed for 14 days. If mortality was observed in two out of three animals, then the dose administrated was assigned as toxic dose. If mortality was observed in one animal, then the same dose repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for higher doses such as 50,100 upto 2000 mg/kg body weight.

Antiinflammatory activity of carrageenan induced hind paw edema

Albino rats of both sexes weighing 150-200 grams were splited into four groups of five animals each. The quantity of the drugs directed to the different groups as follows. Group I - Control (normal saline), Group II - ethanol extract of *C. umbellata* (200 mg/kg, p.o.); Group III - ethanol extract of *C. umbellata* (400 mg/kg, p.o.); and Group IV- Indomethacin (10 mg/kg, p.o). All the drugs were administered orally. Indomethacin provided as the reference standard anti inflammatory drug.

After one hour of the organization of the drugs, 0.1 ml of 1% W/V carrageenan solution in normal saline was introduced into the sub plant as tissue of the left hind hand of the rat and the right hind hand was served as the control. The paw volume of the rats were measured in the digital plethysmograph (Ugo basile, Italy), at the end of 0 min, 60min, 120min and 180min. The percentage increase in paw edema volume of the treated groups was compared with that of the control and the inhibitory effect of the drugs was studied. The relative potency of the drugs under investigation was calculated based upon the percentage inhibition of the inflammation. Percentage inhibition was calculated using the formula;

$$\text{Percentage inhibition} = [(V_c - V_t) / V_c] \times 100$$

Where, V_t the percentage represents the percentage difference in increased paw volume after the administration of test drugs to the rats and V_c represents difference of increased volume in the control groups.

Statistical Analysis

The data were analyzed using student's t-test statistical methods. For the statistical tests p values less than 0.001, 0.01 and 0.05 were taken as significant.

RESULT

The phytochemical screening of ethanol extract of whole plant of *C. umbellata* revealed the presence of glycoside, sterol, coumarin, flavonoid, phenol, protein, carbohydrate, catachin and terpenoid. Acute toxicity study revealed the non-toxic nature of the ethanol extract of whole plant of *C. umbellata*.

In the present study, the anti-inflammatory activity of ethanolic extract of whole plant of *C. umbellata* was evaluated by carrageenan induced paw edema volume method. Table 1 shows the anti-inflammatory activity of ethanol extracts of whole plant

of *C. umbellata* significantly inhibited the rat paw edema at 3rd hour post carrageenan tested at 200 mg/kg b.wt. and 400 mg/kg b.wt dose level as compared with that of the standard drug, indomethacin.

Table-1: Effect of *C. umbellata* extract on the Percentage inhibition of Carrageenan induced paw edema

Treatment Groups	Dose mg/kg	Edema volume volume (ml)				% Inhibition after 180 min
		0 min	60 min	120 min	180 min	
CONTROL (Group-I)	Normal saline	26.73±1.27	69.31±1.24	106.84±1.54	141.54±2.68	–
Group-II	200 mg/kg	29.94±1.65	50.65±1.87*	28.96±1.54***	23.16±1.08***	83.63
Group-III	400 mg/kg	30.16±1.18	42.54±1.19**	25.81±1.62***	20.89±1.13***	85.24
Indomethacin (Group-IV)	10 mg/kg	28.54±1.46	43.18±1.27**	27.16±1.31***	21.54±1.84***	84.78

Each Value is SEM ± 5 individual observations * $P < 0.05$; ** $P < 0.01$ *** $P < 0.001$, Compared paw edema volume induced control Vs drug treated rats

This result indicated that the ethanol extract of *C. umbellata* at the dose of 400 mg/kg b.wt. Showed a maximum anti-inflammatory activity at 3rd hour post carrageenan (85.24%) as compared to the standard drug. The ethanol extract of whole plant of *C. umbellata* at dose of 200mg/kgb.wt. significantly inhibited the rat paw edema at 3rd hour post carrageenan was 83.63%.

DISCUSSION

Carrageenan-induced inflammation is a sensitive test and is widely used as a model for the evaluation of anti-inflammatory activity of drugs. Carrageenan-induced edema is a biphasic event, with early hyperemia due to the release of histamine and serotonin and the delayed edema due to the release of bradykinin and prostaglandin. The major constituents of inflammation are the edema formation, leukocyte infiltration and granuloma formation [13]. Formation of edema in the paw is the result of a synergism between various inflammatory mediators that increase vascular permeability or the mediators that increase blood flow and expansion of edema induced by carrageenan is commonly correlated with the early exudative stage of inflammation [14,15]. It has been reported that the second phase of edema is sensitive to both clinically useful steroidal and non-steroidal anti-inflammatory agent [16,17]. Dale and Foneman [18] reported that the steroidal anti-inflammatory drugs reduce the vasodilation which occurs during inflammation. The non-steroidal anti-inflammatory drugs block prostaglandin and thromboxane formation by inhibiting cyclooxygenase activity.

According to Dassoler *et al.* [19] the inflammatory mediators such as cytokinin, histamine, serotonin, leukotrienes and prostaglandin increase the vascular permeability to all on the migration leukocytes cells to act on the site of inflamed tissue. Any

interruption of this sequence of events results in the reduction of the liberation of the mediators causing the microcirculation to come back to normal hemodynamic state. The extract exhibited the paw edema in last phase of inflammation and it may be attributed to the inhibition of the release of pro-inflammatory mediators like prostaglandins. The test model basically reflects the action of prostaglandins involved in the inflammation process induced by carrageenan [20]. Most of the Apocyanaceae members have anti-inflammatory potential. The ethyl alcohol extract of *Wrightia tinctoria* (Apocyanaceae) showed 70% protection of HBRC in hypotonic solution [21]. The ethanolic extract of seeds of *Holarra pubescens* showed significant activity against inflammation [22]. The present study clearly indicates that the ethanol extracts of whole plant of *C. umbellata* possessed potent anti-inflammatory properties. This study gives an idea that the compound of plant *C. umbellata* can be used as a lead compound for designing a potent anti-inflammatory drug which can be used to cure inflammation.

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