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Evaluation of anti-inflammatory activity in ethanolic extract of *Coriandrum sativum L.* using carrageenan induced paw oedema in albino rats

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ABSTRACT

The present study investigates the anti-inflammatory activity in ethanolic extract of Coriandrum sativum. L using carrageenan induced paw edema in albino rats. The medicinal values of the Coriandrum sativum. L has been mentioned ancient literature as useful in disorders of inflammation. Dried leaves of Coriandrum sativum. L powdered and extracted with ethanol using shaker. The anti-inflammatory was done by carrageenan induced hind paw edema method using plethysmometer. Indomethacin used as a standard drug. For this activity test groups received Control, Standard Indomethacin (40mg/kg), Induced 1% Carrageenan (0.1 ml),ethanolic leaf extract of Coriandrum sativum L. in 200mg/kg and 400mg/kg.The anti-inflammatory activity is more effective in Group V Carrageenan induction with oral administration of Coriandrum sativum ethanolic leaf extract of 400mg/kg/i.p compared to Group IV Carrageenan is subcutaneously induced along with the oral administration of Coriandrum sativum ethanolic leaf extract of 200mg/kg/i.p.

Key words: *Coriandrum sativum* L, Leaf ethanolic extract, Indomethacin, Anti-inflammatory activity, Carrageenan induced paw edema.

INTRODUCTION

Many herbal preparations are being prescribed widely for the treatment of inflammatory conditions (1).Inflammatory diseases are becoming common in aging society throughout the world. Recent studies indicate that the mediators and cellular effectors of inflammation are important constituents of the local environment of tumors (2).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 (3). Natural products in general and medicinal plants in particular, are believed to be an important source of new chemical substances with potential therapeutic efficacy (4). Inflammation is a major condition associated with various diseases. Rheumatoid arthritis is one of the challenging disorders associated with inflammatory condition. Various molecules have been proven very effective in such condition. Drugs which are in use presently for the management of pain and inflammatory conditions are either narcotics e.g. opioids or non-narcotics e.g. salicylates and corticosteroids e.g. hydrocortisone. All of these drugs present well known side and toxic effects. It is well documented that these non-steroidal anti-inflammatory drugs (NSAIDs) produce intestinal tract ulcers (With potential internal bleeding) in 10-30 % of long-term users, and erosions of the stomach lining and intestinal tract in 30-50 % of cases (5). As a result of these side effects, NSAID use is associated with 10,000-20,000 deaths per year in the U.S (6). Even the new COX-2 inhibitor drugs only been reported to reduce intestinal tract damage by 50 %, and their toxicity to the liver and kidney is still under review (7).

In the Indian traditional medicine, coriander is used in the disorders of digestive, respiratory and urinary systems, as it has diaphoretic, diuretic, carminative and stimulant activity. In Iranian traditional medicine, Coriander has been indicated for a number of medical problems such as dyspepticcomplaints, loss of appetite, convulsion and insomnia (8) (9) (10) (11) (12) . It is an annual herb originating from the Mediterranean countries (13). The leaves of *Coriandrum sativum L.* is reported as anti-inflammatory in traditional literature. Systemic studies with respect to standardization of this drug are not reported in literature; therefore an attempt has been made to develop their standardization profile. Attempts are being made globally to get scientific evidences for these traditionally reported anti-inflammatory herbal drugs to sort out the problems.

So, the present research work has been undertaken with the ethanolic leaf extract of *Coriandrum sativum* L. to investigate anti-inflammatory activity.

MATERIALS AND METHODS

COLLECTION AND PREPARATION OF PLANT EXTRACT

The leaves of *Coriandrum sativum* were collected from the local market of Kerala and Tamilnadu, India.

25gm of the plant powder was weighed and transferred to a sterile beaker.125 ml of ethanol (1:5) was added to it and mixed well with shaker for 24 hours. When the powder mixed with ethanol thoroughly, it was filtered through What Mann No:1 filter paper. Then the solution was used for the experiments.

EXPERIMENTAL ANIMALS

Male Albino rats weighing 200-250 g were for animal studies. The animals were grouped in polyacrylic cages and maintained under standard laboratory conditions (temperature $25\pm2\ ^{0}C$) and relative humidity ($50 \pm 5\%$) with dark and light cycle (14/10h).They were allowed free access to standard dry pellet diet (Hindustan Lever, Bangalore, India) and water ad libitum. The experimental protocol was approved by Institutional Animal Ethical Committee (IAEC) constituted under CPCSEA. The rats were acclimatized to laboratory condition for 14 days before commencement of experiment. The experiments were done in KMCH pharmacy, Coimbatore. The animals were fed with Gold Mohar commercial feed manufactured by Hindustan Lever Limited, Bangalore.

CHEMICALS

Carrageenan, Standard drug Indomethacin

EXPERIMENTAL DESIGN

Acute inflammation is provided by injection of 0.1ml of 1% carrageenan into the sub plantar surface of rat hind paw.

Group I : Served as control.
Group II : Rats were received 0.1 ml of 1% carrageenan.
Group III : Rats were received indomethacin (40mg/kg/i.p)
Group IV : Rats were received 1.0ml of ethanolic extract of *Coriandrum sativum* (200 mg/kg/i.p) and 0.1ml of carrageenan.
Group V : Rats were received 1.0ml of ethanolic extract of *Coriandrum sativum* (400mg/kg/i.p) and 0.1 ml of carrageenan.

The paw volume up to the tribiotural articulation was measured at 0, 1, 2, 3, 4, 5 and 6^{th} hours.

STATISTICAL ANALYSIS

The statistical analysis of the evaluation of the anti-inflammatory activity of *Coriandrum sativum* leaves in ethanolic extract against the carrageenan induced paw oedema in albino rats were analyzed using Anova followed by Dunnett's t test and expressed as mean ± SEM. Differences between the mean of treated animals and control groups were considered significant at $P < 0.05$ (14)

RESULTS AND DISCUSSION

Carrageenan induced inflammation

The acute antiinflammatory effect was evaluated by carrageenan-induced hind paw edema.The edema was induced by injection of 1% suspension of carrageenan in 0.9% sterile saline solution into the rat's right plantar region. Different group of animal s were pretreated with The *Coriandrum sativum* extract (200 and 400 mg/kg) and 10 mg/kg body weight standard drug (indomethacin)at 1 hr before eliciting paw edema.. Rats' paw volumes were measured by digital Plethysmometer

Measurement was done immediately before, first and third hour following carrageenan injection. The edema inhibitory activity was calculated according to the following formula-

Edema (%) inhibition = (1-D/C) ✕ 100

Where,
D-represents the percentage difference in increased paw volume after the administration of test drugs to the rats.

C-represents the percentage difference of increased volume in the control groups.

Indian system of medicine, certain herbs are claimed to provide relief of pain and inflammation. Carrageenan-induced paw edema as an *in vivo* model of inflammation has been frequently used to assess the anti-edematous effect of the contribution of mediators involved in vascular changes associated with acute inflammation. Oedema formation in the carrageenan-induced paw edema model is a biphasic response. In the early hyperemia, 0-2 hrs after carrageenan injection, there is a release of histamine, serotonin and bradykinin on vascular permeability. The inflammatory edema reached its maximum level at the 1 hr and after that it started declining. The late phase of the inflammatory response has been shown to be due to potentiating effect of bradykinin on mediator release and prostaglandins, producing edema after mobilization of the leukocytes (15). Nitrous oxide (NO) is a potent vasodilator and is also involved in carrageenan-induced edema, which may be related to its ability to increase vascular permeability and edema through changes in local blood flow (16).

TABLE 1 : Anti-inflammatory activity of *Coriandrum sativum* leaf ethanolic extract in experimental rats

Group	Initial Paw Volume	Paw volume After Induction					
		1st hr	2nd hr	3rd hr	4th hr	5th hr	6th hr
I	1.20 ± 0.13	1.20 ± 0.13	1.20 ± 0.13	1.20 ± 0.13	1.20 ± 0.13	1.20 ± 0.13	1.20 ± 0.13
II	1.21± 0.17	1.91 ± 0.21*	2.27 ± 0.02*	2.37 ± 0.14*	2.48 ± 0.18*	2.62 ± 0.17*	2.78 ± 0.16*
III	1.01± 0.06	2.10 ± 0.26*	1.56 ± 0.15*	1.47 ± 0.25^{ns}	1.34 ± 0.18^{ns}	1.25 ± 0.16^{ns}	1.20 ± 0.22^{ns}
IV	1.17 ± 0.13	1.39 ± 0.26^{ns}	1.40 ± 0.07^{ns}	1.32 ± 0.13^{ns}	1.26 ± 0.12^{ns}	1.22 ± 0.13^{ns}	1.19 ± 0.13^{ns}
V	1.02 ± 0.20	1.60 ± 0.07^{ns}	1.75 ± 0.25^{ns}	1.52 ± 0.46^{ns}	1.39 ± 0.28^{ns}	1.27 ± 0.26^{ns}	1.18 ± 0.26^{ns}
CD P<0.05	0.325						

Values are mean ±SD of six samples in each group.
** - Significant*
ns – Not significant

The effect of ethanolic extract of *Coriandrum sativum* was studied in albino rats by observing its anti inflammatory activity induced by Carrageenan. The experiment showed (Table 1) that the extract exhibited statistically significant in doses of 200 mg/kg and 400 mg/kg within 10 minutes of administration of *Coriandrum sativum.* The effect of ethanolic extract of *Coriandrum sativum* on carrageenan-induced rat paw edema at different hours of study was compared to that of control for the evaluation of anti-inflammatory activity on the basis of percent inhibition of paw edema volume.

Here in the control group there is no difference between the Initial Paw Volume and the Paw Volume of each hour after induction. The Group II is carrageenan induced which will show an elevated level of paw volume in each hour. At the end of the 6thhr the paw volume is higher than the Initial Paw Volume. In Group III the Standard Indomethacin is intraperitoneally received which gives low paw volume in each hr (1st to 6th hr) Finally at the end of 6th hr paw volume shows least value. The Group IV the Carrageenan is subcutaneously induced along with the oral

administration of *Coriandrum sativum* ethanolic leaf extract of 200mg/kg/i.p. Here the 1st and 2nd hr shows elevated values of Paw Volume. After that the values were lowered in 3rd, 4th, 5th and 6th hrs respectively. In the same way Group V Carrageenan induction with oral administration of *Coriandrum sativum* ethanolic leaf extract of 400mg/kg/i.p is given, which show increased values of Paw Volume in 1st and 2nd hour continuously and 3rd day onwards reached low paw volume at the end of the 6th hr.

From this statistical analysis, concluded that the 'Carrageenan induced' Group II shows the inflammatory action and elevated level of Paw Volume is observed. But the 4rd and 5th Groups is deals with the anti-inflammatory activity of the *Coriandrum sativum* leaf ethanolic extract which gives low Paw Volume at the end of 6th hr. The anti-inflammatory activity is more effective in Group V Carrageenan induction with oral administration of *Coriandrum sativum* ethanolic leaf extract of 400mg/kg/i.p compared to Group IV Carrageenan is subcutaneously induced along with the oral administration of *Coriandrum sativum* ethanolic leaf extract of 200mg/kg/i.p.

Carrageenan-induced inflammation is an acute test and is widely used as a model for the evaluation of anti-inflammatory activity of drugs. Carrageenan-induced oedema is a biphasic event, with early hyperemia due to the release of histamine and serotonin and the delayed oedema due to the release of bradykinin and prostaglandin (17).

TABLE 2: PERCENTAGE OF INHIBITION

Group	Initial Paw volume	6 hr (mm)	Difference in Paw	Inhibition percentage
I	1.20 ±0.13	1.20±0.13	0.00	100
II	1.21± 0.17	2.78 ±0.16*	1.57	43.52
III	1.02 ±0.20	1.18 ±0.26^{ns}	0.16	85.59
IV	1.17 ±0.13	1.19 ±0.13^{ns}	0.02	86.44
V	1.02 ±0.20	1.18 ±0.26^{ns}	0.16	98.15

Inhibition of carrageenan-induced rat paw edema by indo-methacin and Coriandrum sativum measured at 1, 2, 3, 4, 5 and 6 h after carrageenan injection.

The values obtained from each group were expressed as Mean ± Standard deviation. Dunnet's t- test was done to compare the statistical significant changes between control, Carrageenan induced paw odema, indomethacin treatment rats and with *Coriandrum sativum* extract treatment. The significant levels between the groups was compared using row wise comparison between Initial with different hours.

The experiment showed (Table 2) that the extract exhibited statistically significant ($p<0.05$) inhibition of paw volume in a dose-dependent manner. Significant inhibition of paw edema was observed with both doses tested till the sixth hour. However, maximum inhibition of paw edema was found to be in Group V 98.15 % and although the inhibition of paw edema with the extract was higher than that found with the standard drug Indomethacin. The low percentage of inhibition is 43.52 % which belongs to the Group II i.e. Carrageenan Induced. The duration of action was found to be comparable to that of Indomethacin till the sixth hour during investigation.

CONCLUSION

This study has shown that the ethanolic extract of the *Coriandrum sativum* leaves possessed a significant anti-oedematogenic effect on paw oedema induced by carrageenan. Since carrageenan-induced inflammation model is a significant predictive test for anti-inflammatory agents acting by the mediators of acute inflammation the results of this study are an indication that *Coriandrum sativum* can be effective in acute inflammatory disorders.

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