

Research Article

Anti-inflammatory activity of whole plant of *Asystasia travancorica* Bedd (Acanthaceae)

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Abstract

Background and objectives: To study the anti-inflammatory activity of *Asystasia travancorica* whole plant extract in albino rats.

Method: Whole plants of *Asystasia travancorica* were extracted with ethanol. The extract was screened for anti-inflammatory activity in albino rats using carrageenan paw edema.

Results: Despite progress within medical research during the past decades, the treatments of many serious diseases remain problematic. Acute and chronic inflammatory diseases remain one of the world's major health problems. There are numerous plants claimed to have anti-inflammatory activity. Producing carrageenan – induced inflammation in the rat hind paw (acute inflammation) is a useful method for screening potential anti-inflammatory agents.

Conclusion: The whole plant extract of *Asystasia travancorica* showed anti-inflammatory activity in albino rats. Ethanol extract exhibits plant anti-inflammatory activity at 500 mg/kg at 3 hr administration.

Keywords: *Asystasia travancorica*, Paw edema, Carrageenan.

1. Introduction

Inflammation is a normal protective response to tissue injury that is caused by physical trauma, noxious chemicals or microbiological agents. Inflammation is the result of concentrated participation of more number of proliferative factors at different stages and there are many targets for antiinflammatory activity. Their respective tissue injury is a type of inflammatory response suppressed by glucocorticoids and this is the basic clinical uses and also it interferes with several steps in the inflammatory response. The alternate use of corticoids is hazardous other than the corticosteroids, the NASIDs are also used to treat inflammation. The main mechanism of action of NASIDs is the inhibition of prostaglandin (PG) synthesis or preferential or selective COX-2 inhibition. Due to the inhibition of prostaglandin (PG) synthesis it may produce toxic effects like bleeding, inhibition of platelet function, gastric mucosal damage, asthma and anaphylactic reactions may cause some individuals^{1,2}. Consequently there is a need to develop new anti-inflammatory agents with minimum side effects³.

Asystasia includes approximately 70 species of perennial herbs and shrubs from tropical Africa, India and Asia. *Asystasia* belongs to the family Acanthaceae. Paste of leaves and flowers of *Asystasia travancorica* mixed with honey is taken orally, twice a day, for three weeks for the treatment of rheumatism⁴. The objective of this investigation was to ascertain the scientific basis of its use in the treatment of inflammation, on which there is no previous data available. Hence in the present study effort has been made to establish the scientific validity to the anti-inflammatory property of whole plant of *Asystasia travancorica* extract using carrageenan induced paw edema in experimental rats.

2. Materials and methods

2.1. Collection of plant material

The well grown and healthy whole plants of *Asystasia travancorica* were collected from natural forests of Agasthiarmalai Biosphere Reserve, Western Ghats, Tamil Nadu.

2.2. Preparation of plant extract for anti-inflammatory activity

The dried whole plant material of *A. travancorica* was powdered in a Wiley mill. Hundred grams of whole plant powder was packed in a Soxhlet apparatus and extracted with ethanol. The ethanol extract was concentrated in a rotary evaporator. The concentrated ethanol extract was used for anti-inflammatory activity.

2.3. 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±2°C) 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*.

2.4. Acute toxicity study

Acute oral toxicity was performed by following OECD-423 guidelines (acute toxic class method), albino rats (n=6) of either sex selected by random sampling were used for acute toxicity study⁵. The animals were kept fasting for overnight and provided only with water, after which the extracts were administered 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 administered 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 and 2000 mg/kg body weight.

2.5. Anti-inflammatory activity

Carrageenan induced hind paw edema

Albino rats of either sex weighing 150-200 grams were divided into four groups of six animals each. The dosage of the drugs administered to the different groups was as follows. Group I - Control (normal saline), Group - II and III – Ethanol extract of *A. travancorica* whole plant (250 mg/kg and 500 mg/kg, p.o.), Group IV – Indomethacin (10 mg/kg, p.o). All the drugs were administered orally. Indomethacin served as the reference standard anti-inflammatory drug.

After one hour of the administration of the drugs, 0.1 ml of 1% W/V carrageenan solution in normal saline was injected into the sub plantar tissue of the left hind paw of the rat and the right hind paw 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, 180min, 240min, 360min, and 480min. The percentage increase in paw edema 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.

2.6. Statistical analysis

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

3. Results and Discussion

The plant extract did not exhibit any mortality upto the dose level of 2000mg/kg. So, the extract is safe for long term administration. The ethanol extract of whole plant of *Asystasia travancorica* at the dose level of 250 and 500 mg/kg (Group II and III) decreased the edema significantly ($p < 0.0001$) at 3rd hr after administration of the extract when compared to the control group (Group I). The effect was compared to the activity ($p < 0.001$) produced by standard indomethacin at 3rd hr after administration.

Inflammation induced by carrageenan was observed to have two phases i.e. early phase (upto 2 hrs) and late phase (1-6 hrs). The early phase was associated with significantly severe inflammation; whereas late phase was observed to have slow increase in volume of paw edema. The initial phase has been attributed to the action of mediators such as histamine, serotonin & bradykinin on vascular permeability⁶. The late phase edema has been shown to be a result of over production of prostaglandins⁷. The result of pre treatment of ethanol extract of *A. travancorica* whole plant is effective in the early phase of inflammation which has been reported because of release of histamine and serotonin primarily. Based on this an assumption can be made that the extract may be showed its effect through inhibition of histamine release.

Ethyl-iso-allochololate, Phytol, 2, 6, 10- Dedecatrien -1-01, 3, 7, 11- trimethyl-(E,E)- (trans-farnesol), Stigmasterol, Tetrahydrospirilloxanthin & Levo-a-Elerrcenel were reported in the ethanol extract of *A. travancorica* whole plant by GC -MS analysis. These compounds may have the role in anti-inflammatory effect. Further study will be carried out to isolate and characterize other anti-inflammatory chemical constituents present in the extract of this plant.

Table1. Effect of *Asystasia travancorica* extract on the percentage inhibition of Carrageenan induced paw edema

Treatment	Dose (mg/kg)	Edema volume (ml)				% Inhibition After 180 min
		0 min	60 min	120 min	180 min	
Group -I	Normal saline	29.56±1.93	56.55±1.63	98.56±2.54	119.56±2.53	-
Group -II	250mg/kg	24.33±1.35	38.26±1.34	42.64±1.65***	22.91±1.90***	80.83
Group -III	500mg/kg	24.15±1.29	32.65±1.65	40.11±1.74***	20.84±1.65***	82.56
Group -IV	10 mg/kg	20.33±1.84	34.93±1.66	39.63±1.26***	20.66±1.54***	82.71

Each value is SEM+ 5 individual observations * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$., Compared paw oedema induced control vs drug treated rats

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