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Antiinflammatory activity of whole plant of *Sonerila tinnevelliensis* Fischer (Melastomataceae)

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Abstract

In the present study, *Sonerila tinnevelliensis* whole plant was extracted with ethanol and evaluated for antiinflammatory activity in rats using a carrageenan induced paw edema method. Ethanol extract exhibits potent antiinflammatory activity at 500mg/kg at 3hr administration. The study was compared with standard drug indomethacin (10mg/kg). Observed pharmacological activity in the present study provides scientific validation of ethnomedical uses of this plant in treating acute inflammation.

Key words: *Sonerila tinnevelliensis,* Paw edema, Carrageenan

1. Introduction

Acute inflammation is the initial response of the body to harmful stimuli and is achieved by the increased movement of plasma and leucocytes from the body into the injured tissues. A cascade of biochemical events propagates and matures the inflammatory response, involving the local vascular system, the immune system, and various cells within the injured tissue. Chronic inflammation leads to a progressive shift in the type of cells which are present at the site of inflammation and is characterized by simultaneous destruction and healing of the tissue from the inflammatory process[1].

Inflammation is considered as a primary physiological defense mechanism that helps body to protect itself against infection, burn, toxic chemicals, allergens or other noxious stimuli. An uncontrolled and persistent inflammation may act as an etiologic factor for many of these chronic illness[2]. Although it is a defence mechanism, the complex events and mediators involved the inflammatory reaction can induce, maintain or aggravate many diseases[3]. Currently, both steroidal antiinflammatory drugs and Non-Steroidal Antiinflammatory Drugs (NSAIDS) are used in the relief of inflammation. Steroids have an obvious role in the treatment of inflammatory diseases, but due to their toxicity, can be used over short periods. Prolonged use of NSAID is also associated with reverse side effects[4]. Consequently there is a need to develop new antiinflammatory agents with minimum side effects[5].

Sonerila tInnevelliensis is used to cure liver diseases and gastrils. Its leaf extract is orally administered to cure body swelling by kanikaran. Decoction of fresh leaves is consumed on an empty stomach once in a day to get relief from rheumatic complaints[6].

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 antiinflammatory property of whole plant of *Sonerila tinnevelliensis* 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 plant of *Sonerila tinnevelliensis* Fischer were collected from natural forests of Agasthiarmalai Biosphere Reserve, Western Ghats, Tamil Nadu.

2.2 Preparation of plant extract for antiinflammatory activity: The dried whole plant material of *S. tinnevelliensis* 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 antiinflammatory 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^{0}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 study[7] (OECD, 2002). 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 and 2000 mg/kg body weight.

2.5 Antiinflammatory activity

2.5.1 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 *S. tinnevelliensis* 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 antiinflammatory 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;

Percentage inhibition = [(Vc-Vt)/Vc] × 100

Where, Vt the percentage represents the percentage difference in increased paw volume after the administration of test drugs to the rats and Vc 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 safe for long term administration. The ethanol extract of whole plant of *S. tinnevelliensis* at the dose level of 250 and 500 mg/kg (Group II and III) decreased the edema significantly (p<0.001) 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 indomethacim at 3rd hr after administration.

Inflammation has different phases, the first phase is caused by an increase in vascular permeability, the second one by infiltrate of leucocytes and the third one by granuloma formation. In the present study, the antiinflammatory activity of the ethanol extract of whole plant of *S. tinnevelliensis* has been established. The extract was found to be significantly inhibiting the carrageenan induced rat paw edema, a test which has significant predictive value for antiinflammatory agents acting by inhibiting the mediators of acute inflammation[8]. Carrageenan induced inflammation is useful in detecting orally active anti-inflammatory agents[9]. The development of carrageenan induced edema is bi-phasic the first phase is attributed to the release of histamine, serotonin and kinins and the second phase is related to the release of prostaglandins and bradykinins[10,11]. In the present study, the extract of *S. tinnevelliensis* whole plant possessed varying degree of antiinflammatory activity when turned at various doses of 250 and 500mg/kg. The ethanol extract at the dose of 500mg/kg showed high significant antiinflammatory activity at 3rd hr, where it caused 78.11% inhibition as compared to that of 10mg/kg of indomethacin (82.71%).

Ethyl-iso-allocholate, Linolelaidic acid, Methyl ester, Tetrahydro spirilloxanthin and Stigmasterol were reported in the ethanol extract of *S. tinnevelliensis* whole plant by GC -MS analysis. These compounds may have the role in antiinflammatory effect. Further study will be carried out to isolate and characterize other antiinflammatory chemical constituents present in the extract of this plant.

Table 1: Effect of *Sonerila tinnevelliensis* extract on the percentage inhibition of Carrageenan induced paw edema

Treatment	Oedema volume(ml)					% Inhibition after 180 min
	Dose mg/kg	0 min	60 min	120 min	180 min	
Control (Group-I)	Normal saline	29.56+1.93	56.55+1.63	98.56+2.54	119.56+2.53	_
Group-II STW extract	250 mg/kg	28.22+1.83	41.92+1.32	63.21+1.84**	44.16+1.28**	66.50
Group III	500 mg/kg	29.11+1.93	32.16+1.59	44.95+1.29	26.16+1.17**	78.11
Indomethacin (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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