ANTI-INFLAMMATORY ACTIVITY OF TUBER OF *RUELLIA TUBEROsa* L. (ACANTHACEAE)

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ABSTRACT

In the present study, tuber of *Ruellia tuberosa* 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 400 mg/kg at 3 hr administration compared with reference standard drug, Indomethacin. Observed pharmacological activity in the present study provides scientific validation of ethnomedicinal use of this plant in treating acute inflammation.

**Key words:** Antiinflammatory, paw edema, *Ruellia tuberosa*.

INTRODUCTION

Inflammation is considered as a primary physiological defense mechanism that helps body to protect itself against infection, burns, toxic chemicals, allergens or other noxious stimuli, an uncontrolled and persistent inflammation may it’s an etiologic factor for many of these chronic illness [¹]. Although it is a defense mechanism the complex events and mediators involved in the inflammatory reaction can easily be induced [²]. Currently both steroidal antiinflammatory drugs (NSAIDs) are used in the relief of inflammation. Steroids have an obvious role in treatment of inflammatory diseases. But due to their toxicity can only be used over short periods. Prolonged use of NSAIDs is also associated with severe side effects [³].
Therefore more potent antiinflammatory drugs with lesser side effects are necessary.

Plants have great importance due to their nutritive value and they are the major source of medicines which play an important role in the human history. Plants synthesize primary metabolites (proteins, fats, nucleic acids and carbohydrates) by simple substances such as water, carbon dioxide, nitrogen and a number of inorganic salts in small amounts. These primary metabolites are transformed into secondary metabolites (alkaloids, steroids, terpenoids, saponins, flavonoids etc.) that are used as drugs. Ruellia tuberosa L. is a tropical plant and widely distributed in Southeast Asia. In folk medicine, it has been used as anti diabetic, antipyretic, analgesic, anti hypertensive, thirst-quenching, and antidotal agent. Taking into consideration, the medicinal value and utility, the present study has been initiated to evaluate the antiinflammatory studies on the tuber of Ruellia tuberosa.

MATERIALS AND METHODS

Plant Material

The tubers of Ruellia tuberosa L. (Acanthaceae) were collected from Government Girl’s Higher Secondary School Campus, Barugur, Krishnagiri District, Tamil Nadu. They were shade dried at room temperature for 10-15 days. The dried plant material was granulated or powdered by using a blender, and sieved to get uniform particles by using sieve No. 60. The final uniform powder was used for the extraction of active constituents of the plant material.

Preparation of plant extract for antiinflammatory activity

The dried tuber of R. tuberosa was powdered in a Wiley mill. Hundred grams of plant powder was packed in a Soxhlet apparatus and extracted with ethanol. The ethanol extract was concentrated in a rotary evaporator.

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.

Acute toxicity study

Acute oral toxicity study was performed as per OECD-423 guidelines (acute toxic class method), albino rats (n=6) of either sex selected by random sampling were used for acute
toxicity study (OECD, 2002). 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 was 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.

**Antiinflammatory activity**

**Carrageenan induced hind paw edema**

Albino rats of either sex weighing 150-200 grams were divided into five groups of six animals each. The dosage of the drugs administered to the different groups was as follows. Group I - Control (normal saline 0.5 ml/kg), Group – II, III, and IV tuber of *R. tuberosa* (100, 200 and 400 mg/kg, p o. respectively), Group V – 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. 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.

\[
\text{Percentage Inhibition} = \left[\frac{(V_c - V_t)}{V_c}\right] \times 100
\]

Where,

- \(V_t\) = Percentage difference in increased paw volume after the administration of test drugs to the rats
- \(V_c\) = 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 a \(p\) values of less than 0.01 and 0.05 was taken as significant.
RESULTS
In the present study, the anti-inflammatory activity of ethanol extract of tuber of *R. tuberosa* was evaluated by carrageenan induced paw edema method in albino rats. In carrageenan induced paw edema model, *R. tuberosa* tuber of 100, 200, and 400 mg/kg caused significant inhibition of paw edema by 65.20%, 71.00% and 84.54 (p<0.001) respectively, 3 hour after carrageenan administration (Table 1).

Table 1: Effect of tuber of *R. tuberosa* extracts on the percentage inhibition of Carrageenan induced paw edema

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>edema volume (ml)</th>
<th>Dose mg/kg</th>
<th>0 min</th>
<th>60 min</th>
<th>120 min</th>
<th>180 min</th>
<th>% Inhibition after 180 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL (Group-I)</td>
<td></td>
<td>Normal saline</td>
<td>29.31±1.36</td>
<td>91.44±1.67</td>
<td>112.43±2.94</td>
<td>138.27±2.83</td>
<td>-</td>
</tr>
<tr>
<td>RT extract</td>
<td></td>
<td>Group- II</td>
<td>100 mg/kg</td>
<td>38.13±1.83</td>
<td>67.18±1.93</td>
<td>56.92±1.84</td>
<td>48.11 ±1.86***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group-III</td>
<td>200 mg/kg</td>
<td>36.27±1.55</td>
<td>51.73±1.54</td>
<td>46.35±1.22</td>
<td>40.09±1.39***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group-IV</td>
<td>400 mg/kg</td>
<td>32.51±1.92</td>
<td>57.18±1.98</td>
<td>28.65±1.93</td>
<td>21.37±1.46***</td>
</tr>
<tr>
<td>Indomethacin</td>
<td></td>
<td>(Group-V)</td>
<td>10 mg/kg</td>
<td>30.83±1.17</td>
<td>61.59±1.67</td>
<td>31.88±1.27</td>
<td>24.48±1.39***</td>
</tr>
</tbody>
</table>

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

DISCUSSION
Carrageenan-induced edema has been commonly used as an experimental animal model for acute inflammation and is believed to be biphasic. The early phase (1 to 2h) of the carrageenan model is mainly mediated by histamine, serotonin and increased synthesis of prostaglandins in the damaged tissue surroundings. The late phase (3 h) is sustained by prostaglandin release and mediated by bradykinin, leukotrienes, polymorphonuclear cells and prostaglandins produced by tissue macrophages \[^7,8\]. Prostaglandin-E\(_2\), a powerful vasodilator, synergizes with other inflammatory vasodilators such as histamine and bradykinin and contributes to redness and increased blood flow in areas of acute inflammation. The significant (p<0.001) suppressive activity of the ethanol extracts tuber of *R. tuberosa* in late phase shows its potent anti-inflammatory effect. This result is quite similar to the one observed for group IV at 400 mg/kg, which inhibited 84.54%.
Heptacosane, 1,2-Benzenedicarboxylic acid, diisooctyl ester and stigmasterol were reported in the ethanol extract of *R. tuberosa* tubers by GC-MS analysis. Therefore, it is suggested that the mechanism of action of the extract may be related to histamine and prostaglandin synthesis inhibition. Further studies will be carried out to isolate and characterize antiinflammatory chemical constituents present in the ethanol extracts of this plant.

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**REFERENCES**


