Evaluation of Antiinflammatory Activity of Ethanol Extracts of *Barleria courtallica* Nees (Acanthaceae)

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ABSTRACT

Ethanol extracts of *Barleria courtallica* stem, root and leaf were evaluated for its antiinflammatory activity at the dose levels of 150 mg/kg and 300 mg/kg body weight using a carrageenan induced paw edema method (acute inflammation). Results showed that all the studied ethanol extracts had potent and significant antiinflammatory activity. These results were also comparable with reference drug indomethacin.

Keywords: *Barleria courtallica*, carrageenan, paw edema, indomethacin.

INTRODUCTION

Inflammation is a pathophysiological response of living tissue to injury that leads to local accumulation of plasmatic fluid and blood cells. Although it is a defense mechanism that helps body to protect itself against infection, burns, toxic chemicals, allergens or other noxious stimuli, the complex events and mediators involved in the inflammatory reaction can induce, maintain or aggravate many diseases¹. Inflammation can be classified as either acute or chronic and involves a cascade of biochemical events comprising the local vascular system, the immune system and different cell types found in the injured tissue. Acute inflammation is the initial response and is characterized by the increased movement of plasma and innate immune system cells, such as neutrophils and macrophages from the blood into the injured tissue. Chronic inflammation concerns a progressive change in the type of cells present at the site of the inflammatory reaction and is characterized by simultaneous destruction and healing of the injured tissue².

These diseases are mainly treated with nonsteroidal antiinflammatory drugs (NSAIDs) and steroidal drugs, which have proven effective but can have negative side effects. For instance, NSAIDs may induce gastric and intestinal ulcers, anaemia, platelet inhibition in uterine motility and in some reported cases, an increased risk of myocardial infarction³. Steroidal antiinflammatory drugs prevent or suppress inflammation but do not attack the root cause of the disease and the prolonged use of these compounds can inhibit the synthesis of the inducible isoform of nitric oxide synthase enzyme and cause pituitary-adrenal suppression, hyperglycaemia, glycosuria and an increased susceptibility to infections and peptic ulcers⁴.

On the contrary many medicines of plant origin had been used since ages without any adverse effects. It is therefore essential that efforts should be made to introduce new medicinal plants to develop more effective and cheaper drugs. Plant represents a large natural sources of useful compounds that might serve as lead for the development of novel drugs⁵,⁶.

Genus *Barleria* belongs to the family Acanthaceae. Whole plant extract *Barleria* contains a number of active compound like alkaloids, terpenes, flavonoids, glycosides, lignins, phenolics etc., which have shown potent therapeutic activities against several diseases⁷-¹⁰. *Barleria* also shows various pharmacological effects such as antimicrobial, anethelmintic, antifertility, antioxidant, antidiabetic, antiarthritic, hepatoprotective, diuretic, cytotoxic, antidiarrhoeal, analgesic, antileukemic, anti-inflammatory and hypoglycemic properties without any toxic effects¹¹,¹².

Taking into consideration of the medicinal importance of the plant the ethanol extract of *Barleria courtallica* was analyzed for the GC-MS. Till now, the investigation of phytocomponents by GC-MS has not been done on *Barleria courtallica* Nees. Up to date no pharmacological study has been systematically conducted to evaluate the antiinflammatory activity of ethanol extract of *Barleria courtallica* stem, root and leaf. Hence, the present study was undertaken to evaluate the antiinflammatory activity of *Barleria courtallica* Nees in wistar Albino rats using ethanol extracts.

MATERIALS AND METHODS

Plant material

The stem, root and leaf of *Barleria courtallica* Nees were freshly collected from Agasthiarimalai Biosphere Reserve, Southern Western Ghats of Tamil Nadu. The plant specimen was identified and authenticated in Botanical...
Preparation of plant extract for antiinflammatory activity

The stem, root and leaf of Barleria courtallica Nees were powdered in a Wiley mill. Hundred grams of stem, root and leaf powders were packed in a Soxhlet apparatus and extracted with ethanol. The ethanol extracts were concentrated in a rotary evaporator. The concentrated ethanol extracts were used for preliminary phytochemical screening and antiinflammatory activity.

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.

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. 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 up to 2000 mg/kg body weight.

Antiinflammatory activity of Carrageenan induced hind paw edema

Albino rats of either sex weighing 150-200 grams were divided into eight groups of five animals each. The dosage of the drugs administrated to the different groups was as follows. Group I - Control (normal saline), Group II and III – Ethanol extract of B.courtallica stem whole plant (150 and 300 mg/kg, p.o.); Group IV and V- ethanol extract of B.courtallica root (150 and 300 mg/kg, p.o.); Group VI and VII- ethanol extract of B.courtallica root (150 and 300 mg/kg, p.o.); and Group VIII- Indomethacin (10 mg/kg, p.o.). All the drugs were administered orally. Indomethacin served as the reference standard antiinflammatory drug.

RESULTS

The phytochemical screening of ethanol extracts of stem, root and leaf of B.courtallica revealed the presence of alkaloid, catechin, coumarin, flavonoid, tannin, saponin, steroid, phenol, glycoside, terpenoid and xanthoprotein. Acute toxicity study revealed the non-toxic nature of the ethanol extracts of stem, root and leaf of B.courtallica.

In the present study, the antiinflammatory activity of ethanol extracts of stem, root and leaf of B.courtallica were assayed in albino rats using carrageenan induced rat paw edema method. Table 1 shows the antiinflammatory activity of ethanol extracts of stem, root and leaf of B.courtallica significantly inhibited the rat paw edema at 3rd hour post carrageenan were 77.15%, 88.01% for 150 mg/kg and 300 mg/kg of stem extract, 85.74%, 87.23%

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose mg/kg</th>
<th>0 min Edema volume (ml)</th>
<th>60 min Edema volume (ml)</th>
<th>120 min Edema volume (ml)</th>
<th>180 min Edema volume (ml)</th>
<th>% Inhibition after 180 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Normal saline</td>
<td>36.92±0.36</td>
<td>69.11±0.98</td>
<td>118.64±1.13</td>
<td>143.84±2.11</td>
<td>52.16±0.27*</td>
</tr>
<tr>
<td>Group-I</td>
<td>150 mg/kg</td>
<td>35.11±0.92</td>
<td>68.38±1.13ns</td>
<td>41.65±1.12***</td>
<td>32.86±1.31***</td>
<td>77.15</td>
</tr>
<tr>
<td>Group-III</td>
<td>300 mg/kg</td>
<td>37.26±0.16*</td>
<td>51.63±0.15*</td>
<td>30.18±1.16**</td>
<td>21.56±0.81***</td>
<td>85.01</td>
</tr>
<tr>
<td>Group-IV</td>
<td>150 mg/kg</td>
<td>36.84±0.11</td>
<td>56.18±0.36ns</td>
<td>24.13±0.27**</td>
<td>20.51±0.28***</td>
<td>85.74</td>
</tr>
<tr>
<td>Group-V</td>
<td>300 mg/kg</td>
<td>34.81±0.26*</td>
<td>51.93±0.67*</td>
<td>31.48±0.84***</td>
<td>18.36±0.11***</td>
<td>87.23</td>
</tr>
<tr>
<td>Group-VI</td>
<td>150 mg/kg</td>
<td>35.12±0.13</td>
<td>62.84±0.16ns</td>
<td>26.93±0.16***</td>
<td>18.12±0.16***</td>
<td>87.40</td>
</tr>
<tr>
<td>Group-VII</td>
<td>300 mg/kg</td>
<td>36.92±0.76</td>
<td>52.16±0.27*</td>
<td>22.31±0.26***</td>
<td>16.22±0.31***</td>
<td>88.73</td>
</tr>
<tr>
<td>Group-VIII</td>
<td>10 mg/kg</td>
<td>34.83±0.21</td>
<td>49.36±0.16**</td>
<td>24.63±0.84***</td>
<td>18.46±0.84***</td>
<td>87.13</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: ns-Not significant.
for 150 mg/kg and 300 mg/kg root extract and 87.40 %, 88.73% for 150 mg/kg and 300 mg/kg of leaf extract respectively. The results were compared with indomethacin at 10 mg/kg, which shows paw reduction of 87.13%.

DISCUSSION

Carrageenan induced hind paw edema is the standard experimental model of acute inflammation. The time course of edema development in carrageenan induced paw edema model in rats is generally represented by a biphasic curve14. The first phase of inflammation occurs within an hour of carrageenan injection and is partly attributed to trauma of injection and also to histamine and serotonin components15. The second phase is associated with the production of bradykinin, protease, prostaglandin and lysosome15. Prostaglandins (PGs) play a major role in the development of the second phase of inflammatory reaction which is measured at 3rd hour16. The doses 150 mg/kg and 300 mg/kg of ethanol extracts of B.courtallica produced a significant inhibition of carrageenan induced paw edema at 3rd hour. Therefore, it can be inferred that the inhibitory effect of ethanol extracts of B.courtallica on carrageenan induced inflammation could be due to inhibition of the enzyme cyclooxygenase and subsequent inhibition of prostaglandin synthesis. Significant inhibition of paw edema in the early hours of study by B.courtallica could be attributed to the inhibition of histamine and/or serotonin17. Prostaglandin-E2, 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 of stem, root and leaf of B.courtallica in late phase shows its potent antiinflammatory effect. This result is quite similar to the one observed for indomethacin at 10mg/kg, which inhibited 87.13%. Therefore, it is suggested that the mechanism of action of the extract may be related to histamine and prostaglandin synthesis inhibition. At present, there are no reports on investigation to identify the active components present in ethanol extract of B.courtallica. Further investigations are anticipated to identify the active components and lead to their further clinical uses.

REFERENCES