Analgesic and Anti-inflammatory Activities of the Essential oil from *Cymbopogon flexuosus*

K.S.Chandrashekar¹, K.S.Prasanna²

¹Department of Pharmacognosy, Manipal College of Pharmaceutical Sciences, Manipal University, Manipal-576104, India. ²Department of community medicine, Father muller medical college, Mangalore-575002, India

**ABSTRACT**

*Cymbopogon flexuosus* (D.C) Stapf.(Graminae) commonly known as lemon grass is used as indigenous medicine. Externally applied, it forms an excellent embrocation in chronic rheumatism, neuralgia and other painful affections. Hence The essential oil from leaves of *Cymbopogon flexuosus* (D.C) Stapf (Graminae) was subjected to analgesic and anti-inflammatory screening using various animal models. The anti-inflammatory activity was studied using acute or chronic treatment in rats. Analgesic effect of the essential oil was evaluated in acetic acid-induced writhing and tail flick model. The essential oil exhibited significant anti-inflammatory activities in the acute carrageenan-induced rat paw edema and the chronic granuloma pouch models. However, it was devoid of analgesic activity in tail flick model. On the basis of these findings, it may be inferred that *Cymbopogon flexuosus* is an anti-inflammatory and analgesic agent and the results are in agreement with its traditional use.

**Key words:** Carrageenan, writhing, aspirin

**INTRODUCTION**

*Cymbopogon flexuosus* (D.C) Stapf.(Graminae) commonly known as lemon grass is used as indigenous medicine. The grass is laxative appetizer, aphrodisiac, anthelmintic and antiepileptic. Externally applied, it forms an excellent embrocation in chronic rheumatism, neuralgia and other painful affections. This is also said to be a good cure for fever. Commercially important essential oils derived from these grass are: East Indian lemon grass oil obtained from *Cymbopogon flexuosus* (D.C) Stapf and West Indian lemon grass oil obtained from *Cymbopogon citratus* (D.C) Stapf. Citral and myrcene have been reported from the essential oil. To our knowledge, no previous studies have been undertaken on analgesic and anti-inflammatory activities of *C. flexuosus*. In the present investigation, essential oil from the leaves of *C. flexuosus* was used for analgesic and anti-inflammatory activity studies.

**MATERIALS AND METHODS**

**Plant material**

The leaves of *C. flexuosus* were collected from Udupi district. They were identified by Dr. K. Gopalkrishna Bhat by comparison with standard specimens deposited at the Department of Botany, Poorna Prajna College, Udupi. A voucher specimen was deposited in NGSM Institute of Pharmaceutical Sciences, Paneer, Mangalore, India. Fresh leaves were subjected to steam distillation. 0.8% of essential oil is obtained. The essential oil was maintained protected from light and heat until use. This essential oil was subjected to pharmacological screening.

**Experimental animals**

Swiss albino mice and albino rats (HA strain) of either sex weighing 20 – 25 g and 100 – 150 g, respectively, were obtained from animal colony of NGSM Institute of Pharmaceutical Sciences, Paneer, Mangalore, India. They were housed in polypropylene cages in an air conditioned area at 25+/−2°C with 10:14 h light and dark cycle, and maintained on Amrut brand balanced animal feed and water ad libitum. In all experiment sets, 6 rats and 10 mice were used for each treatment.
**LD<sub>50</sub> studies**
Mice were treated in graded doses up to 2000 mg/kg per oral (p.o) and were observed for any behavioral changes or mortality up to 7 days. There were few changes in the behavioral response like alertness, touch and restlessness. Therefore 1/10<sup>th</sup> of maximum tolerated dose i.e 200 mg/kg body weight was chosen for the studies.

**ANALGESIC ACTIVITY**

**Acetic acid induced writhings**
Male mice were injected intraperitoneally with 1 ml/kg of 3% aqueous acetic acid 30 min after oral administration of essential oil (50, 100, 200 mg/kg) or aspirin (50 mg/kg) orally to various groups of mice. The number of writhing episodes of individual mouse were recorded for 30 min after acetic acid treatment.

**Tail flick**
Male mice were administered orally with 50 or 200 mg/kg doses of essential oil or aspirin (50 mg/kg) to various groups of mice. The mouse was held firmly to immerse its tail in a water bath maintained at the constant temperature of 58° C. The time required for the typical reaction, a violent jerk of the tail, was recorded to assess response to noxious stimulus.[4]

**Antiinflammatory activity**
This activity was studied using acute or chronic treatment in rats.

**Acute. Carrageenan-induced rat paw edema**
Essential oil was administered in 50, 100 or 200 mg/kg doses or diclofinac sodium (100 mg/kg), 0.5 h prior to Carrageenan subcutaneous (s.c) n the planter region of the rat hind paw to induce inflammation.[5] The paw volume was measured initially and 1, 2, 3, 4 and 5 h after Carrageenan injected by the plethysmographic method.[6]

**Chronic. Cotton pellet-induced granuloma in rats**
Four sterilized cotton pellets, each weighing 10 mg, were implanted s.c., one in each axilla and groin in an anoesthetized rat, using the method.[7] After treatment with essential oil at 10 or 50 mg/kg or diclofinac sodium (5 mg/kg) for 7 days, the rats were sacrificed next day. The pellets were dissected out and granuloma was dried at 60° C overnight to determine the dry weight.

**Statistical Analysis**
The statistical analysis was carried out to calculate mean (SEM). Further analysis was carried out by Student’s t-test to calculate significance of results. P values >0.05 were considered as non-significant.

**RESULTS**

**Acetic acid-induced writhing**
There was significant reduction in acetic acid–induced writhing due to essential oil treatment at various doses and with aspirin pre-treatment as shown in Table 1.

**Tail Flick**
There was no effect on tail flick response due to the hot water-induced noxious stimuli after extract pre-treatment. However, this response was significantly altered due to Aspirin pre-treatment.

**Carrageenan-induced Rat Paw Edema**
The extract as well as diclofinac sodium showed antiinflammatgeic activity. This anti-inflammatory was dose dependent and significant at 3 and 4 h after carrageenan injection, as shown in Table 2.

**Cotton pellet-induced granuloma in rats**
There was statistically significant reduction in weight of granuloma in extract and diclofinac sodium treated rats as shown in Table 3.

### Table 1: Effect of essential oil of Cymbopogon flexuosus leaves on acetic acid induced writhing in albino mice.

<table>
<thead>
<tr>
<th>Pre-treatment</th>
<th>Mean number of writhing ± SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>83.1 ± 0.44</td>
</tr>
<tr>
<td>Essential oil</td>
<td></td>
</tr>
<tr>
<td>50 mg/kg</td>
<td>70.3 ± 0.51*</td>
</tr>
<tr>
<td>100 mg/kg</td>
<td>41.3 ± 1.63*</td>
</tr>
<tr>
<td>200 mg/kg</td>
<td>27.4 ± 1.25*</td>
</tr>
<tr>
<td>Aspirin</td>
<td>22.9 ± 0.76</td>
</tr>
</tbody>
</table>

*P < 0.05 = Significant as compared to control.

### Table 2: Antiinflammatory activity of essential oil of Cymbopogon flexuosus in Carrageenan-induced rat paw edema.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>20.01 ± 1.14</td>
<td>31.71 ± 1.12</td>
<td>45.20 ± 1.13</td>
<td>60.21 ± 2.11</td>
<td>78.12 ± 2.14</td>
</tr>
<tr>
<td>Essential oil</td>
<td>14.03 ± 1.44</td>
<td>28.01 ± 2.12</td>
<td>33.89 ± 1.24*</td>
<td>41.11 ± 1.61*</td>
<td>64.12 ± 4.76*</td>
</tr>
<tr>
<td>50 mg/kg</td>
<td>14.03 ± 1.44</td>
<td>28.01 ± 2.12</td>
<td>33.89 ± 1.24*</td>
<td>41.11 ± 1.61*</td>
<td>64.12 ± 4.76*</td>
</tr>
<tr>
<td>100 mg/kg</td>
<td>13.02 ± 0.70</td>
<td>25.15 ± 1.76</td>
<td>32.03 ± 1.55*</td>
<td>41.41 ± 3.13*</td>
<td>63.21 ± 5.53*</td>
</tr>
<tr>
<td>200 mg/kg</td>
<td>12.55 ± 1.35</td>
<td>21.60 ± 1.33*</td>
<td>25.40 ± 1.65*</td>
<td>33.15 ± 1.66*</td>
<td>61.82 ± 3.17*</td>
</tr>
<tr>
<td>Diclofinac</td>
<td>14.50 ± 1.14*</td>
<td>23.75 ± 1.15</td>
<td>29.55 ± 2.35*</td>
<td>46.13 ± 3.28*</td>
<td>62.62 ± .12</td>
</tr>
</tbody>
</table>

*P < 0.05 = significant as compared to the control.
To conclude, the results showed anti-inflammatory and analgesic activities of essential oil of *Cymbopogon flexuosus*. These activities were related to dose and these results corroborate the traditional use of the plant in inflammatory conditions.

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**REFERENCES**
