ANTI-INFLAMMATORY ACTIVITY OF WHOLE PLANT OF POLYCARPAEA CORYMBOSA (L.) LAM (CARYOPHYLLACEAE)

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ABSTRACT
In the present study, Polycarpaea corymbosa whole plant was extracted with ethanol and evaluated for anti-inflammatory activity in rats using a carrageenan induced paw edema. Ethanol extract exhibits potent anti-inflammatory activity at 500mg/kg at 3hr after administration. The study was compared with standard drug indomethacin (10mg/kg). Observed pharmacological activity in the present study provides scientific validation of ethnomedicinal uses of this plant in treating acute inflammation.

Keywords: Polycarpaea corymbosa, Paw edema, Carrageenan.

INTRODUCTION
Inflammation is a severe response by living tissue to any kind of injury. There can be four primary indicators of inflammation: pain, redness, heat or warmness and swelling. When there is injury to any part of the body, the arterioles in the encircling tissue dilate. This gives a blood circulation towards the areas (redness)\(^1\). Vasoactive chemicals also increase the permeability (increase pore size) of these arterioles which allows blood cells, chemical substance, blood proteins and fluid to accumulate in that region. This fluid accumulation causes swelling and may compress nerves in the area resulting in pain. In addition, prostaglandins, that might also result in irritation of the nerves and further contribute to pain.

The commonly used drugs for management of inflammatory conditions are non-steroidal anti-inflammatory drugs, which have several adverse effects especially gastric ulcers. Natural products have contributed significantly towards the development of modern medicine. The attention of pharmacologists throughout the world has been focused on finding out safer and potent anti-inflammatory drug. The natural products today
symbolize safety in contrast to the synthetic drugs that are regarded as unsafe to humans and environment. So, people are returning to the natural products with the hope of safety and security.

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*Polycarpaea corymbosa* (L.) Lam. Belongs to ‘Caryophyllaceae” is commonly known as “Pallipoondu” in Palliyar tribals of Sirumalai hills, Western Ghats, Tamil Nadu. Paste prepared from the leaf is taken once in a day for a period of 2-3 weeks to treat jaundice by the Palliyars\textsuperscript{[3]}. However, so far there is no systematic study on anti-inflammatory activity has been reported in the literature. Hence the present study focuses on evaluating the anti-inflammatory activity of root, leaves and stem of *Polycarpaea corymbosa*.

**MATERIALS AND METHODS**

**Collection of plant sample**

Whole plant of *Polycarpaea corymbosa* (L.) Lam was collected from Sirumalai hills, Western Ghats, Tamil Nadu. With the help of local flora, voucher specimens were identified and preserved in the Ethnopharmacology Unit, Research Department of Botany, V.O.Chidambaram College, Tuticorin, Tamil Nadu for further references.

**Preparation of plant extract for anti-inflammatory activity**

The whole plant of *Polycarpaea corymbosa* were cut into small pieces, washed, shade dried at room temperature and the dried leaves was powdered in a Wiley mill. Hundred grams of whole plant powder was packed in Soxhlet apparatus and extracted with ethanol extracts were concentrated in a rotary evaporator. The concentrated ethanol extract was used for anti-inflammatory activity.

**Animals**

Adult Wistar albino rats of either sex (150-200g) were used for present investigation. Animals were housed under standard environmental conditions at temperature (25±2°C)
and light and dark (12:12 hr). Rats were feed standard pellet diet (Goldmohur brand, MS Hindustan lever Ltd., Mumbai, India) and water ad lib bitum.

**Acute toxicity study**

For toxicity studies, six albino rats of either sex were administered orally with the test substance in the range of doses 200-2000mg/kg and the mortality rates were observed after 72hr. the ethanol extract of *Polycarpea corymbosa* has shown no mortality at 2000mg/kg. Therefore 2000mg/kg dose was considered as LD<sub>50</sub> cut off dose (safe dose), 1/8 and 1/4 of that were selected (250 and 500 mg/kg) for the experiment as sub-maximal and maximal dose.

**Anti-inflammatory activity**

**Carrageenan-induced hind paw edema**

Albino rats of either sex weighing 150-200grams were divided into 4 groups of six animals each. The dosage of the drugs administered to the different groups was as follows. Group I- Control (normal saline 0.5ml/kg), Group II and Group III - *Polycarpea corymbosa* (250 and 500mg/kg, p.o.) respectively and Group IV- Indomethacin (10mg/kg, p.o.). All the drugs were administered orally.

After one hour of the administration of the drugs, 0.1ml 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 and 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 were studied. The relative potency of the drugs under investigations was calculated based upon the percentage inhibition of the inflammation. Percentage inhibition was calculated using the formula;

\[
\text{Percentage inhibition} = \left( \frac{Vc-Vt}{Vc} \right) \times 100
\]

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.
RESULTS AND DISCUSSION

The anti-inflammatory activity of extract of Polycarpaea corymbosa was calculated by carrageenan-induced paw edema method in albino rats. In model, Polycarpaea corymbosa at doses of 250 and 500mg/kg caused significant inhibition of paw edema by 75.78% (p<0.05) and 79.92% (p<0.001) respectively, 3hrs after carrageenan administration (Table-1). It shows that the plant extract have significant anti-inflammatory effect and the results were compared with indomethacin (79.62%).

**TABLE 1: ANTI-INFLAMMATORY ACTIVITY OF POLYCARPAEA CORYMBOSA WHOLE PLANT EXTRACTS AGAINST CARRAGEENAN INDUCED PAW EDEMA MODEL**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (mg/kg)</th>
<th>Edema volume (ml)</th>
<th>% Inhibition after 180 min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0 min</td>
<td>60 min</td>
</tr>
<tr>
<td>Control (Group -I)</td>
<td>Normal saline</td>
<td>29.83±1.23</td>
<td>55.91±1.87</td>
</tr>
<tr>
<td>Polycarpaea corymbosa whole plant extract (Group –II)</td>
<td>250 mg/kg</td>
<td>26.48±1.84</td>
<td>47.34±1.89**</td>
</tr>
<tr>
<td></td>
<td>500 mg/kg</td>
<td>25.87±1.62</td>
<td>37.84±1.71**</td>
</tr>
<tr>
<td>Indomethacin (Group -III)</td>
<td>10 mg/kg</td>
<td>27.83±1.72</td>
<td>39.89±1.34**</td>
</tr>
</tbody>
</table>

Each Value is SEM ± 5 individual observations **p<0.01; ***p<0.001 compared paw edema induces control Vs drug treated rats.

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 2 hr) of the carrageenan model is mainly mediated by histamine, serotonin and increased synthesis of prostaglandins in the damaged tissue surroundings. The late phase (3hr) is sustained by prostaglandins release and mediated by bradykinin, leukotrienes, polymorphonuclear cells and prostaglandins produced by tissue macrophages\[^4,5\]. The significant (p<0.001) suppressive activity of the different extracts of Polycarpaea...
corymbosa whole plant in late phase shows its potent anti-inflammatory effect. The result is quite similar to the one observed for indomethacin at 10mg/kg, which inhibited the edema by 79.62%. The results were statistically significant ($p<0.001$). Ueno et al.,[6] found that the injection of carrageenan into the rat paw induces the liberation of bradykinin, which later induces the biosynthesis of prostaglandin and other autacoids, which are responsible for the formation of the inflammation exudates[6]. Besides, in the carrageenan-induced rat paw edema model, the production of prostanoids has been through the serum expression of COX-2 a positive feedback mechanism[7]. PGE$_2$, a powerful vasodilator, synergizes with other inflammatory vasodilators such as histamine and bradykinin and contributes to the ness and increased blood flow in areas of the acute inflammation. Therefore, it is suggested that the mechanism of action of the extracts may be related to histamine and prostaglandin synthesis inhibition. GC-MS analysis of Polycarpaea corymbosa whole plant revealed the presence of 2-Pyrrolidinone, 1-ethenyl and 2-Pyrrolidineacetic acid, methyl ester. These compounds may have the role in anti-inflammatory effect[8]. In the present study the anti-inflammatory activity of Polycarpaea corymbosa whole plant can be attributed to the above chemical constituents. The effect may be due to the synergists rather than single constituents. Further studies are necessary to ascertain the mechanism and constituents behind its anti-inflammatory action.

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