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## Studies on antipyretic and anti-inflammatory activities of *Scaevola frutescens*

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The aim of the present study was to investigate the anti-inflammatory and antipyretic effects of a methanolic extract of *Scaevola frutescens* leaves by carrageenan-induced paw edema and yeast-induced pyrexia in rats. The plant extract showed a significant reduction in yeast-induced hyperthermia and carrageenan induced paw edema and the effects were comparable to the standard drugs, paracetamol and indomethacin respectively.

*Scaevola frutescens* (Goodeniaceae), a genus of herbs and shrubs is distributed in Australia, Polynesia, Asia (The wealth of India 1966) and the seashores of India (Kirtikar et al. 1935). The plant has been used in the treatment of tachycardia, heart diseases, dropsy, indigestion, headache, tumours, swollen legs, ophthalmic diseases, diarrhoea, syphilitic affections and dysentery, and as a diuretic. The bark and leaves contain a bitter substance and two glycosides. The leaves contain an alkaloid. The plant possesses several medicinal and therapeutic properties but has not been fully investigated (The Wealth of India 1966; Quinn 2003). Thus, the present initial study was carried out of the antipyretic and anti-inflammatory effects of the leaf extract.

In an acute toxicity study, *Scaevola frutescens* extract given to mice at doses up to 2 g/kg neither resulted in mortality nor any visible clinical signs of general weakness (except muscle twitching). This might be due to the broad non-toxic range of this plant extract.

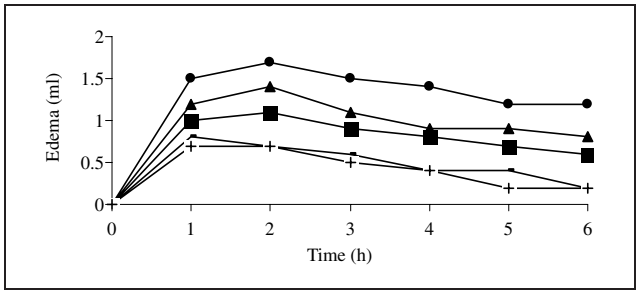


Fig.: Effect of the *Scaevola frutescens* on carrageenan-induced edema in rats. + Indomethacin; – 300 mg/kg SF; ■ 100 mg/kg SF; ▲ 10 mg/kg SF; ● Control

Yeast induced hyperthermia reached a maximum of 38.6 °C in rats. A dose dependent antipyretic effect was observed with *Scaevola frutescens* with significant effect, observed at dose levels of 100 and 300 mg/kg, an effect comparable to that of paracetamol (Table).

The primary test most widely used for screening new anti-inflammatory agents is carrageenan-induced edema in the rat hind paw (Winter et al. 1962). The development of carrageenan-induced edema is biphasic, the first phase is attributed to the release of histamine, 5 HT and kinin, the second phase is related to the release of prostaglandins (Larsen et al. 1983; Brooks et al. 1991; Vane et al. 1987). It has been reported that the second phase of edema is sensitive to both steroidal and non steroidal anti-inflammatory agents (Badilla et al. 2003).

Based on these results, it could be argued that the significant activity observed in the suppression of the first phase of carrageenan-induced inflammation may be due to inhibition of the release of early mediators, such as histamine and serotonin and the action in the second phase may be explained by an inhibition of cyclooxygenase.

The carrageenan injection in the right hind paw of rats induced edema but there was no edema in the saline treated paw. The extract at doses of 100 and 300 mg/kg gave a significant reduction in edema and the effect was dose-related and comparable with that of indomethacin 10 mg/kg (Fig.).

The presence of the alkaloid (The Wealth of India 1966) may be responsible for the antipyretic and anti-inflammatory activities. Thus, it is concluded that the crude methanolic extract of leaves of *Scaevola frutescens* produces significant antipyretic and anti-inflammatory activities.

**Table: Effect of *Scaevola frutescens* on yeast induced pyrexia in rats[a]**

| Treatment | Dose (mg/kg i.p.) | Rectal temperature (°C) | | Rectal temperature after administration of drug (°C) | | |
|---|---|---|---|---|---|---|
| | | normal | 18 h after yeast administration | 1 h | 2 h | 3 h |
| | | A | B | $C_1$ | $C_2$ | $C_3$ |
| Control (saline) | 0.5 ml | 37.64 ± 0.14 | 38.68 ± 0.05 | 38.63 ± 0.07 | 38.56 ± 0.06 | 38.56 ± 0.07* |
| Paracetamol | 10 | 37.47 ± 0.09 | 38.54 ± 0.07 | 37.9 ± 0.07* | 37.85 ± 0.08* | 37.56 ± 0.09* |
| SF | 10 | 37.91 ± 0.07 | 38.66 ± 0.06 | 38.65 ± 0.09 | 38.47 ± 0.09 | 38.44 ± 0.09 |
| SF | 100 | 37.55 ± 0.07 | 38.45 ± 0.09 | 38.45 ± 0.08 | 38.19 ± 0.07* | 37.83 ± 0.07* |
| SF | 300 | 37.43 ± 0.07 | 38.26 ± 0.09 | 37.9 ± 0.09* | 37.84 ± 0.08* | 37.56 ± 0.05* |

[a] Data were expressed as mean ± SEM (n = 6)
* $P < 0.05$ (ANOVA) compared to B

## Experimental

### *1. Plant material*

*Scaevola frutescens* was collected in Kerala (India), the leaves were extracted by maceration with methanol (yield: 12%) for 48 h and the dried extract was made into a suspension with 1% gum acacia and used for the experiment. The protocols for animal study were approved by the Institutional Animal Ethical committee.

### *2. Acute toxicity test*

The test extract was administered orally at doses of 5, 50, 300 and 2000 mg/kg to a group of 3 animals (mice) as a stepwise procedure. General signs and symptoms of toxicity, and intake of food and water were recorded for 24 h. Mortality was recorded for 14 days.

### *3. Antipyretic test*

Pyrexia was induced in all groups of rats by injecting 15% (w/v) aqueous suspension of Brewer's yeast intramuscularly (Rao et al. 1977; Vogel 1997). After 18 h, animals showing 0.5 °C or more rise in the rectal temperature (about 60% of the total number of animals injected) were selected. Five groups of six rats each were treated with the test extract at doses of 10, 100 and 300 mg/kg, i.p., one group with paracetamol (10 mg/kg, i.p.) and a control group with normal saline solution (0.5 ml, i.p.). Rectal temperature was noted at different time intervals. Percentage reduction in rectal temperature was calculated by considering the total fall in temperature to normal level as 100%.

$$\% \text{ reduction} = \frac{B - Cn}{B - A} \times 100; \text{ where } n = 1, 2 \text{ or } 3$$

### *4. Anti-inflammatory test*

Acute inflammation was induced in all groups of rats by carrageenan injection. Carrageenan (0.1 ml of 1% solution in saline) was injected into the sub-plantar region of the right hind paw of rats, while the contralateral paw was injected with 0.1 ml saline solution. The test extract (10, 100 and 300 mg/kg) or indomethacin (10 mg/kg) were administered i.p., 1 h before carrageenan injection. The paw volume was measured before the injection and thereafter each hour for a period of 6 h with a plethysmometer (Badilla et al. 2003). Mean increase in paw volume of each group was calculated.

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