

### Analgesic Anti-Inflammatory Activity of *Acanthus illicifolius* Linn.

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Methanol extract of *A. illicifolius* was tested for analgesic activity by tail clip method in mice with pethidine hydrochloride as standard drug and by hydrochloric acid induced writhing in mice using sodium salicylate as standard drug for comparison. ED<sub>50</sub> of the extract administered (ip) was 2.5 ± 1 and 13.0 ± 1.5 mg/kg in the 2 methods respectively. The extract exhibited statistically significant ( $P < 0.01$ ) anti-inflammatory activity in carrageenin induced oedema in rats. LD<sub>50</sub> was found to be >1g/kg.

**MANGROVES**, in view of their peculiar habitat, are known to have acquired unique morphological, ecological and physiological characteristics. Intrigued by the traditional use of leaves of the mangrove plant *Acanthus illicifolius* for relief from rheumatic pains by villagers in Goa, it has been decided to take up a detailed study of the pharmacological and chemical aspects of this plant. This plant occurs extensively, fringing the tidal creeks of the Mandovi-Zuari estuarine system in Goa. This paper presents results of screening of the methanolic extract of the plant leaves for possible analgesic and anti-inflammatory activities.

**Preparation of extract**—Fresh material (approx. 1 kg) was collected from the banks of Cumbarjua canal connecting the 2 estuaries of the rivers Mandovi and Zuari during August–September 1978. It was cut into smaller pieces and soaked in 3 litre of 90% methanol at room temperature for 48 hr. This process was repeated thrice and the combined extract was concentrated to dryness under reduced pressure using a Rotary vacuum flash evaporator (bath temperature 50°C). The concentrated extract (approx. yield 30 g) was kept in a vacuum desiccator for final drying before it was tested for pharmacological activity.

**Analgesic activity**—Analgesic activity of the extract was studied in albino mice (Haffkine strain) of either sex weighing 25–30 g. Six mice fasted overnight were used per group.

**Tail clip method**—An artery clip with the jaws covered by thin rubber tubing was applied to the base of the tail of the mouse. Only those animals which made repeated attempts to remove the clip within 15 sec were used. Absence of any attempt to remove the clip within 30 sec was taken as criterion of analgesia. Pethidine hydrochloride was used as a standard for comparison. Different doses of the extract or

pethidine were administered (ip) 30 min before application of the clip.

ED<sub>50</sub> was calculated by the method of Miller and Tainter<sup>2</sup>.

**Writhing method**<sup>3</sup>—An aqueous solution (v/v) of hydrochloric acid 0.5% was administered (ip) in the dose of 0.2 ml/mouse. The animals were observed continuously for 20 min for writhing syndrome. Sodium salicylate was used as a standard for comparison. Different doses of the extract or sodium salicylate were administered (ip) 30 min before the injection of hydrochloric acid and the per cent protective effect was noted.

ED<sub>50</sub> was calculated by the method of Miller and Tainter<sup>2</sup>.

**Anti-inflammatory activity**—Anti-inflammatory activity of the extract was studied in groups of 6 albino rats (Haffkin strain) of either sex weighing 150–200 g. Oedema was induced by injection of 0.1 ml of 1% carrageenin into the hind paws of the rats according to the method of Winter *et al*<sup>4</sup>. The paw volume was measured before and 3 hr after the injection of carrageenin by the plethysmographic method of Buttle *et al*<sup>5</sup>. Phenylbutazone was used as a standard drug and saline was used as control.

The results were analysed by student's *t* test.

**Acute toxicity**—Groups of 10 albino mice of either sex weighing 20–25 g were used. The extract dissolved in 0.9% NaCl was administered (ip) in doses ranging from 0.25–1 g/kg. The animals were kept under observation for 72 hr.

**Analgesic activity**—Tail clip method: The extract in doses ranging from 1 to 100 mg/kg showed graded analgesic activity ranging from 42.8 to 85.7%; ED<sub>50</sub> was 2.5 ± 1 mg/kg compared to 10 ± 3.1 mg/kg of pethidine (Table 1).

**Writhing method**—The extract exhibited graded protective effect against writhing when used in doses ranging from 1 to 100 mg/kg. ED<sub>50</sub> was 13 ± 1.5 mg/kg compared to 240 ± 34.1 mg/kg sodium salicylate (Table 2).

**Anti-inflammatory activity**—The carrageenin induced oedema. The extract in doses of 5 and 50 mg/kg showed statistically significant ( $P < 0.01$ ) activity with respect to the control group. However, phenylbutazone in doses of 20 and 40 mg/kg exhibited greater anti-inflammatory activity ( $P < 0.001$ , Table 3).

TABLE 1—EFFECT OF DIFFERENT DOSES OF THE EXTRACT AND PETHIDINE IN TAIL CLIP METHOD IN MICE

Acanthus extract		Pethidine hydrochloride	
Dose mg/kg (ip)	% Analgesia	Dose mg/kg(ip)	%Analgesia
1	42.8	5	16.6
10	57.1	10	50.0
50	71.4	15	70.0
100	85.7		
ED <sub>50</sub> *	2.5 ± 1	ED <sub>50</sub> *	10.0 ± 3.1

\*Expressed in mg/kg

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TABLE 2—EFFECT OF DIFFERENT DOSES OF THE EXTRACT AND SODIUM SALICYLATE ON HYDROCHLORIC ACID INDUCED WRITING IN MICE

<i>Acanthus</i> extract		Sodium salicylate	
Dose mg/kg (ip)	% Protection	Dose mg/kg(ip)	%Protection
1	31.1	150	31.0
10	47.5	300	67.0
50	62.0	450	93.9
100	70.7		
ED <sub>50</sub> *	= 13.0 ± 1.5	ED <sub>50</sub> *	= 240 ± 34.1

\*Expressed in mg/kg

TABLE 3—EFFECT OF THE EXTRACT AND PHENYLBUTAZONE ON CARRAGEENIN INDUCED HIND PAW OEDEMA IN RATS

Dose (mg/kg. ip)	%Anti-inflammatory effect ± SD	P
<i>Acanthus</i> extract		
5	18.0 ± 11.5	<0.01
50	23.8 ± 16.6	<0.01
Phenylbutazone		
20	30.3 ± 6.1	<0.001
40	42.0 ± 5.0	<0.001

*Acute toxicity*—There was no mortality in mice when the extract was administered (ip) in the doses up to 1 g/kg.

The methanol extract of *Acanthus illicifolius* exhibited marked analgesic effect when tested with methods which are conventionally employed for narcotic as well as non-narcotic analgesics. As seen from ED<sub>50</sub> values of the extract in comparison to standard analgesics like pethidine and sodium salicylate, its analgesic potency is of a high order. Further, the Straub-tail phenomenon<sup>6</sup> is negative indicating absence of addiction liability.

The extract, also showed significant anti-inflammatory activity against the proliferative phase of inflammation induced by carrageenin. However, increasing the dose 10 fold did not show significant difference between the 2 doses. It is likely that the maximum effect is manifest at the lower dose level. This is in contrast to phenylbutazone where there was dose-dependent increase in the anti-inflammatory effect.

Acute toxicity in mice by ip administration showed that the LD<sub>50</sub> was more than 1 g/kg.

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