Analgesic Activity of Pandanus fascicularis Lam.

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Summary

Pandanus fascicularis Lam has been used in rheumatic fever, rheumatism and rheumatoid arthritis in traditional medicine. There is no scientific study report available on the analgesic action of this plant. The present study is aimed at evaluating the analgesic activity of aqueous extract of Pandanus fasicularis (PF) in rodents. Analgesic activity of the aqueous extract of PF (400 mg/kg and 800mg/kg) was investigated in hot-plate models, tail-flick method in rats and the writhing model of mouse and compared with the analgesic action of codeine and aspirin. Aqueous extract of PF revealed significant analgesic activity by both central ($p<0.001$) and peripheral ($p<0.001$) mechanisms in this study. These results suggest that the aqueous extracts of PF possess analgesic activity which is comparable to that of codeine and aspirin and this favours the use of PF in rheumatism and rheumatoid arthritis in traditional medicine. .

Keywords: Pandanus fasicularis, analgesic action, hot plate, tail flick, writhing test.

Introduction

Plants are widely used in the various traditional systems of medicine like Ayurveda, Siddha and Unani for their analgesic,anti-inflammatory and antipyretic activity. *Pandanus fascicularis Lam.(Synonyms-Pandanus tectorius, Pandanus odoratissimus*, family –Pandanaceae, Fig 1) has been used in rheumatic fever, rheumatism and rheumatoid arthritis.

Vernacular names[1,2] of this plant are :Sansktit- ketaki, Hindi-keura, kewda, ketki, gagandhul,Tamil- tazhai, Telugu-mugali, Kannada-tale mara, English-screw pine. *Pandanus fascicularis* grows wildly in coastal regions of India and Andaman islands.

This plant is a branched palm like shrub with its stem supported by aerial roots, leaves glaucous-green, 0.9-1.5m, ensiform, long lanceolate, acuminate with three rows of prickles each on the margins and on midrib beneath,[3] Propagation is by seeds and vegetative method. Parts of the plant used are the leaves, flowers, roots, fruits, spadices , bracts[2,3,4] and these have been used in leprosy,smallpox, syphilis, scabies, pain, heat of body, diseases of the heart, brain and in leucoderma. Oil from the bracts has been administered for headache and rheumatism and considered as a stimulant and an anti spasmodic**.** The juice obtained from inflorescence has been used for rheumatic arthritis in veterinary medicine[5].

Chemical constituents

The principle constituent is the kewda oil, isolated from the inflorescences of *Pandanus fascicularis.* The chemical composition of this essential oil, kewda oil has been shown to contain many (>60) components, amounting to 98.7% of the total oils. The major components of the hydrodistillated kewda oil were 2-phenyl ethyl methyl ether (37.7%), terpene-4-ol (18.6%), α –terpeniol (8.3%) and 2- phenyl ethyl alcohol (7.5%), benzyl benzoate (11%), viridine (8.8%) and gesmacrene B (8.3%) along with a small amount of benzyl salicylate, benzyl acetate, benzyl alcohol etc.

The greatest disadvantage in the potent synthetic analgesic drugs available at present lies in their side effects, toxicity and reappearance of symptoms after discontinuation. Hence the search for new analgesic agents that retain the therapeutic efficacy and yet are devoid of adverse effects is on going. There is much hope of finding active potent analgesic agents from indigenous plants as these are still used in therapeutics despite the progress in conventional chemistry and pharmacology in producing effective synthetic drugs.

Many plants have been shown to possess analgesic activities in animals and humans. PF has been traditionally used for rheumatism but to-date no scientific proof has been claimed on its leaf. The present study has been undertaken to investigate and evaluate the analgesic activities of aqueous extract of *Pandanus fascicularis* leaves in rats and mice.

Material and methods

Plant material and extraction: Pandanus fasicularis (PF) was collected locally during the month of November and December. Institutional Ethical Committee clearance was obtained for the experiment. The dried plant (1.2 kg) was boiled with water in batches of 600g each. The extract was concentrated and dried on water bath (yield=10%). In all experiments two doses (400mg/kg and 800mg/kg) of PF were tested.

Animals: Albino rats of Wistar strain (150-200g) belonging to either sex and Swiss albino mice, bred in the animal house of Kasturba medical college, Manipal, were used in all experiments. The animals were maintained in individual cages under standard laboratory conditions (12:12 hour light/dark cycle at 25±2^{0}C). They had full access to water and food (Animal pellets, Hindustan Lever). They were randomly divided into different groups of ten before the experiment. There were four groups (vehicle control group, standard drug group and two test drug groups for PF). For all experiments different groups of animals were used. All drugs were administered orally.

Analgesic activity: Three different tests were employed to study analgesic activity. In each experiment a control group (vehicle treated), standard drug group (codeine/aspirin) and two test drug groups were employed (Table 1). In the hot plate test reaction time was measured between placing the animals on the hot plate and licking of paws or jumping off before drug administration and at 30, 60, 120 and 180 minutes following administration of vehicle or drug. The hot plate was maintained at 55ºC. A cut off time of 10 seconds was used to avoid thermal injury to animal [6]. Analgesic activity was measured by the tail flick test using an analgesiometer as described by D'Amour and Smith [7]. For each animal tail, flick latency was obtained thrice and the mean was used. Tail flick latencies were measured before drug administration and again at 1 and 2 hours post administration

Peripheral analgesic activity was investigated by using the writhing test. Writhing was induced in mice by intra peritoneal administration of 1 ml/100g of body weight of 0.6% acetic acid[8] The number of writhing movements was observed for 10 minutes. The test was performed 30 minutes after administration of vehicle or drug.

Statistical analysis: All values are presented as Mean ± SEM of 10 animals. Differences between means were assessed by one way analysis of variance (ANOVA) followed by Dunnet test using SPSS software version 10. $p<0.05$ was considered significant.

Results

Hot plate test: Table 1 shows the analgesic effect of PF in the hot plate model. Significant activity started with both the doses of PF at 1hour ($p<0.001$) and persisted up to 2 hours ($p<0.001$).

Tail flick: In the tail flick test, significant ($p<0.001$) latency suggesting analgesic activity of PF, in both the doses, was observed only at 2 hours (Table 1).

Writhing test in mice: Peripheral mechanism of analgesic activity is shown by writhing test in Table 1. PF in the doses of 400mg/kg and 800mg/kg produced significant ($p<0.05$) decrease in the number of writhes suggesting its analgesic effect.

Discussion

The results of the study indicates that PF possesses significant analgesic activity in all the three tests indicating that the analgesic action is by both central and peripheral mechanism. Hot plate and tail flick tests are methods for testing central mechanism of analgesic activity and the writhing test for peripheral mechanism[8]. Acetic acid administered intraperitonially liberates endogenous prostaglandins that cause inflammatory pain which is inhibited by PF [9].The results of the present study indicate that PF has significant analgesic activity by both central and peripheral mechanisms.

Conclusion

To conclude, PF showed significant anti-nociceptive activity. These results validate the use of the plant in joint pains and inflammatory conditions in traditional medicine.

Table 1: Analgesic effect of PF (hot plate, tail flick and writhing tests) in rodents. (Mean±SEM)

Groups (Dose)	Hot plate (Latency in seconds) Rats			Tail flick (Latency in seconds) Rats			*No. of writhes in Mice*
	0 h	1 h	2 h	0 h	1 h	2 h	
Control (Gum acacia)	1.4± 0.14	2.1± 0.23	1.9± 0.16	2.4± 0.24	2.5± 0.22	2.4± 0.19	*15.5± 1.05*
Codeine(5)$^{+}$ or Aspirin(400)$^{+}$	1.15± 0.15	6.2± 0.51*	5.9± 0.5*	2.1± 0.2	6.4± 0.3*	5.7± 0.42*	*7.8± 0.75**
PF (400)	1.6± 0.22	5.1± 0.31^{a}	6.5± 0.4*	2.3± 0.22	4.4± 0.16	5.4± 0.30*	*10.7± 1.0*^{b}
PF (800)	*1.56± 0.22*	*5.3± 0.32*^{a}	*6.6± 0.43**	*2.2 ±0.22*	*5.4± 0.18*	*5.7± 0.28**	*11.0±0.88*^{c}

$^{+}$ Codeine for hot plate and tail flick tests, aspirin for writhing tests. $^{*}p<0.001$, $^{a}p<0.01$, $^{b}p<0.04$, $^{c}p<0.02$, n=10.

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