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Research Article

ANALGESIC ACTIVITY OF THE FRUIT EXTRACT OF *AVERRHOA CARAMBOLA*

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This experimental study was done to investigate analgesic activity of fruit extract of Averrhoa carambola in Swiss-Albino mice. Analgesic activity was assessed by acetic acid-induced writhing method (for peripheral action) and radiant heat tail-flick test (for central action). For both tests, healthy Swiss-Albino mice of either sex weighing 20-25 g were used for the test; twenty-four mice, aged 4-5 weeks, were randomly selected and divided into four groups with six animals in each group. Each group was given a particular treatment i.e. control, positive control and the two different doses of the extract. In the acetic acid-induced writhing test, the extract in doses of 200 and 400 mg/kg showed 37.13% ($p < 0.001$) and 42.76% ($p < 0.001$) inhibition of writhing respectively. In radiant heat tail-flick method the crude extract produced 33.65% and 40.88% elongation of tail flicking time 60 minutes after oral doses of 200 and 400 mg/kg body weight respectively.

Keywords: *Averrhoa carambola*, Analgesic activity, Acetic acid-induced writhing test, Radiant heat tail-flick method

INTRODUCTION

After decades of serious obsession with the modern medicinal system, people have started looking at the ancient healing systems like Ayurveda, Siddha and Unnani. This is because of the adverse effects associated with synthetic drugs. Herbal drugs play an important role in health care programs especially in developing countries. Ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considers 'all plant parts to be potential sources of medicinal substances' (Shankar and Ved, 2003). However a key obstacle, which has hindered the acceptance of the alternative medicines in the developed countries, is the lack of documentation and stringent quality control. There is a need for documentation of research work carried out on traditional medicines (Dahanukar *et al*., 2000). With this backdrop, it becomes extremely important to make an effort

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towards standardization of the plant material to be used as medicine. The process of standardization can be achieved by stepwise pharmacognostic studies (Ozarkar, 2005). These studies help in identification and authentication of the plant material. Correct identification and quality assurance of the starting materials is an essential prerequisite to ensure reproducible quality of herbal medicine which will contribute to its safety and efficacy. Simple pharmacognostic techniques used in standardization of plant material include its morphological, anatomical and biochemical characteristics (Anonymous, 1998). *Averrhoa carambola* (Oxalidaceae) also known as star fruit, is cultivated extensively in India (Almeida, 1996) for its edible fruits (Cooke, 1967; and Flora, 2004). In India, the ripe fruit or its juice may be taken to counteract fever. A salve made of the fruit is employed to relieve eye afflictions. In Brazil, the carambola is recommended as diuretic in kidney and bladder complaints. In Chinese Materia Medica it is used to quench thirst, increase the salivary secretion, and in fever. In Ayurveda, the ripe fruit is considered as digestive, tonic and causes biliousness. The dried fruit is also used in fever; it is cooling and possesses antiscorbutic properties. It is considered as one of the best Indian cooling medicines (Kirtikar and Basu, 1989; and Parrotta, 2001). Fruits and its fruit juice are used as antioxidant and astringent (Mia, 2007).

As a part of our continuing study on chemical and biological characterization of different plants, the present study was designed to investigate the analgesic activity of *Averrhoa carambola* to search for newer, safer and more potent analgesic agent.

MATERIALS AND METHODS

The fruit of the plant *A. carambola* was collected from Gazipur, Bangladesh in March 2009. The Specimens of the plant was submitted to the Herbarium of Botany Department, University of Dhaka and taxonomically identified and authenticated by the experts(Voucher number: 0324). The collected fruits were washed, cut into small pieces and dried in the sun for about a week. The coarse powder was extracted with an equal proportion mixture of solvents comprising of petroleum ether, ethyl acetate and methanol. All the animals used in the study were purchased from the Animal Research Branch of the International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR, B). The animals were taken care of under ethical consideration.

Peripheral Analgesic Sctivity

Swiss-Albino mice of either sex, aged 4-5 weeks, average weight 20-25 g were used for the experiment. Twenty four experimental healthy animals were randomly selected and divided into four groups denoted as group-I, group-II, group-III and group-IV, consisting of six mice in each group. Each group received a particular treatment i.e. control, positive control and the two doses of the extract. At zero hour test samples, control (1% Tween-80 solution in saline) and aminopyrine (standard analgesic drug) were administered orally by means of a long needle with a ball-shaped end. After forty minutes acetic acid (0.7%) was administered intra-peritoneally (0.1 ml/ 10 g of body weight) to each of the animals of all the groups. The forty minutes interval between the oral administration of test materials and intra-peritoneal administration of acetic acid was given to assure proper absorption of the administered samples (Koster *et al.,* 1959). Five minutes after the administration of acetic acid, number of squirms or writhing were counted for each mouse

for fifteen minutes (Hendershot and Forsaith, 1959; Chakraborty *et al.,* 2004).

Central Analgesic Activity

The analgesic activity was also determined by measuring drug-induced changes in the sensitivity of the pre-screened (reaction time: 2-4 s) mice to heat stress applied to their tails. A Medicraft Analgesiometer Mask-N was employed for this experiment (Ahmed *et al.,* 2001). Swiss-Albino mice of either sex, aged 4-5 weeks, average weight 20-25 g were used for the experiment. Twenty four experimental healthy animals were randomly selected and divided into four groups denoted as group-I, group-II, group-III and group-IV, consisting of six mice in each group. Each group received a particular treatment i.e. control, positive control and the two doses of the extract. Intensity of the current passing through the naked nicrome wire was 5 ampere. The distance between the heat source and the tail skin was 1.5 cm and cut-off reaction time was fixed at 10 second to avoid tissue damage. The tail-flick latencies were recorded at 30, 60 and 120 min after administration of vehicle or drugs. Morphine was used as the standard analgesic for comparing the tail-flick latencies of crude extract.

RESULTS

The above study showed that fruit extract of *A. carambola* exhibit significant Central and peripheral analgesic activities as compared to control ($p < 0.001$). In acetic acid induced writhing model in Swiss-Albino mice *A. carambola* at doses of 200 and 400 mg/kg showed 37.13% ($p < 0.001$) and 42.76% ($p < 0.001$) inhibition of writhing respectively (Tables 1 and 2). In radiant heat tail-flick test the crude extract produced 33.65% and 40.88% elongation of tail flicking time 60 minutes after oral doses of 200 and 400 mg/kg body weight respectively (Tables 3a and b).

Table 1: Effect of the Crude Extract of *A. carambola* on Acetic Acid Induced Writhing of Mice

Animal Group	Writhing Count						Mean	Writhing (%)
Control	13.50	14	16	17	17	17.50	16.16	100
Aminopyrine	7	7.50	6	8	6.50	8.50	7.25	44.86
A. carambola (200 mg/kg)	11	9.50	10.50	9	9.50	11.50	10.16	62.87
A. carambola (400 mg/kg)	10	8.50	11	8	7.50	10.50	9.25	57.24

Table 2: Effect of *A. carambola* on Acetic Acid Induced Writhing in Mice

Animal Group	Dose (mg/kg, p.o.)	Writhing*	Inhibition (%)
Control	_	16.16 ± 0.66**	0.00
Aminopyrine	50	7.25 ± 0.11	55.14
A. carambola (200 mg/kg)	200	10.16 ± 0.06	37.13
A. carambola (400 mg/kg)	400	9.25 ± .065	42.76

Note: (N = 6); * Values are mean ± SE; and ** Significant at $P < 0.001$.

Table 3: Observation of the Tail Flicking Time of Mice With the Crude Extract of *A. carambola* in Radiant Heat Method

A.

Treatment	Dose (mg/kg)	Reaction Time(s)		
		30 min (% of Tail Flicking Time)	60 min (% of Tail Flicking Time)	120 min (% of Tail Flicking Time)
Control (vehicle, 10ml/kg)	–	100.00	100.00	100.00
Morphine	2	176.12	152.44	134.33
Fruit extract (*A. carambola*)	200	132.46	133.65	105.44
	400	161.66	140.88	117.61

B.

Treatment	Dose (mg/kg)	30 min (% Elongation)	60 min (% elongation)	120 min (% elongation)
Control (vehicle, 10ml/kg)	–	0.00	0.00	0.00
Morphine	2	76.12	52.44	34.33
Fruit extract (*A. carambola*)	200	32.46	33.65	5.44
	400	61.66	40.88	17.61

DISCUSSION

In the present study, analgesic activity of two doses of extract *A. carambola* was observed, both centrally and peripherally, as compared to control. The central action is probably mediated via opioid receptors because opioid drug morphine was used as standard analgesic and the analgesic action of morphine was compared with that of plant extracts. It is evident from the study that increase in dose of extract increases percent elongation of tail flicking time. Aminopyrine offers relief from inflammatory pain by suppressing the formation of pain mediators in the peripheral tissues, where prostaglandins and bradykinin were suggested to play an important role in the pain process. Prostaglandins elicit pain by the direct stimulation of sensory nerve endings. Moreover, prostaglandins especially PGE_1 was reported to act on cell membrane during inflammatory conditions. This causes destabilization of cell membrane leading to degenerative cellular changes. Therefore, it is likely that *A. carambola* extracts might suppress the formation of prostaglandins by inhibiting or antagonizing the enzyme cyclooxygenase. It is clear from the study that increases in dose increases percent of inhibition of writhing. Results of two doses are also comparable with standard drug (aminopyrine).

It is evident from the study that *A. carambola* exhibits significant central and peripheral analgesic effect in Albino mice. All the above results support the traditional uses of the plant. Since Bangladesh is rich in medicinal plants, the present study may direct significantly for their best uses. So the purpose of the present study is the rationalization of the traditional use of the selected plant and exploration of possible newer medicinal activities of the same plant.

CONCLUSION

It can be concluded from this study that extracts of *A. carambola* possess significant central and peripheral analgesic activities. These support the traditional uses of this plant in various painful inflammatory diseases. Information of the present study may help the future researchers. The plant can be further screened against various diseases in order to find out its unexplored efficacy and can be a potential source of chemically interesting and biologically important drug candidates.

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