Biomedical & Pharmacology Journal Vol. **4**(2), 263-267 (2011)

Studies on the Anti-Inflammatory and Antipyretic Properties of *Haldinia cordifolia*

Y. RAVI KIRAN*, C. MANJUNATH, U. ASHOK KUMAR and Y. BRAHMAIAH

Department of Pharmacology, Bharathi College of Pharmacy,
Bharathi Nagara, Mandya Dist, Karnataka - 571 422 (India).
*Corresponding author: E-mail: ravi.kiran.cips@gmail.com

(Received: July 12, 2011; Accepted: August 04, 2011)

ABSTRACT

The purpose of this investigation was study to the anti-inflammatory and anti-pyretic properties of stem bark extract of *Haldinia cordifolia* in rats. The ethanolic extract of dried stem bark of *Haldinia cordifolia* was investigated for anti-inflammatory (carragenan induced rat paw oedema) and anti-pyretic (brewer's yeast induced pyrexia) activities. Pre treatment with the extract (200 - 400 mg/kg, p.o.) significantly prevented increase in volume of paw oedema in dose dependent manner. Its effects on antipyretic activity were also significant and reduce fever at higher doses. In conclusion, this study has established the anti-inflammatory activity and antipyretic activity of *Haldinia cordifolia* and thus justifies the ethnic uses of the plant.

Key words: Anti-inflammatory activity, Ayurvedic, *Haldinia cordifolia*.

INTRODUCTION

Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects. Many plants synthesize substances that are useful to the maintenance of health in humans and other animals. These include aromatic substances, most of which are phenols or their oxygen-substituted derivatives such as tannins. Herbal therapy is used to treat a large variety of ailment and symptoms, e.g., inflammation, fever and pain; however, there are no adequate experimental evidences about their effectiveness. Inflammation is a body defense reaction to eliminate or limit the spread of an injurious agent and is characterized by five cardinal signs, redness, swelling, heat, pain and loss of function. The inflammatory process involves a cascade of events elicited by numerous stimuli that include infectious agents, ischemia, antigen-antibody interaction and thermal or physical injury[1, 2]. Disadvantage in presently available synthetic drugs is that they cause gastrointestinal irritation and reappearance of symptoms after discontinuation. Need for screening and development of novel, but better anti-inflammatory drugs and indigenous medicinal plants could be a logical source to find these.

Haldinia cordifolia have been reported to possess astringent, antipyretic and wound healing properties[3]. The group of flavanoids is famous for its anti-inflammatory, anti-allergic, antithromtic, vasoprotective and protection of gastric mucosa properties. These properties have been attributed to influence of flavanoids on production of prostaglandins and their antioxidant effects. Phytochemical evaluation of the bark extract showed the presence of alkaloids, tannins, flavanoids, and steroids etc., till now *Haldinia cordifolia* has not been the subject of any pharmacological research. Therefore, aim of this study was to carry out a pharmacological evaluation of ethanol extract of *Haldinia cordifolia* for its anti-inflammatory and antipyretic properties.

MATERIAL AND METHODS

Plant material

The stem bark of *Haldinia cordifolia* was collected from Sri Venkateswara University, Chithoor Dist, Andhra Pradesh and identified by Prof. Sri Madhavachetty, voucher specimen (No.561) has been deposited at the Herbarium of the Department of Pharmacology, Bharathi College of Pharmacy, Karnataka. The plant material was air dried, powdered and extracted with ethanol in soxhlet apparatus. The extract was evaporated to dryness under reduced pressure.

Animals

In breed Albino Wistar rats (150-200 g) were used for the experiments. All the animals were obtained from the laboratory animal centre, Bharathi College of Pharmacy, Karnataka. The animals were maintained under standard environmental conditions and fed with standard diet and water ad libitum. The experimental was approved by the Institutional Animal Ethics Committee (BCP/IAEC/PCL/03).

Phytochemical screening

Preliminary phytochemical evaluation revealed the presence of alkaloids, flavonoids, tannins, sterols and saponins in the ethanolic extract of the *Haldinia cordifolia*.

Drugs and chemicals

The drugs and fine chemicals were purchased from Sigma-Aldrich. All other chemicals and solvents were obtained from local firms (India) and were of highest purity and analytical grade.

Preparation of Extract

The powdered drug was dried and packed well in Soxhlet apparatus and extracted with 1500 ml of ethanol for 72 hrs. The extract was concentrated and dried using Rotary vaccum evaporator. It was kept in a desiccator until used.

Acute toxicity studies[4]

The result of acute toxicity study in rats indicated that the ethanolic extract did not produce any significant changes in the behavioral or neurological responses up-to 2000 g/kg b. wt.

Studies on inflammation

Acute inflammation study

Carrageenan-induced paw oedema in rats[5]

The anti-inflammatory activity of the extract was determined using carrageenan induced rat paw oedema assay. The rats were divided into five groups of six rats each. The control group received distilled water p.o. at a dose of 2 ml/kg. The positive control group was treated orally with the standard drug, diclofenac (20 mg/kg). The test groups received the test drug in doses of 200 and 400 mg/kg p.o. All the doses were administered 30 min before the induction of oedema by administering 0.1 ml of 1% w/v carrageenan in saline in sub plantar region of hind paw of animal. The degree of paw oedema of all the groups was measured using a plethysmometer (Ugo Basile, Italy) at 30, 60, 120, 180 and 240 min after the administration of

Table 1: Effect of HCEE on paw oedema induced by carrageenan in rats

Treatment	Dose	Paw volume (in ml) at various times(%inhibition)				
	(mg/kg)	30 min	60 min	120 min	180 min	240 min
Control	2 ml/kg	0.32±0.06	0.42±0.04	0.63±0.04	0.81±0.02	0.62±0.02
Diclofenac	20	0.21±0.07	0.26±0.05*	0.41±0.07*	0.52±0.02*	0.44±0.05*
	(34)	(38)	(35)	(36)	(30)	
HCEE	200	0.24±0.03	0.29±0.09*	0.45±0.04*	0.59±0.03*	0.48±0.06*
	(25)	(31)	(29)	(28)	(23)	
HCEE	400	0.22±0.03*	0.24±0.02*	0.42±0.09*	0.54±0.06*	0.46±0.07*
	(32)	(43)	(33)	(33)	(26)	

Values are expressed as mean ± S.E.M. (n = 6); *p<0.05, ** p<0.01 vs control. HCEE- *Haldinia cordifolia* ethanolic extract

carrageenan to each group. The inhibitory activity was calculated according to the following formula[6]

$$\text{Inhibition (\%)} = 100\text{-}\frac{\text{Oedema volume in the treated}}{\text{Oedema volume in the control}}\times 10$$

Antipyretic studies (Brewer's yeast induced hyperpyrexia method)

Animals of either sex were divided in to four groups of six each for this experiment. The normal body temperature of each rat was measured rectally at one hour interval on a thermometer and recorded. The antipyretic activity of extract was evaluated using Brewer's yeast induced pyrexia in Wister rats [8]. Before yeast injection the basal rectal temperature of rats was recorded and after recording animals were given subcutaneous injection of 10 ml/ kg of 15 % w/v yeast suspended in 0.5 % w/v methyl cellulose solution for elevation of body temperature of rats. Rats were then returned to their housing cages. At the 18hrs after yeast injection, the vehicle, standard drug and test drugs were administered in to different groups. Propylene glycol at dose of 5 ml/kg was administered orally to the control groups of animals and paracetamol at dose of 150mg/kg was administered orally to standard group of animals. The ethanolic extract of *Haldinia cordifolia* plant was administered orally at a dose of 100 mg/kg and 200 mg / kg of body weight to two groups of animals respectively. Rectal temperature was recorded by clinical thermometer at 0, 1, 2 and 3hrs after drug administration and tabulated in table. no. 2[7].

Statistical analysis

The results are presented as Mean ± SEM. Statistical analysis of data was performed using Student't' test to study the differences amongst the means.

RESULTS

Preliminary Phytochemical screening

Phytochemical studies revealed that stem bark extract of *Haldinia cordifolia* contains phytosterols, alkaloids, flavanoids, glycosides, and saponins.

Carrageenan-induced paw oedema in rats

The effect of ethanolic extract on

Table 2. Effect of HCEE on rectal temperature of rats

Treatment	Dose	Rectal temperature (0C) after yeast injection						
	(mg/kg)	***0hr***	***1hr***	***2hr***	***3hr***	***4hr***	***5hr***	***6hr***
Control		37.39±0.03	39.16±0.02	39.2±0.15	39.2±0.15	39.2±0.15	39.05±0.18	38.58±0.21
Paracetamol	150	36.93±0.41	38.6±0.56	37.33±0.21**	37.33±0.31**	37.52±0.17**	37.41±0.2**	37.26±0.16**
H. cordifolia	200	37.26±0.17	39.1±0.18	38.5±0.34	38.35±0.335*	38.28±0.17*	38.12±0.21*	38.1±0.106
H. cordifolia	400	37.4±0.17	38.78±0.45	37.86±0.42*	37.63±0.22**	37.45±0.19**	37.57±0.20**	37.4±0.17**

Values are in mean ±SEM; (n=6) *p<0.05, ** p<0.01 vs control HCEE- *Haldinia cordifolia* ethanolic extract

Carrageenan induced hind paw edema test in rats was shown in Table. The results showed that the Ethanolic extract of *Haldinia cordifolia* (200 and 400 mg/kg) potently and significantly reduced the oedema in a dose-dependent manner as compared to the control animals.

Anti pyretic activity test

The effect of ethanolic extract of *Haldinia cordifolia* plant on yeast induced pyraxia has been shown in table. Treatment with extract at dose of 200 mg/kg and 400 mg/kg body weight and Paracetamol at dose of 150mg/kg decreased body temperature of yeast induced rats. The results obtained from both standards and extract treated groups were compared with the control group. A significant reduction in the yeast elevated rectal temp was observed in the test in a dose dependent manner.

DISCUSSION

Carrageenan induced paw oedema is a commonly used primary test for the screening of new anti-inflammatory agents and is believed to be biphasic. The first phase (1-2 hr) is due to the release of histamine or serotonin and the second phase of oedema is due to the release of prostaglandin[9]. The results of this study indicate that the ethanolic extract of *Haldinia cordifolia* significantly reduced carrageenan induced paw oedema in rats. Therefore, the mechanism of action may be by inhibition of histamine, serotonin or prostaglandin synthesis. Usually most anti-inflammatory and analgesic drugs possess antipyretic activity. In general, non-steroidal anti-inflammatory drugs produce their antipyretic action through the inhibition of prostaglandin synthetase within the hypothalamus[10]. Therefore, the antipyretic activity of ethanolic extract of *Haldinia cordifolia* is probably by inhibition of prostaglandin synthesis in hypothalamus. The antiinflammatory and antipyretic activities of methanolic extract may be due to the presence of alkaloids, sterols and flavonoids.

CONCLUSION

The results of the present study indicate the anti-inflammatory and antipyretic activities of the stem bark of the *Haldinia cordifolia*. However, further investigation is required to isolate the active constituents responsible for these activities and to elucidate the exact mechanisms of action.

REFERENCES

1. Burke A, Smyth EM, Fitzerald GA., Goodman and Gilman's The Pharmacological Basis of Therapeutics, 11th edn, McGraw-Hill, Sydney, 671(2006).
2. Hunskaar S, Hole K. "The formalin test in mice: Dissociation between inflammatory and non-inflammatory pain." Pain, **30**: 103 (1987).
3. Dr Madhava chetty K, Sivaji K, Tulasi Rao k. Flowering plants of Chittor district. 2nd edn. Student offset printers, Tirupathi,154(2008).
4. Rupesh Kumar M, Palanivel M, Rajkapoor B, Senthil kumar R, Einstein J.W, Prem kumar E, Kavitha K, Pradeep Kumar M, Jayakar B. "Hepatoprotective and antioxidant effect of *Pisonia aculeata* L. against CCl_4- Induced Hepatic Damage in Rats." *Sci Pharm*, **76**: 203:159(2008).
5. Winter CA, Risley EA, Nuss GW. "Carrageenin-induced oedema in hind paws of the rat as an assay for anti-inflammatory drugs." *Proc. Soc. Exp. Biol. Med*, **111**: 544-547 (1962).
6. Chu, D. and B.A. Kovacs. "Anti-inflammatory activity in oak gall extracts". Arch. Int. Pharm. Ther, **230**: 166-176 (1977).
7. H. G. Vogel, Drug Discovery and Evaluation Pharmacological Assays, 2nd edn, Springer, New York, 716 (2002).
8. R. A. Turner, Screening method in Pharmacology, Academic Press, New York & London, 268 (1965).
9. Britto ARMS, Antonio MA, "Oral anti-inflammatory and anti-ulcerogenic activities of a hydroalcoholic extract and partitioned fractions of *Turnera ulmifolia* (Turneraceae)."

Ethnopharmacol, **61**: 215-228(1998).

10. Hayare SW, Chandra S, Tandan SK, Sarma J, Lal J, Telang AG, "Analgesic and antipyretic activities of *Dalbergia sissoo* leaves." *Indian J Pharmacol*, **32**: 357-360 (2000).