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Anti-pyretic and Analgesic Activity of *Zingiber zerumbet*

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Abstract: The objective of the present study was to evaluate the anti-pyretic and analgesic activities of aqueous and ethanol extracts of *Zingiber zerumbet* rhizomes. The anti-pyretic activity of *Zingiber zerumbet* (25, 50 and 100 mg kg^{-1}) was studied in Brewer's yeast-induced pyrexia in rats. The analgesic activity of *Zingiber zerumbet* (10, 25, 50 and 100 mg kg^{-1}) was studied using acetic acid-induced writhing in mice. Both aqueous and ethanol extracts of *Zingiber zerumbet* showed significant anti-pyretic activities in Brewer's yeast-induced pyrexia in rats throughout the observation period of 8 h. The ethanol extract of the rhizomes of *Zingiber zerumbet* however significantly decreased the writhing movements in mice in acetic acid-induced writhing test. In conclusion, rhizomes *Zingiber zerumbet* have both analgesic and anti-pyretic activities.

Key words: *Zingiber zerumbet*, analgesic, anti-pyretic

INTRODUCTION

Zingiber zerumbet (L) Smith or known as wild ginger and lempoyang in Malaysia is one in the Zingiberaceae family, which is a widely cultivated plant in village gardens in the tropics for its medicinal properties[1]. Zingiberaceae is widely distributed throughout the tropics particularly in Southeast Asia[2]. The rhizomes of *Z. zerumbet* are used to relieve stomach ache and macerated in alcohol as tonic or stimulant in China[3]. In Southeast Asia, *Z. zerumbet* is traditionally used for the treatment of fever, constipation and to relieve pain[3].

The volatile oils of the rhizomes have been shown to contain zerumbone, humulene and camprene[4,5]. Plants from this family have been reported to have antihyperglycaemic[6], anti-inflammatory[7], anti-ulceration[8], antioxidant[2,9] anti-platelet activating factor[10] and anti-microbial activities[2]. Recently, *Zingiber zerumbet* has been shown to inhibit prostaglandin induced paw oedema, a commonly used acute inflammatory reaction and the efficacy is equivalent to the nonsteroidal anti-inflammatory drug, mafenamic acid[11].

In view of the uses of *Z. zerumbet* in Southeast Asia, the objectives of this current investigation were to evaluate the anti-pyretic and analgesic activities of aqueous and ethanol extracts of *Z. zerumbet* rhizomes.

MATERIALS AND METHODS

Plant material: Zingiber zerumbet plants and rhizomes were collected from the University Campus. The plant was identified and a voucher specimen was deposited at the Phytomedicinal Herbrium, Institute of Bioscience, Universiti Putra Malaysia under the number of SK 231/02.

Preparation of extract: One kilogram of rhizomes of *Z. zerumbet* was used for the extraction. The rhizomes were washed with distilled water, chopped into small pieces, dried in oven (50°C) for about 1 to 2 days and then powdered. Water and ethanol extracts from the rhizomes of *Z. zerumbet* were prepared with distilled water and 98% ethyl alcohol in Soxhlet apparatus. The extracts were then freeze-dried. The extract yield: 8.34% (water) and 4.52% (ethanol). Phytochemical screening[12] gave positive tests for phenolic compounds, tannins, amino acids, carbohydrates and alkaloids.

Experimental animals: Male Sprague Dawley rats (180 to 200 g) and male Balb/C mice (25 to 30 g) were kept in polypropylene cages with wood shavings as bedding at 27±2.0°C in 12 h light dark cycle. The animals were adapted to laboratory conditions for 7 days prior to the experiments. They were given laboratory and tap water *ad libitum*. The experimental procedures were carried out

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in strict compliance with the Animal Ethics Committee rules and regulation followed in this institute. The water and ethanol extracts of *Z. zerumbet* were devoid of any mortality or behavioral changes when the rats were given upto 500 mg kg^{-1} ip in rats and mice[11].

Anti-pyretic test: Rats (n=6/group) were divided into groups of treatment:Brewer's yeast at 2 mg kg^{-1} ip, vehicle control (normal saline), *Z. zerumbet* water and ethanol extracts at 25, 50 and 100 mg kg^{-1}).

Rats which received *Z. zerumbet* extracts were then injected with Brewer's yeast at 2 mg kg^{-1} ip, 30 min after the injection of extracts. The detailed method described by Bruguerolle and Roucoules[13]. Subsequently, the rectal temperature was recorded every hour up to 8 h.

Acetic acid-induced writhing: The method described by Dambisya and Lee[14] was used. Mice were divided into 10, 25, 50 and 100 mg kg^{-1} *Z. zerumbet* aqueous and ethanol extracts. Control animals received equivalent amount of normal saline ip. Thirty minutes later 0.6% (w/v) acetic acid (10 mL kg^{-1}) was intraperitoneally injected.

The number of writhings during the following 10 min period were counted. A significant reduction in the number of writhings compared to the control animals was considered as an antinociceptive response. Morphine sulfate (0.2 and 0.8 mg kg^{-1}, ip. gift from Department of Pharmacology, National University of Malaysia, Kuala Lumpur) was used for comparison.

Statistical analysis: The data were analysed using one-way analysis of variance. Values of $p<0.05$ were considered significant. Duncan multiple post-test was performed to significant treatment means.

RESULTS

The ethanol and aqueous extracts of *Zingiber zerumbet* elicited moderate to marked anti-antipyretic activities, which was dose-dependent (Fig. 1A and 1B). At 25 mg kg^{-1} concentration of the ethanol extract, no significant anti-pyretic property was observed in the Brewer's yeast induced pyrexia in rats. At 50 and 100 mg kg^{-1} marked anti-pyretic activity detected were significantly different than controls ($p<0.05$). Generally, all concentration of aqueous extracts showed marked anti-pyretic activities (Fig. 1B).

The ethanol extract of *Z. zerumbet* revealed a dose dependent analgesic property, which was significantly different than controls (Table 1). The 25 mg kg^{-1} ethanol extract of the rhizome was similar to 0.2 mg kg^{-1} morphine

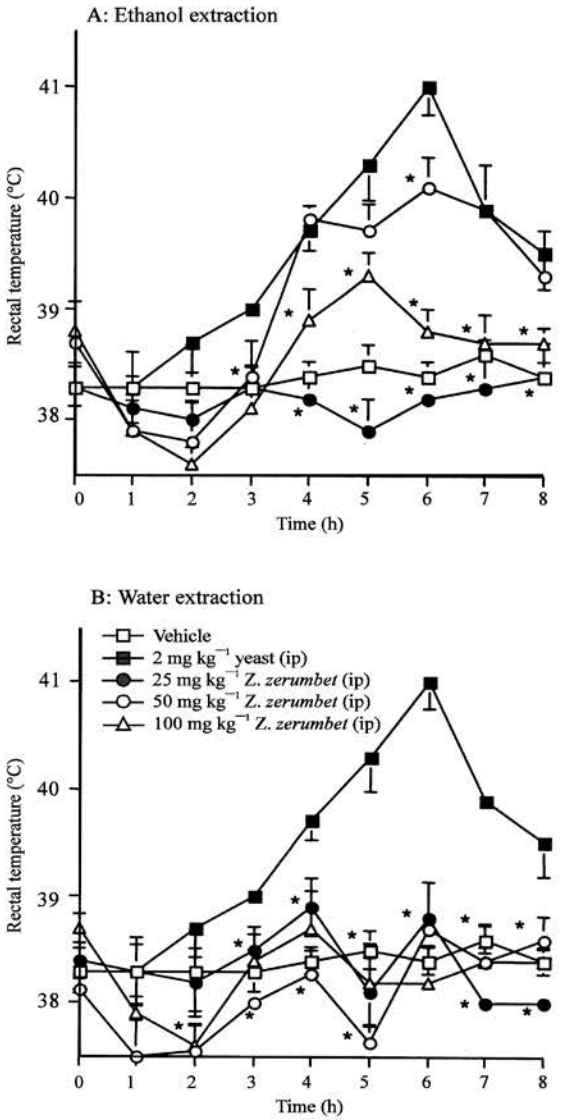

Fig. 1: Anti-pyretic activity of *Zingiber zerumbet* extracts in Brewer's yeast induced pyrexia in rats *Significant different when compared to 2 mg kg^{-1} Yeast group ($p<0.05$)

and 100 mg kg^{-1} ethanol extract was similar to 0.8 mg kg^{-1} morphine (Table 1). The aqueous extract of *Z. zerumbet* was devoid of any analgesic effects at 50 and 100 mg kg^{-1} concentrations. There was no significant difference at all time points when compared to controls (Table 2).

DISCUSSION

The ethanol extract of *Zingiber zerumbet* rhizomes exhibited a significant and dose-dependent suppression

Table 1: Analgesic effects of ethanol extracts of *Zingiber zerumbet* on acetic acid-induced writhing in mice

		No. of writhing in 10 min			
Treatments	Dose (mg kg^{-1})	10 min	20 min	30 min	40 min
Control	-	47.50±7.1^{aw}	75.67±18.3^{ax}	42.60±6.2^{aw}	41.67±6.3^{aw}
Z. zerumbet	10.0	51.3±1.86^{aw}	41.35±4.33^{bx}	25.06±4.04^{by}	13.67±2.03^{bz}
	25.0	21.6±9.35^{bw}	23.68±8.35^{cx}	23.33±4.9^{bw}	10.54±5.56^{bx}
	50.0	5.84±1.33^{cw}	11.67±2.03^{dx}	9.75±1.25^{cy}	5.33±0.88^{cw}
	100.0	5.33±2.25^{cw}	6.35±3.48^{dw}	3.34±2.02^{dxy}	1.74±0.50^{cy}
Morphine	0.2	33.4±4.15^{dw}	24.30±1.57^{cx}	20.41±2.50^{by}	17.54±3.51^{by}
	0.8	2.01±1.89^{c}	0.0*	0.0*	1.54±1.12^{c}

n = 10 mice/group. Values are mean±SD $^{a-d}$Means with different superscript(s) differ significantly ($p<0.05$) in the same column
$^{w-z}$Means with different superscript(s) differ significantly ($p<0.05$) in the same row * = No abdominal constriction detected in 10 min period

Table 2: Effects of aqueous extracts of *Zingiber zerumbet* on acetic acid-induced writhing in mice

		No. of writhing in 10 min			
Treatment	Dose (mg kg^{-1})	10 min	20 min	30 min	40 min
Control	-	47.50±7.06	75.67±18.3	42.60±6.24	41.67±6.36
Z. zerumbet	50.0	46.67±12.2	62.12±11.1	45.2±14.23	50.35±12.5
	100.0	37.50±10.3	48.15±24.2	36.67±8.65	32.04±6.89
Morphine	0.2	33.45±4.15	24.30±1.57	20.41±2.50	17.54±3.51
	0.8	2.01±1.89	0.0*	0.0*	1.54±1.12

n = 10 mice/group. Values are mean±SD. Data for control and morphine treatment are from Table 1 * = No abdominal constriction detected in 10 min period

of abdominal constriction caused by acetic acid (Table 1). The analgesic (antinociceptive) activity of 100 mg kg^{-1} *Z. zerumbet* ethanol extract was similar to the activity of 0.8 mg kg^{-1} morphine. However, the aqueous extract of the rhizome was devoid of any antinociceptive property. The extracts of *Z. zerumbet* revealed significant anti-pyretic activity in Brewer's yeast induced pyrexia in rats. Both ethanol and aqueous extracts of the rhizome was potent anti-pyretic agent.

Increased body temperature and pain are two major signs of the body against inflammation[15]. A drug with anti-inflammatory activity usually also exhibit anti-pyretic and analgesic properties[16]. The best examples would be the nonsteroidal anti-inflammatory drugs (NSAIDs), which possess all three activities[17]. Recently, we reported that *Z. zerumbet* extract has anti-inflammatory properties[11].

The mechanism underlying the activity of *Z. zerumbet* anti-pyretic and analgesic is still unknown. However, previously *Z. zerumbet* inhibited inflammation induced by prostaglandin in rat paws[14]. Prostaglandin is one of the causing factors for fever[18] and inflammation causes pain. In this current investigation, extracts of *Z. zerumbet* might inhibit prostaglandin that will reduce the body temperature and pain. Preliminary phytochemical screening of the rhizome extract gave positive test for phenolic compounds, tannins, amino acids, carbohydrates and alkaloids, which might be in part responsible for the anti-pyretic and analgesic activity reported in this current investigation.

Therefore, the overall obtained results, while suggesting that the ethanol extract of *Z. zerumbet* rhizome might relieve pain, provide some justification for the folkloric use of *Z. zerumbet* in the treatment for inflammation and pains. Further studies are on-going, aimed at isolating the bioactive principles and elucidating the mechanism of antinociceptive by using opioid receptor antagonists.

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REFERENCES

1. Saadiah, M.H. and I. Halijah, 1995. Zingiberaceae. Proceedings of the National Convention on Herbal Medicine. Forest Research Institute Malaysia. Kuala Lumpur, 21: 205-207.
2. Habsah, M., M. Amran, M.M. Mackeen, N.H. Lajis, H. Kikuzaki, N. Nakatani, A. Rahman, A. Ghafar and A.M. Ali, 2000. Screening of Zingiberaceae extracts for antimicrobial and antioxidant activities. J. Ethnopharmacol., 72: 403-410.
3. Perry, L.M., 1980. Medicinal Plants of East and South East Asia: Attributed Properties and Uses. MIT Press, Cambridge.
4. Hasnah, M.S., 1991. Chemical constituents of some medicinal plants of Zingiberaceae. Medicinal products from tropical rain forest. Proceedings of the Conference, Forest Research Institute Malaysia. Kuala Lumpur, pp: 299-304.
5. Bordia, A., S.K. Verma and K.C. Srivastava, 1997. Effect of ginger (*Zingiber officinale* Rosc.) and fenugreek (*Trigonella foenumgraecum* L.) on blood lipids, blood sugar and platelet aggregation in patients with coronary artery disease. Prostaglandins Leukot Essent Fatty Acids, 56: 379-384.

6. Husen, R., L.P.A. Hawariah and M.M. Nallappan, 2004. Screening for antihyperglycaemic activity in several local herbs of Malaysia. J. Ethnopharmacol., 95: 205-208.
7. Jaganath, I.B. and L.T. Ng, 2000. Herbs: The green pharmacy of Malaysia. VinPress Sdn. Bhd. and Malaysian Agricultural Research and Development Institute, Malaysia, pp: 95-99.
8. Mascolo, N., R. Jain, S.C. Jain and F. Capasso, 1989. Ethnopharmacologic investigation of ginger (*Zingiber officinale*). J. Ethnopharmacol., 27: 129-140.
9. Agrawal, A.K., C.V. Rao, K. Sairam, V.K. Joshi and R.K. Goel, 2000. Effect of *Piper longum* Linn, *Zingiber officianalis* Linn and Ferula species on gastric ulceration and secretion in rats. Indian J. Expl. Biol., 38: 994-998.
10. Jantan, I., I.A.A. Rafi and J. Jalil, 2005. Platelet Activating Factor (PAF) receptor-binding antagonist activity of Malaysian medicinal plants. Phytomedicine, 12: 88-92.
11. Somchit, M.N. and M.H. Shukriyah, 2003. Anti-inflammatory property of ethanol and water extracts of *Zingiber zerumbet*. Indian J. Pharmacol., 35: 181-182.
12. Trease, G.E. and W.C. Evans, 1983. Pharmacognosy. London: Brailliere Tindall Press, pp: 307-706.
13. Bruguerolle, B. and X. Roucoules, 1994. Time-dependent changes in body temperature rhythm induced in rats by brewer's yeast injection. Chronobiol. Intl., 11: 180-186.
14. Dambisya, Y.M. and L.T. Lee, 1995. Effects L-NG-nitro arginine methyl ester (L-NAME), L-NG-monomethyl arginine (L-NMMA) and L-arginine on the antinociceptive effects of morphine in mice. Methods Find Expl. Clin. Pharmacol., 17: 577-582.
15. Meli, R., E. Antonelli and G. Cirino, 2001. Analgesia and cyclo-oxygenase inhibitors. Digestive and Liver Disease 33, Suppl., 2: S8-S11.
16. Perianayagam, J.P., S.K. Sharma, A. Joseph and A.J.M. Christina, 2004. Evaluation of anti-pyretic and analgesic activity of *Emblica officinalis* Gaertn. J. Ethnopharmacol., 95: 83-85.
17. Buffum, M. and J.C. Buffum, 2000. Nonsteroidal anti-inflammatory drugs in the elderly. Pain Management Nursing, 1: 40-50.
18. Milton, A.S., 1982. Prostaglandins and fever. Trends in Pharmacological Sciences, 40: 490-492.