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[2]. 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 camphene[4-5]. Plants from this family have been reported to have antihyperglycaemic[6], anti-inflammatory[7], anti-ulceration[8], antioxidant[9] anti-platelet activating factor[10] and anti-microbial activities[1]. 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 Phytomedical 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[13] 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 up to 500 mg kg\(^{-1}\) ip in rats and mice\(^{1}\).

**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

![Ethanol extraction](image)

![Water extraction](image)

**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
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[10]. A drug with
anti-inflammatory activity usually also exhibit anti-pyretic
and analgesic properties[11]. The best examples would be
the nonsteroidal anti-inflammatory drugs (NSAIDs),
which possess all three activities[7]. 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[10]. Prostaglandin is one of the
causing factors for fever[10] 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


