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Evaluation of the antipyretic activity of the aqueous extract of Zinger (*Zingiber officinale*) rhizome in female rats

Awatif M. Al-Saaedi* and Zainab Mohsin Ibrahim*
* *University of Thi-Qar/ College of Science/ Biology Department*
Corresponding Author: Awatif M. Al-Saaedi

Abstract: This study was designed to evaluate the antipyretic activity of the aqueous extract of *Zingiber officinale* rhizome by the use of Brewer's yeast induced pyrexia method in female rats. The animals were randomly divided into 5 groups, the first group was served as a control group, the second group was subcutaneously injected by 30% yeast suspension (10 ml/kg). The third group was served as a standard group, it treated with yeast suspension and paracetamol (150 m/kg). The fourth and fifth groups were treated with yeast suspension and with 100 and 200 mg/kg respectively. Rectal temperature was taken at the start of the test and after 19 h after yeast injection to detect the rise of rectal temperature, after then paracetamol and the plant extract were administrated. Rectal temperature was noted again after 0, 1,2 and 3 h of drug administration. The results appeared that the aqueous extract of *Zingiber officinale* has significant antipyretic activity at P< 0.05.

Keywords: *Zingiber officinale*, aqueous extract, Antipyretic.

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I. INTRODUCTION

Fever "pyrexia" is the most common reasons for medical consultations around the world. It often occurs due to microbial infection, inflammation or trauma. Pyrexia has been defined by the American college of critical care medicine, the international statistical classification of diseases and the international statistical classification of diseases and the infectious disease society of America as the core temperature of 38.3˚C or higher (Dimie, 2011; Edward*et al*., 2016).

According to their body temperature animals are divided into homoeothermic and poikilothermic. Homoeothermic animals (mammals and birds) are the animals that can maintain their body temperature relatively constant in spite of the variations in environmental temperature. In homoeotherms heat exchanges between the animal's body and the surrounding environment are regulated by thermoregulatory centers in the hypothalamus (Eugene, 1982; Rastogi, 2001).

The body temperature of homoeotherms increases above the physiological ranges due to physiological stress such as increasing thyroid secretion, exercise, leukemia and the most of microbial infections. Human body temperature is elevated whenever the body finds the infectious agent for creating an unfavorable environment for microbial survival (Sabira*et al*., 2015).

Medicinal plants are widely used to cure diseases since the earliest times. About 80% population in the developing countries relies on folk medicines. Nowadays a substantial number of drugs is developed from medicinal plants (Ignacimuthu and Ayyanar, 2009).

Zingiber officinale , Zinger, (Zingiberaceae) is one of the most important plants with nutritional and medicinal values. It is widely used as a spice or herbal remedy to cure a variety of diseases like digestive disorders, rheumatism, cough, inflammation (Mascol*et al*., 1989; Jyotsna *et al*., 2017).

Although ginger is traditionally for fever remedy, there are not enough studies to evaluate its antipyretic activity. Thus, the current study was designed to study the antipyretic effect of the aqueous extract of *Zingiber officinale* rhizome.

II. MATERIALS AND METHODS

Plant collection

Dried *Z. officinale* rhizomes are collected from the local market of Nasiriyah city, Thi-Qar province, south of Iraq, and were authenticated as *Z. officinale* in the laboratories of University of Thi-Qar/ College of Science. The plant rhizomes were well ground for the following extraction process.

Extraction

Twenty grams of *Z. officinale* is extracted with 200 ml of distilled water by the use of using a stirrer hot plate for 8 hours. The plant extract was left to stand for 20 min. and was filtered through Whatman’s No.1 filter papers.

The extract was dried at 25˚C.The dried extract was stored in dry clean vials at 4˚C for antipyretic evaluation (Harborne, 1984).

Experimental animals

Thirtyfemale rats weighing about 150-200 g were purchased from the animal house of Biology department/ College of Science/ University of Thi-Qar. The animals maintained under standard hygienic conditions at 20°C ± 2°C with a 12-hour day/night cycle and access to food and water *ad libitum*. Animals were treated in accordance with the local Ethical Guidelines for the animal care ethics committee.

Antipyretic activity

Antipyretic activity was investigated by Brewer's yeast induced pyrexia method in rats (Vasundra and Divya, 2013). The animals were randomly divided into 5 groups (6 animals each). At the initiation of the test, rectal temperature was measured by inserting a digital clinical thermometer to a depth of 2 cm into the rectum. Then the animals were set for administration as follows:

Group 1: animals served as control. The rats weren't treated with any substance. Group 2: animals were treated with 30% (w/v) yeast suspension in distilled water via subcutaneous injection (10ml/kg). Group 3: animals were subcutaneously injected by yeast suspension in distilled water 30% (w/v) (10 ml/kg) and with paracetamol (150mg/kg) as a standard drugorally.Group4 and 5: animals were injected by 30% yeast suspension in water(10 ml/kg) and then wereorally administrated100 mg/kg and 200 mg/kg of aqueous extract of *Z. officinale* respectively.

The animals were treated according to the following pattern: yeast suspension was first injected, then after 19 h of yeast injection, rectal temperature was taken again to detect the rise in rectal temperature. Standard drug and the plant extract were administrated. The changes in rectal temperature were noted again at regular intervals following the respective treatments.The temperature was measured at 0, 1,2 and 3 hours after drug administration.

Statistical analysis

The results are presented as mean ± SEM. The statistical analysis was performed using one way analysis of variance (ANOVA) followed by LSD post hoc test as appropriate using SPSS 14 software. Differences between groups were considered significant at a level of $p < 0.05$.

III. RESULTS AND DISCUSSION

Antipyretic effects of aqueous extract of *Z. officinale* rhizome on rectal temperature is presented in Table (1). Rectal temperature markedly increased after 19h from yeast injection in the comparison with control group. Comparing with the control group,treatment with extracts at the dose of 100 mg/kg, 200 mg/kg body weight and Paracetamol at the dose of 150mg/kg significantly decreased body temperature of yeast induced ratsat $p< 0.05$.

Table1: Effect of aqueous extract of *Z. officinale* rhizome on body temperature in yeast induced pyrexia

Group	0 hr	1 hr	2 hr	3 hr
1	37.23 b ± 0.25	37.23 d ± 0.2	37.53 d ± 0.15	37.43 c ± 0.35
2	40.53 a ± 0.3	40.13 a ± 0.15	39.53 a ± 0.35	38.96 a ± 0.15
3	40.56 a ± 0.15	38.56 c ± 0.15	38.13 b ± 0.15	37.60 c ± 0.10
4	40.50 a ± 0.20	39.46 b ± 0.15	38.63 c ± 0.20	38.03 b ± 0.05
5	40.50 a ± 0.36	38.23 c ± 0.25	38.36 c ± 0.25	37.43 c ± 0.25
LSD	3.2	0.66	0.50	0.43

Values are means ±S.E.M

Different letters refer to the significant difference at $P< 0.05$

In a study conducted to (Govindarajan, 1982a,b)*Z. officinale* rhizome is reported to have essential oils, phenolic compounds, proteins, flavonoids, alkaloids, saponins, tannin, glycosides, steroids and terpenoids as the major active phytochemical groups.

Flavonoids have been linked with antipyretic activity because of having the capacity to interfere with eicosanoids biosynthesis pathways and have the ability to decrease the release of arachidonic acid by the inhibitionof neutrophils degranulation. Both of these actions lead to suppression of the inflammatory mediators such as prostaglandinsand lipoxygenase end products responsible for inflammation,pain, and fever (Goda *et al* ., 1992; Tordera *et al*., 1994; Robak and Gryglewski, 1996; Mutalik *et al*., 2003; Venkatesh *et al*., 2003).

Other investigations have studied the effect of flavonoids as antipyretic drugs. Flavonoid-containing extract of *Gratiola officinalis* L. showed antipyretic effect (Polukonova*et al*., 2015).

IV. CONCLUSIONS

We concluded that the aqueous extract of *Z. officinale* rhizome has antipyretic activity, further studies are necessary to detect the pure compounds responsible for the antipyretic activity.

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