

**EVALUATION OF ANTI INFLAMMATORY ACTIVITY OF THE DRIED RHIZOMES OF ZINGIBER OFFICINALIS IN RATS**

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**ABSTRACT**

In the present Study of Aqueous extract of Stem of *Zingiber officinalis* (Zingiberaceae) was screened for anti-inflammatory activity in carrageenan induced paw oedema rats. The effect was assessed by Difference in paw oedema volume, before & after the low & high dose administration of the extract in Rats. Aqueous root extract of *Zingiber officinalis* (10 & 40 mg./kg./ml.) were administered orally. Anti-inflammatory effects were compared with Standard drug Ibuprofen (10mg/kg/ml). These observations helped us to conclude that aqueous Extract is endowed with anti-inflammatory property.

**Key words:** *Zingiber officinalis*, Zingiberaceae, carrageenan, Ibuprofen.

**INTRODUCTION**

Inflammation is the tissue reaction to infection, irritation or foreign substance. It is a part of the host defense mechanisms that are known to be involved in the inflammatory reactions such as release of histamine, bradykinin & prostaglandins. The development of non-steroids in overcoming human sufferings such as Rheumatoid arthritis has evoked much interest in the

extensive search for new drugs with this property<sup>1</sup>.

Ginger, the rhizome of *Zingiber officinale* (Zingiberaceae) is a perennial herb with an aromatic pungent taste. The exact country of origin is uncertain, but was thought to be originally native of tropical south East Asia before it spread to Africa. It is now grown abundantly in Northern Nigeria. The rhizomes of ginger are used as spice in food and beverages and in

traditional medicine as carminative, antipyrexia and treatment of waist pain rheumatism and bronchitis. It is used for the treatment of gastrointestinal disorders and piles. However it has no effect on gastric emptying rate, but has protective activity on gastric ulcerogenesis. Organic solvent extract of ginger rhizomes has also been shown to cause significant inhibition of skin tumour. On the basis of these common uses of this plant in traditional folk medicine and its above reported activities in the literature, we have evaluated the antiinflammatory properties of the rhizome extract of *Z. officinale* in rats<sup>2</sup>.

## **MATERIAL AND METHODS**

### **Animals:**

Adult male Wistar strain albino rats (180 – 200 g), were used for this study. The animals were bred and housed in the pre-clinical animal house, Annamacharya college of pharmacy, Rajampet. The animals had free access to food (Sri Venkateswara animal care, Tirupathi) and water ad libitum.

### **Plant Material:**

The rhizomes of *Zingiber officinale* were purchased from local market, of Tirupathi. The plant material was authenticated by Dr. Madhava Setty, Department of Botany, Sri Venkateshwara University, Tirupathi. The rhizomes were dried under shelter, finely cut, and then ground into powder. Extraction of this powder (50g) in a Soxhlet apparatus using Distilled water (200ml) was carried out. The collected extracts were concentrated and dried in vacuo. The pharmacological tests were carried out with the dry extract dissolved in 0.9% physiological saline solution.

### **LD50 Determination:**

LD50 determination was carried out according to the method of Meyer et al<sup>3</sup>, using brine shrimp. This method determines LD50  $\mu\text{g/ml}$  values of *Z. officinale* aqueous extract, in the brine medium. Activities of a broad range of *Z. officinale* extract were manifested as toxicity to the shrimp. Appropriate amounts of ethanol extract (100, 1000, 2000, 3000, 4000, 5000 mg/ml) were assayed (LD50 values were determined from 24 h counts using probit analysis).

### **Carrageenan–induced paw oedema:**

The rats were divided into four groups containing six rats in each group (one control, one standard & two test groups (aqueous extract of 10mg/kg and 40 mg/kg body weight)) acute inflammation was induced according to edema assay Pedal inflammation in rats was induced essentially as described by Winter et al<sup>4</sup>. An injection was made of 0.1ml of 1% carrageenan suspension into the right hind foot of each rat under the subplantar aponeurosis. The test groups of rats were treated intraperitoneally with 10 and 40 mg/kg of ginger extract 1h before carrageenan injection. The control group received only the vehicle (0.2ml normal saline) and the reference group received 50 mg/kg Ibuprofen (i.p). Paw volume measurement was done by wrapping a piece of cotton thread round the paw of each rat and measuring the circumference with a meter rule<sup>5-7</sup>. After 1 hour, the rats were challenged with subcutaneous injection of 0.1 ml of 1 % w/v solution of carrageenan in normal saline, into the plantar side of the left hind paw. The paw was marked with ink at the level of lateral malleolus and immersed in mercury up to the mark. The plethysmograph apparatus was used for the

measurement of rat paw volume. The paw volume was measured immediately after injection (0 h) and then every hour till 4hrs after the injection of carrageenan to each group. The difference between the initial and subsequent reading gave the actual edema volume.

Control group 1: Carrageenan + normal saline solution (10 ml /kg b.w)

Standard group 2: Carrageenan + ibuprofen (10 mg/kg b.w)

Test group1: Carrageenan + aqueous extract (10 mg/kg b.w)

Test group2: Carrageenan + aqueous extract (40 mg/kg b.w)

#### **Statistical Analysis:**

Data were expressed as mean  $\pm$  S.E.M. The results were statistically analysed by the students  $t$  – test;  $P < 0.05$  versus respective control was taken as significant.

#### **RESULTS AND DISCUSSION:**

LD50 determination value for the ethanol extract of *Z. officinale* rhizome extract is 3000 mg/kg. The extracts were subjected to phytochemical screening for the presences of type of phytoconstituents.

The extracts were found to contain carbohydrates, alkaloids, glycosides, flavonoids, tannins and saponins. The results of anti-inflammatory activity revealed that, all the extracts exhibited dose dependent antiinflammatory activity. At the dose of 40 mg/kg the aqueous extract have shown maximum inhibition of the edema (69.52% and 58.09 % respectively) as compared to control. The detailed results are shown in Table 1.

The extracts were tested for anti-inflammatory activity using carrageenan induced edema models (Table 1). Among them since aqueous extract (40 mg/kg b.w) has shown maximum activity (69.52%) compared with the control group using carrageenan induced oedema model. The present study establishes the anti-inflammatory activity of the aqueous extracts of *Zingiber officinalis* in a number of experimental models.

Carrageenan induced rat paw edema is a suitable experimental animal model for evaluating the anti-edematous effect of natural products and this is believed to be triphasic, the first phase (1hr after carrageenan challenge) involves the release of serotonin and histamine from mast cells, the second phase (2hr) is provided by kinins and the third phase (3hr) is mediated by prostaglandins, the cyclooxygenase products and lipoxygenase products<sup>8</sup>.

The metabolites of arachidonic acid formed via the cyclooxygenase and lipoxygenase pathways represent two important classes of inflammatory mediators, prostaglandins (products of the cyclooxygenase pathway) especially prostaglandin E2 is known to cause or enhance the cardinal signs of inflammation, similarly, leukotriene B4 (product of lipoxygenase pathway) is a mediator of leukocyte activation in the inflammatory cascade<sup>9</sup>.

From the results, the aqueous extract of *Zingiber officinalis* significantly inhibited (\* $p < 0.05$  & \*\* $p < 0.01$ ) Carrageenan induced rat paw edema at 40 mg/kg (Table 1). At the Of 40 mg/kg the activity of the aqueous extracts is comparable than that elicited by ibuprofen.

**Table 1: Anti-inflammatory activity of *Zingiber officinalis* on carrageenan-induced Paw edema in rats**

Groups	Initial Paw Volume (CM)	1 <sup>st</sup> hour	2 <sup>nd</sup> hour	3 <sup>rd</sup> hour	4 <sup>th</sup> hour	% Increase in paw volume at 4 <sup>th</sup> h	% Inhibition in Paw Volume at 4 <sup>TH</sup> h
Control (normal saline)	0.283±0.0 11	0.303±0.1 02	0.353±0.0 10	0.417±0.0 11	0.428±0.0 10	51.242	-----
Standard (Ibuprofen 10 mg/kg)	0.294±0.0 02	0.323±0.0 03	0.333±0.0 02	0.340±0.0 02	0.303±0.0 02	3.033	94.02
Low Dose (10mg/kg)	0.296±0.0 02	0.308±0.0 02	0.346±0.0 03	0.348±0.0 02	0.342±0.0 03	32.481	74.26
High Dose (40 mg/kg)	0.285±0.0 03	0.304±0.0 02	0.327±0.0 02	0.318±0.0 03	0.318±0.0 02	33.861	76.00

Test drugs were orally administered 1 h before carrageenan injection. The control group received saline. Values represent the mean ± S.E.M. (N= 6).

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