



Investigation of Anti Inflammatory, Analgesic and Antipyretic Activity of Rhizome Volatile Oil of *Alpinia speciosa*

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ABSTRACT: *Alpinia speciosa* (Zingiberaceae) is a widely used medicinal plant in the many parts of the World including India the management of various conditions including pain, inflammation and fevers conditions. In the present study the anti-inflammatory, analgesic and antipyretic activities of the volatile oil of rhizome were investigated and were reported and was found that the volatile oil have significant effect when compared to respective standard.

Key words: *Alpinia speciosa*, Anti-inflammatory, Analgesic, Anti-pyretic, Volatile oil, Rhizome

INTRODUCTION

The use of medicinal plants is an ancient practice common to all societies. About 80% of the world population living in developing relies on traditional medicine for their primary health care need. The world Health Organization encourages the inclusion of herbal medicine of proven efficacy and safety in health care delivery system of developing countries. There is, therefore, a need to validate the folkloric claim of the medicinal plants used in traditional medicine so that the beneficial ones can be deployed as phytomedicines while the bioactive constituents from such beneficial plants could be isolated and used as "leads" in drug discovery process (Usman H et al., 2008; Farnsworth N et al., 1998; Amos S et al., 2001).

Alpinia speciosa K. Schum (Family: Zingiberaceae) commonly known as "sittarattai" in Tamil and "chatium" in Hindi, is useful in treating various diseases. The essential oil of this species is found to be useful in the treatment of high blood pressure and used as a heart tonic. It is also used for treating cold, fever, flatulence, indigestion, diuretic, antimicrobial activity, etc. in various traditional systems of medicine (Alpinia S, 1990). Till date no any systematic study was performed to revealed rhizome volatile oil activity for analgesic, anti-inflammatory and antipyretic activity. Therefore, the present work was undertaken.

MATERIALS AND METHODS

Collection and Authentication of Plant Material:

The leaves of the selected plant were collected from in and around Servarayan hills, Salem and were identified and

authenticated by Dr. P. Jayaram, Director, Plant Anatomy Research Center, Chennai.

Acute toxicity studies:

Swiss albino mice (20-25 gm) of either sex and of approximate same age, used in the present studies, were procured from listed supplier Sri Venkateswara Enterprises, Bangalore, India. The animals were fed with standard pellet diet (Hindustan lever Ltd. Bangalore) and water ad libitum. All the animals were housed in polypropylene cages. The animals were kept under alternate cycle of 12 hours of darkness and light. The animals were acclimatized to the laboratory condition for 1 week before starting the experiment. The animals were fasted for at least 12 hours before the onset of each activity (OECD, 2000). The experimental protocols were approved by Institutional Animal Ethics Committee (IAEC No.-Ph.Chem/20/2008) after scrutinization. The animals received the drug treatment by oral gavages tube. Anti-inflammatory activity of volatile oil was studied by Carrageenan-induced rat paw oedema method. Animals are divided into three groups; 6 animals in each. Group I receive control saline 10 mg/kg b.w., Group II receive indomethacin as standard drug 10 mg/kg s.c. and Group III receive rhizomes volatile oil of *Alpinia speciosa* 250 mg/kg b.w. After 30 minutes, 0.1 ml of carrageenan (1% suspension) was injected into plantar region of hind paw of rats. Measurement of paw volume (ml) was made by mercury displacement technique using plethysmometer immediately before and 3 hour after carrageenan injection (Gupta M, 2005; Jayakumari S, 2008). The ratio of the

anti-inflammatory effect of volatile oil was calculated by using following formula:

$$\text{Percentage Inhibition} = \frac{C - T}{C} \times 100$$

Where, T- Increase paw volume after volatile oil was administered and C- Increase paw volume of control group.

Analgesic activity:

The number the mice, divide the animals into 3 groups, consists 6 in each. Group I: Control saline 10 mg/kg bow. Group II: Paracetamol as standard drug 100 mg/kg b.w., p.o. Group III: Rhizomes Volatile oil of *Alpinia speciosa* 250 mg/kg b.w. Take reaction-time by observing hind paw-licking or jump response (whichever appears first) in animals when placed on the hot plate maintained at constant temperature (55±10°C), normally animals show such response in 6-8 seconds, a cut off period of 15 seconds as observed to avoid, damage to the paws. Administered the standard drug and volatile oil to their respective groups. Note the reaction time of animals on the hot plate at 15, 30, 60 and 120 minutes. 15 seconds is taken as maximum analgesia and the animals are removed from hot plate to avoid injury to the paws (Gupta M, 2005; Wamtinga Richard S, 2006).

Antipyretic activity:

Wistar rats of either sex were arranged in three groups, six rats in each. A 20% suspension of Brewer's yeast in 0.9% saline was prepared. By insertion of thermocouple to a depth of 2 cm into the rectum, initial rectal temperature was recorded. The animals were febrile by injection of 10ml/kg of brewer's yeast suspension subcutaneously in back below the nape of neck. The site of injection was massaged in order to spread the suspension beneath the skin. Room temperature was maintained immediately after yeast administration, food was withdrawn, 18 hours post challenge period and rise in rectal temperature was recorded. The measurement was repeated two times. Only animal with body temperature of at least 38°C were taken into the test. After that animals were treated as follows: Group I: Control saline solution, Group II: Paracetamol (33 mg/Kg) orally, Group III: Rhizomes volatile oil of *Alpinia speciosa* (250mg/kg) orally. The rectal temperature was measured 1, 2 and 3

hours after drug treatment and decrease in temperature compare with control group values (Abena M, 2003; Mutalik S, 2003).

Statistical analysis:

Result was expressed as Mean + SEM. The data were analyzed by using ANNOVA followed by Dunnett's multiple comparison test. P values less than 0.05 were considered significant.

RESULTS AND DISCUSSION

Determination of LD50:

The rhizomes volatile oil of *Alpinia speciosa* was screened for acute toxicity study by OECD guideline for getting LD50. The results showed that the LD50 was found to be 2500 mg/kg. Therefore its ED50 is 250 mg/kg (Table 1).

Table 1: Acute toxicity studies

S. No.	No. of animals	Dose (mg/kg)	Result
1.	3	5	No death
2.	3	50	No death
3.	3	300	No death
4.	3	2000	1 death

Anti-inflammatory study:

The volatile oil showed significant anti-inflammatory activity against the carrageenan-induced paw edema in rats. The reduction of paw edema of rats is compared with the standard drug that is indomethacin (Table 2).

Analgesic activity:

The rhizomes volatile oil of the plant *Alpinia speciosa* showed significant analgesic activity. As compared to standard drug it showed near about same action. Volatile oil increases the time to aware with the pain (Table 3).

Antipyretic activity: The volatile oil of *Alpinia speciosa* at dose level of 250 mg/kg was studied for antipyretic activity against Brewer's yeast induced pyrexia in wistar rats. Volatile oil has significant antipyretic activity (Table 4).

Table 2: Effect of volatile oil of *Alpinia speciosa*, on carrageenan induced rat paw edema

Treatment	Dose	Paw Volume (in ml) as measured by displacement of Hg at						% Inhibition
		0 min	15 min	30 min	60 min	120 Min	180 Min	
Control	0.9% w/v	0.696±0.01	0.870±0.04	1.044±0.02	1.392±0.12	1.566±0.12	1.566±0.12	-
Indomethacin	10 mg/Kg	0.696±0.02 ^a	0.696±0.03 ^c	0.870±0.02 ^a	1.044±0.15 ^b	0.870±0.04 ^a	0.870±0.02 ^a	52.68
Volatile Oil	250mg/Kg	0.696±0.01 ^b	0.870±0.01 ^c	1.044±0.01 ^b	1.392±0.04 ^c	1.044±0.03 ^c	1.044±0.01 ^c	43.80

Values are expressed in Mean ± SEM. a, P < 0.05; b, P < 0.01; c, P < 0.001. One way ANNOVA followed by Dunnett's multiple comparison test is used.

Table 3: Analgesic effect of volatile oil by using Hot Plate Method

S.No.	Design of treatment	Basal reaction Time in seconds after drug administration					
		5 mins	15 mins	30 mins	60 mins	120 mins	180 mins
1.	Control	6.5±0.01	7.166±0.20	7.833±0.22	8.0±0.20	8.0±0.22	8.33±0.22
2.	Standard	6.33±0.28	7.66±0.48	11.5±0.26	12.83±0.22	13.84±0.28	14.66±0.28 ^a
3.	Volatile oil	6.23±0.48	7.66±0.42	10.66±0.28	10.66±0.48	11.66±0.42	10.33±0.48 ^b

Values are expressed in mean ± SEM. a, p<0.001; b, p<0.01. One way ANNOVA.Followed by Dunnetts multiple comparison testsare used.

Table 4: Effect of volatile oil of *Alpinia speciosa* on Brewer yeast induced pyrexia rats.

S.No.	Treatment	Rectal Temperature (°C)				
		Initial	18 hrs. after yeast injection	Time after drugAdministration		
				1 hr.	2 hr.	3 hr.
1.	Control	38.45±0.42	38.96±0.22	39.43±0.46	39.65±0.24	39.8±0.22
2.	Standard	38.38±0.48	38.75±0.44**	39.05±0.46	38.83±0.26	38.41±0.44**
3.	Volatile oil	38.43±0.48	39.05±0.22*	38.73±0.28	38.85±0.26	38.63±0.26*

Values are expressed in mean ± SEM. *p<0.001 and **p<0.01. One way ANNOVA followed by Dunnetts multiple comparison test is used.

CONCLUSION

The plant *Alpinia speciosa* is a tropical plant which was chosen for this study. The plant belongs to the family Zingiberaceae. The scanty availability of information on this plant facilitates the study on it. The present study does give valuable information about identification of the plant. The ash values and extractive values are used to determine the pharmacological activities of volatile oil obtained from the rhizomes. The LD50 of the volatile oil of rhizomes of *Alpinia speciosa* K. Schum was found to be 2500 mg/kg. Therefore, ED50 was calculated as 250 mg/kg. The anti-inflammatory activity was evaluated by carrageenan induced paw-oedema model in rats. The volatile oil of *Alpinia speciosa* showed significant activity when compared with standard drug i.e. indomethacin. Analgesic activity was evaluated by hot-plate method on mice. The volatile oil of *Alpinia speciosa* showed significant analgesic activity when compared with standard drug paracetamol. Antipyretic activity was evaluated by Brewer's yeast induced pyrexia in rats. By comparing with standard drug paracetamol, it is found that the volatile oil of *Alpinia speciosa* showed significant activity.

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