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Research Article

Evaluation of anthelmintic activity of rhizomes of *Hedychium spicatum* Buch.Ham.

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ABSTRACT

Hedychium spicatum Buch. Ham. (Zingiberaceae), commonly known as spiked ginger lily, is found in the entire Himalayan region. Traditionally, the rhizomes are used in the treatment of respiratory disorders, fevers, tranquilizer, hypotensive, antispasmodic, CNS depressant, analgesic, anti-inflammatory, antimicrobial, antioxidant, antifungal, pediculicidal and cytotoxic activities. The present study is an attempt to explore the anthelmintic activity of rhizomes of *Hedychium spicatum* against adult Indian earthworms, *Pheretima posthuma*. The time taken for each worm for paralysis and death was determined. The results were compared with that of standard i.e., piperazine citrate. Methanol extract of *Hedychium spicatum* produced dose dependent anthelmintic activity whereas aqueous extract was not all effective. Methanol extract showed better anthelmintic activity when compared with the standard drug piperazine citrate.

Keywords: *Hedychium spicatum*; Zingiberaceae; anthelmintic activity; piperazine citrate; methanol extract; rhizome.

1. INTRODUCTION

Hedychium spicatum Buch. Ham. (Zingiberaceae) is also known as spiked ginger lily, has a rich history of use in India. The plant is a perennial rhizomatous herb, up to 1mt tall with elongate stem. The rhizomes are 15-20 cm long; 2-2.5cm in diameter and externally yellowish brown. The edge of each piece is covered by rough reddish brown layer marked with numerous scars and circular rings, rudiments of rootlets are visible (Nadkarni, 2000). The essential oil from rhizomes are used in the treatment of respiratory disorders, fevers, tranquilizer (Dixit and Varma,1979), hypotensive, antispasmodic, CNS depressant, analgesic (Rastogi and Mehrotra, 1980), anti-inflammatory (Tandon et al., 1997), antimicrobial (Bishit et al., 2006), antioxidant (Joshi et al., 2008), antifungal (Aqil and Ahmad,2003), pediculicidal (Jadhav et al., 2007) and cytotoxic(Reddy et al.,2009) activities. The literature survey reveals that previously work has been done on the essential oils of the rhizome for antimicrobial and antioxidant activity but there were no reports on the anthelmintic activity of the extracts of *Hedychium spicatum*. This prompted us to investigate the anthelmintic activity of *Hedychium spicatum* rhizome extracts.

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2. MATERIALS AND METHODS

2.1. Drugs and Chemicals

The drug, Piperazine citrate was procured from SD Fine Chemicals Ltd., Mumbai. All organic solvents and chemicals were purchased From SD Fine Chemical Ltd., Mumbai and were of analytical grade.

2.2. Plant material

The rhizomes of *Hedychium spicatum* (Zingiberaceae) were collected, identified and authenticated by Dr Shiddamallayya N (SMPU/NADRI/BNG/ 2010-11/307) at National Ayurveda Dietetics Research Institute, Bengaluru, Karnataka. A voucher specimen was deposited in the Herbarium of Department of Pharmacognosy, The Oxford College of Pharmacy, Bangalore. The rhizomes were dried under normal environmental conditions. The dried rhizomes were powdered and stored in a closed container for further use.

2.3. Preparation of Extract

The dried rhizomes of *Hedychium spicatum* were coarsely powdered and subjected to successive extraction by soxhlation. The extraction was done with different solvents in their increasing order of polarity such as petroleum ether, benzene, chloroform, methanol and distilled water. Each time the marc was dried and later extracted with other solvents. All the extract were concentrated by rotary vacuum evaporator and evaporated to dryness. The yield was found to be 2.176, 0.831, 0.861, 6.06 and 5.41 % w/w respectively with reference to the air dried plant material. The methanol

and aqueous extracts were used for the evaluation of anthelmintic activity.

2.4. Earthworms collection and authentication

Healthy adult Indian earthworm (*Pheretima posthuma*; Annelida; Megascolecidae) were collected from Microbial Resources Division, Gandhi Krushi Vijnana Kendra (GKVK), Government of Karnataka, Bengaluru. Earthworms in moist soil were washed with normal saline and used for the study. The earthworm of 3 -5 cm in length and 0.1-0.2 cm in width were used for all the experimental protocol due to its anatomical and physiological resemblance with the intestinal roundworm parasites of human beings(Thorn et al., 1977; Vigar,1984).

2.5. Anthelmintic activity

The anthelmintic activity of different extracts of *Hedychium spicatum* was evaluated as per the method reported by Dash et al. The extracts were suspended in Tween 80 (0.1 %) in normal saline. All the drugs and extracts were freshly before starting the experiment. Eleven groups of six earthworms each were released into 20 ml of desired formulation as follows; vehicle (0.1 % Tween 80 in normal saline), piperazine citrate (40, 60 mg/ml), methanol extract (20, 40, 60, 80

Table 1: Anthelmintic activity of methanol and aqueous extracts of rhizomes of *Hedychium spicatum*

Groups	Treatments	Time taken for paralysis (min) ±S.D.	Time taken for death (min) ± S.D.
1.	**Vehicle**	-	-
	Piperazine citrate		
2.	40mg/ml	42.0 ± 1.26	59.4 ± 0.40
3.	60mg/ml	33.4 ± 0.60	55.6 ± 0.24
	Methanol Extract		
4.	20mg/ml	45.0 ± 0.44	141.2 ± 0.83
5.	40mg/ml	23.2 ± 0.48	110.4± 0.50
6.	60mg/ml	19.0 ± 0.63	98.0 ± 0.44
7.	80mg/ml	16.2± 1.20	91.6 ± 0.94
	Aqueous Extract		
8.	20mg/ml	-	-
9.	40mg/ml	-	-
10.	60mg/ml	-	-
11.	80mg/ml	-	-

Results are expressed as mean ± SD of six determinations; vehicle worms were alive up to 24 hrs of observation. -: worms were alive.

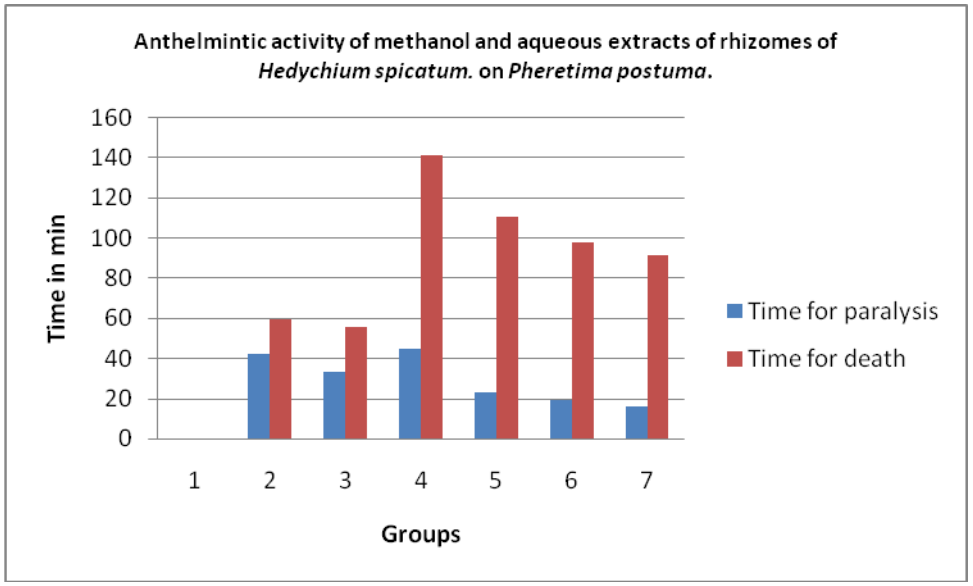

Figure 1: Anthelmintic activity of methanol and aqueous extracts of rhizomes of *Hedychium spicatum* on *Pheretima postuma*

Each bar is represented as mean ± standard deviation (n=5).

Group 1: control (normal saline), Group 2: Piperazine citrate 40mg/ml, Group 3: Piperazine citrate 60 mg/ml, Group 4 to 7: Methanol extracts 20mg/ml, 40mg/ml, 60mg/ml, and 80mg/ml, respectively.

mg/ml) and aqueous extract (20, 40, 60, 80 mg/ml). The wide range of dose was taken to establish the relationship between dose and pharmacological activity and also to find out the maximum and minimum dose that can be better therapeutically effective in comparison with the standard drug. Observation were made for the time (in minutes) taken to paralysis and death of individual worms up to 4 hrs of the test period. Paralysis was said to occur when the worms did not revive even in normal saline. Death was concluded when the worms lost their motility followed by fading away of their body color (Tambe et al., 2006).

3. RESULTS AND DISCUSSION

The results of the anthelmintic activity are given in the Table 1 and Fig 1.

The perusal of the data [Table 1 and Fig 1] reveals that methanol extract containing 20, 40, 60, 80mg/ml, produced dose dependent paralysis ranging from loss of motility to loss of response to external stimuli, which gradually progressed to death. The methanol extract of dose 20, 40, 60, 80mg/ml produced paralysis within 45, 23.2, 19, 16.2 min and the corresponding death time was 141.2, 110.4, 98, 91.6min respectively. Aqueous extract of dose 20, 40, 60, 80mg/ml did not produce any paralysis even after four hours and was found to be ineffective. The standard drug Piperazine citrate of dose 40 and 60mg/ml showed paralysis at 42 and 33.4min and death occurred at 59.4 and 55.6 min respectively. The present study therefore reveals that methanol extract beyond 20mg/ml is effective and the activity is comparable with that of reference standards. The higher concentrations of the extract produced paralytic effect more quickly and the time taken for death was shorter. It was observed that the methanol extract was more potent than the aqueous extract. The activity revealed concentration dependent nature of methanol extract. Potency of the extract was found to be inversely proportional to the time taken for paralysis/death of the individual worms.

4. CONCLUSION

It can be concluded that the methanol extract showed more potent and dose dependent anthelmintic activity. Out of the two extracts, aqueous extract is ineffective at all the concentrations and we can conclude that it is not endowed with anthelmintic activity. Further studies are required to identify the actual chemical constituents that are present in the crude extracts of this plant which are responsible for anthelmintic activity and to establish the effectiveness and pharmacological rationale for the use of *Hedychium spicatum* as an anthelmintic drug.

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