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Research Article

ANTHELMINTIC ACTIVITY OF RHIZOME EXTRACTS OF *CURCUMA LONGA* AND *ZINGIBER OFFICINALE* (ZINGIBERACEAE)

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ABSTRACT

Hydro-alcoholic extracts of *Curcuma longa*, *Zingiber officinale* and combination of *Curcuma longa* and *Zingiber officinale* rhizome extracts (1:1) were evaluated for their anthelmintic activity using *Pheretima posthuma* model (Indian earthworm). Three concentrations (10, 20 and 50 mg/ml) of each extracts were used for this study which involved the determination of time of paralysis (vermifuge) and time of death (vermicidal activity) of the worms. Extracts obtained from both rhizomes not only paralyzed but also killed the earthworms. Among the two drug extracts, *Curcuma longa* showed maximum vermifuge activity at the concentration of 50mg/ml. Maximum vermicidal activity was shown in *Zingiber officinale* extract at the concentration of 50 mg/ml. Combination of hydro-alcoholic rhizome extracts of *Curcuma longa* and *Zingiber officinale* also showed a significant anthelmintic activity. Observations were comparable with the standard drug at concentration of 20mg/ml. On the basis of the observations, it is concluded that both *Curcuma longa* and *Zingiber officinale* rhizomes extracts bearing a potential anthelmintic property

Keywords: Anthelmintic activity, *Curcuma longa, Zingiber officinale, Pheretima posthuma.*

INTRODUCTION

Helminthes are the most common infections in man, affecting a large proportion of the world's population. Parasitic diseases may cause severe morbidities including lymphatic filariasis (a cause of elephantiasis), onchocerciasis, and schistosomiasis [1-2]. Development of resistance to most of commercially available anthelmintic became a severe problem worldwide [3].

Curcuma longa and *Zingiber officinale* rhizomes are rich for phytoconstituents *viz.* alkaloids, saponins, flavonoids, terpenes and steroids. These drugs are widely used in the treatment of different ailments in the Indian system of medicine.

Curcuma longa Linn. (Zingiberaceae) is commonly known as "Haldi" in Hindi, is a perennial plant having a short stem with large oblong leaves. It bears ovate pyriform or oblong, ovate or cylindrical rhizomes, which are often branched and brownish-yellow in color. Externally the drug is yellowish brown in color with characteristic odour and slightly pungent bitter in taste. Root scars and annulations are present on the surface of the rhizome. The fracture is horny and internal surface is orange in color. Its oil has a great importance in medicine. It contains of essential oil (5%), alkaloid, starch grain, yellow matter curcumin (5%) a polyphenol, which is the active substance of turmeric. Its systematic chemical name is (1E, 6E)-1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione. It also contains turmeric oil (5-8%), coporioc acid (1%) as a free acid and veleric acid (0.1%) as combined acid. It is used as analgesic, antibacterial, antioxidant, expectorant and flavouring agent. The rhizomes are used for the treatment of inflammation as a household remedy on empirical basis [4]. It is commonly cultivated in Ceylon, Belgium, Indonesia, France, and in South India and Bengal [5].

Zingiber officinale Linn. (Zingiberaceae), commonly known as "Adrak", is an herbaceous rhizomatous perennial plant, reaching up to 90 cm in height under cultivation. Rhizomes are aromatic, thick lobed and pale yellowish in color. Leaves are long and 2-3 cm broad with sheathing bases, simple, alternate, distichously narrow, oblong and lanceolate. The blades are gradually tapering to a point. The herb develops several lateral shoots in clumps which begin to dry when the plant matures. Inflorescence is solitary, lateral radical, pedunculate, oblong and has cylindrical spikes. Flowers are rare, rather small, calyx superior, gamosepalous, three toothed and open splitting on one side. Corolla is of three sub equal oblong to lanceolate connate greenish segments [6]. It mainly contains up to 3% of volatile oil, a mixture of 24 constituents containing monoterpenoid fraction (β-phelladrene, cineol, and citral). and sesquiterpenoids (β-sesquiphellandrene, bisabolene and farnesene), with (-)-zingiberene. It also contains 5-8% resinous matter, starch and mucilage. It is reported to have antioxidant, analgesic and antipyretic properties [7-9]. Ginger oil has been shown to prevent skin cancer in mice. The gingerrols, an active constituent of ginger oil has demonstrated to kill ovarian cancer cells. The major world producers of *Zingiber officinale* are Piji, India, Nigeria, Sierra Leone and China. Based on the traditional uses and scientific reports, both plant extracts were selected to evaluate their anthelmintic activity using Indian earthworm as model.

MATERIALS AND METHOD

Plant materials

Rhizomes of *Curcuma longa* and *Zingiber officinale* were collected from botanical garden of the department and authenticated from Department of Botany, Doctor Hari Singh Gour University, Sagar (M.P.) 470003 (Voucher specimen number: Bot./Her./1910 & Bot./Her./1324, respectively).

Drug and chemicals

The following drugs and chemicals were used:

Piperazine citrate (Pankaj Medicos), Sodium chloride (Himedia), Ethanol (Qualigens).

Preparation of extract

The collected plant material (Rhizomes) of *Curcuma longa* and *Zingiber officinale* were washed thoroughly in water, cut into small pieces and air dried for 2 weeks at 35-40 ^{0}C. Extraction was done by using Soxhlet apparatus with 70% ethanol (hydro-alcoholic) as solvent. The extracts were concentrated under reduced pressure, dried and stored at 4 ^{0}C in air tight containers for further studies.

Preliminary phytochemical screening

Phytochemical screening was carried out on *Curcuma longa* and *Zingiber officinale* rhizome extracts which revealed the presence of alkaloids, saponins, flavonoids, terpenes and steroids [10].

Test organism

Indian adult earthworms (*Pheretima posthuma)* collected from the botanical garden of the department and washed with normal saline. The earthworms of 3.5 cm in length and 0.1-0.2 cm in width were used for all the experimental protocol due to their anatomical and physiological resemblance with the intestinal roundworm parasites of human beings [11-12].

Anthelmintic activity

The anthelmintic activity of hydro-alchoholic extracts of *Curcuma longa* and *Zingiber officinale* was carried out by methodology followed by John *et al;* 2009 [13.] and Ajayieoba *et al;* 2001 [14.] The ethanolic extracts were suspended in normal saline to prepare 10, 20 and 50 mg/ml concentrations. Piperazine citrate (20 mg/ml) was used as the standard drug. All the extracts and drug solution were freshly prepared before starting the experiment. Eleven groups with six earth-worms in each were placed into 10 ml of desired formulations as following: vehicle (normal saline), Piperazine citrate (20 mg/ml), and three sets of three different groups were treated with extracts of respective concentration. Observations were made for the time until the paralysis and death of an individual worm. The paralysis was said to occur when the worms were not able to move even in normal saline. Death was concluded when the worms lost their motility followed with fading away of their body colors[15]. Results are shown in Table-1.

Table 1: Anthelmintic activity of *Curcuma longa* and *Zingiber officinale*

Plant extract	Conc.(mg/ml)	Time taken for paralysis(min)	Time taken for death (min)
Vehicle control	-	-	-
Curcuma longa	10	10.4±0.20	32±0.38
	20	6.2±1.5	27.5±2.2
	50	4.6±0.8	16.1±1.2
Zingiber officinale	10	11.2±1.8	31.2±0.13
	20	7.0±1.7	26.3±2.8
	50	5.2±0.4	11.6±1.4
Curcuma longa + *Zingiber officinale* (1:1)	10	10.6±0.4	31.8±0.12
	20	6.8±0.6	27±0.44
	50	4.8±0.4	16.3±0.32
Piperazine citrate	20	7.2±0.6	15.9±1.3

All values represent Mean ± SD; n = 6 in each group.

RESULTS AND DISCUSSION

The Preliminary phytochemical analysis showed the presence of alkaloids, saponins, flavonoids, terpenes and steroids in the extracts of *Curcuma longa* and *Zingiber officinale*. *Curcuma longa* extract at the concentration of 10 mg/ml showed the time of paralysis and death at 10.4 min. and 32 min. respectively. For concentration of 20mg/ml, the paralysis and the death time was found 6.2 min. and 27.5 min. respectively. At the concentration of 50mg/ml, time was 4.6 min. for paralysis and 16.1 min. for death. While in *Zingiber officinale* extract at the concentration of 10mg/ml, the time of paralysis and death was found to be 11.2 min. and 31.2 min. respectively. At concentration of 20 mg/ml, it was 7.0 min. for paralysis and 26.3 min. for death. For concentration at 50mg/ml, the time of paralysis and death was 5.2 min. and 11.6 min. respectively. In case of combination of both the plant extracts *(Curcuma longa* and *Zingiber officinale),* the time of paralysis and death was 10.6 min. and 31.8 min. respectively at concentration of 10 mg/ml. At concentration of 20 mg/ml, the time of paralysis and death was 6.8 min. and 27 min. respectively and at 50 mg/ml concentration, the time of paralysis and death was 4.8 min. and 16.3 min. respectively. The observations with piperazine citrate showed that time of paralysis and death was 7.2 min. and 15.9 min. respectively for concentration at 20 mg/ml). It was observed that both ginger as well as turmeric hydro-alcoholic extracts showed a remarkable anthelmintic potential against intestinal parasitism. Amongst the both extracts, *Curcuma longa* showed better activity in combination with *Zingiber officinale.* Anthelmintic activity of *Curcuma longa* was enhanced in the presence of *Zingiber officinale*. The anthelmintic activity of *Zingiber officinale* and *Curcuma longa* may be due to the synergetic effect of active phyto-constituents i.e. alkaloids, saponins, flavonoids, terpenes, steroids, etc. presenent in the extracts. Further, there is scope to evaluate the active principles of *Curcuma longa* and *Zingiber officinale* rhizomes for their anthelmintic activity to open the new door for natural anthelmintic.

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