

Journal of Pharmaceutical Advanced Research

(An International Multidisciplinary Peer Review Open Access monthly Journal)

Available online at: www.jparonline.com**Determination of phytochemical and anthelmintic activity of rhizome of *Zingiber zerumbet***Abinash Kumar Sahu^{1*}, Chhayakanta Panda¹, Bhabani Shankar Nayak²¹Dept. of Medicinal Chemistry, The Pharmaceutical College, Tingipali, Barpali, Bargarh - 768029, Odisha, India.²Institute of Pharmacy & Technology, Salipur, Cuttack – 754202, Odisha, India.

Received: 24.11.2018

Revised: 26.11.2018

Accepted: 28.11.2018

Published: 30.11.2018

ABSTRACT: Background: Medicinal plants have many creative properties due to the presence of many complex chemical substances with different chemical composition which are found as secondary plant metabolites in many parts of these plants. So one of the medicinal plant *Zingiber zerumbet* is one of the important medicinal plants which show many pharmacologically as well as therapeutically effective for the different purposes for the human beings. **Aim:** The aim of the study is to extract *Z. zerumbet* powdered rhizomes, to carry out the phytochemical screening and to evaluate the anthelmintic activity. **Methods:** The rhizome of *Z. zerumbet* was extracted by Percolation method using the solvents hydroalcoholic and water. The anthelmintic activity of extract of *Z. zerumbet* was evaluated on the adult Indian earthworm *Pheritima posthuma* at different doses of 10, 20, 30, 40 and 50 mg/ml. The Albendazole was used as standard drug. The paralysis and death time of *P. posthuma* were determined. **Results:** The phytochemical screening showed that the *Z. zerumbet* rhizome extract is containing phyto-constituents that are Glycosides, Carbohydrate, Phenolic compounds, Flavonoids and Saponins. The *Z. zerumbet* extract at all the doses exhibited the anthelmintic activity in dose dependent manner. The anthelmintic activity was well comparable with standard drug Albendazole. The water extract of *Z. zerumbet* rhizome showed greater activity than Albendazole. **Conclusion:** It could be concluded that the rhizome of *Z. zerumbet* exhibited significant anthelmintic study and research has to be progress to identify the chemical which is responsible for anthelmintic activity.

Corresponding author*

Mr. Abinash Kumar Sahu

Assistant Prof.

The Pharmaceutical College, Tingipali,
Barpali, Bargarh - 768029, Odisha, India

Tel: +91-9090986145

Mail ID: abinashkumar.sahu@gmail.com**Keywords:** *Zingiber zerumbet*, Phytochemical evaluation, *P. posthuma*, Anthelmintic activity.**INTRODUCTIONS:**

Medicinal plants always have been the principal form of medicine in India. Medicinal plants have therapeutic property due to the presence of various complex chemical substances of the different composition which are found as the secondary plant metabolites in one or more parts of these plants^[1].

Zingiber zerumbet (*Zingiberaceae*) is also a very pharmacologically important plant. It is smooth, erect,

herbaceous plant. This genus of plant is confined to the tropics of Asia, Malaysia, and the Pacific Islands ^[1,2]. The root stocks are tuberous and pale yellow. The leaf stem is 0.6 to 2.0 m high. These leaves are numerous and long narrow types. The flowering stem which directly grows from the root stock in late summer resembles pine cones ^[2,3]. This plant is found to contain many flavonoid and alkaloid. Some of the major chemicals isolated from this plant are as Camphene, camphor and monoterpenoids as gingerol, zingerol, zingerone, sesquiterpenoids zerumbone, zerumbone epoxide, oxalic acid, kaempferol derivative terpine and humulene ^[4]. It also contain many flavonoids like Afzelin 1,3, flavonoid glycosides, essential oils, chlorogenic acid and ferulic acid. The rhizome part possesses stimulating action, anti-hyper tensive action ^[1], carminative, flavouring ^[4]. It is also used to treat dyspepsia wound treatment, for hemorrhoids and flatulent colic for the cure of the stomach trouble and fever ^[1]. It is used for the treatment for leprosy ^[4], peptic ulcer, mouth infection ^[1], asthma ^[4], rheumatism ^[4], anticancer, anti-tumor effects ^[6], anti inflammatory effects ^[8], anti microbial ^[9], anti-fungal activity ^[9], anti-bacterial ^[8], anti-hyperglycemic activities ^[1]. Thus the aim of the study to evaluate the *Z. zerumbet* rhizome for anthelmintic activity.

MATERIALS AND METHODS:

The drug Albendazole was procured as gift sample from Bandy from Mankind company, Mumbai. The Mayer's, Hager's, Barfoed's, Benedict's and millon's reagent were purchased from S.D. Fine Chemical, Mumbai. The solvents petroleum ether, Chloroform, and Ethanol were purchased from Hi Media Laboratories Pvt. Ltd., Mumbai. All others chemicals, solvents and reagents were of analytical grade and procured from authorized dealer.



Fig 1. The *Zingiber zerumbet* plant.

Plants collection, Identification and processing:

The plant was collected from the Botanical garden of The Pharmaceutical College, Barpali, in the month of September 2017. The plant was identified by Prof. (Dr.) S.K. Dash, Retired Professor and H.O.D., PG Dept. of Biosciences, C.P.S., Mohuda, Berhampur, Ganjam, Odisha. The plant was washed properly with water to remove the mud or dust, and then it was dried in sun light for 1 h and kept in shade dried. The dried plant was cut in to chips and powdered by means of wood grinder. The dried form of rhizome was stored in air tight container for further study.



Fig 2. The rhizome of the plant *Zingiber zerumbet*.

Preparation of extracts:

Preparation of hydroalcoholic extracts:

The rhizome of *Z. zerumbet* powdered was extracted by using hydro-alcoholic and water solvents in the ratio 30: 70 (water: ethanol) respectively. The shade dried course powder of rhizome (75 g) was packed well in a percolator for 5 days in cold extraction method. After 5 days the extract was filtered and the resultant extract was distilled in vacuum under reduced pressure in order to remove the solvent completely. It was dried and kept in a desiccator to further experiment. The obtained extract was weighed and the percentage yield was calculated in terms of air-dried powdered crude material.

Preparation of water extract:

The aqueous extracts were prepared by dissolving 100 g of powdered plant material in 500 ml of distilled water in a glass percolator. It was allowed to macerate for 24 h at room temperature and the brew was filtered using Whatman number one filter paper. The process of percolation was repeated three times (500 ml). The combined filtrate was then concentrated in a water bath

to ensure the complete evaporation of the solvent. The final crude aqueous extract was transferred to a vial and kept air tight.

Qualitative phytochemical analysis:

Qualitative phytochemical studies of extract will be studied for the presence of different secondary metabolites responsible for the therapeutic values as per the standard procedures mentioned in Pharmacopoeiae [9,10]. The solvent free extract of about 50 mg was stirred with few ml of dilute hydrochloric acid filtered. The filtrate was tested carefully for alkaloids (Mayer's, Wagner's, Hager's and Dragendorff's test), Carbohydrates and Glycosides (Molish's, Fehling, Barfoed and Benedicts test), Glycosides (Borntrager's and Legal's test), Saponins (Foam test), Proteins and Amino acids (Millon's, Biuret and Ninhydrine test), Phytosterols (Liebermann-Burchard's test) and Phenolic and Flavonoids Compounds (Ferric chloride and Alkaline reagent test).

Determination of biological (Anthelmintic) activity:

The Anthelmintic activity was performed on adult Indian earthworm, *Pheretima posthuma* due to its anatomical and physiological resemblance with human intestinal roundworm parasite [11-14]. Because of easy availability, earthworms have been used widely for the initial evaluation of anthelmintic activity [15-17]. Indian adult earthworms (*P. posthuma*) collected from moist soil and washed with normal saline to remove all fecal matter were used for the anthelmintic study. The earthworms of 3 to 5 cm in length and 0.1 to 0.2 cm in width were used for all the experimental protocol.

Earthworms were divided into 7 groups and each group consisting of 6 earthworms and were released into 20 ml of the desired formulation. Group I served as control and received only normal saline water, Group II served as standard and received standard drug Albendazole (10 mg/ml), Group III to VII, served as tests and received the *Z. zerumbet* rhizome (Water and hydro-alcoholic) extract of different doses of 10 to 50 mg/ml. The observations were done for the time taken for the paralysis and death of individual worms.

Paralysis was said to be occurred when there no movement of any sort could be observed except that the worms were shaking vigorously. Death was said to be occurred when the worms lost their motility followed with fading of their body color.

Statistical study:

All data thus obtained in study were verified by using statistical analysis like mean, standard deviation and standard error of mean [18].

RESULTS AND DISCUSSION:

The percentage yield of air-dried powdered crude material was found to be 1.03 %.

The finding of phytochemical detection was shown in Table 1. Qualitative Phytochemical analysis reports for presence of phytoconstituents in *Z. zerumbet* are Glycosides, Carbohydrate, Phenolic compounds, Flavonoids and Saponins.

The different extracts exhibited anthelmintic activity in dose dependent manner giving shortest time of paralysis (P) and death (D) with 50 mg/ml concentration. The Hydro-alcoholic extract of *Z. zerumbet* caused paralysis of 12.07 min and time of death of 12.05 min while water extract revealed paralysis of 21.25 min and death of 31.34 min against the earthworm *P. posthuma*. The reference drug Albendazole showed paralysis and death time of 10.15 and 12.25 min respectively. The anthelmintic activity was well comparable with standard drug Albendazole. The water extract of *Z. zerumbet* rhizome showed greater activity than Albendazole. The extent of activity shown by the extracts was found to be nearly equal than that of the standard drug Albendazole, which justifies its activity. The predominant effect of Albendazole on worm is to cause a flaccid paralysis which results in expulsion of the worm by peristalsis. The crude extracts of *Z. zerumbet* not only demonstrated paralysis but also caused death of worms especially at higher concentration of 100 mg/ml.

Table 1. Phytochemical evaluation data of *Z. zerumbet* rhizome extract.

Plant constituents	Hydro-alcoholic Extracts
Alkaloids	-
Saponins	+
Glycosides	+
Carbohydrates	+
Phenolic Compound	+
Phytosterols	-
Flavonoids	+
Steroids	-
Proteins and Amino acids	-

(-) – Absent and (+) – Present.

CONCLUSION:

The results of the present study indicate that the hydro-alcoholic extract of *Zingiber zerumbet* rhizome has significant anthelmintic activity property. The presence of various phytoconstituents may be responsible for exhibiting anthelmintic activity.

Table 2. Anthelmintic activity of *Z. zerumbet* rhizome extract.

Drug	Dose (mg/ml)	Paralysis time (min) (X±S.D.)	Death time (min) (X±S.D.)
WE	10	45±1.7	80.15±0.4
	20	41±0.56	65±0.17
	30	36±0.41	52.9±0.5
	40	26±0.12	45.5±0.54
	50	21.25±0.81	31.34±0.02
HAE	10	12.13±1.7	12.19±0.67
	20	12.10±0.56	12.15±0.96
	30	12.08±0.41	12.12±0.67
	40	12.06±0.12	12.10±0.87
	50	12.05±0.88	12.07±0.54
NSW	--	231	331
ALB	10	10.15±1.16	12.25±0.88

WE and HAE– Water and hydroalcoholic extract. NSW – Normal saline water. ALB – Albendazole. All data are represented as mean±standard deviation (n = 6).

ACKNOWLEDGEMENT:

The authors sincerely thanks to the Principal and Management of The Pharmaceutical College, Barpali, Bargarh for providing all the facilities to carry out the study.

REFERENCES:

- Prajapati P, Sharma K. A hand book of medicinal plant a complete source book. US: Food and agriculture Society of United State; 2003. pp. 552-553.
- Rao RS. Flora of china. Cyanotis, 1990; 24: 326-330.
- Harborne JB, Baxter H. The hand book of natural flavonoid. Vol. 1. 1999. US: Wiley; pp. 1497-1499.
- Ainsle JR. List of Plants Used in Native Medicine in Nigeria. London: Oxford University Press; 1937.
- Bombadelli E, Gabetta B, Mustica G. Plants of Mozambique II. Flavonoids of *Cladostemon kirkii*. Fitoterapia, 1973; 44: 91-99.
- Irvine FR. Woody Plants of Ghana. 2nd ed. London: Oxford University Press; 1961. pp. 51-58.
- Ayoola GA, Coker HA, Adesegun SA, Adepoju-Bello AA, Obaweya KEzennia EC, et al. Phytochemical screening and antioxidant activities of some selected medicinal plants used for malaria therapy in Southwestern Nigeria. Trop J Pharm Res, 2008; 7(3): 1019-1024.
- Praveena A, Suriyavathana M. Preliminary studies on phytochemical and antimicrobial activity of methanolic extract of *Toddalia asiatica* L.Var floribunda. Asian J Pharm Clin Res, 2013; 5(4): 212-214.
- Ajaiyeoba EO, Onocha PA, Olarenwaju OT. In vitro Anthelmintic Properties of *Buchholzia coriaceae* and *Gynandropsis gynandra* Extracts. J Pharm Biol, 2001; 39(3): 217-20.
- Vidyardhi RD. A Text Book of Zoology. New Delhi: S. Chand and Co; 1967. pp. 329-370.
- Thorn GW, Adams RD, Braunwald E, Isselbacher KJ, Petersdorf RG. Harrison's Principles of Internal Medicine. New York: McGraw Hill Co; 1977. pp. 1088-1097.
- Vigar Z. Atlas of Medical Parasitology. Singapore: P.G. Publishing House; 1984. pp. 216-222.
- Chatterjee KD. Parasitology, Protozoology and Helminthology. Calcutta: Guha Ray Sree Saraswaty Press Ltd; 1967. pp.168-169.
- Sollmann T. Anthelmintics: Their efficiency as tested on earthworms. J Pharmacol Exp Ther, 1918; 12: 129-170.
- Dash GK, Suresh P, Sahu SK, Kar DM, Ganapaty S, Panda SB. Anthelmintic activity of *Cissus quadrangularis* Linn Stem. J Nat Rem, 2002; 2(2): 182-185.
- Szewezuk VD, Mongelli ER, Pomillo AB. Antiparasitic activity of *Meliza dirach* growing in Argentina. Mole Med Chem, 2003; 1: 54-57.
- Shivkar YM, Kumar VL. Anthelmintic activity of latex of *Calotropis procera*. Pharm Biol, 2003; 41(4): 263-65.
- Bolton S. Statistical analytical methods. New York: Marcel Dekker; 2006.

Conflict of Interest: None

Source of Funding: Nil

Paper Citation: Sahu AK, Panda C, Nayak BS. Determination of phytochemical and anthelmintic activity of rhizome of *Zingiber zerumbet*. J Pharm Adv Res, 2018; 1(9): 399-402.