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Evaluation of Anthelmintic Activity of *Pistia stratiotes* Linn.

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ABSTRACT: The ethanolic extract of the plant *Pistia stratiotes* (Araceae) was investigated for activity against Indian earthworms *Pheretima posthuma* and nematode *Ascaridi galli*. Various concentrations (10, 20, 50 mg/ml) of ethanolic extract were tested, which involved determination of time of paralysis and time of death of the worms. It was compared with Piperazine citrate (15 mg/ml) and Albendazole (20 mg/ml) as standard reference and normal saline as control. The study indicated the potential usefulness of *Pistia stratiotes* against earthworm infections.

KEYWORDS: *Pistia stratiotes*, anthelmintic activity, *Pheretima posthuma*, *Ascaridi galli*

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INTRODUCTION

Pistia stratiotes (Araceae) is commonly known as Borajharji in Orissa¹. The plant is distributed through out the tropical and sub-tropical regions of the world. It is also found in China, Indo-China, Malaya, La Reunion and Brazil¹. The plant is a floating aquatic, stoloniferous herb found in ponds and streams through out the India up to an altitude of 1000m. A number of medicinal properties are attributed to the plant, particularly the leaves^(1,2). The plant is considered antiseptic, antitubercular and antidyseric. In Gambia the plant is used as an anodyne for eye wash. Juice of the plant is used by Mundas in ear complains. The ashes of the plant are applied for ring worm infection of the scalp. The leaves are used in eczema, leprosy, ulcers, piles and syphilis. With rose water and sugar they are given for cough and asthma. Leaves are said to be anathematic. Traditionally, the plant is used as bitter, cooling agent, laxative useful in "tridosha"; for curing fever, blood diseases, tuberculosis. The whole plant has long been employed in ancient Chinese preparations.

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In spite of its traditional use as anthelmintic, there are no reports on systematic and scientific study of anthelmintic activity of *Pistia stratiotes*. In the present study, we investigate the anthelmintic activity of ethanolic extracts of *P. stratiotes*.

MATERIALS AND METHODS

Plant material

The plant *Pistia stratiotes* (Araceae) were collected from the rural belt of Salipur, district Cuttack in November 2009 and authenticated by Botanist of Govt. College Salipur.

Preparation of extracts

The plants were shade dried, powdered. The powdered material was defatted with Petroleum ether (60-80°C). Then the powdered material was extracted with 70% ethanol and extract was vacuum dried. Standard methods were used for preliminary phytochemical screening of ethanolic extract to know the nature of phyto-constituents present in it⁽³⁾.

Drugs and chemicals used

Piperazine citrate (Noel, Mumbai) and Albendazole (Pfizer, Mumbai) were used as reference standards.

Chemicals: Ethanol (95% v/v) (Bengal Chemicals, Calcutta), petroleum ether AR (SD Fine Chemicals, Mumbai) and gum acacia.

Animals

Indian adult earth worm (*Pheritima posthuma*) was collected from water logged areas of Salipur and *Ascaridia galli* (nematode) worm were obtained from freshly slaughtered fowls (*Gallus gallus*). Both worm types were identified at the department of Zoology, Utkal University, Bhubaneswar.

Evaluation of anthelmintic activity

The anthelmintic activity was evaluated on adult Indian earthworm *Pheritima posthuma* as well as on worm parasites of human beings *Ascaridia galli* (nematodes) which are available in slaughtered fowls^(4,5). Six groups of worms were used to assess the anthelmintic properties of ethanolic extracts of *Pistia stratiotes*. Group 1 were the control worms placed in normal saline; groups 2-4 were treated with 10, 20 and 50 mg/ml of ethanolic extracts *Pistia* in 1% gum acacia in normal saline; group 5 with Piperazine citrate in normal saline; and group 6 with Albendazole in normal saline. Each group included six worms of each type. Observations were made for the time taken to set paralysis and death of the individual worms. Mean time for the paralysis (P) in min. was noted when no movement of any sort could be observed, except when the worm

was shaken vigorously; time of death (D) in min. was recorded after ascertaining the worms neither moved when shaken vigorously nor when dipped in warm water (50°C). Piperazine citrate (15 mg/ml), albendazole (20 mg/ml) were included as reference compound.

RESULTS

Results of the preliminary phytochemical screening are shown in Table 1. The study indicates that the extract and its fractions contains alkaloids, tanins, flavonoids, saponins, fixed oils, fats and glycosides.

In this anthelmintic assay, extract of *Pistia stratiotes* L. not only produced paralysis but also cause death of both species of worms. As shown in Table 2, ethanolic extract exhibited anthelmintic activity in dose-dependent manner giving shortest time of paralysis (P) and death (D) with 50 mg/ml concentration. Similar effects were observed for the tested standard drugs (i.e., Piperazine citrate and albendazole), although Piperazine citrate caused only paralysis, not death to the worms. Moreover, the anthelmintic effect of ethanolic extract of *P. stratiotes* was comparable with the standard drugs, although it caused both paralysis and death of the worms similar to Albendazole.

DISCUSSION

In this study, anthelmintic assay was performed on adult Indian earthworm, *Pheritima posthuma* due to its anatomical and physiological resemblance with the intestinal roundworm parasite of human beings⁽⁶⁾. Because of easy availability, earthworms have been used widely for the initial evaluation of anthelmintic compounds *in vitro*⁽⁷⁻¹¹⁾. *Ascaridia galli*

Table 1: Phytochemical screening of *Pistia stratiotes* L.

Type of extract	Constituents present
Ethanolic	Alkaloids, tanins, flavonoids, saponins, fixed oils, fats and glycosides.

Table 2: Anthelmintic Activity of Ethanolic Extract of *Pistia stratiotes* L

Test	Concentration (mg/ml)	Time taken for paralysis (P) and death (D) of worms (mins)			
		<i>P. posthuma</i>		<i>A. galli</i>	
		P	D	P	D
Control	-	A	A	A	A
Ethanolic extract	10	50.63 ± 0.42	94.17 ± 0.91	30.5 ± 0.58	57.45 ± 0.77
	20	15.37 ± 0.71	45.00 ± 0.41	9.37 ± 0.75	27.45 ± 0.56
	50	3.15 ± 0.13	14.75 ± 0.33	1.92 ± 0.32	9.16 ± 0.58
Piperazine citrate	15	18.00 ± 0.36	A	11.05 ± 0.91	A
Albendazole	20	34.66 ± 0.72	63.83 ± 0.79	21.14 ± 0.85	39 ± 0.24

Results are expressed as Mean ± SEM from six observations. 'A' indicates absence of activity in 24 h of administration.

worms are easily available in plenty from freshly slaughtered fowls and their use, as a suitable model for screening of anthelmintic drug was advocated earlier⁽¹²⁻¹⁴⁾.

Piperazine citrate causes flaccid paralysis of worms that resulting expulsion of worms by peristalsis. Although Piperazine citrate does not cause death of worms; Albendazole on the other hand causes death of the parasite. The lethal effect of Albendazole was attributed to its inhibition of tubulin polymerization and blocking glucose uptake⁽¹⁵⁾.

The mechanism action of *Pistia stratiotes* is not yet fully understood, but the anthelmintic activity, as evident from the results of current study, could be attributed to its inhibition of tubulin polymerization and blocking glucose uptake due to its similarity in action with Albendazole. Moreover, the activity may be attributed to the phyto-constituents present in the plant, jointly or separately.

Therefore, it can be concluded that the ethanolic extract and its fractions of *Pistia stratiotes* L. have profound anthelmintic activity against tested worm species. It justifies its folklore use in curing helminthic infections. Further studies are needed to establish the mechanism of action and isolation of phyto-constituents responsible for the concerned activity.

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