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Research article

COMPARATIVE STUDY OF ANTHELMINTIC ACTIVITY BETWEEN AQUEOUS AND ETHANOLIC EXTRACT OF *SOLANUM SURATTENSE* LINN.

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ABSTRACT

Solanum surattense Linn is found in the tribal area of Koraput district and extensively used traditionally by the tribal people as anthelmintic, diuretic, antiarrhythmic, hypotensive, expectorant and carminative. The present study is an attempt to explore the anthelmintic activity of aqueous and ethanolic extract of fruits of plant *Solanum surattense* in a comparative study. The various doses of aqueous and ethanolic extracts were evaluated for their anthelmintic activities on adult Indian earthworms, *Pheretima postuma*. All extracts of both the solvent were able to show anthelmintic activity at 10 mg/ml concentration. The activities are well comparable with the standard drugs, Piperazine citrate and Albendazole. All the doses of aqueous and ethanolic extract of *Solanum surattense* showed better anthelmintic activity than the standard drugs. When the dose of the extract is increased, a gradual increase in anthelmintic activity was observed. Aqueous extract showed better anthelmintic activity in comparison to the ethanolic extract of *Solanum surattense.* The data were verified as statistically significant by using one way ANOVA at 5 % level of significance ($p < 0.05$).

Keywords : *Solanum surattense,* Anthelmintic activity.

INTRODUCTION

Solanum surattense belongs to family *Solanaceae* and also called as yellow berried or nightshade (English), kantakari (Sanskrit), nelamulaka (Telgu), bhejibaugana (Oriya), kandangatri (Tamil) and Kateli (Hindi)[1]. It is a very prickly perennial herb with woody base. Stem branched much and younger ones clothed with dense, stellate and tomentose hairs. Prickles are compressed straight, glabrous and shining, often 1-3 cm long. Leaves are ovate or elliptic, sinuate or subpinnatifid, obtuse or subacute, stellately hairy on both sides, armed on the midrib and often on the nerves with long yellow sharp prickles. Petiole is long, stellately hairy and prickly. Flowers are in cymes or some

times reduced as solitary. Calyx tube is short, globose and lobes linear-lanceolate, acute, densely hairy and prickly. Corolla purple, lobes deltoid, acute, and hairy outside. Anther filament is long, glabrous and anthers open by pores. Ovary is ovoid and glabrous. Berry yellow, green-blotched and surrounded by enlarged calyx. Seeds are glabrous[2]. The plant is reported to contain glycoalkaloids (solasodin, diosgenin and apigenin), fatty acids, resins and mucilages[3]. The literature survey reveals that various parts of *Solanum surattense* have been used as a folklore medicine for curing various ailments like Asthma and cough (root and plant); rheumatism (leaf); sore throat (fruit); anthelmintic (fruit); as a carminative and in dropsy (plant), for relief in burning sensation in the feet accompanied by vesicular watery eruptions (plant)[4]. There are no reports on systematic and scientific study of anthelmintic activity of fruit extracts. In the present study, we report the anthelmintic activity of aqueous and ethanolic extracts of the fruits of *Solanum surattense* and their comparative study.

MATERIALS AND METHODS

The plant material *Solanum surattense* fruits were collected from local area of Koraput in the month of June. The plant was identified and authenticated by the Biju Pattnayak Medicinal Plants Garden and Research Centre, Dr. M.S. Swami Nathan Research Foundation, Jeypore, Koraput (Dt), Orissa (Letter no. MJ08/DBT/553, dt. 19.11.2008). The fruits were soaked in distilled water, shaken for 4 to 5 hours and filtered. The filtrate was gently heated in heating mantle at 45ºC to get a concentrated viscous solution. The viscous solution thus obtained was passed through muslin cloth. The coagulated mass was dried in hot air oven at 40-50°C for 2 to 3 hours. The dried product was grinded, powdered and passed through sieve (Sieve no 80) and the obtained aqueous extract powder was stored in an air tight container. The ethanolic extract was obtained by treating the above aqueous mucilage with 95 % ethanol in the ratio 1:1 with continuous stirring. The coagulated mucilage which formed as a white mass floating on ethanol was transferred to an evaporating disc and treated successively with ethanol. The coagulated mass was dried in hot air oven at 40-50°C for 2 to 3 hours. The dried product was grinded, powdered and passed through sieve (Sieve no 80) and the obtained ethanolic extract powder was stored in an air tight container.

Biological study

Healthy adult Indian earthworms, *Pheretima postuma,* due to its anatomical and physiological resemblance with the intestinal roundworm parasites of human beings[5,6,7], were used in the present study. All earthworms were of approximately equal size. They were collected from local place, washed and kept in water.

Drugs

The ethanolic extract of *Solanum surattense* was tested in various doses in each group. Normal saline water was used as control. Piperazine citrate and Albendazole were used as the standard drugs for comparative study with aqueous and ethanolic extracts.

Experimental method

The method of *Nargund*[8] was followed for the screening of anthelmintic activity. Anthelmintic activity was evaluated on adult Indian earthworm, *Pheretima postuma*. Earthworms were divided into fifteen groups (5 each). The first group (I) served as normal control which received saline water only. The second (II) and third (III) groups received the standard drugs is Piperazine citrate and Albendazole at a dose level of 10 mg/ml. Groups (IV) to (IX) received doses of aqueous extracts of 10 mg/ml, 15 mg/ml, 20 mg/ml, 25 mg/ml, 30 mg/ml and 35 mg/ml respectively. Groups (X) to (XV) received doses of ethanolic extracts of 10 mg/ml, 15 mg/ml, 20 mg/ml, 25 mg/ml, 30 mg/ml and 35 mg/ml respectively. Observations were made for the time taken to cause paralysis and death of individual worms for two hours. Paralysis was said to occur when the worms do not revive even in normal saline water. Death was concluded when the worms lost their motility followed with fading away of their body colors.

Statistical analysis

The data on biological studies were reported as mean ± Standard deviation (n = 5). For determining the statistical significance, standard error mean and analysis of variance (ANOVA) at 5 % level significance was employed. $P < 0.05$ were considered significant[9].

RESULTS AND DISCUSSION

The extracts of *Solanum surattense* produced a significant anthelmintic activity in dose dependent manner as shown in Table 1. The anthelmintic activity of both aqueous and ethanolic extract was comparable with that of standard drugs. The normal saline water was used as a control. The activity shown by aqueous and ethanolic extracts is of considerable importance and has justified its use in controlling the disease causes by worms as reported by the tribal people. By employing one-way

ANOVA, all data were found to be statistically significant at 5 % level of significant ($p<0.05$). The extent of activity shown by the crude extracts was found to be better than that of the both standard drugs Piperazine citrate and Albendazole which justifies its activity as shown in Fig 1. It could be concluded and confirmed that the aqueous and ethanolic extract of fruits of plant *Solanum surattense* is having anthelmintic activity. Aqueous extract showed better anthelmintic activity in comparison to the ethanolic extract of *Solanum surattense.* 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.

Table 1. Anthelmintic activity of aqueous and ethanolic extracts of *Solanum surattense*

Groups	Treatments	Dose (mg/ml)	Time taken for paralysis (min) (X ± S.D.)	Time taken for death (min) (X ± S.D.)
I	Control (Normal saline water)	-	-	-
II	Standard – 1 (Piperazine citrate)	10	53.4 ±0.45	60.8 ±0.52
III	Standard – 2 (Albendazole)	10	65.6 ±0.31	73.4 ±0.82
IV	Aqueous extract	10	37.1 ±0.83	50.3 ±0.83
V	Aqueous extract	15	34.6 ±0.62	44.0 ±0.69
VI	Aqueous extract	20	30.4 ±0.57	38.5 ±0.65
VII	Aqueous extract	25	24.5 ±1.08	29.1 ±1.10
VIII	Aqueous extract	30	22.2 ±0.69	27.3 ±0.69
IX	Aqueous extract	35	20.0 ±0.92	23.2 ±0.92
X	Ethanolic extract	10	36.2 ±0.63	48.2 ±0.63
XI	Ethanolic extract	15	35.6 ±0.52	46.4 ±0.89
XII	Ethanolic extract	20	31.2 ±0.67	40.8 ±0.75
XIII	Ethanolic extract	25	25.6 ±1.10	30.6 ±1.09
XIV	Ethanolic extract	30	25.0 ±0.63	29.8 ±0.66
XV	Ethanolic extract	35	23.0 ±0.89	27.6 ±0.82

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	392.2514	1	392.2514	2.14583	0.0154946	4.225201
Within Groups	4752.723	26	182.797			
Total	5144.974	27				

Each values is represented as mean ± standard deviation (n = 5). Standard error mean < 0.294.Data are found to be significant by testing through one way ANOVA at 5 % level of significance ($p < 0.05$).

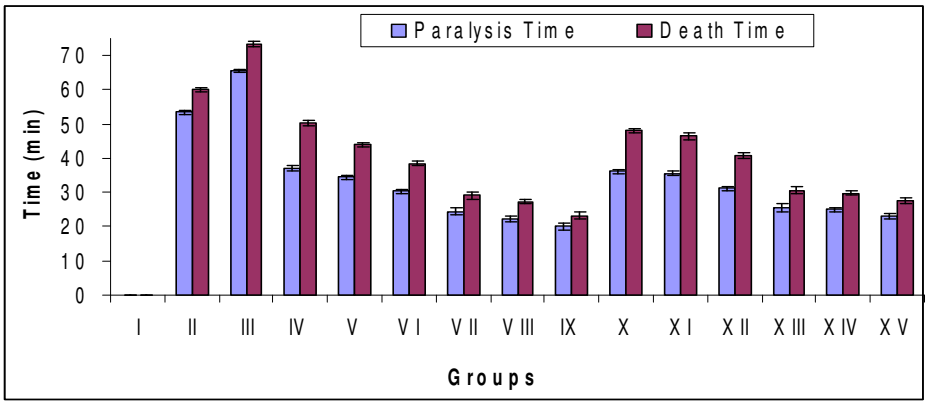

Fig. 1 : Anthelmintic activities of aqueous and ethanolic extracts of fruits of plant *Solanum surattense* on indian earthworm *Pheretima postuma*.

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

Group I – Control (Normal saline water), group II – standard – 1 (Piperazine citrate), group III – standard – 2 (Albendazole), group IV to IX – Aqueous extract of dose 10, 15, 20, 25, 30 and 35 mg/ml respectively and group X to XVI – Ethanolic extract of dose 10, 15, 20, 25, 30 and 35 mg/ml respectively.

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