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Research Article

ANTICONVULSANT ACTIVITY OF WHOLE PLANT OF *SOLANUM SURATTENSE* BURM AGAINST MES AND PTZ INDUCED SEIZURES IN RATS

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ABSTRACT
The anticonvulsant activity of whole plant of *Solanum surattense* was assessed by successive hot soxhlet extraction using Petroleum-ether (40-60^{0}C), Chloroform, and Methanol respectively and finally with Water maceration against MES and PTZ induced seizures in rats. The Methanolic and Aqueous extracts showed significant ($p<0.01$) activity in MES induced seizures by reducing tonic hind limb extension phase than pet-ether and chloroform when compare to control. Also Methanolic and Aqueous extracts significantly ($p<0.01$) delayed the onset of clonic convulsions induced by Pentylenetetrazol.
Thus Methanolic and Aqueous extracts of whole plant of *Solanum surattense* possess the anticonvulsant activity.

KEYWORDS: Anticonvulsant, *Solanum surattense*, MES, PTZ.

INTRODUCTION

Solanum surattense Burm F. (Solanaceae) found in waste places, along railway lines, on road sides as weed. Plant occurs wild throughout India, Sri Lanka, South-East Asia[1].Many empirical applications have been used in India for various ailments such as antiasthmatic, diuretic, febrifuge, bronchitis, cough and in dropsy[2-5], anthelmintic, leprosy, rheumatoid arthritis, cardiac disorders,[6] epilepsy[7].

However traditional peoples are using this plant for various disorders such as Gonorrhea, urolithiasis, amenorrhoea, also as an ingredient of an Ayurvedic drug *Arkadhi* a remedy for bronchitis, dengue and fever.[6] The plant contains alkaloids as major chemical constituent along with glucoalkaloids, flavonoids, carbohydrates and triterpenoids.[8]

MATERIALS AND METHODS

Plant Collection and Authentication

In the present study, the plant *Solanum surattense* was collected from local areas of Ramling Mudgade (Maharashtra) India.. The whole plant was authenticated from Botanist Smt. R. S. Bavadekar Department of Botany, M. M's Arts, Commerce, Science and Home Science College Belgaum, Karnataka, India.

Preparation of Extracts

The plant material (whole plant) were dried for several days and powdered with the help of an electric grinder. The coarsely powdered whole plant was extracted successively with petroleum ether (B.P.40-60°), chloroform and methanol in soxhlet extractor for 24-34 hr .Finally powdered plant was macerated with chloroform-water. The yields obtained of the different successive extract were Pet-ether (4.39%), Chloroform (3.02%), Methanol (4.76%) and Aqueous (4.7%) extracts were stored in desiccator.

Preparation of Test Sample

For Pharmacological experiment weighed amount of the extract was suspended in 1% tween- 80 solution.

Animals

Male Swiss albino mice weighing 22-25g and albino Wistar rats weighing 150-220 gms (8 to 12 weeks old) were housed in groups of 6-8 per case at a temperature 25° ± 1 °C and relatively humidity of 41.55%. A 12:12, light: dark cycle was following during the experiment. The experiment was carried out during 1200-1400 hr. Animals had free access to food and water. However, food but not water was withdrawn 8hr before and during the experiments. The Institutional Animal Ethical Committee approved the protocol of the study.[9]

Drugs

Pentylenetetrazole (Sigma,USA), Phenytoin injection (Ranbaxy),Diazepam (Calmpose inj. Ranbaxy, India), were used in this study. The drugs were dissolved in water for injection and all the drugs were administered intraperitoneally.

Acute Toxicity

The extracts were administered in doses of 50,300, 1000, 2000 mg/kg p.o. to different groups of mice, each containing ten animals and mortality were observed after 24hrs. LD_{50} cut off values for each extracts were found to be 2000 mg/kg. $1/10^{th}$ of the lethal dose was taken for effective dose (therapeutic dose) for subsequent anticonvulsant activity.

ASSESSMENT OF ANTICONVULSANT ACTIVITY

Maximum Electroshock Induced Seizures (MES)

The animals were divided into six groups of six rats each. Group I received 1ml/rat saline (p.o.), group II received 25 mg/kg of Phenytoin (i.p.), groups III, IV, & VI received 200 mg/kg of p.o Pet-ether, Chloroform and Aqueous extracts of *Solanum surattense* whole plant respectively. Group V received 180 mg/kg of p.o. Methanolic extract *Solanum surattense* whole plant. Maximal electroshock (Inco Electroconvulsiometer model# 100-3) of 150 mA current for 0.2 sec was administered through ear electrodes to induce convulsions in the control and drug treated animals.

MES produced various phases of convulsions i.e. Flexion, Extension, Clonus and Stupor. The duration of tonic extension of hind limb was used as end point i.e. prevention or decrease in the duration of hind limb extension was considered as a protective action[10,11].

Pentylenetetrazole (PTZ) Induced Seizures

The animals were divided into six groups of 6 rats each. Group I received 1ml/rat Saline (p.o.), group II 4mg/kg Diazepam (i.p.) as reference standard, groups III, IV, & VI received 200 mg/kg of p.o pet. Ether, chloroform and aqueous extracts of *Solanum surattense* whole plant respectively. Group V received 180 mg/kg of p.o. Methanolic extract *Solanum surattense* whole plant. PTZ was administered (80 mg/kg, i.p.) 45 min after administration of saline, Standard drug and extracts of *Solanum surattense*. Animals were observed for 30 min after injection of PTZ

The anticonvulsant property of different extracts of *Solanum surattense* in this model was assessed by its ability to delay the onset of myoclonic spasm and clonic convulsions. Protection against PTZ induced convulsions and percentage of mortality was measured[10,11].

Statistical Analysis

The data are presented as mean ± SEM. The data of MES and PTZ tests were analyzed by one-way analysis of variance (ANOVA) followed by Dunnet's Multiple Comparison test.

RESULTS

Maximal Electroshock Test (MES Test)

The result of anticonvulsant effect of *Solanum surattense* plant against MES induced convulsions are shown in Table-1. The data resulted from anticonvulsant effect of different extracts of *Solanum surattense* showed that the Methanol and Aqueous extracts decreased the duration of hind limb extension (7.167 ± 0.4773 sec., 10.17±0.4773 sec. respectively) which is most significant ($p<0.01$) when compared to control (13.00± 0.5774sec) and the effects produced by Pet-ether (40-60^{0}C) (13.00 ± 0.4472 sec), Chloroform extract (11.00 ± 0.5164 sec).The Methanolic and Aqueous extracts of *Solanum surattense* also decreases the duration of clonus (12.00 ± 0.7303 sec., 12.17±0.009 sec. respectively) and stupor (74.20 ± 0.6325

sec., 76.67±0.7601 sec. respectively) phase of MES induced convulsion as compared to control (clonus 15.67 ± 0.6667 sec and stupor (96.00 ± 1.949 sec).

Pentylenetetrazole Induced Seizures

In PTZ induced seizures, Methanolic and Aqueous extracts showed delayed onset of clonus (92.33 ± 1.6667 sec, 86.33±0.4944sec respectively) and extensor (322.2 ± 8.724 sec, 94.7±1.308sec respectively), showed significant anticonvulsant activity as compared to control (clonus (74.33 ± 0.6146 sec) and extensor (275.3 ±1.145 sec.). The Methanolic and Aqueous extracts protected the all the animals in the group since there was no mortality was observed.

Pet-ether (clonus 77.67±1.229, extensor 278.3±1.145) and Chloroform (clonus 77.87±1.138, extensor 276.0±1.506) extract did not produce any significant effect when compared to control group. The result of anticonvulsant effect of *Solanum surattense* plant against PTZ induced convulsions are shown in Tab.2

DISCUSSION

The observations which were found in the present study indicated that all the extracts of *Solanum surattense* were without any lethal effect in dose upto 2000mg/kg. Methanolic and Aqueous extracts possessed significant anticonvulsant activity against MES and PTZ seizures than other extracts when compared to control group

Since inhibition of the MES test predicts activity against generalized tonic-clonic and cortical focal seizures so activity against MES induced seizures suggests that the methanolic and aqueous extracts of *Solanum surattense* are useful in suppressing generalized tonic-clonic seizures by regulating GABA mediated synaptic inhibition through an action at distinct sites of this synopsis.[12]

PTZ test predicts activity against absence seizures. Since PTZ is a GABAA receptor antagonist, the Methanolic and Aqueous extracts may be acting by increasing GABA concentration in the brain.

CONCLUSION

In conclusion, Methanolic and Aqueous extracts of *Solanum surattense* possessed significant anticonvulsant activity against MES and PTZ seizures than other extracts when compared to control group.

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Table I - Effect of Whole plant of *Solanum surattense* against MES Induced convulsions

Drug	Dose mg/Kg b.w.	Time (Sec) in various phases of convulsions (Mean±SEM)				
		Flexion	***Extension***	***Clonus***	***Stupor***	***Recovery***
Control	-	3.5 ±0.4282	13.00 ±0.5774	15.67 ±0.5627	96.00 ±1.949	125.8 ±1.302
Standard Phenytoin	25	1.333 ±0.2108**	00.0 ±0.0**	9.333 ±0.4944 **	52.33 ±0.6667 **	71.33 ±0.8819
Pet-ether Extract	200	3.5 ±0.5627	13.00 ±0.4472 *	12.67 ±0.9545 *	89.17 ±9.272*	116.2 ±2.242
Chloroform Extract	200	4.0 ±0.5774	11.00 ±0.1564*	13.00 ±0.5774*	89.00 ±1.826 *	118.0 ±1.461
Methanol Extract	180	1.667 ±0.2108**	7.167 ±0.4773**	12.00 ±0.7303**	74.20 ±0.6325**	105.0 ±1.033
Aqueous Extract	200	1.683 ±0.2375**	10.17 ±0.4773**	12.17 ±0.009**	76.67 ±0.7601**	114.5 ±0.7638

Values are expressed as MEAN±SEM
One way Anova followed by Dunnets 't' test.
Note: n=6 in each group. *P<0.05, **P<0.01.

Table II - Effect of Whole plant of *Solanum surattense* against PTZ Induced Convulsions

Drug	Dose (mg/kg)	Onset time in Seconds (MEAN±SEM)			Recovery/ Mortality
		Jerks	**Clonus**	**Extensor**	
Control (Saline 1ml/rat)	-	46.67 ±0.3333	74.33 ±0.6146	275.3 ±1.145	Mortality
Standard drug (Diazepam)	4	0.0 ±0.0**	0.0 ±0.0**	0.0 ±0.0**	Recovery
Pet. Ether (40-60^{0}C) Extract	200	48.50 ±0.4282 *	77.67 ±1.229*	278.3 ±1.145*	75%Recovery
Chloroform Extract	200	48.6 ±0.4216*	77.87 ±1.138*	276.0 ±1.506*	Recovery
Methanol Extract	180	71.83 ±0.4773 **	92.33 ±1.6667**	322.2 ±8.724**	Recovery
Aqueous Extract	200	65.00 ±0.7303**	86.33 ±0.4944**	294.7 ±1.308 **	Recovery

Values are expressed as MEAN±SEM
One way Anova followed by Dunnets 't' test.
Note: n=6 in each group. *P<0.05, **P<0.01.

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