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

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Summary

The anticonvulsant activity of whole plant of *Solanum surattense* was carried out by successive hot soxhlet extraction method using petroleum-ether (40-60^{0}C), chloroform, and methanol solvents respectively and finally with Chloroform-Water maceration and all these extracts assessed 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. The results showed that methanolic and aqueous extracts of whole plant of *Solanum surattense* possess the anticonvulsant activity.

Key words: Anticonvulsant, *Solanum surattense*, MES, PTZ.

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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, anthelmintic, leprosy, rheumatoid arthritis, cardiac disorders[2-5]. 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[7]. The survey of literature reveals that *Solanum surattense* plant posses cardiac depressant[8], Antiseptic property[9], Antipyretic activity[10]. According to traditional text plant is used in epilepsy[11].

However plant of *Solanum surattense* has not been investigated for anti-convulsant property and also keeping in view the potential medicinal uses, chemicals which are present in *Solanum surattense*, the study was undertaken to evaluate anti-convulsant activity.

Materials and Methods

Plant material

In the present study, the whole plant *Solanum surattense* was collected from local areas of Belgaum, Karnataka. 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. After authentication, Plants were dried at room temperature until they were free from the moisture and subjected to physical evaluation with different parameters. The parameters which were used for evaluation were nature, odour, colour, taste, size, shape, width, length.

Preparation of extract

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. On evaporation of solvents from extract in vacuum a residue was obtained. Pet-ether (4.39%), Chloroform (3.02%), Methanol (4.76%) and Aqueous (4.7%) extracts were stored in desiccator. For Pharmacological experiment weighed amount of the extract was suspended in 1% tween 80 solution. So, there is attempt to find out common morphological study for human or experimental epilepsy.

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.

Drugs and chemicals

Pentylenetetrazole (Sigma,USA), Phenytoin injection (Ranbaxy),Diazepam injection (Ranbaxy). PTZ was dissolved in water for injection and all the drugs were administered intraperitoneally.

Acute toxicity studies

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

An imbalance between the excitatory and inhibitory neurotransmitters is responsible for seizures[12, 13]. At neuronal level, seizure activity often occurs when glutamatergic excitatory major transmitter's overrides gamma aminobutyric acid (GABA), for GABA mediated inhibition convulsion several animal models have been developed to evaluate anti-seizure activity. Many drugs that increase the brain content of GABA have exhibited anticonvulsant activity against seizures induced by maximum electric shock (MES), pentylenetetrazole (PTZ).The MES is probably the best validated method for assessment of antiepileptic drugs in generalized tonic clonic seizures[14, 15]. The PTZ induced seizures are similar to the symptoms observed in the absence seizures and drugs useful in treatment of absence seizures suppresses PTZ induced seizures.

Maximum electroshock induced seizures (MES) [16, 17]

The animals were divided into six groups of 6 rats each. Group I received 1ml/rat saline (p.o.), group II received 25 mg/kg of Phenytoin (i.p.), groups III, IV, V & VI received 200 mg/kg of p.o Pet-ether, Chloroform, methanolic and Aqueous extracts of *Solanum surattense* whole plant respectively. 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 that is prevention or decrease in the duration of hind limb extension was considered as a protective action.

Pentylenetetrazole (PTZ) induced seizures[16, 17]

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, V & VI received 200 mg/kg of p.o pet. Ether, chloroform, methanolic and aqueous extracts of *Solanum surattense* whole plant respectively. 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.

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 ± 0.5774 sec) and the effects produced by Pet-ether (40-60^0) (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).

Table No. 1 - 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 (Saline 1ml/rat)	-	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 (40-60^{o}C) 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	200	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.

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, 294.7±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 Table-2.

Table No. 2 - 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*	Recovery
Chloroform Extract	200	48.6 ± 0.4216*	77.87 ± 1.138*	276.0 ± 1.506*	Recovery
Methanol Extract	200	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.

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[18].

PTZ test predicts activity against absence seizures. Since PTZ is a $GABA_A$ 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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