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Evaluation of antidepressant activity of ethanolic and aqueous extract of *Solanum tuberosum* peel

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ABSTRACT:

Aim: The Present study was undertaken to evaluate the antidepressant potential of aqueous extract of *Solanum tuberosum* peel (AESTPL 250mg/kg, 400mg/kg) and ethanolic extract of *Solanum tuberosum* peel (EESTPL 250 mg/kg, 400mg/kg) by using forced swim test, tail suspension test.

Methods: Healthy Wistar albino rats weighing between 200-250gm were used for the study. Imipramine was used as standard drug.

Results: In these studies both the extracts of *Solanum tuberosum* peel (STP) significantly reduced the duration of immobility in both experimental models as compared to the control group animals.

Conclusion: The present study suggested that the STP extracts (both Aqueous and Ethanolic) possessed potential antidepressant effects which could be of therapeutic value for using in the treatment of patients with depressive disorders.

Key words: antidepressant, *Solanum tuberosum* peel, Imipramine, duration of immobility.

INTRODUCTION:

Depression is a common mental disorder that presents with depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration [1]. Depression is characterized by extended periods of feelings of meaninglessness, hopelessness and dysphoria. Depression is a significant public health problem that can occur to any one and are likely to occur on adults in between the age of 20-50 years old with no relations to race, education status, civil status or income [2]. Depression is caused by depletion of brain monoamines, 5-HT and NA. Several drugs are now available as 'antidepressants', sometimes also called as 'psychoanaleptics' or 'mood elevators' [3]. They act by increasing the intrasynaptic availability of the monoamines in the brain. MAOIs, TCAs, SSRIs have many adverse reactions, such as allergic reactions

like urticaria, skin rashes, pruritus and photosensitivity, tachycardia, difficulty in micturition, impotence, decrease libido, constipation delayed ejaculation, anxiety, jitteriness, insomnia, Feeling of tiredness, lethargy, headache and sedation may be observed.

The Indian traditional system of medicine, have many drug formulations of plant origin that are used in the treatment of psychiatric disorders. Potatoes (*Solanum tuberosum* L.) are one of the most important staple crops for human consumption, together with wheat, rice, and corn [4]. The potato peel contains various types of poly Phenolic compounds and flavonoids. These Phenolic compounds and flavonoids have effects on CNS. The *Solanum tuberosum* exhibited hepatoprotective, anti microbial, anti ulcer, anti inflammatory activities. The flavonoids have the ability to stimulate the CNS and they ligands to GABA_A receptors and ability to inhibit MAO-A and MAO-B.

So, because of presence of flavonoids in potato peel [5]; the potato peel extracts may be used for the treatment of depression as an antidepressant.

MATERIALS AND METHODS

Animals

Healthy Wistar albino rats weighing between 200-250g were used for the study. The animals were kept in polypropylene cages (6 in each cage) and animals were acclimatized to our lab environment for about a 3-5 days prior to the study, so that they could adapt to the new environment. Animal house is maintained under standard hygienic conditions, at $25 \pm 2^\circ\text{C}$, humidity ($60 \pm 10\%$) with 12 hrs day and night cycle, with food and water and libitum.

Drug and plant material

Imipramine, is a gift sample from Talent health care, Ahmadabad. Potatoes (*Solanum tuberosum* L.) are collected from local market of Karimnagar, Telangana, India. And they were peeled, dried, powdered, and extracted for the drug and used for the Experimental studies.

Acute Toxicity Studies

The ethanolic and aqueous extracts of *solanum tuberosum* L. was subjected for the acute toxicity studies to determine the therapeutic dose using albino rats in controlled environment. Acute oral toxicity study was performed as per OECD-423 guidelines. Acute toxicity study carried out on *EESTP* and *AESTP* up to the dose of 2000 mg/kg.

Experimental design

The experimental animals were divided into 6 (six) groups, Group I was treated as Control which were feed with Water, Group II animals were treated with Standard Imipramine, Group III & IV animals was served as treatment groups and given *EESTP* 250 & 400 mg/kg, and Group V & VI were given with *AESTPL* 250 & 400 mg/kg respectively.

Experimental Procedure

Forced Swim Test (FST)

Third, fourth, fifth group of animals were treated with test drug dose for the period of 10 days. On the test day, the rat was forced to swim individually in a glass jar ($25 \times 12 \times 25$ cm³ sub) containing fresh water of 15 cm height and maintained at 29°C ($\pm 2^\circ\text{C}$) after 60 min of the administration of last dose. After an initial 2 min period of vigorous activity, each animal assumed a typical immobile posture. A rat was considered to be immobile when it remained floating in the water without struggling, making only minimum movements of its limbs necessary to keep its head above water.

The total duration of immobility was recorded with a naked eye during the next 4 min of a total 6 min test. The changes in immobility duration were studied and compared after administering drugs in separate groups of animals. The water was changed to fresh water after each session to eliminate excrement, urine and fur. Each animal was used only once [6, 7&10].

Tail Suspension Test (TST)

Third, fourth, fifth group of animals were treated with test drug dose for the period of 10 days. Mice both acoustically and visually isolated were suspended 58 cm above the floor by adhesive tape placed approximately 1-2 cm from the tip of the tail. Immobility time was manually recorded during a 5 min period [9]. Mice were considered immobile only when they hung passively or stayed completely motionless. Animal was considered to be immobile when it did not show any movement of body and hanged passively [6, 8].

Statistical analysis

The mean $\pm$ S.E.M. values were calculated for each group. The data were analyzed using Graph Pad software version 5 by one-way ANOVA followed by Dunnet's multiple comparison test. $P < 0.0001$ was considered to be statistically significant.

RESULTS

Acute toxicity studies

The ethanolic and aqueous extract of *Solanum tuberosum* was subjected for the acute toxicity study to determine the therapeutic dose using albino rats in controlled environment. Acute oral toxicity study was performed as per OECD-423 guidelines. Acute toxicity study carried out on *EESTP* and *AESTP* up to the dose of 2000 mg/kg demonstrated that the extract did not show any sign of toxicity and mortality. Hence 250 and 400 mg/kg dose of the extract selected for evaluation of anti depressant activity.

Forced swim test

The results obtained in forced swim test are tabulated in Table. 1 and Figure. 1. As shown in the table the extracts *EEST PH* 400 and *AEST PH* 400 mg/kg showed similar results that of Standard. More over the extract *AEST PH* 400 mg/kg had shown significant result when compared to standard than that of *EEST PH* 400 mg/kg.

Tail suspension test (TST)

The results obtained in Tail suspension test are tabulated in Table. 2 and Figure. 2. As shown in the table the extracts *EEST PH* 400 and *AEST PH* 400 mg/kg showed similar results that of Standard.

Table. 1: Effect of ethanolic & aqueous extract of *Solanum tuberosum* on duration of immobility in forced swim test.

Groups (n=6)	Treatment	Duration of immobility(secs)
I	Control	184.2 ± 4.362
II	Imipramine 10mg/kg	52.67 ± 3.018***
III	EESTPL 250 mg/kg	91.33 ± 3.159 ***
IV	EESTPH 400mg/kg	65 ± 3.651***
V	AESTPL 250mg/kg	75.33± 2.445***
VI	AESTPH 400mg/kg	54.33 ±1.563***

Values express as mean ± SEM; n=6 in each group, statistical comparisons as follows: significant at P < 0.0001*** Compared to control group.

Figure. 1: Effect of ethanolic and aq extract of *Solanum tuberosum* peel on duration of immobility in tail suspension test**Table. 2:** Effect of ethanolic & aq extract of *Solanum tuberosum* on duration of immobility in tail suspension test.

Groups (n=6)	Treatment	Duration of immobility(secs)
I	Control	149.3 ± 4.631
II	imipramine 10mg/kg	47.50 ± 3.819 ***
III	EESTP 250 mg/kg	77.67 ± 5.283 ***
IV	EESTP 400mg/kg	54 ± 4.250***
V	AESTP 250mg/kg	61.50 ± 1.803***
VI	AESTP 400mg/kg	48.33 ± 2.171***

Values express as mean ± SEM; n=6 in each group, statistical comparisons as follows: significant at P < 0.0001*** compared to control group

Figure. 2: Effect of ethanolic and aq extract of *Solanum tuberosum* peel on duration of immobility in tail suspension test

DISCUSSION

Solanum tuberosum is widely used in the Indian subcontinent and is known to be safe on chronic consumption. *Solanum tuberosum* peel extract was found to be safe as no mortality was observed following treatment with doses as high as 2000 mg/kg. In the present study, AESTP in the highest dose tested (400mg/kg) was very close to imipramine in both the experimental models compare to EESTP highest dose (400mg/kg) because of more amount of flavonoids are observed in phytochemical screening. Exact mechanisms underlying the antidepressant action cannot be concluded at the movement due to the presence of large number of phytochemicals in the STP. However, the antidepressant activity may be attributed to the presence, polyphenolic compounds,

flavonoids and ascorbic acid in the extract [5]. Several flavonoids have been identified as inhibitors of MAO-A and MAO-B. Many flavones derivatives were found to be ligands for the GABA_A receptors in the CNS [11, 12]; and thus they bind to the benzodiazepine binding site with resulting depressant actions in mice. Further studies may help to elucidate the possible mechanism of action of *Solanum tuberosum* peel

CONCLUSION

The present study confirmed that the ethanolic and aqueous extract of STP has the antidepressant activity as it's significantly reduces the immobility time

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