



Original Research Article

Evaluation of antidepressant activity of ethanolic extract of *Mimosa pudica* in swiss albino mice

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ABSTRACT

Introduction: Depression is a widely prevalent form of mental illnesses worldwide. It is commonly associated with sad mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, and low energy. *Mimosa pudica* has many medicinal properties, and are used in traditional medicine in the treatment of various medical conditions. This study was conducted to better understand the antidepressant activity of *Mimosa pudica*.

Objective: To evaluate the potential antidepressant activity of Ethanolic Extract of *Mimosa pudica* (EEMP) leaves on depression in Swiss Albino mice.

Materials and Methods: Swiss albino mice of either sex weighing 20-30g were used. Sixty mice were divided into two arms. Each arm was further divided into five groups (n=6). Drugs were given orally once daily, for ten days. Group 1 was the Control group and received saline. Group 2 received standard drug – Imipramine (15mg/kg). Group 3 received EEMP (100mg/kg). Group 4 received EEMP (200mg/kg). Group 5 received EEMP (400mg/kg). Antidepressant potential of EEMP was evaluated by submitting the mice to Forced Swim Test (FST) and Tail Suspension Test (TST) on the first and tenth day.

Results: The study showed significant reduction in immobility time in both Forced Swim Test and Tail Suspension Test in the EEMP group when compared with the control group.

Conclusion: The study suggests that Ethanolic Extract of *Mimosa pudica* has anti-depressant activity and can be considered for use in therapy of depression after further testing.

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1. Introduction

Depression is an extremely prevalent form of mental illnesses worldwide. In 2017, World Health Organisation released a report which estimated that 4.4% of the global population suffered from depression.¹ Depressed patients commonly complain about feeling sad, lack of interest in their day to day work, inability to find pleasure in activities that would normally please others, and feelings of discontent. It is also associated with feeling of guilt or reduced self-worth, disturbed sleep, changes in appetite, and low energy.² In severe forms of depression, patients are known to cause self harm or even suicide.³ Although

drugs available for the therapy of depression, they have their limitations, such as delayed therapeutic response and low responders to these drugs, which poses a problem with patient compliance.^{4,5} Hence, there is a requirement for alternative treatment of depressive disorders with the use of medicinal plants.

The plant *Mimosa pudica* is a weed that grows in humid areas, open fields and by roadsides. It grows as a shrub, under 100 cm in height, and is easily identifiable by its characteristic 15 – 20 pairs of leaflets that folds when disturbed, and is hence known as “Lajwanti” in Hindi, and “Touch me not plant” in English.⁶ It is believed to be native to the Middle Americas and is now found in other in all tropical countries of the Asian subcontinent and South East Asia.⁷ It has been used as a folk lore medicine since

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many years because of its various medicinal properties, and because it is an easily cultivable plant and is abundantly available.⁸

It has been used in treatment of hemorrhoids, anal fistulas, diarrhea and dysentery. The plant roots were used in treatment of respiratory conditions like cough and asthma, and in some urinary infections.⁹ Phytochemical studies revealed the presence of alkaloids, amino acid, flavonoids glycosides, sterols, terpenoids, tannins and fatty acids in this plant.¹⁰

The purpose of this study was to get a better understanding of the antidepressant activity of *Mimosa pudica*.

2. Materials and Methods

Ethical clearance was obtained from the Institutional Animal Ethics Committee before starting the study (Ref No. IAEC/02/02/2019/CPCSEA).

Swiss albino mice, 60 in number, weighing 20-30 g, of either sex, maintained under standard conditions in the Institutional animal house were used. They were housed in clean, transparent polypropylene cages in groups of six and maintained at standard laboratory temperature and humidity (40-60%) with light/dark cycle of 12:12 hours. Animals were fed commercial pelleted chow and water. The mice were allowed to acclimatize to these conditions for a week before starting the experiments.

The standard drug, Imipramine hydrochloride, was obtained from Abbot healthcare Pvt Ltd (Depsonil 25). *Mimosa pudica* plant was obtained from district Udipi, Karnataka, India. The plant was authenticated by Jyothi K T, Lecturer and HOD, Department of Botany, Sri Siddhartha First Grade College, Tumkur. Ethanol 99.9% was obtained from Changshu Yanguan Chemicals.

The *Mimosa pudica* plants were washed, the leaves were shade dried and powdered. About 200 g of the dried leaf powder of *Mimosa pudica* was extracted with 99.9% Ethanol in Soxhlet extractor for about 36 hours. The ethanol was then evaporated from the mixture by placing it in a beaker and heating it over a water bath. The extract gave a yield of brownish paste like mass weighing 6g. The yield obtained was 3% w/w with respect to dried powder.¹¹

The mice (n=60) were divided into two arms which was further divided into five groups, each group having six mice. Drugs were given orally after 12 hours of fasting every day, for ten days.

The drugs were prepared and administered per oral (0.1ml/10g).

Group 1 was administered normal saline(10ml/kg).

Group 2 was given standard drug Imipramine (15mg/kg).¹²

Group 3, 4 and 5 received 100mg/kg, 200mg/kg, 400mg/kg doses of the test compound Ethanolic Extract of *Mimosa pudica* (EEMP) respectively.¹³

For the Acute study, on day 1, one arm of 30 mice were subjected to Tail Suspension Test (TST), while 30 mice in the other arm were subjected to Forced Swim Test (FST), one hour after feeding the respective drugs. For Subacute study, on day 10, the mice were again subjected to TST and FST, one hour after feeding respective drugs.

2.1. Procedure

2.2. Forced swim test (FST)

The method used was as described by Porsolt et al. The mice were individually forced to swim in a vertical plexiglass cylinder (capacity: 5L, height: 50cm diameter: 18cm) containing 15cm of water maintained at temperature: 25°C. Mice were subjected to pre-screening, which lasted for 15 minutes. 24 hours after pre-screening, the trial was performed for 6 minutes of which the first two minutes were not recorded, and the periods of immobility for the latter four minutes was measured (in seconds) with a stopwatch. Mice were considered to be immobile when they made only the bare necessary movements to stay afloat, or when they were motionless. The mice were taken out of the plexiglass cylinder after 6 minutes. They were dried with a dry towel, and kept under a dim lamp for drying. The water was discarded after every test, and fresh water was used for the next mouse.^{14,15}

2.3. Tail suspension test (TST)

The method used was as described by Steru et al. Antidepressants that are used in practice are able to reduce the period of immobility of mice when they try to escape when suspended by their tail. This test was a reliable screening method for antidepressants, including those involving serotonergic system. Mice were hung on a wooden rod, 50 cm above the table, by attaching them from their tail end with the use of an adhesive tape. The first two minutes were not recorded, and the periods of immobility for the latter six minutes was recorded (in seconds) with a stopwatch. Mice were considered to be immobile only when they were motionless and not attempting to escape.^{14,16}

2.4. Statistics

The recorded data was entered in Microsoft Excel.

The variables recorded followed normal distribution, hence, results have been expressed as mean (in seconds) ± standard error of mean (SEM). The data was analysed using one way ANOVA followed by post-hoc Dunnet's test.

Probability 'p' value less than 0.05 was considered as statistically significant.

3. Results

In the Acute study, on Day 1, standard drug Imipramine (15mg/kg) and test drug EEMP (100mg/kg, 200mg/kg,

Table 1:

Day 1	Tail Suspension Test	Forced Swim Test
Normal Saline	231.3(±19.55)	139.5(±6.43)
Imipramine 15mg/kg	175.3(±5.34)*	104.83(±5.86)*
EEMP 100mg/Kg	169.7(±13.8)*	94.83(±7.67)*
EEMP 200mg/kg	181.7(±9.81)*	111.83(±3.00)*
EEMP 400mg/kg	116.8(±6.65)*	109.16(±5.93)*

Immobility time shown in seconds as mean (± SEM),

*denotes statistically significant value, #denotes statistically not significant value

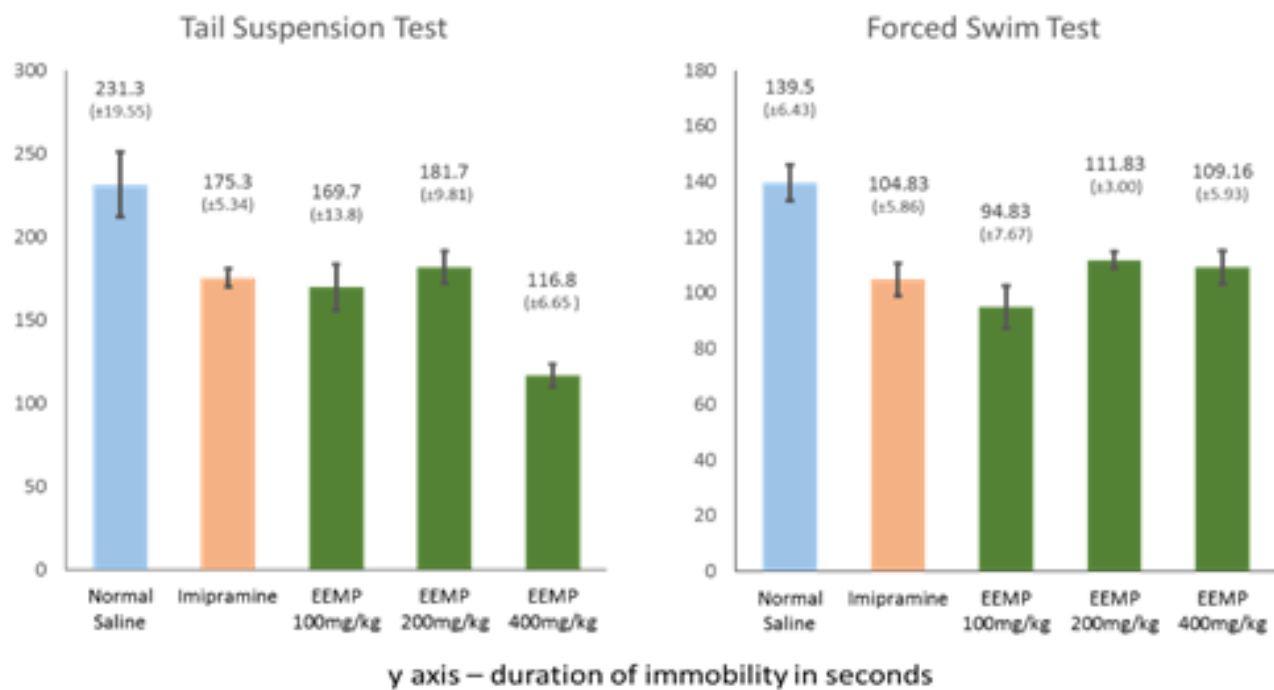
Table 2:

Day 10	Tail Suspension Test	Forced Swim test
Normal Saline	225.16(±12.32)	144(±5.49)
Imipramine 15mg/kg	151.33(±11.64)*	92.17(±7.00)*
EEMP 100mg/Kg	93.66(±8.196)*	68.667(±8.58)*
EEMP 200mg/kg	211.33(±16.77)#	91.667(±15.38)*
EEMP 400mg/kg	102(±14.74)*	86.5(±6.386)*

Immobility time shown in seconds as mean (±SEM),

*denotes statistically significant value, #denotes statistically not significant value

Day 1

**Fig. 1:**

Day 10

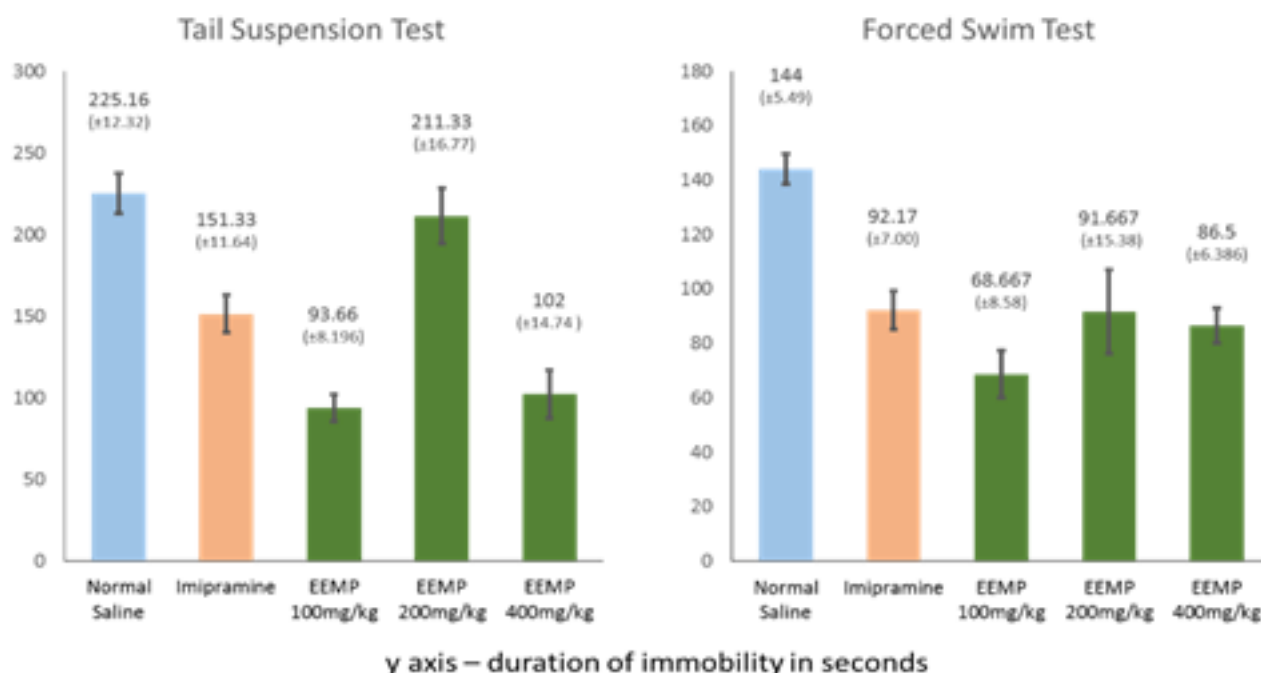


Fig. 2:

400mg/kg) showed significant reduction in immobility times when compared to control in both FST and TST (Table 1, Figure 1). In the Subacute study, on Day 10, both Imipramine (15mg/kg) and EEMP (100mg/kg, 400mg/kg) showed significant reduction in immobility times when compared to control in both FST and TST (Table 2, Figure 2).

4. Discussion

A previous study concluded that lyophilized aqueous leaf extract of *Mimosa pudica* exhibited antidepressant and anxiolytic properties in forced swimming (FST) and tail suspension (TST) tests, the elevated plus maze (EPM) model and locomotor activity count.¹⁷ Another study on Effects of *Mimosa pudica* leaves extract showed that ethyl acetate extract of *Mimosa pudica* has anti-anxiety, antidepressant and memory enhancing activities.¹³

In this study, both Imipramine and EEMP showed a reduction in immobility times in acute and subacute study in both FST and TST. Lowest immobility times were recorded with EEMP at 100 mg/kg doses in most recordings, and at times, it showed comparable or even better reduction in immobility times than Imipramine in both tests in acute and subacute study.

Imipramine inhibits Norepinephrine transporter and Serotonin transporters, increasing their availability at synaptic cleft, thereby reducing depression. The antidepressant action of EEMP is probably similar to the mechanisms of antidepressant agents, like Imipramine, that are effective in the above screening models.

Phytochemical investigations done in a study showed the presence of alkaloids, flavonoids and tannins in the extract. It is likely that the antidepressant activity seen with *Mimosa pudica* could be because of the above mentioned phytoconstituents.¹⁸ Further pharmacological investigations are required to understand its underlying mechanism of action in depression.

5. Conclusion

The results obtained in this study suggests that Ethanolic Extract of *Mimosa pudica* has antidepressant activity and can be considered for use in therapy of depression after further testing.

6. Source of Funding

None.

7. Conflicts of Interest

Nil.

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