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ANTIDEPRESSANT ACTIVITY OF METHANOL EXTRACT OF *COMMELINA BENGHALENSIS* LINN. WHOLE PLANT.

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ABSTRACT

Objectives: The present study was to investigate antidepressant action of the methanol extract of *Commelina benghalensis*. **Methods:** Leaves of *C. benghalensis* was extracted with pure methanol (MECB). The forced swimming (FST) and tail suspension (TST) tests were used as predictive animal models of antidepressant activity, where the time of immobility was considered. For *in vivo* tests, doses of 200 and 400 mg/kg body weight were used. **Results:** The extract also significantly decrease the duration of immobility in both animal models of antidepressant activity, forced swimming and tail suspension tests. In FST, mice treated with two doses of MECB (200 and 400 mg/kg) showed decreases in their immobility times, which was significant (131.17±2.75 and 108.70±1.14 respectively; $p<0.001$) when compared with control (194.27±4.81). In TST, animals treated with two doses of MECB showed decreases in their immobility times, which was significant (133.07±1.87 and 109.08±1.38 respectively; $p<0.001$) when compared with control (205.9±1.01). **Conclusions:** The overall results of the study indicated significant antidepressant activity of methanol extract of *C. benghalensis* leaves. So this plant deserves further investigation to isolate the active constituents responsible for these activities and to establish the mechanism of action.

KEYWORDS: *C. benghalensis*, antidepressant, forced swimming test, tail suspension test, immobility.

INTRODUCTION

Depression is a serious mood disorder that afflicts several millions of the world population. Furthermore, the World Health Organization revealed that depression is the fourth leading cause of disability worldwide, exceeded by lower respiratory infections, perinatal conditions and HIV/AIDS.[1] Approximately, two third of depressed patients experience suicide thoughts and 10-15% of them attempt suicide.[2] The main symptoms of depression are due to functional deficiency in the levels of monoaminergic transmitters noradrenalin, 5-hydroxytriptamine and dopamine in the brain.[3] Drugs that increase the level of these neurotransmitters in the CNS show antidepressant activity .The major antidepressant therapies aim for an enhancement in the transmitters levels in the neurons and thus normalize the neurotransmission.[4]

Commelina benghalensis (family Commelinaceae) is a perennial herb native to tropical Asia and Africa, used in the Indian subcontinent as a folk medicine for the treatment of leprosy, headache, fever, constipation, jaundice and snake bite.[5, 6] The plant is also used for mouth thrush, inflammation of the conjunctiva, psychosis, epilepsy, nose blockage in children[7], insanity and exophthalmia. *C. benghalensis* is used medicinally as a diuretic, febrifuge and anti-inflammatory.[8][9] It is used as an animal fodder, eaten by humans as a vegetable in Pakistan, also used there medicinally, but with different purported effects, including as a laxative and to cure inflammations of the skin as well as leprosy.[10] The plant is also reported to have antitumor, anticancer and antioxidant activity.[11,12] Previous phytochemical investigations of the Commelina genus were reported on *C. undulata* R.Br., *C. benghalensis* L. and *C. communis* L. from which several types of compounds such as alkaloids, steroids, terpenoids, iridoids, flavonoids, lignans, aliphatic alcohols, polyols, and phenolic acids were obtained.[13-15] Moreover, the whole plant of *C. benghalensis* was reported to contain alkaloid, volatile oil, wax[16], vitamin-C and higher levels of both lutein and β-carotene.[17]

The purpose of this experiment was to test the antidepressant activity of *C. benghalensis* on mice using forced swimming and tail suspension tests.

MATERIALS AND METHODS

Experimental animals

Swiss albino mice, weighing about 25–30 g, were collected from Jahangir Nagar University, Savar, Bangladesh. The animals were provided with standard laboratory food and distilled water ad libitum and maintained at natural day-night cycle having proper ventilation in the room. All the experiments were conducted in an isolated and noiseless condition. The study protocol was approved by the P&D Committee, Department of Pharmacy, International Islamic University Chittagong, Bangladesh. The animals were acclimatized to laboratory condition for 10 days prior to experimentation.

Plant material and preparation of extract

C. benghalensis was collected from Sadarghat area of Chittagong, Bangladesh and authenticated by Dr. Shaikh Bokhtear Uddin (Professor, Department of Botany, and University of Chittagong, Bangladesh). The collected plant was washed thoroughly with water and air dried for a week at 35 to 40°C and pulverized in an electric grinder. For methanol extract, 250 g powder of leaves was boiled in 1 liter of methanol for 30 min. Subsequently, the mixture was filtered using Whatman filter paper. The filtrate was concentrated over the vapor of the water bath and dried under vacuum.

Antidepressant activity

Forced Swimming Test

Forced swim test, the most frequently used behavioral model for screening antidepressant like activity in rodents, was first proposed by Porsolt *et al.*[18] Group I treated as control (1% tween 10 ml/kg body weight o.p.), Group II received standard drug (Imipramine 10 mg/kg) and Group III-IV received MECB extract (200 and 400 mg/kg). The procedure was same as followed previously. Mice were individually forced to swim in open glass chamber (25 × 15 × 25cm) containing fresh water to a height of 15 cm and maintained at 26°±1°C. At this height of water, animals were not able to support themselves by touching the bottom or the side walls of the chamber with their hind paws or tail. Water in the chamber was changed after subjecting each animal to FST because “used water” has been shown to alter the behavior. Each animal showed vigorous movement during initial 2 min period of the test. The duration of immobility was manually recorded during the next 4 min of the total 6 min testing period. Mice were considered to be immobile when they ceased struggling and remained floating motionless in water, making only those movements necessary to keep their head

above water. Following swimming session, mice were towel dried and returned to their housing conditions.

Tail Suspension Test

Tail suspension test commonly employed behavioral model for screening antidepressant-like activity in mice, was first given by Steru *et al.*[19] Animals were moved from their housing colony to laboratory in their own cages and allowed to adapt to the laboratory conditions for 1 to 2 hr. Group I treated as control (1% tween 10 ml/kg body weight o.p.), Group II received standard drug (Imipramine 10 mg/kg) and Group III-IV received MECB extract (200 and 400 mg/kg). Each mouse was individually suspended to the edge of a table, 50 cm above the floor, by adhesive tape placed approximately 1 cm from the tip of the tail. Each animal under test was both acoustically and visually isolated from other animals during the test. The total period of immobility was recorded manually for 6 min. Animal was considered to be immobile when it didn't show any body movement, hung passively and completely motionless. The test was conducted in a dim lighted room and each mouse was used only once in the test. The observer, recording the immobility of animals, was blind to the drug treatments given to the animals under study.[20]

Statistical analysis

The data was analyzed by one-way ANOVA followed by Dunnet's test to estimate significant differences between the test and control groups with GraphPad Prism Data Editor for Windows, Version 6.0 (GraphPad software Inc., San Diego, CA). Values were expressed as mean ± Standard error for mean (± SEM). $P < 0.05$ - 0.01 were considered as statistically significant.

RESULTS

Forced Swim test

The possible antidepressant effect of MECB after oral administration was studied in the forced swimming test. In this test (Table 1), animals treated with two doses of MECB (200 and 400 mg/kg) showed decreases in their immobility times, which was significant (131.17±2.75 and 108.70±1.14 respectively; $P<0.01$) when compared with control (194.27±4.81). Similarly, animals treated with Imipramine (10 mg/kg), as expected, showed a significant decrease in the immobility time (88.66±2.93; $P<0.01$).

Table 1: Antidepressant activity of methanol extract of leaves of *C. benghalensis* on swimming test in mice.

Treatment	Time of Immobile (sec)
Control(1% tween)	194.27±4.81
Imipramine hydrochloride (10mg/kg)	88.66±2.93[b]
MECB (200mg/kg)	131.17±2.75[a]
MECB (400mg/kg)	108.70±1.14[b]

MECB=Methanol extract of *C. benghalensis*; P<0.05, P<0.01 as control. One-Way ANOVA followed by Dunnett t-test performed.

Antidepressant activity

Tail suspension test

In this test (Table. 2), animals treated with two doses of MECB (200 and 400 mg/kg, o.p) showed decreases in their immobility times, which was significant (133.07±1.87 and 109.08±1.38 respectively; P<0.01) when compared with control (205.9±1.01). Similarly, animals treated with Imipramine (10 mg/kg), as expected, showed a significant decrease in the immobility time (82.05±1.23; P<0.01).

Table 2: Antidepressant activity of methanol extract of leaves of *C. benghalensis* on tail suspension test in mice.

Treatment	Time of Immobile (sec)
Control(1% tween)	205.9±1.01
Imipramine hydrochloride (10mg/kg)	82.05±1.23[b]
MECB (200mg/kg)	133.07±1.87[a]
MECB (400mg/kg)	109.08±1.38[b]

MECB=Methanol extract of *C. benghalensis*; P<0.05, P<0.01 as control. One-Way ANOVA followed by Dunnett t-test performed.

DISCUSSION

Five decades of antidepressant research focused on the monoaminergic system and wrestled with the fact that monoaminergic antidepressants require several weeks to produce their full therapeutic effects. Therefore, there is a clear and urgent need for rapid-acting antidepressants with robust efficacy. A major problem in the screening for new antidepressant effect is the establishment of a valid animal model able to sufficiently and accurately identified diverse depressant treatments, without making errors of omission.[21] In that case, the forced swimming (FST) and tail suspension (TST) tests have been validated as a suitable tool for predicting the antidepressant properties of drugs.[22]

Behavioral despair paradigms played an important role in the evaluation and development of antidepressant drugs. The TST and FST in mice are among the behavioral models that are widely and routinely used to screen new antidepressant compounds for their ease of use, reliability, specificity, high predictability of clinical efficacy[23], and generally high sensitivity to 5-HT1A receptor agonists.[24] The characteristic behavior evaluated in these tests, termed immobility, has been considered to reflect behavioral despair similar to that seen in human depression, and it is well known that antidepressant drugs are able to reduce the immobility time in rodents.[25] It is interesting to note that the immobility shown by mice when subjected to unavoidable stress such as forced swimming test is thought to reflect a state of despair or lowered mood, which is thought to reflect depressive disorders in humans. In addition, the immobility time is reduced by treatment with antidepressant drugs.[26] There is a significant correlation between the clinical efficacy of antidepressant drugs and their potency in the FST, this was not found in any other model.[19] Interestingly, our data indicate that higher doses of plant extracts were more effective than smaller doses both in forced swimming and tail suspension tests. The result showed that MECB at 200 mg/kg and 400 mg/kg significantly reduced the duration of immobility time, respectively, in FST and TST ($P < 0.05$ and $P < 0.01$).

CONCLUSION

The study showed that aqueous extract of *Commelina benghalensis* possesses significant antidepressant effects compared Imipramine hydrochloride. The findings of present studies deserve further studies for isolation and identification of the responsible bioactive component(s) and to elucidate the mechanism(s) lying with antidepressant effect.

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COMPETING INTERESTS

The authors declare that they have no competing interests.

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