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Investigation of Antidepressant Activity of *Cressa cretica* in Mice Using Tail Suspension Test & Forced Swim Test

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Abstract: Objective: *Cressa cretica* (Convolvulaceae) is a traditional medicinal plant known as Rudanti. This plant has been used for the treatment of a variety of diseases. The plant of *Cressa cretica* showed antibilous, anti-tuberculosis and expectorant, nootropic activities. Methods this study was done to investigate the possible antidepressant effect of *Cressa cretica* plant extract (CCE) using Tail suspension test (TST) & Forced swim test (FST). 30 Swiss albino mice of either sex weighing between 25-30gm were randomly selected and divided into 5 equal groups. Group-I (Control) received polyethyleneglycol (1ml/100gm), Group-II, III received CCE in doses of 200,400 mg/kg orally (p.o.) respectively. Group IV & V (positive control) received Fluoxetine & Imipramine at doses of 20mg/kg & 15mg/kg p.o respectively. Drug treatment was given for seven & fourteen successive days. After 60 minutes of the last dose of drug or standard the immobility period was recorded. Results: CCE produced significant antidepressant like effect at dose of 200 & 400 mg/kg administered for 7 & 14 consecutive days as indicated by reduction in immobility times of mice in TST & FST ($P<0.05$). The efficacy of CCE at 200mg/kg was found to be comparable to that of Fluoxetine & Imipramine at doses of 20mg/kg & 15mg/kg. Conclusion: The results of the present study indicate that CCE possesses significant antidepressant activity compared to that of both Fluoxetine & Imipramine.

Key words: *Cressa cretica* · Forced Swim Test · Tail Suspension Test · Antidepressants

INTRODUCTION

Cressa cretica L. (Convolvulaceae), popularly known as 'Rudanti' in Hindi is a useful medicinal plant. Different parts of the plant have been claimed to be valuable in a wide spectrum of diseases [1]. In earlier studies *Cressa cretica* Linn flowers exhibited cytotoxic and anti-inflammatory activity *in vitro*. *Cressa cretica* is reported to be antibilous, anti-tuberculosis and expectorant [2]. It has been reported that five flavonoids (Quercetin, quercetin-3-O-glucoside, kaempferol-3-Orhamnoglucoside and rutin) are present in the aerial parts of *Cressa cretica* [3].

Depression affects about 9.5% of population. In the patients of depression, it has been reported that there are changes in the monoamine neurotransmitters [4]. The use of herbal medicines for the treatment of human ailments has been a natural approach to the health care. In the search for new therapeutic products for the treatment of neurological disorders, medicinal plants have proven to exhibit pharmacological effectiveness in variety of animal models [5].

Thus the present study has been done to investigate the antidepressant activity of *Cressa cretica* plant extract (CCE) in mice by using tail suspension test (TST) & forced swim test (FST). Standard antidepressant drugs such as Fluoxetine and Imipramine have been used to standardize the animal models of depression.

MATERIALS AND METHODS

Preparation of *Cressa cretica* Plant Extract (CCE): The plant of *Cressa cretica* was washed thoroughly in tap water, shade dried and powdered. This powder was packed into Soxhlet column and extracted with petroleum ether (60 - 80°C) for 24 h. The same marc was successively

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extracted with chloroform (50 - 60°C) and later with ethanol (68 - 78°C) for 24 h. The extracts were concentrated on water bath (50°C). After concentrated preparation, the dried powder extract was stored at room temperature. The yield of the petroleum extract, chloroform extract and ethanolic extract were found to be 0.8 % (w/w), 0.8 % (w/w) and 1.0 % (w/w) respectively. Ethanolic extract was used for the experimental study.

Plan of Study

Animals: Animals were procured from Central Animal House, MIET, Meerut. Animals were approved by Institutional Animal Ethic Committee (IAEC) of MIET, Meerut. Approval number (711/02/a/CPCSEA/2011-12/14) was given for this work. The preferred rodent species included mice. Swiss albino strains of young healthy adult of either sex animal in equal numbers per group (n= 6) were taken. At the commencement of the study the weight variations of animals used was kept minimal and not exceeded ± 20% of the mean weight of each animal. Normal weight of mice was 25-30 gm.

The temperature of the experimental animal room was maintained to be 22°C (±3°C). Relative humidity was maintained between 50–60%. Lighting was artificial, the sequence being 12 hours light, 12 hours dark. For feeding, conventional laboratory diets were used with drinking aqueous supplied *ad libitum*. Animals of same group were caged together. Healthy young adult of either sex mice were randomly assigned to the control, standard and treatment groups. The animals were identified uniquely (i.e., by marking at the base of the tail) and acclimatized for not less than 5 days in their cages prior to the start of the study.

Drugs and Chemicals: CCE, Fluoxetine Hydrochloride (Ranbaxy Lab.), Imipramine Hydrochloride (Sigma Aldrich).

Vehicle: Polyethylene Glycol (PEG).

Study Design: The animals were selected randomly for each experiment and divided into 5 equal groups. Drugs (PEG, CCE, Fluoxetine, Imipramine) administered orally (p.o.) for 7&14 successive days as depicted in (Table 1)

Table 1: Protocol of the study

Group	Drug	Dose
I	PEG	1ml/100gm.
II	CCE	200mg/Kg.
III	CCE	400mg/Kg.
IV	Fluoxetine	20mg/Kg.
V	Imipramine	15mg/Kg.

Laboratory Models for Testing Antidepressant Activity: Forced Swim Test (FST): FST or behavior despair was proposed as a model to test for antidepressant activity. Depression was produced by forcing the animal to swim in a glass jar containing fresh water of 15cm height and maintained at 25°C. This constituted starting session. Twenty-four hour later each animal was again forced to swim. After an initial 2 min period of vigorous activity, each animal assumed a typical immobile posture. The total duration of immobility was recorded in next 4 min of a total 6 min test. The change in the immobility period was calculated after administering drugs to the groups as mentioned in the above table [6].

Tail Suspension Test (TST): The total duration of immobility induced by tail suspension was measured. Depression was produced by suspending the animal from the edge of a table 50 cm above the floor by an adhesive tape placed approx. 1cm. from the tip of the tail. Immobility time was recorded during a 6 min. period. Changes in the immobility duration were studied after administering drugs in separate groups of animals.

The antidepressant activity was expressed as reduction in the immobility duration between the control, standard and animals treated with test drug [7].

Statistical Analysis: All the results are expressed as Mean ± SEM. All the groups were analyzed using student's test.

RESULTS

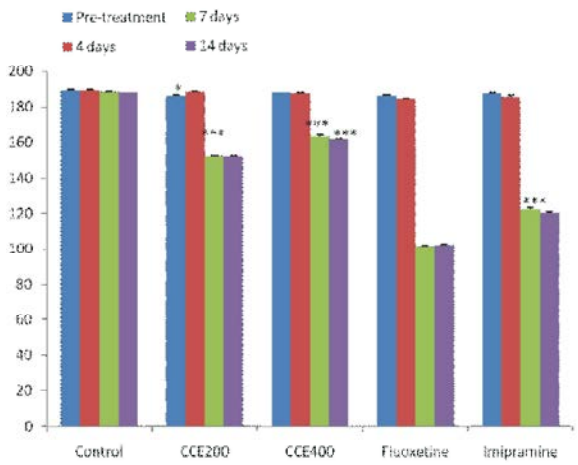

Fig. 1: Effect of CCE on immobility period (secs) of mice using tail suspension test

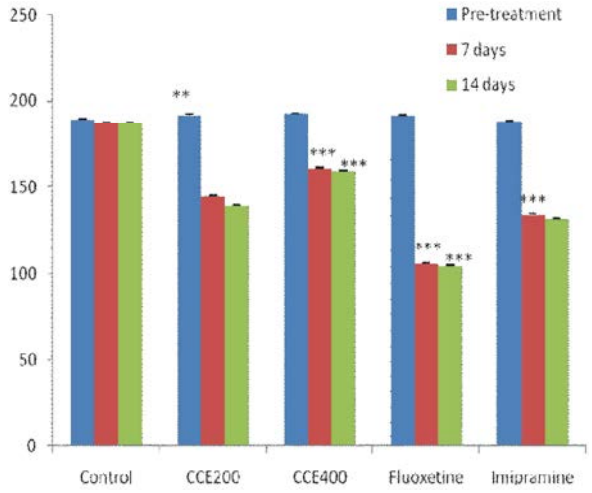

Fig. 2: Effect of CCE on Immobility Period (Secs) of mice using Forced Swim Test

The decrease in immobility period in both the models was observed starting from 200 mg/kg. But the increase in dose from 200 to 400 mg/kg did not produce any further reduction in immobility period, suggesting the ceiling effect at 200 mg/kg. At the dose 200 mg/kg, CCE showed antidepressant effect which is comparable to that of Imipramine and Fluoxetine at the dose of 15 & 20 mg/kg respectively.

DISCUSSIONS

In the present study, CCE (200 mg/kg) produced significant antidepressant effect in FST & TST. These models of depression are widely used to screen novel antidepressant drugs. The tests are quite sensitive and relatively specific to all major classes of antidepressant drugs including TCAs, SSRIs, MAOI, Atypical antidepressants. The forced swimming test is the most widely used tool for assessing antidepressant activity pre-clinically [8]. It has been tested that TST (Tail Suspension Test) is less stressful than FST (Forced swim test) and has greater pharmacological sensitivity. The results obtained from TST are in concordance with the validated FST by Porsolt et al (1978). Environmental factors and hereditary factors play a major role in producing deficient monoaminergic transmission in central nervous system thereby producing symptoms of depression [9]. Five flavonoids (Quercetin, quercetin-3-O-glucoside, kaempferol-3-Orhamnoglucoside and rutin) were reported to be present in the aerial parts of *Cressa cretica* which may be facilitating monoaminergic transmission there by producing antidepressant effects [3].

CONCLUSION

Hence *Cressa cretica* plant extract possesses antidepressant effect in animal models of depression which was comparable to that of Imipramine and Fluoxetine as demonstrated in this study. The phytochemical analysis, separation of active ingredients and further investigation in this line is essential to establish its therapeutic benefits.

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