ejpmr, 2015,2(6), 215-219

SJIF Impact Factor 2.026

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 3294-3211

EJPMR

EVALUATION OF ANTI DEPRESSANT ACTIVITY OF ETHANOLIC EXTRACT OF *TALINUM PORTULACIFOLIUMON*

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Article Received on 15/09/2015 **Article Revised on 06/10/2015** **Article Accepted on 27/10/2015**

ABSTRACT

The ethanolic extract of The Talinum portulacifolium whole plant used for CNS disorders and pain, in animal models of anxiety and depression-the open field test, the light/dark box, the Elevated plus Maze (EPM), the Forced Swimming Test (FST) and Tail Suspension Test (TST) has been reported. The TPE has the antidepressant activity, depends on the dose, thus in the forced swimming test the TPE-400 group showing the significant antidepressant activity, while the TPE-200 is lacking the significance. The TPE 400 mg/kg had significant antidepressant activity which is lower than the standard drug imipramine 30 mg/kg. TPE 200, TPE-400 groups did not showed any significant in the open field test model. The TPE showed significant enhancement of time spent in open arm aswell open arm crossing after 4 weeks of drug administration. Thus both doses of the methanol extract of Talinum portulacifolium having the chronic effect.TPE200 mgkg showed no significant activity in the tail suspension test where as 400 mg/kg decreased the immobility time in tail suspension test models. Thus the TPE is showing the activity in dose dependent manner.

KEY WORDS: Antidepressant activity, Elevated plus Maze, Forced Swimming Test (FST), Open field Test.

INTRODUCTION

Depressive disorders, including major depression and dysthymia, are serious disabling illnesses. Approximately one in five persons is affected by a mood disorder at some point. Although significant progress has been made in the research work of the depression, current treatments for depression are inadequate for many individuals, and progress in understanding the neurobiology of depression is slow.

Lifetime risk of unipolar depression is ~15%. Females are affected twice as frequently as male. Depressive episodes are characterized by depressed or sad mood, pessimistic worry, diminished interest in normal activities, mental slowing and poor concentration, insomnia or increased sleep, significant weight loss or gain due to altered eating and activity patterns, psychomotor agitation or retardation, feelings of guilt and worthlessness, decreased energy and libido, and suicidal ideation, occurring most days for a period of at least 2 weeks. In some cases, the primary complaint of patients involves somatic pain or other physical symptoms and can present a diagnostic challenge for primary care physicians. Depressive symptoms also can occur secondary to other illnesses such as hypothyroidism, Parkinson's disease, and inflammatory conditions. Further, depression often complicates the management of other medical conditions (e.g., severe trauma, cancer, diabetes, and cardiovascular 398 disease, especially myocardial infarction). antidepressants, many plants have been reported to have antidepressant activity and can be effective therapeutic altematives for treatment of depression (Carlo,et aI.,2001).

MATERIALS AND METHODS

Collection of plant material

The *Talinum portulacifolium* whole plant was collected from Sri Venkateswara University, chittoor district of Andhra Pradesh. The material was identified by the taxonomist Prof. V. Raju of the Botany Department at the Kaktiya University, Warangal.

Preparation of methanol extract of *Talinum portulacifolium* whole plant

The collected *T. portulacifolium* whole plant were cut into small pieces. The plant parts were dried in an incubator for 7 d at 40 °C, crushed in an electrical grinder and then the powder was separated. The powder was kept for extraction for about 6 h in a soxhlet apparatus by using methanol as a solvent. The obtained extract was filtered through Whatman No. 1 filter, the resulting filtrate was dried in the air. The methanol extract of Talinum portulacifolium whole plant (TPE) was stored for anti-depressant activity study.

Percent of yield was calculated as follows

Extract yield %= (W1/W2) x100

Where, W1 is net weight of powder in grams after extraction and W2 is total weight of wood powder in grams taken for extraction.

Methods

Anti-depressant activity was evaluated by forced swimming test, Exploratory activity/Open field, Elevated Plus-maze test, and Tail immersion test.

Forced swimming test: (Porsolt *et al*. 1977, 1978)

Rats were placed individually in glass cylinders (19 cm in diameter, 24 cm high) filled with water at 21 ± 1 °C to a height of 14 cm. If used, the test compounds and vehicle were administered 45 minutes prior to testing. The time spent immobile (passive floating, during which the animal was motionless or moving the tail or one hind limb only slightly) was measured during the 6 min test. The latency to the first bout of immobility was also recorded. The results were normalized to the respective controls and expressed as a percentage of the control.

Exploratory activity/Open field: (Erdogan *et al*., 2004; Kasture *et al*., 2002)

The OFT was done to study the locomotor activity, exploratory behavior and the emotional stability of the animal when placed in a new situation (open field). An "emotional animal" is the one which freezes, shows reduced ambulation, exhibits abnormal behavior of rearing and grooming, and shows augmented autonomic activity characterized by increased defecation. The spontaneous exploratory activity of rat was automatically monitored in a transparent, well-illuminated (~ 300 lx) cage equipped with two stacked frames of infrared photo detectors enabling separate monitoring of horizontal (XY-move time) and vertical activity (rearing). The young adult rats were tested using an activity monitor produced by MED Associates (cage dimensions, 28.5 cm × 28.5 cm x 20 cm; St. Albans, VT, USA), while middle-aged rats were tested with the TruScanR activity monitor (cage dimensions, 26 cm x 26 cm x 39 cm; Coulbourn Instruments, CO, USA). The test sessions for young adult rats were 30 min, while the sessions for middle-aged rats were 10 min. To avoid odor traces, the test cage was cleaned with 70% ethanol before each mouse. For analysis of results, the cages were divided into two compartments: a compartment near the walls (7 cm from the walls) and a central area compartment. Interruptions of infrared photo beams were used to calculate the following parameters: the distance traveled (cm), crossing and rearing.

Elevated Plus-maze test: (Pellow *et al*., 1985)

This test was performed in an elevated maze (40 cm above the floor) consisting of two open arms (30 cm x 5 cm), two enclosed arms (30 cm x 5 cm with 15-cm-high transparent or black-painted side and end walls) and a connecting central platform (5 cm x 5 cm). The mouse was placed on the central platform facing one of the enclosed arms, and the time spent in the open and closed arms and the number of total arm entries was observed for 5 minutes. A video camera positioned above the maze recorded the experiments (Ethovision XT 7, Noldus Information Technology, Wageningen, Netherlands). The total number of arm visits was taken as a measure of general activity, while the % time spent in the open arms was used as a measure of anxiety. Only rats with at least 5 arm entries were considered when calculating the latter parameter. Testing occurred in a dimly lit room. To avoid odor traces, the test cage was cleaned with 70% ethanol before each mouse.

Tail immersion test: (Steru *et al*., 1985)

Rats were divided into groups of ten animals each. The lower 3 cm portion of the tailwas immersedi n a beaker of water maintained at 55 + 0.5 ^{0}C (Janssene t al., 1963).The time in seconds for tail withdrawal from the water was taken as the reaction time.with a cut-offtime of immersion set at 10s. The reaction time was measured 1 h afteroral administration of essential oils, hydroethanol extract, fractions and individualcompounds or 20Â tween8O. Morphine hydrochloride (5 mg/kg) was administered subcutaneously 60min before the test.

RESULTS AND DISCUSSION

The forced swimming test: Fig. 1 illustrates the effect of TPE on the duration of immobility time in the FST model. The administration of TPE at the doses of 200 and 400 mg/kg significantly decreased the immobility time to 133.789±4.58 s ($p < 0.001$), 138.789±8.94 s ($p < 0.001$), respectively as compared to control group of 179.675+ 6.34 s. Imipramine (30 mg/kg i.p.) also showed a significant reduction of immobility time (128.014 + 10.47 s, $p < 0.001$), compared to vehicle treated animals.

Table 1: Results obtained by forced swimming test on rats upon treatment of TPE

Group	Dose (mg/kg)	Immobility time (s) (mean±SEM)
Control	2.5 ml/kg	179.675+ 6.34
Standard	30 mg/kg	128.014 + 10.47
TPE-200	200 mg/kg	133.789±4.58
TPE-400	400 mg/kg	138.789±8.94 s

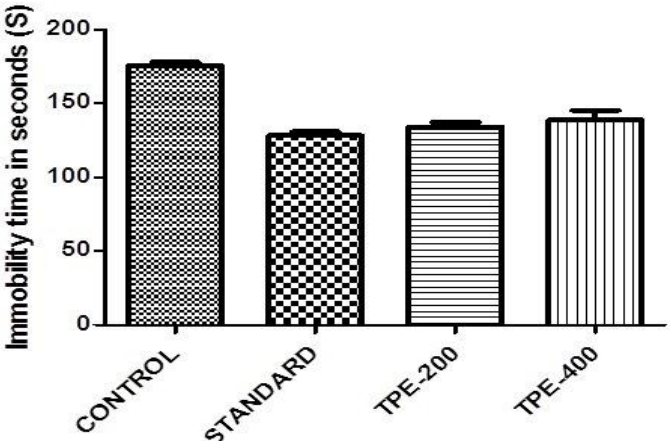

Figure 1 Antidepressant effects of methanolic extract of Talinum portulacifolium

Open field test

In order to determine whether TPE really has an antidepressant-like action, we have to find out whether TPE has significant action on the central nervous system. In this study, TPE at 200 mg/kg, 400 mg/kg and imipramine at 30 mg/kg,, produced no significant difference in rearing and crossing in the open field behavioural test, compared with control as shown in Fig. 2.

Table 2 Results obtained by open field test on rats upon treatment of TPE

Group	Dose (mg/kg)	Crossing	Rearing
Control	2.5 ml/kg	109±4.32	45±2.38
Standard	30 mg/kg	114±2.92	50±3.56
TPE-200	200 mg/kg	100±3.75	38±3.24
TPE-400	400 mg/kg	90±3.38	35±2.35

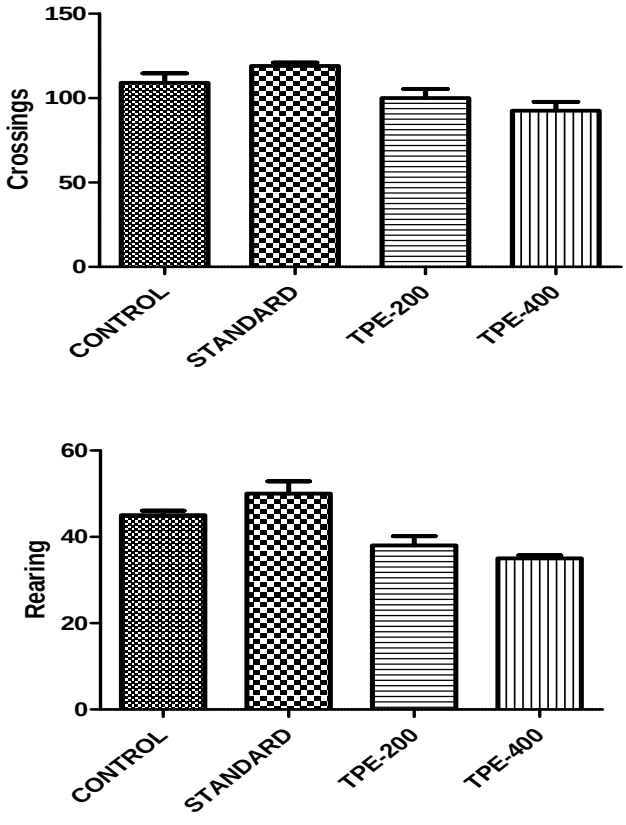

Figure 2: Antidepressant effects of methanolic extract of Talinum portulacifolium

Elevated plus maze test

Table.4 shows that control animals (without drug) maintained similar EPM activity during repeated testing at 4 and 8 weeks. Chronic TPE administration exerted an anxiolytic effect in normal rats after 4 weeks. The time spent in open arm as well as the crossing enhanced significantly ($P < 0.01$ in both doses) after 4 weeks drug administration.

Table 3: Results obtained by Elevated plus maze test on rats upon treatment of TPE

Group	Week	Time spent in open arms		Total arm crossings	
		Normal	Stress	Normal	Stress
Control	0	9.7 ± 0.8	8.35 ±3.2	10 ± 0.9	7.5 ±1.9
	4	13.9 ± 1.7	1.1 ±0.9	6.6 ± 0.9	8.6 ±2.1
	8	12.4 ± 1.3	4.8 ±2.7	5.7 ± 1.1	2.5 ±0.6
TPE-200	0	1.52 ± 0.71	13.1 ±2.4	3.3 ± 0.4	8.4 ±2.1
	4	9.54 ± 1.9	7.21 ±2.1	4.1 ±0.44	5.3 ±1.7
	8	4.02 ± 1.3	4.18 ±2.2	3.1 ± 1.8	1 ±0.9
TPE-400	0	1.25 ± 0.57	12.3 ±2.3	2.8 ±0.67	7.9 ±1.9
	4	8.97 ± 1.5	6.19 ±1.9	3.6 ±0.64	4.9 ±1.5
	8	4.21 ± 0.83	3.91 ±1.6	2.9 ± 1.9	1.2 ±0.3

Tail suspension test

As shown in Fig.4, immobility time in the TST was significantly reduced after treatment with 400 mg/kg of TPE, whose activity is lesser than the positive control imipramine (30 mgkg, i.p.). The decrease in immobility time of TPE 200 mg kg showed no significant activity in the test.

Table 4: Results obtained in tail suspension test on rats upon treatment of TPE

Group	Dose (mg/kg)	Immobility time (s)(mean±SEM)
Control	2.5 ml/kg	135.65+ 2.34
Standard	30 mg/kg	88.45 + 1.04
TPE-200	200 mg/kg	123.789±3.45
TPE-400	400 mg/kg	100.93±5.62

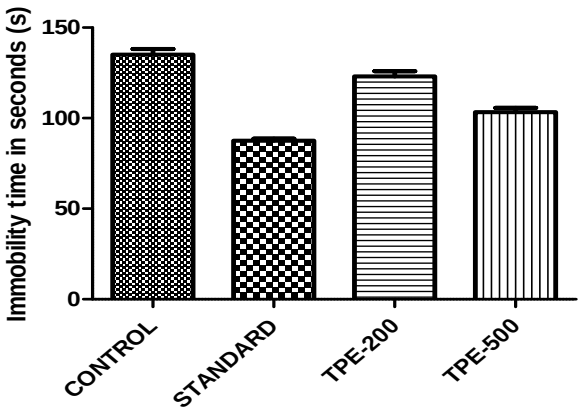

Figure 3: Antidepressant effects of methanolic extract of *Talinum portulacifolium*

In this series experiments forced swimming test and tail suspension test were used to Evaluate the antidepressant effects. Both FST and TST are widely used to screen new antidepressant drugs. These tests are quite sensitive and relatively specific to all major classes of antidepressant drugs including tricyclics, 5-HT-specific reuptake inhibitors, MAO inhibitors and atypical. In FST rats are forced to swim in a restricted space from which they cannot escape, and are induced to a characteristic behavior of immobility. This behavior, reflecting a state of despair, is reduced by several agents which are therapeutically effective in human depression.

The TST also induces a state of despair in animals like that in FST. This immobility, referred to as behavioral despair in animals, is claimed to reproduce a condition similar to human depression. In FST and TST, false-positive results can be obtained with certain drugs, in particular psychomotor, stimulants, which decrease immobility time by stimulating locomotor activity (Bourine et a1., 2001). The present study provides behavioral evidence for the antidepressant-like activities of TPE. In our preliminary studies TPE administration showed a significant activity to reduce the immobility

time at doses of 200 and 400 mg/kg in forced swimming test in rats.

In this model, TPE produced inhibition of the duration of immobility, with a profile comparable to that observed for the classical antidepressant drug imipramine though the antidepressant action of TPE was less potent than imipramine based on the given data, the effect of TPE, as well as other herbal medicine, is slow, mild and lasting, without(or with lower) undesirable side-effects; these are advantages over the classical antidepressants. As changes in the duration of immobility could also result from effects on locomotor activity caused by central nervous system stimulants the rats were tested in the open field test just before FST. The results showed that TPE, at both doses produced an anti-depressant like effect, but did not significantly change locomotor behaviour. Therefore TPE appears to produce a specific antidepressant-like behavioral effect.

The antidepressant effects of TPE also evaluated by the forced swimming test in rats. The administration of TPE at the doses of 200 and 400 mg/kg significantly decreased the immobility time to 133.789±4.58 s ($p < 0.001$), 138.789±8.94 s ($p < 0.001$), respectively as compared to control group of 179.675+ 6.34 s. Imipramine (30 mg/kg i.p.) also showed a significant reduction of immobility time (128.014 + 10.47 s, $p < 0.001$), compared to vehicle treated animals.

TPE at 200 mg/kg, 400 mg/kg and imipramine at 30 mg/kg, which reduced immobility time in the FST in rats, produced no significant difference in rearing and crossing in the open field behavioural test, compared with control as shown in Fig. 3. From the results of elevated plus maze test, the TPE showed time spent in open arm as well open arm crossing enhanced significantly ($P < 0.01$ in both doses) after 4 weeks drug administration. TPE 200 mg/kg showed no significant activity in the test where as 400 mg/kg decreased the immobility time in tail suspension test models.

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