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Neuropharmacological profile of *Portulaca olaracea l. sativa* on animal models

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ABSTRACT

The present study was designed to investigate neuropharmacological profile of p*ortulaca olaracea l. Sativa leaves in rats*. Spontaneous motor responses were monitored and the anxiolytic, antidepressant-like effects were assessed in both extroceptive and introceptive stimuli models, and forced swim test, tail suspension tests respectively. Preliminary extraction was subjected to acute oral toxicity study according to the OECD guidelines no 423. Based on that, two dose levels i.e. 200 and 300mg/kg were selected for further study. Oral administration of the extract showed the significant results. The results from this study strongly suggest that *P.olaracea* possesses varied effects on the nervous system as it showed a reduction in locomotor activity, anti convulsant activity, muscle relaxant activity, anxiolytic activity, antidepressant activity, and learning and memory effects in conscious animals. Further studies using different models are needed to clarify its effects on central nervous system.

Keywords: P*ortulaca olaracea*, neuropharmacological, anxiolytic, antidepressant.

Introduction

The Indian health care scene has inherited a large number of traditional practices, systems, and medicines as part of its total health care scenario, some of them more than 3000 years old. The earliest mention of the medicinal use of plants is to be found in the Rig-Veda which dates back as early as 3500 BC. It is in the Ayurveda, which is considered as an upaveda (or the supplementary Hymns designed for more detailed in structure of the mankind), is the very strong foundation stone of the ancient medical science of India. From the vast array of the Materia medica of indigenous it is thought that investigation and research on medicinal plants might bring to the scientific world many useful remedies for the alleviation of human sufferings. Inspite of the remarkable achievements of modern medicine and medical research, these ancient systems continue to be a major component, "effectively" used in the control or alleviation of diseases [1]. In recent years plants containing flavonoids have gained much of interest in the research area, which is found to have antioxidant property, capable of defending free radical mediated pathological diseases. In our investigation we have tried to evaluate the neuropharmacological profile, antiarthritis and antioxidant potentials of *Portulaca olaracea* extract with its probable mechanism of action [2].

Portulaca oleracea, is an annual succulent in the family Portulacaceae, which can reach 40cm in height. It is a native of India and the Middle East but is naturalized elsewhere and in some regions is considered an invasive weed. It contains Flavonoids, Alkaloids, Saponins, large amounts of l-norepinephrine, and numerous common nutrients, including: Vitamins (A, B_1, B_2, C, niacinamide, nicotinic acid, tocopherol, carotene, etc...), Minerals (especially potassium), Fatty acids, especially Omega - 3acids whose concentration in purslane is the highest found in leafy vegetables, glutathione, glutamic acid, and aspartic acid. Other constituents include a mucilage, calcium oxalate, malic acid and citric acid, dopamine, and dopa,

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coumarins. Traditional uses of *Portulaca oleracea* aphrodisiac, emollient, diuretic, a refreshing agent, antiscobutic, vermifuge [1].

MATERIALS AND METHODS

Plant collection and Authentication

The plant material of *Portulaca oleracea* leaf used for the investigation was collected from Chennai in the month of July. The plant was identified and authenticated from Central Research Institute (Siddha), Arumbakkam, Chennai-106.

Extraction

The freshly collected leaf of this plant was shade dried and coarsely powdered. The powder was passed through 40-mesh sieve and was subjected to continuous hot percolation in Soxhlet apparatus with petroleum ether (60%v/v) and the marc left after Petroleum ether extraction were dried and extracted separately with ethanol (50%v/v). The extracts were evaporated under reduced pressure using rota evaporator untill all the solvent had been removed to give an extract sample with the yield of 5.7%w/w and 4.8%w/w for petroleum ether and ethanol respectively. The ethanol extracts were used for preliminary photochemical screening. The ethanolic extract was alone used for the pharmacological studies. The ethanolic extract of *Portulaca olaracea* (EEPO) was administered to the animals by dissolving each time with propylene glycol.

EXPERIMENTAL ANIMALS

Adult Wister rats and mice of both sexes weighing 150-175gms were used in the pharmacological and toxicological studies. The inbred animals were taken from the animal house in Vel's college of pharmacy, Pallavaram, Chennai -117. The animals were maintained in well-ventilated room temperature with natural 12h ± 1h day-night cycle in the propylene cages .They were fed balanced rodent pellet diet from Poultry Research experimental period . The animals were housed for one week, prior to the experiments to acclimatize to laboratory temperature. The experimental protocol was proved by the Institutional Animal Ethics Committee IAEC Ref No: 290/CPCSEA/PHARMACOL-12/06. Dt.18/7/2006.

NEUROPHARMACOLOGICAL PROFILE

Effect of *Portulaca olaracaea* on CNS

Locomotor Activity:

Locomotor activity is easily measured using Actophotometer which operates on photoelectric cells connected with a counter. When the beam of light falling on the photocell is cut off by the animal a count is recorded. Mice are placed individually in the activity cage for 10mts. Basal activity score of animals are recorded before and after injection of extract and diazepam [3].

Effect of extract on muscle relaxant property

Rotarod Test*:*

Kulkarni suggested that skeletal muscle relaxation induced by a test compound could be evaluated by testing the ability of mice to remain on a rotating rod. For this purpose, groups of mice were trained to remain on the rotarod for three min. The animals were discarded and replaced if they failed to do so. Thirty animals were considered and trained on rotarod. The mice were divided into four equal groups-1, 2, 3& 4 comprising 6 animals each.

Assessment of Anxiolytic Activity

Elevated Plus-Maze (EPM)

The EPM apparatus consisted of two open arms (30x5 cm) and two closed arms (30x5x20cm) emanating from a common central platform (5x5 cm). The two pairs of identical arms were opposite to each other. The entire apparatus was elevated to a height of 50 cm above the floor level. The animals received the treatment as per the schedule, 45min before the start of the session. At the beginning of the session, a mouse was placed at the center of the maze, its head facing the closed arm. It was allowed to explore the maze for 5 min. The time spent in the open arm, percent entries in the open and closed arms and total entries were recorded. An entry was defined as the presence of all four paws in the arm. The EPM was carefully wiped, with 10% ethanol after each trail, to eliminate the possible bias due to the odour of the previous animal [3].

Y-Maze Test

Mice were placed individually in symmetrically Y-shaped run way (33x38x13 cm) for 3 min; the number of times a mouse entered in the arm of the maze with all four feet was counted as a single entry and used for the comparison of control and drug treated groups [3].

Assessment of Antidepressant Activity

Forced Swim Test (FST)

Behavior despair was proposed as a model to test for antidepressant activity by Kulkarni SK. Mice were forced to swim individually in a glass jar (25 × 12 × 25 cm^3sub) containing fresh water of 15 cm height and maintained at 25°C (± 3°C). After an initial 2 min period of vigorous activity, each animal assumed a typical immobile posture. A mouse 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 during the next 4 min of a total 6 min test. The changes in immobility duration were studied after administering drugs in separate groups of animals. Each animal was used only once [3].

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RESULTS

Table1: Effect of EEPO on locomotor activity

S.No	Treatment	Number of scores in min
1	Vehicle (propylene glycol 10ml/kg)	120.2±4.34
2.	EEPO 200mg/kg	62±1.01**
3.	EEPO 300mg/kg	46±1.31**
4.	Standard (Diazepam 4mg/kg)	22±0.30**

Statistical significance test was done by ANOVA followed by Dunnet's 't' test (n=6)
**P<0.001 compared to vehicle treated group.

Table 2: Effect of EEPO on muscle relaxant activity

S.No	Treatment	Fall of time in sec
1	Vehicle (propylene glycol 10ml/kg)	180
2.	EEPO 200mg/kg	108±10.38*
3.	EEPO 300mg/kg	94±15.46*
4.	Standard (Diazepam 4mg/kg)	0±0.12*

Statistical significance test was done by ANOVA followed by Dunnet's test
*P<0.0001 compared to vehicle treated group

Table 3: Effect of EEPO on Elevated plus maze

S.No	Treatment	Time spent in closed arm in sec	Time spent in open arm in sec
1.	Vehicle (propylene glycol 10ml/kg)	221.6±8.52	10.0±4.01
2.	EEPO 200mg/kg	156.6±19.22**	63.3±13.34**
3.	EEPO300mg/kg	187.5±18.03**	80.0±12.69**
4.	Standard (Diazepam 4mg/kg)	187.8±16.3**	48.7±3.9**

Statistical significance test was done by ANOVA followed by Dunnet's test
**P<0.01 compared to vehicle treated group

Table 4: Effect of EEPO on Y-Maze apparatus

S.No	Treatment	No. of Entries
1	Vehicle (propylene glycol 10ml/kg)	13.5±2.86
2.	EEPO 200mg/kg	3.83±0.30*
3.	EEPO 300mg/kg	2.00±0.68*
4.	Standard (Diazepam 4mg/kg)	1.66±0.42*

Statistical significance test was done by ANOVA followed by Dunnet's te
*P<0.01 compared to vehicle treated group

Table 5: Effect of EEPO on Forced swim test

S.No	Treatment	Immovable time in sec
1	Vehicle (propylene glycol 10ml/kg)	112.2 ± 8.4
2.	EEPO 200mg/kg	69.0 ± 7.7**
3.	EEPO 300mg/kg	51.7± 3.8**
4.	Standard (Fluoxetine 20mg/kg)	61.0 ± 6.9**

Statistical significance test was done by ANOVA followed by Dunnet's test
** $P < 0.01$ compared to vehicle treated group.

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DISCUSSION

Anxiety, depression, and mental health problems in general and senile neurological disorders in particular, are widely prevalent in modern fast-paced life with a multitude of stressful conditions. While *Portulaca olaracea* produced restriction of movements in animals during the routine screening studies. Few of neuropharmacological activities were reported earlier [4,5].

The results from the present study on locomotion and muscle relaxant properties provide strong indications of the effects EEPO extract on the central and peripheral nervous systems. The reduction in loco motor activity could be due to inhibitory effects on the CNS or due to the peripheral muscle relaxant activity which was demonstrated in the present study and reported for *P.olaracea* by other investigators [6,7].

The Elevated plus maze test is based on a premise where the exposure to an EPM evoked an approach – avoidance conflict that was considerably stronger than that evoked by the exposure to an enclosed arm. The decrease in aversion to the open arm is the result of an anxiolytic effect, expressed by the increased time spent and entries in the open arm. The EEOP increased the time spent and percent entries in the open arm, with percent decreased in the closed arm [8-11].

In order to assess the effect on psychosis we used Pole climbing avoidance paradigm. It is an avoidance escape procedure used to separate neuroleptics from sedatives and anxiolytics. Whereas sedative compounds suppress both avoidance and escape responding at approximately the same doses, neuroleptics drugs reduce avoidance responding at lower doses than those affecting escape responding. In our studies the EEPO did not show the antipsychotic effect.

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