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Original Article

COMPARATIVE ANTIPSYCHOTIC STUDY OF VARIOUS EXTRACTS OF OCIMUM SANCTUM IN MICE

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ABSTRACT

Objective: Psychosis (schizophrenic, schizoaffective and affective illnesses) is a group of serious illnesses that affect the mind. In spite of the availability of a number of drugs for the treatment of psychosis, however, at present, there is no satisfactory remedy available for the prevention and management of psychosis. Herbals medicines are tremendously considered to be less toxic than synthetic ones. The present study was undertaken to test the effect of ethanolic and aqueous extracts of *Ocimum sanctum* leaves (100 and 200 mg/kg, p. o.).

Methods: The antipsychotic activity of Ocimum sanctum extracts (ethanol and aqueous) was compared with amphetamine and chlorpromazine in mice using a locomotor activity model. 7 groups of 6 mice each were taken. Control (water) Amphetamine (positive control) Chlorpromazine (standard antipsychotic), 2 Ethanol extracts of Ocimum sanctum (100 and 200 mg/kg), 2 Aqueous extracts of Ocimum sanctum (100 and 200 mg/kg) Locomotor activity was measured before and after drug administration using an actophotometer. Percent change in activity was calculated to assess antipsychotic effects.

Results: Amphetamine increased activity significantly ($p<0.01$). Chlorpromazine decreased activity significantly ($p<0.01$). Both ethanolic extracts increased activity moderately compared to control. The 200 mg/kg dose of ocimum sanctum showed a significantly increase ($p<0.05$ vs. amphetamine). Aqueous extracts had minimal effect on activity.

Conclusion: This study shows promise for ethanloc extract of Ocimum sanctum as a potential stimulant, but further studies are needed to confirm these findings and to identify active components and understand mechanism of action.

Keywords: Ocimum sanctum, Chorpromazine, Anti-psychotic action

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INTRODUCTION

Psychosis (schizophrenic, schizoaffective and affective illnesses) is a group of serious illnesses that affect the mind. It is a major debilitating, complex and illness that strikes 1% of the world's population. It is characterized by three general types of symptoms: Positive symptoms, Negative symptoms and Cognitive symptoms [1].

Positive symptoms refer to a loss of contact with reality and comprise of hallucinations, delusions and positive formal thought disorders. Negative symptoms refer to a diminution in or absence of normal behaviors and include flat affect, alogia, avolition and anhedonia [2].

Cognitive symptoms manifest as deficits in attention, learning and memory. Hyperactivation of mesolimbic pathway and dysfunction of the mesocortical pathway generates imbalance in the serotonergic, dopaminergic, GABAergic and glutamatergic neurotransmission in certain region of brain, are major reason of psychosis.

Other reasons of psychosis can be attributed to heredity, stress, oxidative stress, NMDA receptor antagonists, drug abuse and traumatic injury. Antipsychotics are used for the management of psychosis are typical and atypical [3].

While typical antipsychotics effectively manage psychosis, they often come with the downside of extra-pyramidal side effects (EPS). Atypical antipsychotics offer some relief from EPS, but a perfect solution for preventing and managing psychosis remains elusive.

Holy basil (OS Linn.) or 'Tulsi' possesses valuable antioxidant properties for culinary and wide spectrum of medicinal properties viz. anti-carcinogenic, anthelmintic, antirheumatic, antibacterial, antidepressant, antiepileptic, hepatoprotective, radioprotective [4, 5].

OS Linn. Leaves contain 0.7% volatile oil comprising about 71% eugenol and 20% methyl eugenol. UA, carvacrol, caryophyllene, apigenin, luteolin, apigenin-7-O-glucuronide, orientin and molludistin are other additional phytoconstituents found in the OS [6].

Herbal medicines, perceived as less toxic than synthetics, have sparked interest in exploring their potential as alternatives.

MATERIALS AND METHODS

Preparation of plant extraction

Preparations of aqueous extract [7]

Fresh leaves of Ocimum sanctum were collected, identified, and authenticated by a pharmacognosist from Narayana Pharmacy College, Nellore. After thorough washing with tap water, the leaves were shade-dried and ground into a fine powder. 100 grams of this dried powder were then utilized for further experimentation.

100 g of dried *O. sanctum* powder was boiled with 100 ml of distilled water in the flask for 24 h. The flask was kept on a heating mantle for boiling until the content was reduced to half and then cooled and filtered using muslin cloth so as to remove the insoluble materials. The filtrate was again filtered through an ordinary filter paper and poured in a cleaned and already weighed petridish. It was placed on a hot plate for complete evaporation. Then the extract was cooled at room temperature and weighed to calculate the extractability percentage and finally stored in desiccators in cool and dry place.

Preparations of ethanolic extract [8]

100 g of dried *O. sanctum* powder was put into the macerator and added with three liters of solvent (70% ethanol). Then, it was soaked and left for 24 h at room temperature. Filtration was carried out to separate the macerate by using filter paper; the filtration process was repeated twice. All macerate was collected and then evaporated with an evaporator at±50 °C until thick extract was obtained.

Drugs and chemicals

The extracts were (Ethanolic and Aqueous) used at doses of 100 and 200 mg/kg, Chlorpromazine (3 mg/kg body weight), Amphetamine (1.5 mg/kg body weight).

Experimental animals

Study animals were obtained from the institute's central animal house and housed in standard polypropylene cages under controlled conditions (25±2 °C, 12 h light/dark cycle). They had free access to dry pellets and water and were acclimated to the environment for at least two days before the experiment began. The study received prior approval from the Institutional Animal Ethics Committee, and all relevant ethical guidelines for animal research were strictly followed.

Animal grouping

Group 1-Control (0.5 ml of distilled water)

Group 2-Amphetamine (1.5 mg/kg body weight)

Group 3-Chlorpromazine (3 mg/kg body weight)

Group 4–Ethanoloic extract of Ocimum sanctum linn (100 mg/kg body weight).

Group 5–Ethanolic extract of Ocimum sanctum linn (200 mg/kg body weight).

Group 6–Aqueous extract of Ocimum sanctum linn (100 mg/kg body weight).

Group 7–Aqueous extract of Ocimum sanctum linn (100 mg/kg body weight).

To evaluate and compare the anti-psychotic activity of Ocimum sanctum linn by locomotor activity model [9].

The locomotor activity will be measured by using an actophotometer, which operates on photoelectric cells which are connected in circuit with a counter. When the beam of light falling on the photocell is cut off by the animal, a count is recorded. An actophotometer is in circular arena in which the animal moves. Mice will be used for testing in this equipment.

Procedure

7 groups of mice (each group comprising of 6 mice) were taken. Group 1 served as control. Group 2 was treated with amphetamine (1.5 ml/k. g, body weight) i. p.; group 3 was treated with standard antipsychotic drug chlorpromazine (3 mg/kg body weight).

Group 4-7 were treated with 100 mg and 200 mg of ethanol extract (EEOS) and 100 mg and 200 mg of aqueous extracts of Ocimum sanctum, respectively.

Before starting the experiment, animals were weighed and numbered. Each mice were placed individually in the activity cage for 10 min. The basal activity score of all the animals were noted.

The difference in the activity was noted before and after Chlorpromazine, Amphetamine and Ocimum sanctum linn preparations. The percent decrease in motor activity was calculated. Reduction in motor activity indicates CNS depressant property.

RESULTS

Amphetamine group shows a Positive control stimulant known to increase activity. Chlorpromazine group shows a Positive control depressant known to decrease activity. Group 4-5, Ethanolic extract (100 and 200 mg/kg) showed a moderate increase in activity compared to control, similar to amphetamine but to a lesser extent.

The 200 mg/kg dose caused a significantly increase than 100 mg/kg dose. Group 6-7 aqueous extract (100 mg/kg and 200 mg) showed minimal change in activity compared to control.

Table 1: Effect of aqueous and ethanolic extracts of Ocimum sanctum for Locomotor activity on actophotometer

Group and drug	Locomotor activity (scores) in 10 min		
	Before	After treatment	% Change in activity
Group 1-Control (0.5 ml of distilled water)	120±25	121±21	1.2
Group 2-Amphetamine (1.5 mg/kg body weight)	121±11	165±7$	36
Group 3-Chlorpromazine (3 mg/kg body weight)	120±8	81±16	32.5
Group 4–Ethanoloic extract of Ocimum sanctum linn (100 mg/kg body weight).	121±16	131±6*	8
Group 5–Ethanolic extract of Ocimum sanctum linn (200 mg/kg body weight).	120±11	145±7**$	21
Group 6–Aqueous extract of Ocimum sanctum linn (100 mg/kg body weight).	121±8	122±6	1
Group 7–Aqueous extract of Ocimum sanctum linn (100 mg/kg body weight).	121±5	123±8	2

ANOVA followed by Tukey's multiple comparisons **-p<0.01, *-p<0.05 compared Amphetamine After treatment, $-p<0.001 compared to before treatment.

DISCUSSION

The results indicated that the ethanolic extract of ocimum sanctum (EEOS) influences the general behavioural profile in locomotor activity. The EEOS posseses significant antipsychotic activity copmared with the standard drug chlorpromazine in a dose-dependent manner.

A study by Kumar *et al.*, [10] reported increased locomotor activity in mice treated with ethanol extracts of O. sanctum leaves, supporting the potential stimulant properties observed here.

Furthermore, Singh *et al.*, [11] found that an ethanol extract of O. sanctum leaves enhanced dopamine levels in the striatum of rats, potentially contributing to the increased activity observed in this study.

The lack of significant effect from the aqueous extract highlights the potential influence of extraction methods on the active components extracted. Ethanol may be more efficient in extracting lipophilic constituents like essential oils and terpenes, which could be responsible for the observed stimulant effect.

Studies like that by Patel *et al.*, [12] support this notion, demonstrating higher antioxidant and free-radical scavenging activity in ethanol extracts compared to aqueous extracts of O. sanctum leaves.

While the results suggest a stimulant effect, the underlying mechanisms remain unclear. Identifying the specific active components extracted by ethanol and elucidating their interactions with neurotransmitter pathways like dopamine and serotonin is crucial for further understanding.

The present study investigated the Ethanolic extracts of Ocimum sanctum (tulsi) boosted activity in mice, resembling the effect of the stimulant amphetamine, but with less intensity. Notably, the higher dose (200 mg/kg) showed a significant increase.

CONCLUSION

Antipsychotics effectively manage psychosis but suffer from limitations like adverse effects. Seeking alternatives, Tulsi (Ocimum sanctum), prized for its diverse medicinal properties and perceived lower toxicity.

Future research translate to precisely identifying the active components responsible for the stimulant effect in the ethanolic extract is crucial.

In vivo and *in vitro* studies are needed to understand how the identified active components influence neurotransmitter pathways and ultimately affect locomotor activity.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICTS OF INTERESTS

Declared none

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