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Antipsychotic Activity Of Apium Graveolens Extract On Alcohol-Induced Psychosis.

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Abstract: Psychosis is a mental health condition characterized by an inability to distinguish reality from delusions, often associated with hallucinations and disorganized thinking. Early treatment is crucial, but current antipsychotic medications warrant the exploration of alternative, plant-based therapies.

Apium graveolens (celery) is a medicinal plant with reported anti-inflammatory, antioxidant and other pharmacological properties, but its antipsychotic potential has not been extensively evaluated. This study aimed to investigate the antipsychotic activity of Apium graveolens seed extract in an alcohol-induced psychosis model in mice, assessing effects on locomotor activity, stereotypic behaviours, and social interaction

Index Terms - Apium graveolens, celery, antipsychotic, psychosis, alcohol-induced, behavioral models.

I. Introduction

Psychosis is a mental health condition characterized by an inability to distinguish between what is real and what is not. It is often associated with hallucinations, delusions, and disorganized thinking. Early treatment of psychosis is crucial, as it generally leads to better long-term outcomes. While current treatments often involve antipsychotic medications, there is a need to explore alternative, plant-based therapies that may offer improved efficacy and reduced side effects.[1]

Apium graveolens (celery) is a medicinal plant that has been traditionally used in various cultures to treat mental health disorders. Previous studies have reported the plant's potential antipsychotic, anti-inflammatory, and antioxidant properties. However, the antipsychotic potential of Apium graveolens has not been extensively evaluated.[2]

The present study aimed to investigate the antipsychotic activity of Apium graveolens seed extract in an alcohol-induced psychosis model in mice. The study assessed the effects of the plant extract on various behavioural parameters, including locomotor activity, stereotypic behaviours, and social interaction, to elucidate its potential therapeutic applications in the management of psychosis-related disorders.[3,4]

II. MATERIALS AND METHODS

Experimental Animals:

Swiss albino mice (25-30 g) were used in the study.

The animals were housed under controlled conditions (temperature 23 ± 2°C, relative humidity 50 ± 5%, and 12 h light/dark cycle) and acclimatized for 7 days prior to the experiments.

The study was conducted in accordance with the CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals) guidelines.

Drugs and Chemicals:
Standard drug: Haloperidol
Inducing drug: Alcohol/ethanol
Test extract: Methanolic extract of Apium graveolens seeds

Preparation of Plant Extract:
The Apium graveolens seeds were collected, dried, and powdered.
The powdered seeds were extracted with methanol using a Soxhlet apparatus.
The methanolic extract was concentrated under reduced pressure to obtain the crude extract.

Phytochemical Analysis:
The Apium graveolens seed extract was subjected to preliminary phytochemical screening.
The presence of various phytochemicals, such as flavonoids, steroids, tannins, saponins, alkaloids, and glycosides, was qualitatively determined.

Acute Oral Toxicity Study:
The acute oral toxicity of the Apium graveolens seed extract was determined according to the OECD guideline 423.
This study was conducted to evaluate the safety profile of the extract and establish the dose levels for the antipsychotic activity evaluation.

Drug Treatment:
The animals were divided into five groups: negative control, positive control (alcohol-induced), standard drug (haloperidol), and two treatment groups (Apium graveolens seed extract at 200 mg/kg and 300 mg/kg).

Preparation of animal model
Group I – Negative control (Received only 0.9% saline solution)
Group II – Positive control (received ethanol for 14 days)
Group III - Standard group
Group IV- Treatment Group 1
Group V - Treatment Group 2

Evaluation of Antipsychotic Activity:
The antipsychotic-like effects of the Apium graveolens seed extract were evaluated using the following behavioural models:
1. Locomotor activity (actophotometer)
2. Stereotypic behaviours (glass beaker test)
3. Social interaction (social interaction chamber)
Statistical Analysis:
The data was analysed using one-way ANOVA followed by Dunnett's test, and $p<0.05$ was considered statistically significant.

Treatment Protocol

Sr. No.	Group	No. of Animals	Treatment and Dose	Route of Administration
1	Negative control	6	Vehicle only (0.9 % saline solution)	IP
2	Positive control	6	Alcohol (Ethanol) 7 – 20% gradually increased	Oral
3	Standard drug	6	Haloperidol (1 mg/kg)	Oral
4	Treatment group 1	6	Test extract of *Apium Graveolens* Seed extract (100 mg/kg)	Oral
5	Treatment group 2	6	Test extract of *Apium Graveolens* seed extract (200mg/kg)	Oral

III. RESULTS AND DISCUSSION

Extraction Yield and Phytochemical Analysis:

The methanolic extract of Apium graveolens seeds yielded 12.5% w/w. The phytochemical screening revealed the presence of flavonoids, steroids, tannins, saponins, alkaloids, and glycosides.

Locomotor Activity:

Table : Observation table of locomotion

Group	Dose (mg/kg)	Locomotor activity test
Negative control	Received vehicle (0.9% Saline solution)	302.0±16.00****
Positive Control	Alcohol (ethanol 7 - 20% for 14 days)	527.7±24.98
Standard Drug	Haloperidol (1 mg/kg)	377.3±17.45****
Treatment group I	*Apium Graveolens* seeds extract (200mg/kg)	412.8±17.54***
Treatment group II	*Apium Graveolens* seeds extract (300 mg/kg)	389.0±18.53***

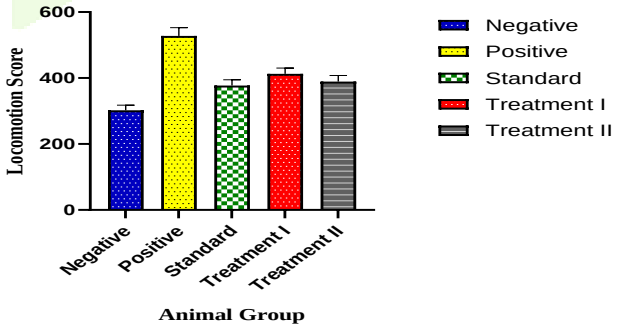

Fig : Effect of treatment on Locomotion

Alcohol administration significantly increased locomotor activity, which was attenuated by haloperidol and both doses of Apium graveolens seed extract ($p<0.0001$).

Stereotypic Behaviors:

Table : Observation table of Sniffling

Group	Dose (mg/kg)	Sniffling score
Negative control	Received vehicle (0.9% Saline solution)	3.333±0.4216 ****
Positive Control	Alcohol (ethanol 7 - 20% for 14 days)	21.33±0.8819
Standard Drug	Haloperidol (1 mg/kg)	7.000±0.3651****
Treatment group I	*Apium Graveolens* seeds extract (200mg/kg)	12.50±0.4282****
Treatment group II	*Apium Graveolens* seeds extract (300 mg/kg)	7.833±0.3073****

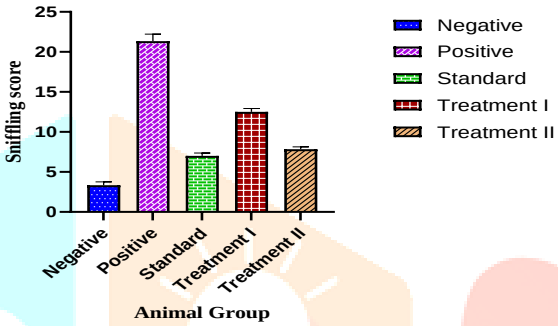

Fig : Effect on Treatment on Sniffling

Table : Observation table of rearing score

Group	Dose (mg/kg)	Rearing Score
Negative control	Received vehicle (0.9% Saline solution)	3.00±0.3162****
Positive Control	Alcohol (ethanol 7 - 20% for 14 days)	19.00±0.7071
Standard Drug	Haloperidol (1 mg/kg)	6.800±0.3742****
Treatment group I	*Apium Graveolens* seeds extract (200mg/kg)	12.80±0.3742****
Treatment group II	*Apium Graveolens* seeds extract (300 mg/kg)	7.800±0.3742****

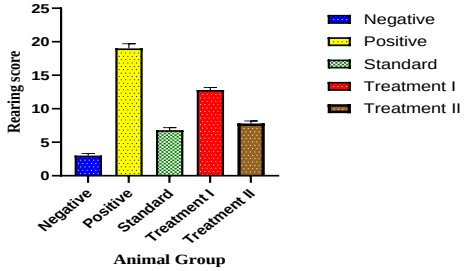

Fig : Effect of treatment on Rearing Score

Table : Observation table of Licking score

Group	Dose (mg/kg)	Licking score
Negative control	Received vehicle (0.9% Saline solution)	3.500±0.4282****
Positive Control	Alcohol (ethanol 7 - 20% for 14 days)	19.83±0.7923
Standard Drug	Haloperidol (1 mg/kg)	5.667±0.4944****
Treatment group I	*Apium Graveolens* seeds extract (200mg/kg)	10.67±0.4944****
Treatment group II	*Apium Graveolens* seeds extract (300 mg/kg)	6.667±0.4944****

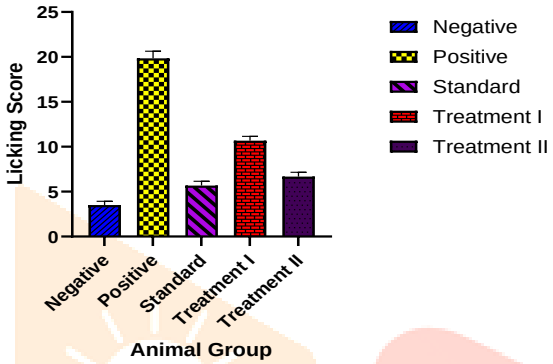

Fig : Effect of treatment on Licking Score

Alcohol-induced mice exhibited increased stereotypic behaviors, such as sniffing, rearing, and licking. Treatment with haloperidol and Apium graveolens seed extract (200 mg/kg and 300 mg/kg) significantly reduced these behaviors ($p<0.0001$).

Social Interaction:

Table : Observation table of social interaction Score

Group	Dose (mg/kg)	Social Interaction Test (In Sec.)
Negative control	Received vehicle (0.9% Saline solution)	40.33±0.8819****
Positive Control	Alcohol (ethanol 7 - 20% for 14 days)	10.33±0.4216
Standard Drug	Haloperidol (1 mg/kg)	34.33±1.256****
Treatment group I	*Apium Graveolens* seeds extract (200mg/kg)	29.33±1.282****
Treatment group II	*Apium Graveolens* seeds extract (300 mg/kg)	34.50±1.648****

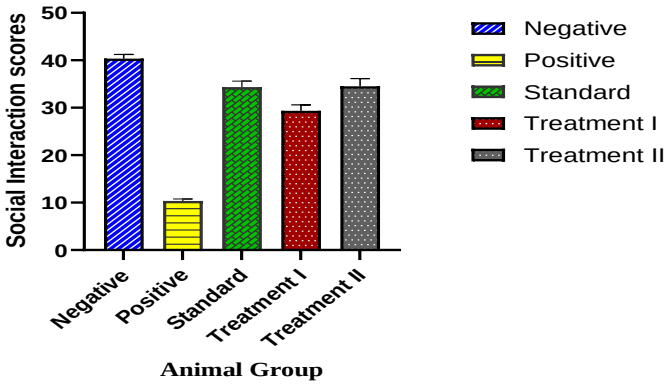

Fig : Effect of Treatment on Social interaction Scores

Alcohol exposure significantly decreased the time spent in social interaction, which was improved by haloperidol and Apium graveolens seed extract (200 mg/kg and 300 mg/kg) ($p<0.0001$).

Discussion

The results of this study suggest that the methanolic extract of Apium graveolens seeds possess significant antipsychotic-like effects in the alcohol-induced psychosis model in mice. The plant extract was able to normalize the hyperactive behaviors, reduce stereotypic activities, and restore social interaction in the treated animals, comparable to the effects of the standard antipsychotic drug, haloperidol.[5]

The observed antipsychotic-like effects of Apium graveolens may be attributed to the presence of various phytochemicals, including flavonoids, steroids, tannins, and alkaloids, which have been previously reported to possess neuroprotective and psychoactive properties. The potential mechanisms underlying the antipsychotic activity of Apium graveolens may involve modulation of dopaminergic, serotonergic, and glutamatergic neurotransmission, as well as anti-inflammatory and antioxidant effects.[6]

These findings contribute to the growing body of evidence supporting the therapeutic potential of Apium graveolens in the management of psychosis-related disorders. Further research is warranted to elucidate the specific molecular targets and signaling pathways involved in the antipsychotic effects of this medicinal plant, as well as to evaluate its efficacy and safety in clinical settings.[7,8]

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