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Evaluation of central nervous system activity of acute administration of ethanolic extract of *Capsicum annuum* in mice

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ABSTRACT

Capsicum annuum L. is known as pepper, is a traditional herb used to treat various disorders. In this study, we check potential pharmacological effects of ethanolic extracts of *C. annuum* with respect to central nervous system (CNS) activity in mice, was studied using models of elevated plus maze test, barbiturate-induced sleeping time, tail suspension test, hot-plate and tail-flick test. *Capsicum annuum* L. extract was administered to mice at single doses of 50 and 200 mg/kg, while diazepam (1 mg/kg), morphine (5 mg/kg) and imipramine (30 mg/kg) were used as reference drugs. CA extract shows the significant results of anxiolytic activity at all dose levels.

KEY WORDS: Antioxidant, Depression, Diazepam, Imipramine, Morphine, *Capsicum annuum.*

1. INTRODUCTION

Pepper has ethno medicinal and nutritional values. Capsicum has its beginning since the beginning of civilizations. It is used extensively worldwide as a spice, flavoring agent and herbal remedy, its importance shows the important place among the most consumed spice crops in the world. Capsicum fruits are useful in gout, arthritis, sciatica, rheumatism, dyspepsia, flatulence, stomach aches, skin rashes, dog/snake bites and flesh wounds.

2. MATERIALS AND METHODS

Plant material and preparation of extract: The dried fruits of *C. annuum* was identified and authenticated by Dr. K.C. Bhatt, at National Bureau of Plant Genetic Resources, New Delhi.

The dried fruits were pulverized to course powder using a mechanical grinder and the powder was preserved in air sealed polythene bag. The course powder was extracted by ethanol in Soxhlet extractor. The ethanolic extract was evaporated under reduced pressure to obtain dry masses. The extract was then stored in a desiccator. Phytochemical and pharmacological evaluations were studied.

Drugs and chemicals: Diazepam (Ranbaxy, India), morphine (Sigma Chemicals, USA), imipramine (Torrent, India), pentobarbital (Neon, India) phenytoin (Sigma Chemicals, USA) and gum acacia (CDH, India) were used.

Phytochemical screening: Phytochemical investigation of ethanolic extract for the presence of various phytoconstituents was carried out using the methods.

Animals: Adult Swiss albino mice (Mus musculus albinus), of either sex, weighing 20-25 g obtained from the animal house of RV Northland Institute, Greater Noida, G B Nagar and Jamia Hamdard, New Delhi, India. The experimental protocol was approved by the Institutional Animal Ethical Committee (IAEC, Reg. No.1149/ac/07/CPCSEA) of RV Northland Institute, Greater Noida, G.B. Nagar and experiments were conducted according to the CPCSEA, India guidelines on the use and care of experimental animals.

Experimental protocol: The ethanolic extract of *Capsicum annuum* was suspended in 1% carboxy methyl cellulose (CMC) and was administered to mice at single doses of 50 and 200 mg/kg perorally 60 min before the start of observation, while diazepam (1 mg/kg), morphine (5 mg/kg) and imipramine (30 mg/kg) as reference drugs were used intraperitoneally 30 min before the observations recorded.

Antinociceptive activity: The antinociceptive activity of the under study substances was performed in mice by tail-flick and hot-plate responses.

Anxiolytic activity: The elevated plus maze test was used to evaluate antianxiety activity, The CA extract was administered perorally in varying doses 60 min before the evaluation of antianxiety activity. At the time of experiment, each mouse was placed at the center of maze, facing one of the enclosed arms. During a 5 min test period the time spent on open arms and in closed arms was recorded.

3. RESULTS

Phytochemical screening: Phytochemical screening of ethanolic extract revealed the presence of various phytoconstituents such as phenolic compounds, flavonoids, tannins, alkaloids, glycosides, saponins, steroids, ascorbic acid, carotenoids, resins and volatile oils.

Antinociceptive activity: The reaction time to nociceptive effect produced by hot-plate or tail-flick test was significantly ($P<0.05$) increased under the administration of CA extract (50 and 200 mg/kg, p.o.). The antinociception caused by CA extract was lower compared with morphine in mice (Fig.1).

Anxiolytic activity: The CA extract (50 and 200 mg/kg, p.o) and diazepam (1mg/kg, i.p) induced significant

(P<0.01) increase in the occupancy in the open arms. The CA extract and diazepam showed a decreased preference for the closed arms. However, the CA extract at a dose level of 200 mg/kg, was found more effective in mice (Fig.2).

Effect on sleeping time: The absolute values of sleep latency and sleeping time demonstrate that mice treated with CA extract (50 and 200 mg/kg), 60 min before the injection of pentobarbital, presented a significant (P<0.05) increase in the sleep latency and reduction of pentobarbital-induced sleeping time in mice (Fig.3).

Antidepressant activity: In this test, CA extract at both the doses (50 and 200 mg/kg) significantly (P<0.05) decreased immobility time in mice, as compared to respective controls.

On the other hand, the mice treated with imipramine (30 mg/kg), as expected of an antidepressant drug, also showed decreased immobility time in mice (Fig.4).

Effect on motor activity: In this test, to check the general locomotor performance of mice, a 5 min activity test was performed for each mouse. No significant result in the total locomotor activity was observed in mice after 60 min of administration of CA extract.

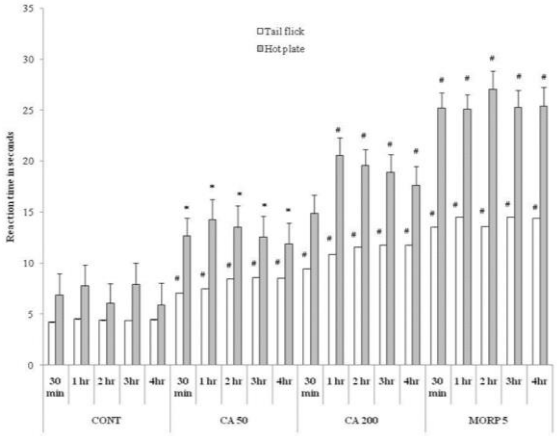

Figure.1. Effect of *Capsicum annuum* (CA) extract (50 and 200 mg/kg) and morphine (5 mg/kg) on hot-plate test in mice.

Statistical analysis was done using ANOVA followed by Scheffe test. Values are expressed as mean±SE (n=8). $^{*}P<0.05$, $^{\#}P<0.01$ Vs vehicle treated control mice.

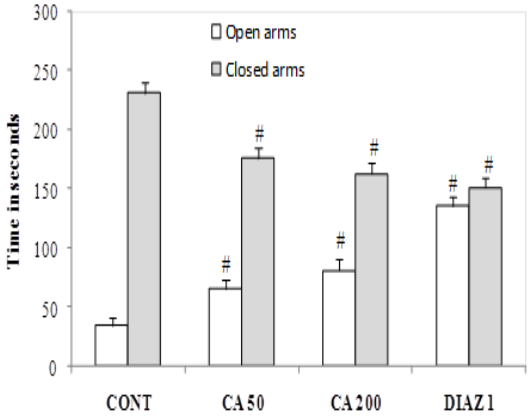

Figure.2. Effect of *Capsicum annuum* (CA) extract (50 and 200 mg/kg) and diazepam (1 mg/kg) on elevated plus maze test in mice after 60 min of extract administration

Statistical analysis was done using ANOVA followed by Scheffe test. Values are expressed as mean±SE (n=8). $^{\#}P<0.01$ Vs vehicle treated control mice.

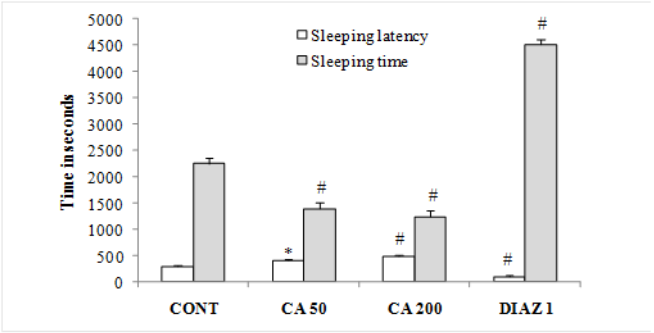

Figure.3. Effect of *Capsicum annuum* (CA) extract (50 and 200 mg/kg) and diazepam (1 mg/kg) on sleeping latency and sleeping time test in mice caused by pentobarbital (40 mg/kg).

Statistical analysis was done using ANOVA followed by Scheffe test. Values are expressed as mean±SE (n=8). $^{*}P<0.05$, $^{\#}P<0.01$ Vs vehicle treated control mice.

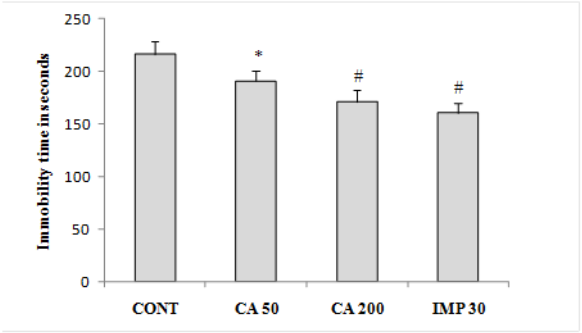

Figure.4. Effect of *Capsicum annuum* (CA) extract (50 and 200 mg/kg) and imipramine (30 mg/kg, ip) on tail suspension test in mice.

Statistical analysis was done using ANOVA followed by Scheffe test. Values are expressed as mean±SE (n=8). $^{*}P<0.05$, $^{\#}P<0.01$ Vs vehicle treated control mice.

Table.1. Phytochemical analysis of ethanolic extract of *Capsicum annuum*

Bioactive Principles	**Ethanolic extract of *C.annuum***
Phenolic compounds	+
Flavonoids	+
Tannins	+
Alkaloids	+
Glycosides	+
Saponins	+
Steroids	+
Volatile oils & Resins	+
Ascorbic acid	+
Carotenoids	+

Key + = present

DISCUSSION

The antinociceptive activity of pepper extract and morphine was assessed by the use of two common tests, tail-flick, specific for spinal reflex and hot-plate, which reflects a more complex, centrally integrated process. Both extract and morphine showed antinociceptive activity.

The antinociceptive activity of extract (200 mg/kg) was almost equivalent to that of morphine in mice at spinal and supra spinal level. The present work demonstrated that the ethanolic extract of pepper has anxiolytic effects in mice. This action of extract represents the functional similarity to benzodiazepines which are widely used as anxiolytic agents.

Phytochemical tests of ethanolic extract of pepper revealed the presence of phytoconstituents such as phenolic compounds, flavonoids, tannins, alkaloids, glycosides, saponins, steroids, ascorbic acid, carotenoids, resins and volatile oils.

Pentobarbital induced sleeping time test was also used to evaluate the possible antidepressive-like effects observed with pepper extract in this study. Increase in sleep latency and decrease in sleeping time are classically related to CNS stimulant drugs. The different doses of extract and imipramine in mice was able to induce antidepressant effect in tail suspension test.

4. CONCLUSION

In conclusion, results of the present study revealed that administration of ethanolic extract of *Capsicum annuum* at both doses (50 and 200 mg/kg) significantly influenced the CNS activities in mice.

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