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CNS activities of few species of sapindaceae

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ABSTRACT

The present study aimed to evaluate the CNS activities of the alcoholic and aqueous extracts of Cardiospermum halicacabum and Dodonea viscosa, family sapindaceae in various experimental models described as pentobarbitone induced sleeping time, locomotor activity and motor coordination. The extracts were subjected for acute toxicity studies and found no mortality upto the dose of 2000mg/kg bodyweight hence 1/5th and 1/10th of the dose tested were used as the test dose and found exhibiting dose dependant CNS activities with all the experimental models. The phytochemical studies revealed the presence of various flavonoids, tannins, triterpenoids and saponins which might have contributed for the said activities.

Key words: Cardiospermum halicacabum, Dodonea viscosa, Pentobarbitone, Locomotor activity, Skeletal muscle relaxant.

INTRODUCTION

The plants *Cardiospermum halicacabum and Dodonea viscosa*, family sapindaceae, categorized under treating rheumatism, stiffness of the limbs, snake bite, nervous diseases, stomach disorders, skin rashes, teeth ache, fever and as astringent in the traditional system of medicines [1-3]. The number of pharmacological properties such as insecticidal [4], anti-filarial [5], and antipyretic [6] activities has been reported with *Cardiospermum halicacabum*, antimicrobial [7], anti-inflammatory [8] and antidiabetic [9], wound healing activities [10] with *Dodonea viscosa*.

The crude leaf extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* have been used traditionally by number of neuronal disorders. However there are no systematic experimental reports on their CNS related activities in literature.

The present study was undertaken to find out the scientific rationale behind the local use of *Cardiospermum halicacabum* and *Dodonea viscosa* for nervous disorders.

MATERIALS AND METHODS

Extraction:
The Plants *Cardiospermum halicacabum* and *Dodonea viscosa* were collected from Hassan, Karnataka, leaves were separated, washed with water, shade dried, reduced to coarse powder, subjected to extraction with alcohol using Soxhlet apparatus and distilled water with maceration and the extracts were subjected to preliminary phytochemical analysis[11]

Animals:
Albino mice of either sex weighing 18-22 gms were acclimatized for a period of seven days in laboratory under standard husbandry conditions i.e. room temperature 26 ± 2^0 C, relative humidity 45-55% and light/dark cycle12/12 hours. All the animals were fed with a standard diet (Gold Mohr, Lipton India Ltd., Bangalore) and water was supplied *ad libitum* under strict hygienic conditions. All the experimental protocols were approved by Institutional Animal Ethical Committee.

Acute toxicity studies:
The acute toxicity of alcoholic and aqueous extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* was determined in albino mice weighing 18-22 gms of either sex. After administration with different doses of these extracts, the number of animals survived with each extract was noted for acute (48hours), and chronic (14 days) period of time. The animals were physically active and regularity in consumption of food and water was observed. The dose up to 2000mg/kg body weight did not produce any signs of toxicity or mortality. LD_{50} was calculated according to the **"**Up and Down method" following OECD guidelines No. 425 of CPCSEA.

CNS Activities:
Behavioral Effect[12]: The method described by Irwin et. al was followed to assess the behavioral pattern/effects of the alcoholic and aqueous extracts of *Cardiospermum halicacabum and Dodanea viscosa*. The mice were divided into groups of six animals each, where group 1 served as control (receives vehicle), group 2-9 were labeled as test group animals were treated with alcoholic and aqueous extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* at the dose of 200mg/kg and 400mg/kg body weight respectively. After treatment with the extracts the animals were observed after 30 min after administration upto 2 hrs for behavioral changes. The observation parameters consisted of body position, righting reflex, food and water intake, quality of the skin, alertness were noted before and after administration of the extracts.

Pentobarbitone induced sleeping time[13]: The animals were divided into 9 groups (n=6). Group 1 animals served as control and fed orally with vehicle and pentobarbitone sodium 45 mg/kg i.p. Group 2-9 were labeled as test group animals were treated with 200 and 400 mg/kg b.w alcoholic and aqueous extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* respectively. Pentobarbitone sodium 45 mg/kg i.p. was injected 30 min before oral administration for all the groups. The time elapsed between loss and recover of the righting reflex was noted and taken as sleeping time.

Locomotor activity[14]: The animals were divided into 10 groups (n=6). Group 1 animals served as control and fed orally with vehicle, group 2 served as standard and received the reference drug. Group 3-10 were labeled as test group animals were treated with 200 and 400 mg/kg b.w alcoholic and aqueous extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* respectively. The spontaneous locomotor activity was recorded using the activity cage (Actophotometer, Inco, Ambala) with automatic counting of animal movements on the cage floor before and thirty minutes after drug administration for a period of 10 min. The locomotor activity of the extracts was evaluated by counting the scores using digital actophotometer.

Motor Coordination[15-16]: The method described by Dunham and Miya (1957) was followed here. The animals were divided into 10 groups (n=6). Group 1 animals served as control and fed orally with vehicle, group 2 served as standard and received the reference drug. Group 3-10 were labeled as test group animals were treated with 200 and 400 mg/kg b.w alcoholic and aqueous extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* respectively. The animals were trained to remain for 3 min on the rod rotating at a speed of 25 rpm. The effect on motor coordination was assessed using rotarod apparatus by assessing the ability to remain on the rod rotating at a speed of 25 rpm. The fall off time from the rod was noted for each animal.

Statistical Analysis:
Statistical analysis was performed by one way analysis of variance (ANOVA) followed by Dunnet't' test to calculate the significance difference among the groups.

RESULTS

The preliminary phytochemical studies confirmed the presence of sterols, saponins, carbohydrates, flavonoids tannins, fixed oils and triterpenoids with alcoholic extracts, moreover saponins, carbohydrates, flavonoids and tannins with the aqueous leaves extracts of *Cardiospermum halicacabum* and *Dodonea viscosa*.

The alcoholic and aqueous extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* have exhibited the dose dependant sound and touch responses, produced moderate to slight depression relating to awareness and alertness, significantly potentiates the pentobarbitone induced sleeping time, however the standard drug diazepam caused a significant depression of all these responses compared to all the extracts. The decrease in the number of count on actophotometer supported the decrease in the locomotor activity of the extracts in the dose dependant manner. Increase in the number of falls and a decrease in the time on the bar as detected by the rotarod suggested the motor incoordination activity exhibited by the extracts.

Table 1: Evaluation of sapindaceae species for their CNS Activities in the different experimental models

Treatment	Locomotor activity			Motor coordination			Pentobarbitone induced sleeping time	
	Before Treatment	After Treatment	Percentage Decrease in activity	Average fall off time (Sec.)		% Decrease	Onset time	Average sleeping time ± SEM
Control				174.83±0.03	171.50±0.04	--	5.7±0.02	60.17±0.02
Reference Drug	318.17±0.01	142.17 ±0.01**	55.31	169.83±0.02	19.50±0.08**	87.9		
CHAL 200	320.83±0.04	221.83±0.01**	30.85	165.33±0.02	95.33±0.02**	42.34	5.57±0.05	91.17±0.01**
CHAL 400	320.33±0.01	200.50±0.02**	37.41	161.67±0.01	80.67±0.02**	50.1	5.63±0.02	108.17±0.02**
CHAQ 200	319.33±0.01	209.33±0.01**	34.44	160.00±0.01	75.17±0.04**	53.02	5.48±0.02	113.33±0.01**
CHAQ 400	318.67±0.01	185.50±0.01**	41.78	162.88±0.07	54.17±0.04**	66.73	5.63±0.01	127.5±0.02**
DVAL 200	323.33±0.02	214.50±0.01**	33.65	165.33±0.02	84.17±0.03**	49.08	5.72±0.02	94.67±0.01**
DVAL 400	318.83±0.01	193.00±0.01**	39.46	159.67±0.03	73.67±0.04**	53.85	5.65±0.02	115.33±0.02**
DVAQ 200	320.67±0.01	192.83±0.02**	39	155.33±0.02	53.17±0.04**	65.78	5.48±0.02	122.83±0.02**
DVAQ 400	322.50±0.01	165.50±0.01**	48.68	160.83±0.03	38.83±0.05**	75.86	5.63±0.02	135.50±0.02**

DISCUSSION

In the present study, the effect of the alcoholic and aqueous extracts of *Cardiospermum halicacabum* and *Dodonea viscosa* on CNS activity has been evaluated. The exhibited results indicated that the extracts proved to influence the general behavioral profile of the experimental animals, as evidenced in the spontaneous activity, righting reflex, pinna reflex and grip strength may be due to blocking synapse of the afferent pathway.

Dose dependant significant increase in the hypnotic effect induced by the pentobarbitone, suggests a profile sedative activity of the extracts of *Cardiospermum halicacabum* and *Dodonea viscosa*. It have been already reported that few plants extracts were found interacting with benzodiazepines and related compounds that binds in the CNS for their sedative action and the responses exhibited in the present study may be influenced by the same mechanism.

The intensity of reduction in exploratory behaviors in the treated animal groups which reflects the same line of action like the standard drug benzodiazepines, which acts as a anxiolytic (at low doses), anti-convulsant, and also produce sedation and a myorelaxant effect at higher doses[17].

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