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EVALUATION OF NOOTROPIC ACTIVITY OF *SALVIA OFFICINALIS* L. EXTRACT USING DIFFERENT EXPERIMENTAL MODELS IN RATS

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ABSTRACT

Salvia officinalis L (Lamiaceae, common sage) is an aromatic plant. The dried leaves are used as raw material in medicine, perfumery and food industry. The present work has been focused on the evaluation of Nootropic activity of ethanolic extract of leaves of *Salvia officinalis (*EESO) in experimental animals. EESO were administered to experimental rats at doses of 200 mg/kg & 400mg/kg p.o. The nootropic activity was evaluated by elevated plus maze & spatial learning in water maze methods. We concluded that ethanolic extract of *Salvia officinalis* L produced notable nootropic activity compared to that of the standard drug. The present study provides a quantitative basis for explaining the folkloric use of *Salvia officinalis* L.

Keywords: Nootropic, Salvia *officinalis* L

INTRODUCTION:

The ability of an individual to record the information and recall it when ever needed is known as Memory. Dementia is a mental disorder characterized by loss of intellectual ability (judgement or abstract thinking) which invariably involves impairment of memory. Approximately in 12 million people the dementia was occuring in worldwide and this is likely to increase by 2040 to 25 millions. Alzheimer's disease (AD) accounts for nearly 50% of all cases of dementia. It affects about 6% of the population aged over the 65 and increases the incidence with age[1]. Learning is defined as the acquisition of information and skills, while subsequent retention of that information is called memory[2]. AD is the progressive neurodegenerative disease characterized in the brain by the presence of senile plaques rich in insoluble aggregates of beta-amyloid and neurofibrillary tangles. Loss of cholinergic neurons in nucleus basalis magnocellularis of cortex is one of the most prominent features of AD[3].

Salvia officinal is a genus belonging to the family lamiaceae presenting approximately 900 species. Amongst these species, *Salvia officinlis* has been extensively used as medicinal plant in treating many diseases and also used as herbal tea and for food flavoring[4].

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MATERIALS & METHODS

ANIMALS

Male albino wister rats (150-200mg/kg body weight) were used. The rats were housed in groups of four in standard laboratory conditions (23±1c temp), the institutional animal ethical committee constituted for the purpose approved the protocol.

COLLECTION OF LEAVES

The *Salvia officinalis linn (Lamiaceae)* leaves were collected in the month of Dec– Jan 2014 in the chittoor district of Andhra Pradesh region.

PREPARATION OF PLANT EXTRACT

The leaves of *Salvia officinalis linn (Lamiaceae)* was collected, washed, dried in shade and pulverized in a mixer to obtain a coarse powder and then passed through 40 mesh sieves. The powdered drug was subjected to solvent extraction by soxhlet apparatus. The powdered drug was extracted with ethanol as a solvent using soxhlet apparatus.The extraction was carried out for 72 hours until the extract becomes colourless. Then the solvent was completely removed by evaporating in a rotatory flask evaporator. The dried extract thus obtained was kept in desicator for further experiment. Percentage yield of ethanolic extract of leaves of *Salvia officinalis linn (Lamiaceae)* was found to be 3.98% w/w.

PRELIMINARY PHYTOCHEMICAL STUDIES

The preliminary phytochemical studies of ethanolic extract of *Salvia officinalis linn* revealed the presence of Glycosides, Flavonoids, Saponins, Steroids & Terpens, Alkaloids, Tannins and gums.

TOXICOLOGICAL EVALUATION

Acute toxicity studies

Male mice weighing 25-30gm were used for the study. The starting dose level of EESO was 2000mg/kg body weight p.o as most of the crude extracts posses LD50 value more than 2000mg/kg p.o. Food was with held for a further 3-4 hours after administration of EESO and observed for signs for toxicity[7,8]. The body weight of the mice before and after administration were noted that changes in skin and fur, eyes, mucous membranes, respiratory, circulatory, autonomic and central nervous system and motor activity and behavior pattern were observed and also sign of tremors, salivation, diarrhoea, lethargy, sleep and coma were noted. The onset of toxicity and signs of toxicity also noted[5, 6, 9].

EXPERIMENTAL PROCEDURE

1. Spatial learning in the water maze:

Rats were divided into four groups of 6 animals each as follows: Group-I animals served as control and received distilled water (10ml/kg.p.o). Group-II animals received scopolamine (0.4mg/kg, p.o) and piractetam (200mg/kg, p.o). Group-III and Group-IV were received Scopolamine (0.4mg/kg, p.o) and ethanolic extract of *S.officinalis* (200mg/kg and 400mg/kg, p.o) repectively. The apparatus is a circular water tank filled to a depth of 20 cm with 25^0C water. Four points equally distributed along the perimeter of the tank serve as starting location. The tank is divided in four equal quadrants and a small platform (19 cm height) is located in the centre of one of the quadrants. The platform remains in the same position during the training days. The rat is released into the water and allowed 60-90s to find the platform. Well trained rats escape in less than 10s[12-13].

2. Elevated plus maze method:

Rats were divided into four groups of 6 animals each as follows: Group-I animals served as control and received distilled water (10ml/kg.p.o). Group-II animals received scopolamine (0.4mg/kg, p.o) and piractetam (200mg/kg, p.o). Group-III and Group-IV were received Scopolamine (0.4mg/kg, p.o) and ethanolic extract of *S.officinalis* (200mg/kg and 400mg/kg, p.o) repectively. The apparatus was made of Plexiglass and consisted of two open arms (30cmx5cm) with 25cm walls. The arms extended from a central platform (5cmx5cm). The maze was elevated 38.5cm from the room floor. Each animal was placed at the centre of the maze; facing one of the enclosed and open arms was recorded for 5min test. All tests were taped by using a video camera. After each test, the maze was carefully cleaned up with a tissue paper (10% ethanol solution) [14, 15, 16].

Table 1: On 8th day the effect of eeso leaves in scopolamine induced Amnesia by elevated plus maze method.

Sl.No.	Groups	Scopolamine (mg/kg)	Elevated plus maze	
			Before scopolamine	After scopolamine
1.	Control	0.4	15.6±0.4014	24.±0.3651*
2.	Piractetam (200mg/kg)	0.4	14.3±0.2108*	18±0.3651**
3.	EESO (200mg/kg)	0.4	15.6±0.3333*	21.2±0.4773*
4.	EESO (400mg/kg)	0.4	13.5±0.2236*	19±0.3651**

Valves are expressed in mean ± SEM, (n=6), when compared with control, *p<0.05, **p<0.01,***p<0.001 one way ANOVA followed by Dunnet's t-Test.

Table 2: On 8th day effect of eeso leaves on scopolamine induced amnesia by Special learning in water maze method.

Sl. No.	Groups	Scopolamine (mg/kg)	Spatial learning in water maze	
			Before scopolamine	After scopolamine
1	Control	0.4	4.16±0.4773	7.5±0.5000
2	Standard Piractetam (200mg/kg)	0.4	2.3±0.2108*	4±0.2582**
3	EESO (200mg/kg)	0.4	3.5±0.2336*	4.8±0.3073*
4	EESO (400mg/kg)	0.4	2.6±0.2108*	3.5±0.5477**

Values are expressed in mean +SEM, (n=6), when compared with control, *p<0.05, **p<0.01, ***p<0.001 one way ANOVA followed by Dunnet's t-Test.

DISCUSSION AND CONCLUSION

In the present study scientific evaluation was carried out by using ethanolic extract of leaves of *Salvia officinalis* to prove the nootropic potential. In the conclusion, data obtained from the study showed significant neuro protection and memory enhancement by extract of *Salvia officinalis* at a dose of 200mg/kg, 400mg/kg, which might also be useful as supportive adjuvant used in treatment of elderly memory loss, Hence *Salvia officinalis* can be used for the management of Alzhemer's disease and other neuro degenerative disorder. Further the isolation and the characterization of *Salvia officinalis* was done to know the exact mechanism of action of nootropic avtivity.

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