Surendra Kumar.M et al /J. Pharm. Sci. & Res. Vol.3(6), 2011,1294-1297

ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in

Screening of Aqueous and Ethanolic Extracts of Aerial Parts of *Alternanthera sessilis* Linn. R.br.ex.dc for Nootropic Activity

Surendra Kumar. M[*1], Silpa Rani. G[1]., Swaroop Kumar. SLVVSNK[2] and Astalakshmi. N[3]

[1]*Dept. of Pharmacy/SCBT, SASTRA University, Thanjavur. Tamil Nadu. India.*

[2]*Department of Pharmacology, Vel's University, Chennai-600 117, Tamil Nadu, India.*

[3]*Dept. of Pharmaceutical sciences, Periyar college of Pharmaceutical sciences for girls, Thiruchirappalli, Tamil Nadu. India*

Abstract:

The objective of the present study is to investigate the nootropic activity of aqueous and 95% ethanolic extracts of aerial parts of *Alternanthera sessilis* Linn. R.Br.ex.DC (*Amaranthaceae*). *Alternanthera sessilis* Linn, commonly known as sessile joy weed a well known herb with fleshy leaves. The herb is mainly used as cholagogue, galactogue, intellect promoting, strength, diarrhea, constipation, leprosy, skin disease and dyspepsia. The nootropic activity was assessed by recording the effect of ethanolic and aqueous extracts of *Alternanthera sessilis* Linn in albino mice at about doses of 125 mg/kg body weight, 250 mg/kg body weight and 500 mg/kg body weight for a period of 9 days on transfer latency, number of entries in to an enclosed arm and duration of occupancy in the enclosed arm. Results showed significant improvement in the retention ability of the normal and amnesic mice as compared to their respective controls. The data emanated in the present study suggests improvement of cholinergic system or inhibition of acetyl choline esterase enzyme is responsible for nootropic activity.

Thus we can conclude that *Alternanthera sessilis* Linn R.BR.ex. DC (*Amaranthaceae*) possesses potent nootropic activity.

Keywords: Nootropic activity, Elevated pluse maze, *Alternanthera sessilis* Linn.

1.0 INTRODUCTION:

The occurrence of the dementia and age related brain disorder is dramatically on the rise as life expectancy likewise increases. Alzheimer's disease (AD), a complex, multifactoral, progressive, neurodegenerative disease primarily affecting the elderly population is estimated to account for 50–60% of dementia cases in persons over 65 years of age. The disease is characterized by loss of memory and impairment of multiple cognitive and emotional functions[1]. There are few synthetic medicines, e.g., tacrine, donepezil and the natural product - based rivastigmine and galatamine to treat cognitive dysfunction and memory loss associated with Alzheimer's disease. These approved drugs are limited in use due to their adverse side effects such as gastrointestinal disturbances and bioavailability problems[2-4]. The current study aims at exploring the nootropic potential of aqueous and ethanolic extracts of aerial parts of *Alternanthera sessilis* Linn on scopolamine-induced amnesia.

2.0 MATERIALS AND METHODS

2.1 Plant material and extraction procedure

Fresh aerial parts of *Alternanthera Sessilis* are collected from the local areas of Thanjavur, Tamilnadu, India and authenticated by Dr. N. Ravichandran M.Sc., Ph.D., Lecturer, Dept. of CARISM, SASTRA University, Thanjavur, Tamil Nadu and a sample specimen of the same is deposited at the herbarium. The collected samples were shade dried at room temperature, pulverized and extracted with 95% ethanol in a soxhlet extractor and with water by maceration technique.

2.2 Drugs and chemicals

Scopolamine Hydrobromide, Piracetam (Normabrain) which were commercially available were utilized.

2.3 Experimental animals

72 male Swiss albino mice of 25-35 gm obtained from Central Animal House Facility (CAF) were used in this study. These animals were allowed to acclimatize to laboratory conditions for 10 days after their arrival. Animals were housed in cages and maintained under standard conditions (12h light/12 dark cycle; 22±3^{o} C and 33- 55.6% humidity. The animals were feed with standard feed and tap water ad libitum.

2.4 Acute toxicity study

Acute toxicity study was performed as per OECD 425 guidelines in albino rats. Based on this one medium, low and high doses were selected for the study as 125mg/kg b.wt, 250mg/kg b.wt, 500mg/kg b.wt and a recovery group with 400mg/kg b.wt.

2.5 Nootropic activity

In the present investigation, the mice were divided in to 9 groups comprising of 8 animals each. The mice were exposed to the training session using elevated plus maze on 1st day followed by administration of the aqueous and ethanolic extracts of aerial parts of *Alternanthera sessilis* at three different doses namely 125 mg/kg/day, 250 mg/kg/day and 500 mg/kg/day orally to the albino mice of different groups and Piracetam (200 mg/kg/day, i.p), an established nootropic agent was used as a standard drug[5-8]. Amnesia was induced using scopolamine hydrobromide 0.3 mg/kg, i. p after half an hour of treatment on 1st day.

2.5.1 Transfer latency in Elevated plus maze

This test was used to assess the retention of learning and memory [9]. The plus maze consisted of two opposite arms, 50x50 cm, crossed with two enclosed arms, of the same dimensions with 40 cm high walls. The arms were connected with a central square (10 x 10 cm) to give apparatus a plus sign appearance. The maze was kept in a dimly lit room. On day 1, the mice was individually placed on the end of one of the open arms, facing away from the centre, and the time taken by the animal to enter in to the enclosed arm (transfer latency (TL) day 1) was recorded with the help of a stop watch. Transfer latency (TL) was defined as the time (in seconds) taken by the animal to move from the open arm in to one of the enclosed arms with all its four legs. On day 2, the procedure was repeated and the TL was recorded. After an interval of one week, on day 9, the TL was again recorded [10]. Similarly, on day 2 and day 9 the number of entries and the time duration spent by the mice in the arm's were evaluated.

2.6 Statistical analysis

The data was analyzed by one way ANOVA. All the values are expressed as mean ± SEM (n=8).

3.0 RESULTS

The nootropic activity was assessed by recording the effect of ethanolic and aqueous extracts of *Alternanthera sessilis* Linn in albino mice at about doses of 125 mg/kg, 250 mg/kg and 500 mg/kg for a period of 9 days on transfer latency, number of entries in to an enclosed arm and duration of occupancy in the enclosed arm. Transfer latency(TL) was the time elapsed between the time, the animal was placed in the open arm and the time when it fully entered (with all its four arms) in to the enclosed arm. Significant reduction in transfer latency value of retention, indicates improvement in memory.

Aqueous and ethanolic extracts showed the dose dependent pharmacological activity i.e., the intensity of pharmacological response is increased with increased in dose and these results were comparable to that of the standard drug piracetam.

Ethanolic and aqueous extracts of *Alternanthera sessilis* Linn successfully reversed memory deficits induced by scopolamine hydrobromide (0.3 mg/kg ,i.p) and the results were expressed in table 1. These results were highly comparable to that of the standard drug piracetam (200 mg/kg, i.p). However, the effect shown by ethanolic extracts is slightly significant than that of the aqueous extract treated groups.

The number of entries into the enclosed arm drastically decreases for the scopolamine hydrobromide treated group of animals, when compared to the group I animals. Scopolamine hydrobromide (0.3 mg/kg, i.p) had significantly reduced these values indicating significant loss in memory. The extracts treated group of animals Group IV –IX had shown the increase in the number of entries in the enclosed arm on day 9, when compared to day 2. These results were highly significant when compared to group II animals and were tabulated in table 2.

Table: 1 Effect of aqueous and ethanolic extracts of *Alternanthera sessilis* (Linn.) on Transfer latency in Scopalmine induced amnesic mice on day 2 and day 9

Group. No	Treatment	Transfer Latency on Day 2(Sec)	Transfer Latency on Day 9(Sec)
1	Normal Control	20.86±0.55***	20.63±0.46***
2	Scopolamine Hydro bromide 0.3 mg/kg	60.88±0.99	88.88±0.48
3	Scopolamine Hydro bromide 0.3 mg/kg+ Piracetam 200 mg/kg	11.75±0.65***	9.88±0.99***
4	Scopolamine Hydro bromide 0.3 mg/kg + *Alternanthera sessilis* aqueous extract 125 mg/kg	18.75±1.18***	17.88±0.64***
5	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* aqueous extract 250 mg/kg	14.88±0.48***	16±1.0***
6	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* aqueous extract 500 mg/kg	12.88±0.48***	13.88±0.81***
7	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* alcoholic extract 125 mg/kg	16.75±1.18***	16±1.18***
8	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* 250 mg/kg	14.75±0.65***	14±0.65***
9	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* 500 mg/kg	12.75±0.65***	12±0.5***

*** P<0.001 *Vs* diseased control.

All values are mean± SEM (n=8).

Table: 2 Effect of aqueous and ethanolic extracts of *Alternanthera sessilis* (Linn.) on number of entries into an enclosed arm in Scopolamine induced amnesic mice on day 2 and day 9.

Group. No	Treatment	Number of entries in to an enclosed arm(Day 2)	Number of entries in to an enclosed arm(Day 9)
1	Normal Control	7.25±1.16**	9±0.65***
2	Scopolamine Hydro bromide 0.3 mg/kg	2.88±0.23	4±0.38
3	Scopolamine Hydro bromide 0.3 mg/kg+ Piracetam 200 mg/kg	10.38±10.38***	13±0.82***
4	Scopolamine Hydrobromide 0.3 mg/kg + *Alternanthera sessilis* aqueous extract 125 mg/kg	11.63±11.63***	11±0.82***
5	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* aqueous extract 250 mg/kg	13.38±13.38***	12±0.65***
6	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* aqueous extract 500 mg/kg	15.88±15.88***	13.5±1.17***
7	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* alcoholic extract 125 mg/kg	10.88±10.88***	10±1.0***
8	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* alcoholic extract 250 mg/kg	12.75±12.75***	11.38±0.38***
9	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* alcoholic extract 500 mg/kg	13.75±13.75***	12.25±0.62***

** P<0.01,*** P<0.001*Vs* diseased control.
All values are mean± SEM (n=8).

Table:3 Effect of aqueous and ethanolic extracts of *Alternanthera sessilis* (Linn.) on time spent by the animal in an enclosed arm in an Scopolamine induced amnesic mice on day 2 and day 9.

Group. No	Treatment	Time spent by the animal in an enclosed arm(Day 2)	Time spent by the animal in an enclosed arm(Day 9)
1	Normal Control	56.63±0.66***	61.75±1.05***
2	Scopolamine Hydro bromide 0.3 mg/kg	25.88±0.79	27±0.82
3	Scopolamine Hydro bromide 0.3 mg/kg+ Piracetam 200 mg/kg	155.5±1.000***	149±0.5***
4	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* aqueous extract 125 mg/kg	127.13±0.69***	114±0.65***
5	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* aqueous extract 250 mg/kg	146.88±0.48***	140.75±1.18***
6	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* aqueous extract 500 mg/kg	161.13±0.85***	144±0.65***
7	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* alcoholic extract 125 mg/kg	109.25±0.90***	114.38±0.38***
8	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* alcoholic extract 250 mg/kg	128.88±0.64***	131±0.65***
9	Scopolamine Hydro bromide 0.3 mg/kg+ *Alternanthera sessilis* alcoholic extract 500 mg/kg	128.63±1.09***	138±0.65***

*** P<0.001 *Vs* diseased control.
All values are mean± SEM (n=8).

The extract treated group (VI – IX) of animals had a higher duration of time spent in the enclosed arms when compared to the induction group of animals. The duration of time spent was very high as compared to normal group (group I) animals. These results were comparable to that of the standard and it is shown in table 3.

4.0 DISCUSSIONS

Alzheimer's disease is a progressive and fatal neurodegenerative disorder manifested by cognitive and memory deterioration, progressive impairment of routine activities of living, and a variety of neuropsychiatry symptoms and behavioral disturbances [5-8]. The clinical features of alzheimer's disease are an amnesic type of memory

impairment, deterioration of language and visuospatial deficits. Motor and memory abnormalities, gait disturbances and seizer are uncommon until the late phases the disease. Despite the severity and high prevalence of this disease, allopathic system of medicine is yet to provide a satisfactory antidote. There fore, we were motivated to explore the new approach in Indian traditional system to manage this deadly disease, alzheimer's disease.

Alternanthera sessilis Linn, commonly known as sessile joy weed a well known herb with fleshy leaves. The herb is mainly used as cholagogue, galactogue, intellect promoting, strength, diarrhea, constipation, leprosy, skin disease and dyspepsia. In the plus maze test, Transfer latency on day 1 and day 2 are taken as acquisition and retrieval, respectively. Both the aqueous ad ethanolic extracts of aerial parts of *Alternanthera sessilis* at three different doses (125 mg/kg, 250 mg/kg and 500 mg/kg) and the standard drug, Piracetam (200 mg/kg) reduced Transfer latency on day 2 and day 9 and significantly reversed scopolamine- induced amnesia, suggesting an underlying cholinergic mechanism. The finding of the present investigation indicated that aqueous and ethanolic extracts of *Alternanthera sessilis* Linn. can be regarded as a nootropic agent in the view of its facilitatory effect on the retention of acquired learning and retention.

The increase in the number of entries in to an enclosed arm and duration of occupancy in the enclosed arm for the extracts and standard treated groups further confirmed the nootropic potential of *Alternanthera sessilis* Linn. Results showed significant improvement in the retention ability of the normal and amnesic mice as compared to their respective controls. The data emanated in the present study suggests improvement of Gamma Amino Butyric Acid (GABA) in the nootropic activity of ethanolic and aqueous extracts obtained from *Alternanthera sessilis* Linn.

5.0 CONCLUSION

In conclusion, we observed that both aqueous and ethanolic extracts of aerial parts of *Alternanthera sessilis* Linn. possess significant nootropic potential. The facilitation of cholinergic system or inhibition of acetyl choline esterase enzyme is responsible for the nootropic activity.

6.0 REFERENCES:

1. Frank, B. and Gupta, S.A.,. A review of antioxidants and Alzhemer's disease. *Annals of clinical Psychiatry*. 2005, 17, 269-286.
2. Melzer. D., New drug treatment for Alzheimer's disease: lessons for healthcare policy. *BMJ*. 1998, 316, 762–764.
3. Schulz, V.,. Ginkgo extract or cholinesterase inhibitors in patients with dementia: what clinical trials and guidelines fail to consider. *Phytomedicine*. 2003, 10, 74–79.
4. Small, G.W., Robins, R.V., Barry, P.P., Buckholts, N.S., Dekosky, S.T., Ferris, S.H., Finkel, S.I., Gwyther, L.P., Khachaturian, Z.S. and Lebowitz, B.D.. Diagnosis and treatment of Alzheimer's disease and related disorders. Consensus statement of the American Association for Geriatric Psychiatry, the Alzheimer's Association, and the American Geriatrics Society. *JAMA*. 1997, 278**,** 1363–1371.
5. Parle, M., Dhingra, D. and Kulkarni, S.K. Improvement of mouse memory by *Myristica fragnans* seeds. *J. Med. Food*. 2004, 7, 157-161.
6. Parle, M. and Dhingra, D. Ascorbic acid: a promising memory enhancer in mice. *J.Pharmacol.Sci*. 2003, 93. 129-135.
7. Parle, M. and Singh, N. Animal models for testing memory. *Asian Pac. J. Pharmacol*. 2004, 16, 101-120.
8. Parle, M., Vasudevam, M. and Singh, N. Swim everyday to dementia away. *J. Soprt Sci. Med*. 2005, 4, 37-46.
9. Itoh, J., Nabeshima, T. and Kameyama, T. Utility of an elevated plus-maze for the evaluation of memory in mice; effects of nootropics, scopalmine and electroconvulsive shock. *Psychopharmacology*. 1990, 101, 27-33.
10. Bhattacharya, S.K, Vikas Kumar, P.N., Singh, A.V. and Muruganadam. Effect of Indian *Hypericum perforatum* Linn. on animal models of cognitive dysfunction. *Journal of Ethnopharmacology*. 2000, 72, 119-128.