Vol. 5/1 (2005) 59 - 62

JOURNAL OF NATURAL REMEDIES

Nootropic activity of *Moringa oleifera* leaves

M. Mohan, N. Kaul, A. Punekar, R. Girnar, P. Junnare, L. Patil.

Department of Pharmacology, M. G. V's Pharmacy College, Panchavati, Nashik - 422003

Abstract

Objective: To study the nootropic activity of leaves of *Moringa oleifera*. Methods: Toluene–ethylacetate fraction of methanolic extract of *Moringa oleifera* (MOE) leaves was assessed for its nootropic activity using passive shock avoidance paradigm and elevated plus maze. MOE (50 and 100 mg/kg) was compared with Piracetam (100 mg/kg). Scopolamine (1 mg/kg) was used to induce cognitive dysfunction. The extract was also studied for its effect on gross behaviour. Results: MOE (50 and 100 mg/kg) significantly decreased Transfer Latency(TL) on Day 2. The extract reduced the latency to reach the SFZ and the number of mistakes. No adverse effects were observed upto a dose of 200 mg/kg. Conclusion: Thus the leaves of *Moringa oleifera* possess a potential for exploring the nootropic principle.

Key words: Nootropic, *Moringa oleifera,* passive avoidance, plus maze.

1. Introduction

Nootropics belong to a class of psychotropic agents with selective facilitatory effect on the cognitive functions of CNS such as intellectual performance, learning and memory [1]. There are extensive reports on the nootropic compounds of plant origin such as *Celestrus paniculatus* [2], *Baccopa monniera* [3], *Centella asiatica* [4] and *Lawsonia inermis* [5].The roots of *Moringa oleifera* (Lam. Moringaceae) are bitter, acrid thermogenic, digestive, carminative, anthelmintic, constipating, anodyne, anti-inflammatory. The bark has antifungal and abortificient effects. The leaves are anti-inflammatory, anodyne, anthelmintic ophthalmic and rich in Vitamin A and Vitamin C. Seeds are useful in neuralgia, inflammations, intermittent fever and ophthalmology [6]. It also has antioxidant [7], hypotensive [8] and hepatoprotective effects [9].

However, reports on its neuropharma-cological studies are scanty. Therefore, the present study is aimed at exploring the nootropic effect of *Moringa oleifera* leaves.

2. Materials and methods

2.1 Preparation of extract

Shade dried leaves (0.5 kg) of *Moringa oleifera* (Moringaceae) collected locally was authenticated and defatted with petroleum

*Corresponding author

E.mail: mohan_mahalaxmi@indiatimes.com

ether (60-80°C) in soxhlet apparatus. The marc was dried and successively extracted with methanol. The methanolic extract (1.34% yield) was concentrated under vaccum below 40°C. It was extracted successively with toluene and ethylacetate (1:1) by column chromatography (0.26% yield). This fraction was used for study.

2.2 Animals

Albino mice (22-25g) were obtained from Serum Institute, Pune. Animals were housed into groups of five at an ambient temp of 25±1°C. Animals had free access to food (Hindustan Lever, India) and water. Animals were deprived of food but not water 4 h before the experiment. The Institutional Animal Ethical Committee approved the protocol of this study.

2.3 Drugs and chemicals:

Piracetam (Pirament-IPCA) and Scopolamine (Buscopan-German Remedies) were used for the study. The drugs and extract were dissolved in water for injection and were administered intra-peritoneally.

2.4 Behavioral paradigms

2.4.1 Passive Shock Avoidance Paradigm

The method used was essentially the same as described earlier [10]. Mice were placed individually on the electric grid and allowed to explore the maze for 1 min. The stimulus (20V) with AC current of 5mA was applied and latency to reach the shock free zone (SFZ) was recorded 3 consecutive times as a basal reading. Animals that reach the SFZ in 2 min in the first trial were selected for the study.

After 1 h of the first trial, each animal was put on the grid again and the latency to reach the SFZ and the number of mistakes (descents) the animal made in 10 min were recorded as parameters of acquisition and retention respectively (Day 1). Scopolamine (1 mg/kg) was injected intra-peritoneally 30 min after MOE or Piracetam. After 30 min the animals were placed on the grid and latency to reach SFZ and the number of mistakes were counted for 10 min. The same parameters were noted on the next day (Day 2)

2.4.2 Elevated Plus Maze

Mice were placed individually at the end of open arm facing away from the central platform and the time it took to move from open arm to either of the closed arm (Transfer latency, TL) was recorded [11]. On the first day, the mouse was allowed to explore the plus maze after the measurement of transfer latency. TL measured on the first and second day served as parameters for acquisition and retrieval respectively. All the drugs were administered 30 min before the first trial either alone or in combination.

2.5 Effect on gross behaviour

Mice of either sex were divided into 4 groups of 6 each. They were administered the extract at a dose of 50,100, and 200 mg /kg p.o and observed for gross behavioral changes. Animals were observed for activity, grooming, convulsions, sedation, and hypothermia for 4 h after the extract was administered.

2.6 Statistical analysis

All values are shown as mean ± SEM. The results were statistically analyzed using one way analysis of variance followed by Dunnett's test. P values < 0.05 were considered significant.

3. Results and discussion

In passive shock avoidance paradigm MOE (100 mg/kg) significantly ($P<0.05$) reduced the latency to reach SFZ on Day 1 and the number of mistakes on both the days. Piracetam (100 mg/kg) significantly reduced the latency to reach the SFZ and the number of mistakes. Scopolomine (1mg/kg) significantly increased the latency to reach the SFZ and the number of mistakes both on the first and the second day. Piracetam also antagonized the cognitive dysfunction induced by Scopolomine. MOE

Table 1
Effect of MOE of leaves of *Moringa oleifera* on Passive shock avoidance paradigm.

Sl. No.	Treatment (mg/kg)	Latency to reach SFZ (secs)		No of mistakes in 10 min	
		Day 1	Day 2	Day 1	Day 2
1	Vehicle	15 ±1.12	11 ± 1.14	12.3 ± 2.66	25.33 ± 0.94
2	Piracetam (100)	8 ± 1*	4.66 ± 0.38	6.5 ± 1.53*	10 ± 1.32*
3	Scopolamine (1)	23.25 ± 0.59	29.5 ± 6.99*	18.75 ± 1.61*	19.75 ± 3.39
4	MOE (50)	11.66 ± 0.72	10.66 ± 0.57	4 ± 0.66*	5 ± 0.12 *
5	MOE (100)	9 ± 0.25*	8 ± 0.66	0.25 ± 0.12*	6.5 ± 1.39 *
6	Piracetam (100) + Scopolamine (1)	9 ± 1.06*	23.5 ± 5.48	9.5 ± 0.53	9.5 ± 2.29 *
7	MOE (50) + Scopolamine (1)	10 ± 1.77*	16 ± 2.61	0.25 ± 0.12*	10.33 ± 0.62*
	F	27.34	6.29	24.87	17.71

n = 5, * P < 0.05 ANOVA followed by Dunnett's test.

Table 2
Effect of MOE of leaves of Moringa oleifera on Transfer Latency (TL) on Elevated plus maze apparatus

Sl. No.	Treatment (mg/kg)	Transfer Latency (TL) (secs)	
		Day 1	Day 2
1	Vehicle	17.5 ±2.10	9.25 ± 1.62
2	Piracetam (100)	8.25 ± 0.80*	5.5±0.47*
3	Scopolamine (1)	20 ± 4.09	6 ± 0.35
4	MOE (50)	9.66 ± 1.12	4.66 ± 0.52*
5	MOE (100)	11.25±2.63	4.75± 0.24*
6	Piracetam (100) + Scopolamine (1)	16.5± 1.23	5.5 ± 0.17*
7	MOE (50) + Scopolamine (1)	9.25± 0.82	7.75 ± 1.38
	F	4.79	3.84

n = 5, * P < 0.05 ANOVA followed by Dunnett's test.

(50 mg/kg) antagonized the effects of Scopolomine.

Additional evidence for the nootropic activity was obtained from the studies on elevated plus maze. Scopolomine increased the TL on the first day. Piracetam significantly shortened the TL on the first and the second day and also antagonized the effect of scopolamine. MOE (50 mg/kg) significantly (P<0.05) reduced the TL on the second day. It also antagonized the effect of Scopolamine .

The present study indicates that the leaves of *Moringa oleifera* possess nootropic effect in view of its facilitatory effect on retention and acquired learning. Despite extensive research, the neurological basis of learning and memory remains controversial.

Although involvement of central cholinergic system is well established the role of other neurotransmitter systems cannot be ignored. The shortening of TL by Piracetam as well as MOE indicates improvement of memory which is in accordance with the nootropic activity, namely improvement of memory in accordance with the hypothesis with Itoh *et al* [11].

Both Piracetam and MOE meet the major criteria for nootropic activity, namely improvement of memory in absence of

cognitive deficit [12].

Further investigations using more experimental paradigms are required for further confirmation of nootropic actions of leaves of *Moringa oleifera*.

4. Acknowledgement

The authors are thankful to Prof. V. M. Aurangabadkar, Principal, M.G.V's Pharmacy College, Nashik, for providing the necessary laboratory facilities and Dr V.S. Kasture for her continuous support and encouragement.

References

1. Giurgea C. (1973) *Cond Reflex,* 8:108-115.

2. Nalini K *et al.* (1995) *J. Ethnopharmacology,* 47: 101-108.

3. Dhawan BN. (1995) In: Koslow SH, Murthy RS, Coelho GV,(eds). Decade of the brain: India/ USA research in mental health and Neurosciences Rockville: National Institute of Mental Health, 197-202

4. Apparao MVR, Srinivasan K, Rao K. (1978) *J. Res. Ind. med.* 8:9-16

5. Iyer MR, Pal SC, Kasture VS, Kasture SB. (1998) *Indian J. Pharmacol.* 30:181-85

6. Orient Longmann. (1995) *Indian Medicinal Plants,* 4: 59

7. Ashokkumar N. (2003) *J. Medicinal Food,* 6(3): 255-259

8. Faizi S, Siddiqui BS. (1998) *Planta Medica,* 64 (3): 225-228.

9. Pari L. (2002) *J. Medicinal Food,* 5(3): 171-177

10. Kulkarni SK, Verma A. (1992) *Indian J. Physiol and Pharmacol.* 36: 29-34

11. Itoh J, Nabeshima T, Kameyama T. (1990) *Psychopharmacol,* 101: 27-33

12. Poschel BPH. (1998) In: LL Iversen, Sd Iversenand SH Synder. (Eds.) *Handbook of Psychopharma- cology.* New York: Plenum Press; 20: 437