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RESEARCH ARTICLE

PHARMACOGNOSY

COMPARATIVE NOOTROPIC EFFECT OF *EVOLVULUS ALSINOIDES* AND *CONVOLVULUS PLURICAULIS.*

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ABSTRACT

The aim of the present study was to highlight the comparative nootropic effects of *Evolvulus alsinoides* and *Convolvulus pluricaulis* using two validated models of memory namely jumping box and elevated plus maze. *Evolvulus alsinoides* and *Convolvulus pluricaulis* are regarded as the botanical source of Shankhpushpi along with *Clitorea ternatea* and *Canscora decussata*. Shankhpushpi, an important drug of indigenous system of medicine is known as a brain tonic, alterative and laxative. However various authors on Indian medicinal plants have different opinion about its correct botanical source.

Rats were treated orally with vehicle (2% Tween 80 suspension), standard treatment (Piracetam, 200mg/kg body weight), alcoholic extracts of *Evolvulous alsinoides* and *Convolvulus pluricaulis* (250mg/kg body weight) respectively, one hour prior to the evaluation of behavioral parameters. The results indicate that alcoholic extracts of *Evolvulous alsinoides* exhibited superior nootropic activity as compared to *Convolvulus pluricaulis* in terms of time spent in the enclosed arm in plus maze model and the mean avoidance response on the jumping box model

KEYWORDS

Shankhpushpi, *Evolvulous alsinoides*, *Convolvulus pluricaulis,,* Nootropic, Plus maze, Jumping Box.

INTRODUCTION

Recent years have seen a sudden surge in an array of mental illnesses such as dementia and other memory related disorders. Stressful lifestyle in this competitive world may be the root cause. Mental illnesses have always been intriguing for the researchers and their treatment a challenge. Allopathic psychoactive drugs have been the main stay of treating mental illness in India and world wide. However experiences with these drugs have always not been satisfying. To compound to this, the associated side effects become detrimental to their use [2,5,9].

Hence, the need of psychotropic drugs belonging to traditional health care system arose[9] .

Dementia or loss of memory has gripped human population world over and it has become an important area of research interest.

Ageing is known to deteriorate memory in human beings. Learning and memory can be conceived as both a psychological process as well as a change in synaptic neural connectivity. Learning is defined as the acquisition of information and skills. Subsequent retention of that information is called memory[12] .

Nootropics are a class of psychotropic drugs with selective facilitatory effect on integrative functions of the central nervous system, mainly on intellectual performance, learning capability and memory. Nootropic drugs such as piracetam and donezipil are being used for improving memory, mood and behavior but as with all other psychotropic drugs, the resulting side effects associated with them pose a major hurdle. The Indian traditional system of medicine offers a number of safe treatments for central nervous system related disorders such as anxiety and memory loss. These nature derived treatments are effective and devoid of any untoward effects.

Shankhpushpi is used to treat various brain disorders and problems like insomnia, loss of memory, mental as well as physical fatigue. It is one of the most well known and widely used medicines to improve memory. It is also used to treat anxiety and stress disorders [3,10].However, controversy still reigns regarding its botanical identity. Descriptions given in ayurvedic texts and in various other literatures suggest a number of plant species being used under the name shankhpusphi. Literature, coupled with the existence in various drug markets, the following plant species are regarded as shankhpushpi [6,8].

a) *Evolvulous alsinoides.* Linn.
b) *Convolvulus pluricaulis.* Choisy
c) *Clitorea ternatea.* Linn
d) *Canscora decussate.* Schultz

Aim

The present work aims at comparing the two plant sources of Shankhpushpi- *Evolvulous alsinoides* and *Convolvulus pluricaulis* for their nootropic effects using two different models for memory evaluation.

MATERIALS AND METHOD

Plant Material Collection and Extraction

Dried whole plant was procured from Tirunelveli, Tamil Nadu (M/S Chelladurai) and authenticated by Department of Botany, Forest Research Institute, Dehradun.

The plant material was pulverized to a coarse powder and subjected to soxhlet extraction. The solvent used was ethanol (95%). A viscous sticky mass was obtained which was dried further by heating on a water bath. Suspension of the extracts was prepared using Tween 80 as suspending agent.

Animals

Adult albino wistar strain rats (80 ±20 Gms) of either sex were procured and were grouped randomly. The rats were acclimatized for one week in the animal house facility. They were housed in polypropylene cages at an ambient temperature of 25±1°C with a natural dark-light cycle. They had free access to standard pellet diet and water given *ad libitum.* All experiments were conducted in the forenoon (9:30 AM to 1:00 PM).

The study was approved by institutional ethics committee (CPCSEA registration no.- 1156/ac/07/CPCSEA).

Drugs/ Chemicals

a) Standard drug- Piracetam (Nootropil®,UCB)
b) Ethanol 95%
c) Tween 80

Treatment groups

All the groups received the vehicle, standard drug and plant extract one hour prior to each experiment. Overnight fasted animals were selected and divided into groups of six animals each .

a*) Control group*- Control animals were treated with 1 ml of vehicle(tween 80 suspension) for seven consecutive days.

b) *Standard group*- Standard group was treated with piracetam(200mg/kg body weight)

c) *Treatment group I*- Animals in this group were fed with alcoholic extracts of *Evolvulus alsinoides* suspended in tween 80, per oral at a dose level of 250 mg/kg body weight for seven consecutive days.

d) *Treatment group II*- Animals in this group were fed on alcoholic extracts of *Convolvulus pluricaulis* suspended in tween 80 per oral at a dose level of - 250 mg/kg body weight for seven consecutive days.

Experimental Procedure

Elevated plus maze [1,4,7,11] .

Rats have an aversion for open-high spaces and prefer enclosed arm then the open arm. They spend more time in enclosed arm. Nootropic agents improve the acquisition process in rats subsequent to training session. Rats avoid open arm exploration and prefer enclosed arm

The plus maze has two opposite arms 50 X 10 cms, crossed with two enclosed arms of the same dimensions with walls 40 cms high. The arms were connected with a central square 10 X 10 cms, giving the apparatus a plus sign appearance. The maze was elevated at 50cms above the floor in a dimly lit room. Naïve rats were placed individually in the center of the maze facing towards an enclosed arm. Initially they were allowed to explore the maze. During the next 5 minute the number of entries and the time spent on the open arm and the enclosed arm were recorded. An arm entry was defined when all four limbs were on the arm.

Jumping box [7,11]

This test was used to evaluate the nootropic potential of the plant extracts. It comprises of a acrylic shuttle avoidance box (50 X 25 X 25 cms) whose floor is made of a series of 1mm caliber parallel bronze bars divided at the mid line by a 1m high acrylic hurdle. The conditioned stimulus was a 5 second, 70 decibel, 1 kilohertz buzzer. Each sound was immediately followed by an unconditioned stimulus of 2 seconds, 0.5 miliampere foot shock. Training and test sessions were procedurally identical. Rats are allowed to explore the box freely for 3 to 5 minutes after which they received foot shock trials with an inter trial interval of 10 to 50 seconds. Each animal was subjected to an experimental session of ten cycles .Each cycle had a total duration of sixty second and started with a conditioning warning stimulus which was terminated by a correct avoidance response i,e ,electric shock. The aversive stimulus was terminated by a correct escape response i.e, jumping into the other compartment. Rats avoided shocks by crossing the hurdle during the buzzer sound (conditioned response).

Statistical Analysis

The data obtained from each response was subjected to statistical analysis. The data are expressed as mean ± SEM for each treatment group.

RESULTS AND DISCUSSIONS

In the plus maze test, the rats treated with alcoholic extract of *Evolvulus alsinoides* and *Convolvulus pluricaulis* showed nootropic effect in terms of significant increase in the time spent in enclosed arm than open arm after their training sessions. This was found comparable to the standard drug and very significant as compared to the control group. However the number of entries in the enclosed arm was less for E*volvulus alsinoides* when compared with the group treated with alcoholic extract of *Convolvulus pluricaulis* (Table I, Figure 1a& 1b).

In jumping box, the second paradigm for evaluating nootropic effect, the conditioned avoidance response of rats was measured at the end of each treatment day for seven days. The alcoholic extract of *Evolvulus alsinoides* exhibited a significant increase in avoidance response which was comparable to the standard. This was found to be superior to that of the alcoholic extract of *Convolvulus pluricaulis* and control group suggesting a significant nootropic activity of alcoholic extract of *Evolvulus alsinoides* when compared to alcoholic extract of *Convolvulus pluricaulis* (Table II)

TABLE I

Effect of Evolvulus alsinoides and Convolvulus pluricaulis on elevated plusmaze behavior in rats.

Treatment	Dose(mg/kg body wt)	Time spent on (sec.)		No. of entries on	
		Enclosed arm	Open arm	Enclosed arm	Open arm
CONTROL	2% tween 80	240±6.583	60±6.583	3.3±0.21	3.3±0.2108
STANDARD	200	284.66±2.011	15.33±2.011	2.16±0.16	1.66±0.2108
EVOLVULUS ALSINOIDES	250	285.66±1.801	13.333±1.174	2.16±0.16	1.33±0.2108
CONVOLVULUS PLURICAULIS	250	276±2.898**	24±2.898**	2.33±0.2108	3.5±0.2236

n= 06,p values : <0.001 is significant and <0.0001 is extremely significant, at 95% confidence interval

Figure 1a

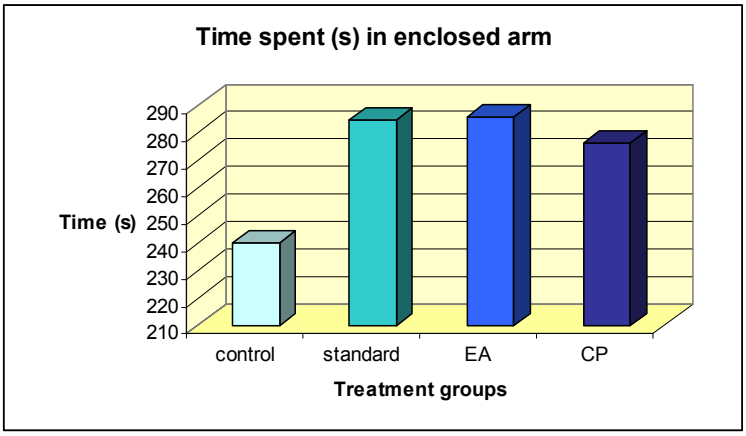


Figure 1b

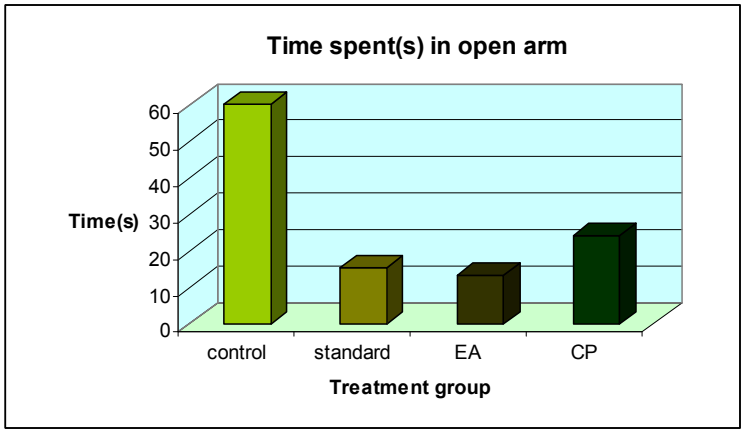


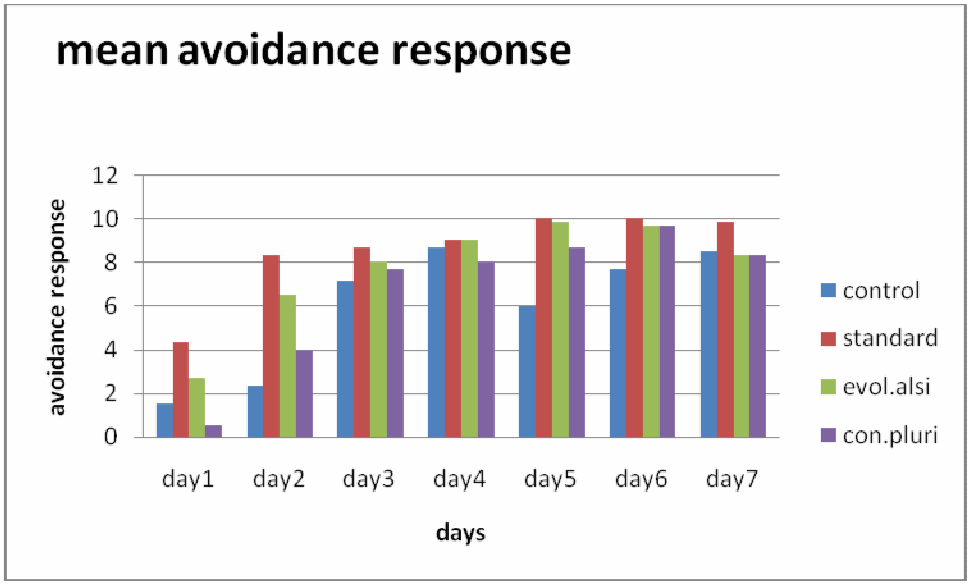
TABLE II

Effect of Evolvulus alsinoides and Convolvulus pluricaulis on conditioned avoidance behaviour using jumping box.

Treatment	Dose(mg/kg body wt)	Mean avoidance response						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
CONTROL	2% tween 80	1.55	2.33	7.17	8.67	6.00	7.67	8.50
STANDARD	200	4.33	8.33	8.67	9.00	10.00	10.00	9.83
EVOLVULUS ALSINOIDES	250	2.67	6.50	8.00	9.00	9.83	9.67	10.00
CONVOLVULUS PLURICAULIS	250	0.50	4.00	7.67	8.00	8.67	9.67	8.33

n= 06,SEM- 0.963,$CD_{\alpha\text{-}0.05}$- 1.890,$CD_{\alpha\text{-}0.01}$-2.481

Figure 2a



CONCLUSION

Nootropic activity was found to be significantly pronounced with both the reported species of shankhapushpi: Evolvulus *alsinoides* (alcoholic extract) and convolvulus pluricaulis (alcoholic extract) when compared to control group on both the models of evaluation. However, the results are indicative that alcoholic extract of *Evolvulus alsinoides* exhibits a potentially superior nootropic effect as compared to alcoholic extract of *convolvulus pluricaulis.* The results may be path breaking to resolve the controversy surrounding the botanical identity of the ayurvedic brain tonic-shankhpushpi.

Marketed samples of memory booster tonic shankhpushpi from different manufacturers have different shankhpushpi sources. Himalayan drug company's brand Mentat® contains *Evolvulus alsinoides* as a source of shankhpushpi whereas Brainokan® of Kangra Herbs contains Convolvulus *pluricaulis* as a source of shankhpushpi .similarly Medhavati® of Patanjali ayurveda contains *Convolvulus pluricaulis* as a source of shankhapushpi besides other ingredients.

The result indicates that there is a dire need of comparative evaluation of the nootropic potential of all the reported species of shankhpushpi and to identify the best taxa amongst all, with regards to cognitive functions.

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