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Anti-anxiety and anti-depressant activities of *Sarasvata choorna* in experimental animals

Kshama Gupta[1], B. K. Ashok[2], B. Ravishankar[3], A. B. Thakar[4]

[1]Lecturer, Department of Kaya Chikitsa, Guru Nanak Ayurvedic Medical College and Hospital, Muktsar, Punjab, [2]Research Assistant, Pharmacology Laboratory, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, Gujarat, [3]Director, Research and Development, SDM Research Centre for Ayurveda and Allied Sciences, Udupi, Karnataka, [4]Associate Professor and I/C Head, Department of Panchakarma, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, Gujarat, India

Abstract

The present study was undertaken to evaluate the anxiolytic and anti-depressant activity of *Sarasvata choorna*. The anxiolytic activity was evaluated in elevated plus maze (EPM) and the anti-depressant activity was evaluated in forced swimming test (FST). The efficacy of *Sarasvata choorna* was compared with the standard anti-anxiety (diazepam 2 mg/kg) and anti-depressant (imipramine – 5 mg/kg) drugs. It was observed that *Sarasvata choorna* at the dose of 390 mg/kg is as effective as standard drugs used in anti-anxiety and anti-depressant activities in mice by increasing time spent in open arm and entries to open arm in EPM model and increasing immobility time in FST model respectively. Hence it can be concluded that *Sarasvata choorna* may be used as a potent therapeutic agent in treating anxiety and depressive disorders.

Key words: Anxiolytic, anti-depressant, elevated plus maze, imipramine, *Sarasvata choorna*

Introduction

Experience of mental illness is as old as human existence. Studies have reported that anxiety and depression may occur together with the association of sub threshold depressive symptoms.[1] Anxiety may also predispose depression or symptoms of anxiety and depression may be external manifestations of one under cause. Thus, depression and anxiety issues are difficult enough to deal without the added concern of side effects and cost. Though several drugs are available, many are associated with some limitations and also drugs having properties to combat both anxiety and depression are very few.

Sarasvata choorna is a compound Ayurvedic formulation mentioned in classical text *Bhaishajya Ratnavali*[2] for the treatment of various psychiatric illness. This formulation contains plants with proven psychotrophic activity like *Acorus calamus* Linn.,[3,4] *Saussurea lappa* (Falc.) Lipsch.,[5] *Withania somnifera* (L.) Dunal.,[6] *Carum carvi* Linn.,[7] *Convolvulus pluricaulis* Forsk.,[8-10] *Bacopa monnieri*(Linn.) Pemmell.[11-13] *Zingiber officinale* Rosc.[14] *etc*., in a variety of animal models.

Address for correspondence: Dr. Kshama Gupta, Lecturer, Departmentt of Kaya Chikitsa, Guru Nanak Ayurvedic Medical College and Hospital, Near Ajit Cinema Barkandi Road, Muktsar, Punjab 152026, India. E-mail: drkshamagupta@gmail.com

Despite considerable literature available on some components of this formulation, there is no known data regarding the pharmacological evaluation on anti-anxiety and anti-depressant activities. Thus, this study was aimed to compare the effects of *Sarasvata choorna* for both anxiety and depression in experimental animal models.

Materials and Methods

Animals

Swiss albino mice (24 ± 04 g) of either sex were procured from animal house attached to the institute and they were housed in the groups of six under the standard laboratory conditions (Temp. 23 ± 2°C, relative humidity 50-60% and lighting 08.00-18.00 h), with food (Amrut brand) and water *ad libitum*. Tests were performed only after the animals had acclimated to the laboratory conditions for at least seven days and the experiments were performed during morning hours (08.00-11.00 h). The experimental protocol was approved by institutional animal ethics committee (IAEC 05/09-10/Ph.D.04).

Test drug

The raw materials [Table 1] of the test formulation were collected from Pharmacy, Gujarat Ayurved University and were subjected to pharmacognostical studies for authenticating them. From the raw materials, the test formulation *Sarasvata choorna* was prepared following the classical guidelines.[15] The

Table 1: Formulation composition of *Sarasvata choorna*

Ingredients	Botanical name	Part used	Quantity
Vacha	*Acorus calamus* Linn.	Rhizome	11 Parts
Kushta	*Saussurea lappa* (Falc.) Lipsch.	Root	1 Part
Ashvagandha	*Withania somnifera* (L.) Dunal.	Root	1 Part
Ajamoda	*Apium graveolens* Linn.	Fruit	1 Part
Sweta Jeeraka	*Cuminum cyminum* Linn.	Fruit	1 Part
Krishna Jeeraka	*Carum carvi* Linn.	Fruit	1 Part
Sunti	*Zingiber officinale* Rosc.	Rhizome	1 Part
Maricha	*Piper nigrum* Linn.	Fruit	1 Part
Pippali	*Piper longum* Linn.	Fruit	1 Part
Patha	*Cissampelos pareira* L. Var.	Root	1 Part
Shankhapushpi	*Convolvulus pluricaulis* Forsk.	Whole plant	1 Part
Brahmi	*Bacopa monnieri* (Linn.) Pemmell.	Whole plant	Q.S*
Saindhava lavana	Rock salt	–	1 Part

*Q.S - Quantity sufficient to give *Bhavana* for three times

vehicles, honey and ghee were purchased from local market of reputed brands. Test drug and vehicles were administered one hour prior to the experiment as a single dose in the morning session between 8:00 and 9:00 am.

Dose selection

The dose fixation for the experimental animals was done on the basis of body surface area ratio by referring to the standard table of Paget and Barnes (1969).[16] On this basis, the mice dose was found to be 390 mg/kg. The test drug was made to suspension in unequal quantity of honey and ghee as advocated in classics,[15] with suitable concentration depending upon body weight of animals and administered orally to overnight fasted animals with the help of gastric catheter sleeved to syringe.

Treatment schedule

The animals were divided into four groups consisting of six animals in each. Group I received water served as normal control (WC), group II received vehicle and served as vehicle control (VC), group III received *Sarasvata choorna* in the dose of 390 mg/kg and group IV received standard drug diazepam (2 mg/kg) for anxiolytic study and antidepressant imipramine (5 mg/kg) for anti-depressant activity.

Elevated plus maze

The plus-maze apparatus, consisting of two open arms (16 × 5 cm) and two closed arms (16 × 5 × 12 cm) having an open roof, with the plus-maze elevated (25 cm) from the floor used to observe anxiolytic behavior in mice. Mice were given a single oral dose of the vehicle, test drug and standard drug one hour before their placement on the Elevated plus maze (EPM). Dose administration schedule was adjusted so that each mouse took its turn on the elevated plus-maze apparatus one hour after administration of the dose. To begin a test session, mice were placed on the open arm facing the center of the maze. An entry into an arm was defined as the animal placing all four paws over the line marking that area. The number of entries and the time spent in the open and closed arms were recorded during a 5-min test period. During the entire experiment, mice were allowed to socialize. Every precaution was taken to ensure that no external stimuli, other than the height of the plus-maze could invoke maze anxiety.[17]

Behavioural despair test

Behavioural despair test is the most frequently used Behavioural model to test for antidepressant activity by *Porsolt et al.*,[18] Mice were forced to swim individually in a glass jar (25 × 12 × 25 cm^3) containing fresh water to a height of 15 cm and maintained at 25° ± 2°C. After an initial 2-min period vigorous activity, each animal assumed a typical immobile posture. A mouse was considered to be immobile when it remained floating in the water without struggling, making only minimum movements of its limbs necessary to keep its head above water. The total duration of immobility was recorded during the next 4 min of a total 6 min test. The changes in immobility periods were studied after administering drugs in separate groups of animals. Each animal was used only once.

Statistical analysis

Results from the pharmacological screening were expressed as mean±SEM. Difference between the control and treatments in the experiments were tested for significance unpaired Student's '*t*' test. Values of $P<0.05$ were considered as statistically significant.

Results

Sarasvata choorna significantly increased the latency of first entry to closed arm and number of entries from closed to open arm and non-significantly increased the time spent in open arm in comparison to control group. Further in comparison to vehicle control group, it significantly increased the number of entries from closed to open arm and non-significantly increased the latency of first entry to closed arm. Diazepam at a dose of 2 mg/kg significantly increased the time spent in open arm and non-significantly increased the latency of first entry to closed arm and number of entries from closed to open arm [Table 2].

Treatment with *Sarasvata choorna* and imipramine significantly reduced the immobility duration of mice in comparison to control group. Further in comparison to vehicle control, *Sarasvata choorna* non-significantly reduced the immobility duration [Table 3].

Discussion

Elevated plus maze is a model which uses the natural fear of rodents to avoid open and elevated places.[19] The conventional plus maze is highly sensitive to the influence of both anxiolytic and anxiogenic drugs acting at the GABA- benzodiazepine complex.[20] In this model, naive mice will normally prefer to spend much of their allotted time in the closed arms. This preference appears to reflect an aversion toward open arms

Table 2: Effect of *Sarasvata choorna* on elevated plus maze in mice

Groups	Latency of first entry to closed arm (s)	Time spent in open arm (s)	Number of entries from closed to open arm
WC	16.70 ± 06.40	25.50 ± 09.84	1.20 ± 0.44
VC	27.75 ± 06.44	62.25 ± 20.23	1.50 ± 0.42
Sarasvata choorna (390 mg/kg)	45.50 ± 09.06*	63.80 ± 19.83	2.83 ± 0.40*¶
Diazepam (2 mg/kg)	26.50 ± 09.75	136.67 ± 27.77**	2.50 ± 1.06

*P<0.05 (compared with WC), ¶P<0.05 (compared with VC)

Table 3: Effect of *Sarasvata choorna* on behavioural despair in mice

Groups	Immobility time (s)
WC	155.18 ± 04.23
VC	142.66 ± 16.86
Sarasvata choorna (390 mg/kg)	100.00 ± 12.32**
Imipramine (5 mg/kg)	69.13 ± 13.94***

**P<0.01, ***P<0.001 (compared with WC)

that is generated by the fears of the open spaces. Drugs that increase open arm exploration are considered as anxiolytics and the reverse holds true for anxiogenics. As expected, diazepam produced significant increase in time spent in open arm and non-significantly increased number of entries from closed to open arm and latency of first entry. Pre-treatment with *Sarasvata choorna* also significantly increased number of entries from closed to open arm and latency of first entry and non-significantly increased in time spent in open arm. Thus the mechanism involved in observed anti-anxiety activity may be similar to that of diazepam.

Antidepressant effect on forced swimming model of depression provides a rapid and reliable behaviour screening test for anti-depressants. The model is valid for a broad spectrum of antidepressants mainly including tricyclics and MAO inhibitors, which significantly decrease immobility time in FST.[21] Immobility is thought to reflect either a failure to persist in escape directed behavior after persistent stress or the development of passive behavior that disengages the animal from active forms of coping with stressful stimuli.[22] Several antidepressants reduce the immobility after forced swimming.[23] In the present study, *Sarasvata choorna* significantly decreased the immobility time of mice in FST and is comparable with standard anti-depressant drug imipramine. The observed effect may be attributed to blockage of 5 –HT reuptake or MAO inhibition.

From the above observations, it can be concluded that *Sarasvata choorna* possesses both anxiolytic and anti-depressant activity and which is comparable with the standards. Being a poly herbal formulation, the observed activity profile may be attributed to one or more bioactive principles present in the different plants of this formulation. However, further studies are required to know the exact mechanism.

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हिन्दी सारांश

सारस्वत चूर्ण का चित्तोद्वेग एवं अवसाद विरोधी प्रभाव – एक प्रायोगिक अध्ययन

क्षमा गुप्ता, बी. के. अशोक, बी. रविशंकर, ए. बी. ठाकर

प्रस्तुत अध्ययन में सारस्वत चूर्ण के चित्तोद्वेग एवं अवसाद विरोधी प्रभाव का अध्ययन किया गया। चित्तोद्वेग विरोधी प्रभाव का एलीवेटेड प्लस मेज द्वारा तथा अवसाद विरोधी प्रभाव का फोर्स स्वीमिंग टेस्ट द्वारा परीक्षण किया गया। सारस्वत चूर्ण की कार्यक्षमता की तुलना मानक चित्तोद्वेग विरोधी औषधि डायजीपाम २ मि.ग्रा./कि.ग्रा. मात्रा से की गयी। चूहों के EPM प्रारूप में खुले मार्ग में प्रवेश व खुली भुजा में व्यतीत समय में वृद्धि एवं FST प्रारूप में जड़त्व काल में वृद्धि के आधार पर पाया गया कि सारस्वत चूर्ण ३९० मि.ग्रा./कि.ग्रा. की मात्रा में चित्तोद्वेग एवं अवसाद विरोधी मानक औषधियों के समान प्रभावी है। अतएव यह निष्कर्ष निकाला जा सकता है कि सारस्वत चूर्ण, चित्तोद्वेग एवं अवसाद जैसी व्याधियों की चिकित्सा में सफलता पूर्वक प्रयोग किया जा सकता है।