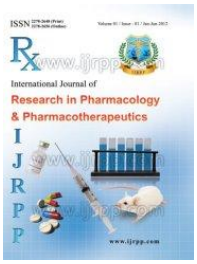
International Journal of Research in Pharmacology & Pharmacotherapeutics



ISSN Print: 2278-2648 ***IJRPP |Vol.4 | Issue 4 | Oct – Dec - 2015***
ISSN Online: 2278-2656 ***Journal Home page: www.ijrpp.com***

Research Article ***Open Access***

In vivo neurological assessment of serotonergic response of *Coriandrum sativum* L seeds in mice

Dr. Aslam Pathan*, Dr. Abdulrahman Alshahrani[1]

**Department of Clinical Pharmacology, College of Medicine, Shaqra University, Ministry of Higher Education, Kingdom of Saudi Arabia, Shaqra-11961*

[1]Department of Neurology, College of Medicine, Shaqra University, Ministry of Higher Education, Kingdom of Saudi Arabia, Shaqra-11961

***Corresponding Author: Dr. Aslam Pathan**

Email Id: dr.aslampathan@gmail.com

ABSTRACT

Ethnopharmacological relevance

Seeds of *Coriandrum sativum* L. have been used in the Indian traditional medicine to relieve stress and other neurological disease conditions.

Aim of the study

The present study was under taken to evaluate the anxiolytic effects of seeds of *Coriandrum sativum* L. Ethanolic Extract (CSEE) in mice.

Materials and methods

Seeds of *Coriandrum sativum* L. Ethanolic extract was screened for anxiolytic effect by using Rota rod test, Open field test and Hole board test at doses of 100 and 200 mg/kg. Distilled water and Diazepam were employed as negative and positive control groups, respectively.

Results

Anxiolytic like activity assessment of seeds of *Coriandrum sativum* L. Ethanolic Extract (CSEE) 200 mg/kg by using rota rod test shows significantly decrease in performance time (124) as compared to standard (110) and control (150) treatment group. While open field test of seeds of *Coriandrum sativum* L. Ethanolic Extract (CSEE) 200 mg/kg shows significantly decrease in number of square crossing (21) as compared to standard (15) and control (28) treatment group. Hole board test of seeds of *Coriandrum sativum* L. Ethanolic Extract (CSEE) 200 mg/kg shows significantly decrease in number of head dipping (09) as compared to standard (07) and control (14) treatment group

Conclusion

The results of this study established a support for the traditional usage of seeds of *Coriandrum sativum* L. as anxiolytic medicinal plant.

Keywords: Anxiolytic, Rota rod, Open field, Hole board, *Coriandrum sativum* L

INTRODUCTION

There are many indications that mental disorders such as depression and anxiety disorders are directly related to mechanisms of central synaptic transmission of serotonin (5-HT). 5-HT is a peripherally and centrally occurring transmitter, which is involved in regulation of anxiety-related behaviour [1,2] and mood, but mediates also learning, appetite, food intake, sexual behaviour, sleep and influences body temperature as well as motor activity [3].

Central serotonergic system

In mammals 5-HT is distributed throughout the body. About 5% are located in the central nervous system (CNS). After 5-HT was found in the CNS [4], detailed studies of the origin and projection areas of serotonergic neurons in the CNS began. Only about 500 000 neurons in the CNS use 5-HT as a transmitter, but serotonergic neurons have connections to almost all structures of the brain and show a high degree of axonal branching [5].

Anxiety and anxiety disorders

Fear or anxiety has protective functions to avoid situations that cause pain, injury or even death [6]. In man, fear is associated with arousal, characterized by symptoms such as restlessness, tremor, less α-waves and frequents α -waves in the electroencephalogram, tachypnea, and tachycardia, elevated systolic blood pressure, hyperemia of the skeletal muscles, decreased blood flow to the internal organs, hypermotility of the stomach, decreased salivation and mydriasis. Clinical studies however, found no uniform physiologic reaction pattern due to large individual differences [7]. It was found that the decrease in the frequency of α -waves in the electroencephalogram and the increase in finger tremor and respiratory rate correlated best with the perceived anxiety of the subjects. What about anxiety and fear in animals? If one assumes that fear is ... "an emotional reaction to the recognition or the recognition of a perceived threat, regardless of whether that risk is also a given objective" is considered [8] and that animals in an aversive environment or threatening situations show similar physiological symptoms as people, it can be expected that at least highly developed animals due to physiological and ethological homologies can feel anxiety or fear [9]. We are aware that anxiety and fear are human emotions. However, to ease reading also in relation to animals we speak of fear, anxious and less anxious behaviour. A distinction between pathological and "normal" anxiety is difficult. If, however, continued intense fear without real danger and threat perception occurs, or the fear response is "unreasonable" compared to the sources of threats, they get disease value. Anxiety disorders are among the most common mental disorders. Up to 15% of all people suffer during their life from an anxiety disorder (lifetime prevalence) [10]. Coriander (*Coriandrum sativum* L.), a member of the family Apiaceae, is among most widely used medicinal plant, possessing nutritional as well as medicinal properties. In our previous study seeds of *Coriandrum sativum* L. evaluated for analgesic (hot plate method), antidepressant (forced swim test), anxiolytic like activity (elevated plus maze, locomotor test) on mice, which shows significant effects [11,12]. In present study *Coriandrum sativum L.* seeds extract was assessed for anxiolytic like effect on albino mice.

MATERIALS AND METHODS

Experimental animals

Swiss albino mice of male sex weighing 22–28 g were used. Animals were maintained under standard conditions in an animal house approved by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). Institutional Animal Ethics Committee approved the experimental protocol. The animals were given standard diet. The animals had free access of standard diet and water and housed in a spacious cage for one week. Mice were housed in cages of 5 at 22 ± 1◦C in a 12- h light/dark cycle. Tap water and food pellets were available as libitum. Groups of 6–11mice were randomly assigned to different treatment groups and were tested in a counter balancing order. Animals were naive to experiment conditions. All experiments were carried out during night cycle of light and the experiments were carried out according to the National Research Council Guide for the Care and Use of Laboratory Animals [7]. All experiments were conducted in accordance with international standards of animal welfare recommended by the Society for Neuroscience [8]. The experimental protocol was approved by the Bioethical Committee on Animal Research. The minimum number of animals and duration of observations required to obtain consistent data were employed.

Drugs and Chemicals

The positive controls were: Diazepam (Calmpose Tablet, Ranbaxy, India) for anxiolytic activity purchased from respective source. Ethanol (Hi Media, India) propylene glycol (Hi Media, India) was purchased from the respective sources and was of analytical grade.

Treatment

The extract of *Coriandrum sativum* L. was freshly dissolved in distilled water to be acutely administered to the rats. Doses of the extract and the time intervals were determined in preliminary tests. Diazepam (3 mg/kg) was dissolved in 40% propylene glycol. Imipramine (10 mg/kg) was dissolved in distilled water. Negative control groups received only distilled water. All administrations were performed intraperitoneally (i.p.) in a dose volume of 1 ml/kg body weight. Thirty minutes after i.p. treatment, the animals were submitted to a battery of behavioral tests.

Source of Coriander Seeds

Dried seeds of coriander were purchased from local market in Shaqra (Saudi Arabia). The identity of the seed was confirmed by the Institutional Botanist. A voucher specimen was kept in laboratory for future reference.

Preparation of Aqueous Extract

Dried coriander seeds were homogenized to a fine powder. Hundred grams of powdered coriander was Infused in 500 ml cold ethanol for 24 h, brought to the boil, then removed from the heat source and allowed to infuse for 15 min. The extract was filtered, concentrated over the water bath and brought to dryness under vacuum. The yield of the extract was 7.9% (w/w).

Acute toxicity study

Acute toxicity study was performed using the limit test dose of 2000 mg/kg as described by Organization for Economic Cooperation and Development guideline and Interagency Research Animal Committee recommendation [9]. Six female mice were dosed sequentially and followed for any signs of toxicity and/ or death within 24 h and then for 14 days thereafter.

Rota rod

The effect on motor coordination was assessed using a rota-rod apparatus. Rota rod apparatus consisted of a base platform and an iron rod of 3 cm diameter and 30 cm length, with a non-slippery surface. This rod was divided in to four equal sections by three disks, and then enabling four mice to walk on the rod at the same time at the speed of 22 rpm observed over a period of 15, 30, 45, 75, and 90 min. Intervals between the mounting of the animal on the rod and falling off of it were recorded as the performance time. There after four mice were randomly selected to determine locomotor activity [10]. The effect on motor coordination was assessed using a rota-rod apparatus. In brief, mice were trained to remain for 5 min on the rod rotating at speed of 22 rpm.

Open field test

Each animal was placed into an acrylic cage (50 × 50 × 10 cm). The arena of the open field was divided into 25 squares, the 9 inner squares in the center and 16 squares in the periphery along the walls. Experimental room was a sound attenuated, dark room after 1hr of oral administration with vehicle, diazepam, and plant extract, animals were placed individually in one of the corner squares and number of rearings, assisted rearings and number of squares crossed were observed for 5 min [11].

Hole board test

The hole board is a white painted wooden board (40 cm x 40 cm) with four equidistant holes (1cm diameter x 2 cm depth). Using two thick colored lines which intersect at the centre, the board was divided into 4 equal sectional squares of 20 cm x 20 cm. Each mouse was placed in turn at one corner of the board with the animal subsequently moving about and dipping its head into the holes. The number of head dips and sectional crossings in 5 min. were recorded for individual mouse [12].

Statistical analysis

The statistical significance was assessed using one way analysis of variance (ANOVA) followed by Dunnet comparison test. The values are expressed as mean ± SEM and $p<0.05$ was considered significant.

RESULT

Acute toxicity test

At a single oral dose of 2000 mg/kg, seeds of *Coriandrum sativum* L. Ethanol Extract showed no signs of toxicity or death in mice within the first 24 h and during the 14 days observation period.

Rota rod test

The effects of CSEE on performance time are shown in table 1and figure 1. CSEE 200 mg/kg elicited significant decrease in performance time as compared to the control. Anxiolytic like activity assessment of seeds of *Coriandrum sativum* L. Ethanolic Extract (CSEE) 200 mg/kg by using rota rod test model shows significantly decrease in performance time (124) as compared to standard (110) and control (150) treatment group. The effect of treatment with CSEE on the performance time was dependent of the dose.

Open field Test

The effects of CSEE by using open field test are shown in table 2 and figure 2. CSEE 200 mg/kg elicited significant decrease in number of square crossing and number of head rearing count as compared to the control. Anxiolytic like activity assessment of seeds of *Coriandrum sativum* L. Ethanolic Extract (CSEE) 200 mg/kg by using rota rod shows significantly decrease in square crossing (21) and head rearing (07)as compared to standard (15) (05) and control (28) (11) treatment group respectively. The effect of treatment with CSEE on above count was dependent of the dose.

Hole board Test

The effects of CSEE by using hole board test are shown in table 3 and figure 3. CSEE 200 mg/kg elicited significant decrease in number of head dipping and line crossing count as compared to the control. Anxiolytic like activity assessment of seeds of *Coriandrum sativum* L. Ethanolic Extract (CSEE) 200 mg/kg by using rota rod shows significantly decrease in head dipping (09) and line crossing (22) as compared to standard (07) (19) and control (14) (34) treatment group respectively. The effect of treatment with CSEE on the above count was dependent of the dose.

Table1: Rota rod test in mice

Group	Dose (mg/kg)	Performance Time (Sec)			
		15 min	30 min	45 min	60 min
Control (distilled water)	-	150	132	112	97
Standard (Diazepam)	03	110	99	70	59
Test 1 CSEE	100	141	126	102	84
Test 2 CSEE	200	124	115	98	77

Table 2: Open field test in mice

Group	Dose (mg/kg)	Number of square crossed	Number of rearing
Control (distilled water)	-	28	11
Standard (Diazepam)	03	15	5
Test 1 CSEE	100	25	9
Test 2 CSEE	200	21	7

Table 3: Hole board test in mice

Group	Dose (mg/kg)	Number of head dipping	Number of line crossing
Control (distilled water)	-	14	34
Standard (Diazepam)	03	07	19
Test 1 CSEE	100	11	28
Test 2 CSEE	200	09	22

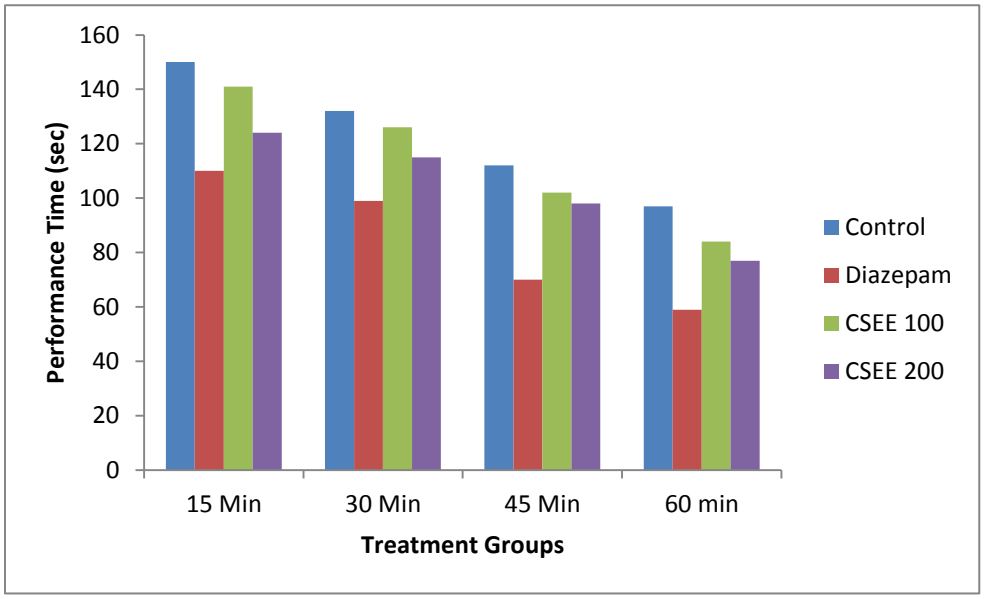


Figure 1: Rota rod test in mice

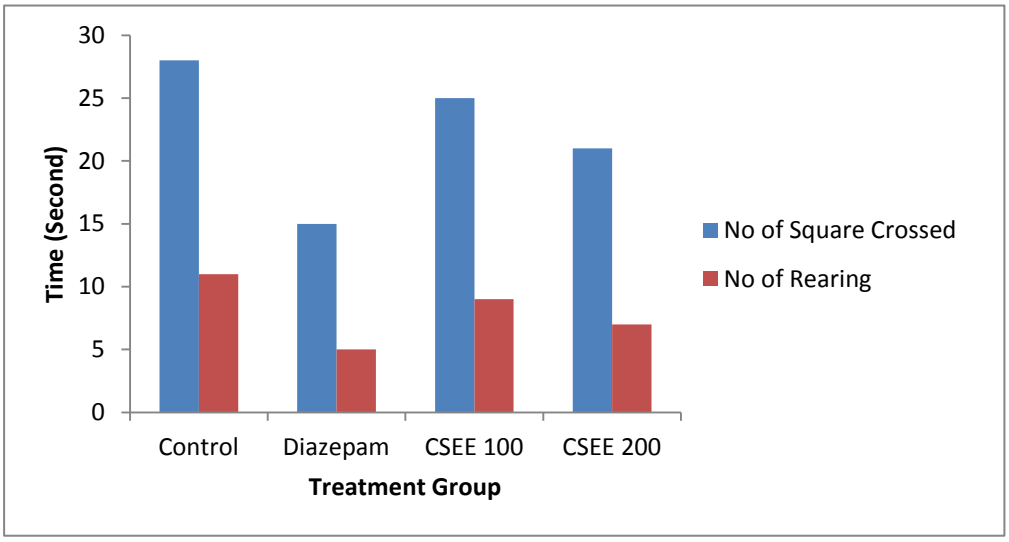


Figure 2: open field test in mice in mice

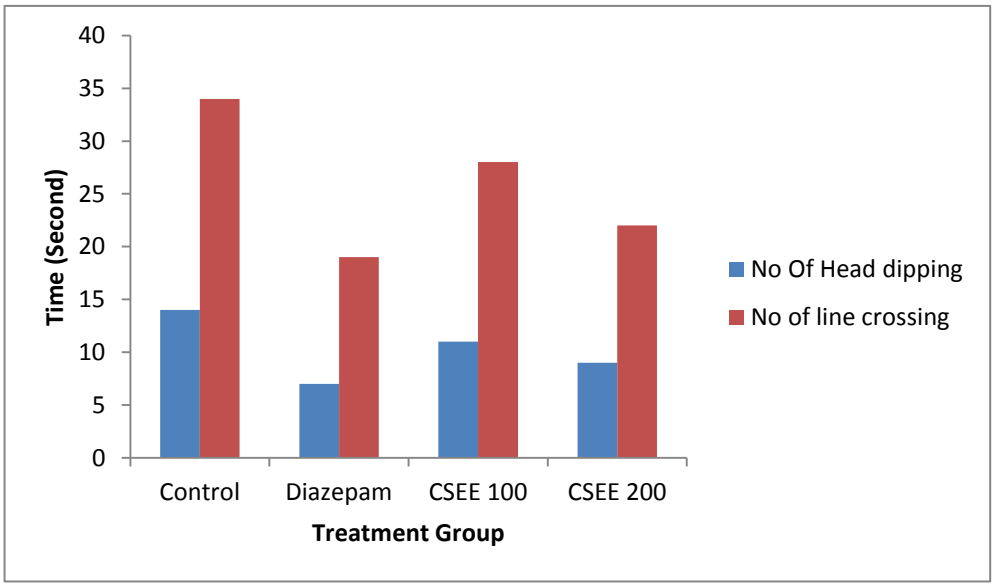


Figure 3: Hole board test in mice

DISCUSSION

Similar to humans, anxiety-related behaviour in animals appears to be influenced by genetic factors and environmental conditions. Changes in housing and breeding conditions and/or variations in experimental conditions and the experimental procedure may change the behaviour of the animals profoundly. Strain differences have a strong influence on the anxiety-related behaviour in the animals. Additionally, separate maintaining and breeding of rodents over several generations may lead to the development of sublines with different anxiety-related behaviour. Further developments of animal anxiety tests, the knowledge of their limits and the evaluation of additional ethological behavioural parameters can be used to detect changes in anxiety-related behaviour more accurately. A correlation between the level of 5-HT concentration in the CNS and the anxiety of rat strains, but not general activation, could be proved experimentally. Anxious rats have higher tissue levels of 5-HT in projection areas of neurons originating in the median and the dorsal raphe nuclei as rat strains with "fearless" behaviour. Anxiolytics decrease extracellular 5-HT levels in the projection areas of the serotonergic neurons in the CNS, especially in more anxious rat strains. Studies using *in vivo* microdialysis while performing tests for anxiety in awake and freely moving animals with permanently reduced 5-HT concentrations in specific brain regions showed that not only the absolute level of 5-HT concentration in the CNS, but also the amount of 5-HT released during an aversive situation, can be related to the behaviour of the animals.

CONCLUSION

In summary our results demonstrate the major role of the serotonergic neurotransmission in the regulation of anxiety-related behaviour. Studies on the role of the serotonergic system under aversive and non-aversive conditions may lead to a better understanding of the mechanisms involved in the development of anxiety disorders and the possible development of novel therapeutic approaches in the treatment of anxiety disorders, too. The present study investigated the putative behavioral effects of the seeds of *Coriandrum sativum* L. Ethanolic extract. The results of this study established a support for the traditional usage of seeds of *Coriandrum sativum* L. as anxiolytic medicinal plant.

ACKNOWLEDGEMENT

The authors are grateful to Shaqra University, Ministry of Higher Education, Kingdom of Saudi Arabia

REFERENCES

[1]. Iversen, S. D. 5-HT and anxiety. Neuropharmacology 1984; 23(12B): 1553-60.
[2]. Griebel, G. 5-Hydroxytryptamine-interacting drugs in animal models of anxiety disorders: more than 30 years of research. Pharmacol Ther 1995; 65(3): 319-95.
[3]. Lucki, I. The spectrum of behaviors influenced by serotonin. Biol Psychiatry 1998; 44(3): 151-62.
[4]. Twarog, B. M.& Page, I. H. Serotonin content of some mammalian tissues and urine and a method for its determination. Am J Physiol 1953; 175(1): 157-61.
[5]. Falck, B., Hillarp, N. A., Thieme, G.& Torp, A. Fluorescence of catechol amines and related compounds condensed with formaldehyde. J Histochem Cytochem 1962; 10: 348- 354.
[6]. Vaas, Emotionen. Lexikon der Neurowissenschaft. Heidelberg, Berlin, Spektrum Akademischer Verlag 2000; 1: 386-397.
[7]. Kielholz, P & Battegay, R. Angst: Psychische und somatische Aspekte. Bern, Hans Huber, 1967.
[8]. Tembrock, G. Angst. Darmstadt, Wissensch. Buchges, 2000.
[9]. Silverman, P. Animal behaviour in the laboratory. London, Chapman and Hall, 1978.
[10]. Kessler, R. C., Ruscio, A. M., Shear, K.&Wittchen, H. U. Epidemiology of anxiety disorders. Curr Top Behav Neurosci 2010; 2: 21-35.
[11]. Aslam Pathan, Nadeem L. Anxiolytic and analgesic effect of seeds of *Coriandrum sativum* Linn. Int J of Research in Pharm and Chem 2011; 1(4): 1087-1099.
[12]. Aslam Pathan, Abdulrahman Alshahrani, Feras Al-Marshad. Neurological assessment of seeds of *Coriandrum sativum* L. by using antidepressant and anxiolytic like activity on albino mice, Inventi Impact: Ethnopharmacology, 2015(3):102-105.
[13]. Handbook for the Use of Animals in Neuroscience Research, 1997 (updated 18-July-97). http://apu.sfn.org/content/Publications/HandbookfortheUseofAnimalsinNeuroscienceResearch/Handbook.htm.
[14]. Organization of Economic Co-operation and Development (OECD). The OECD Guidelines for Testing of Chemical: 423 Acute Oral Toxicity, France, 2001
[15]. Rabbani M, Sajjadi SE and Mohammadi A, Evaluation of the anxiolytic effect of Nepeta persica Boiss in mice. eCAM 2008; 5 (2): 181–186.
[16]. Kulkarni SK, Singh K, Bishnoi M, Comparative behavioral profile of newer antianxiety drugs on different mazes. Indian Journal of Expt. Biol 2008; 46: 633-638.
[17]. Kirtikar KR, Basu BD. Indian Medicinal Plants. Edn 2, Lalit Mohan Basu Publishers, Allahabad (India) 1975; 23-24.