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Effect of Oral Administration of Coriander Extract on Memory Boosting & Regaining in Wistar Albino Rats.

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Abstract

Coriander is cultivated throughout the world for its nutritional value. The present study was undertaken with an objective to study the effects of oral administration of coriander on memory boosting and regaining. Here we investigated the influence of oral intake of coriander on behavioural task performance by using T-maze and radial arm maze and physiological measures relative to a milk control group. We have observed significant memory boosting and memory regaining effects of coriander when administered orally. This effect may be due to memory-improving property and anticholinesterase activity of coriander. Hence we recommend that coriander can be used as a remedy in the management of Alzheimer's disease.

Keywords: *Memory boosting, Memory retention, Coriander consumption*

Introduction

Alzheimer`s disease is the most common cause of dementia in western countries. Approximately 10 percent of all persons over the age of 70 have significant memory loss, and more than half is the result of AD. Clinically AD must often present with subtle onset of memory loss followed by a slowly progressive dementia that has a course of several years, pathologically there is gross, diffuse atrophy of the cerebral cortex with secondary enlargement of the vascular system.

Medicinal plants inhibits acetylcholine esterase activity and improves memory[1]. Coriander (Coriandrum sativum), also known as Chinese parsley or dhania[2]. It is an annual herb belongs to the family Apiaceae. It is a soft, hairless plant growing to 50 cm (20 in) tall. The leaves are variable in shape, broadly lobed at the base of the plant, slender and feathery higher on the flowering stems. It first attested in English late 14th century, the word coriander derives from the Old French coriandre, which comes from Latin coriandrum[3]. Coriander is a powerful herb with many health benefits. This plant is rich in micronutrients and nutritional elements. It contains dietary fiber, vitamins and minerals like calcium, magnesium, sodium and potassium[4]. Coriander has been documented as a traditional treatment for type 2 diabetes[5]. In holistic and traditional medicine, it is used as a carminative and as a digestive aid[6, 7]. Coriander seeds were found in a study on rats to have a significant hypolipidaemic effect, resulting in lowering of levels of total cholesterol and triglycerides, and increasing levels of high-density lipoprotein. This effect appeared to be caused by increasing synthesis of bile by the liver and increasing the breakdown of cholesterol into other compounds[8]. Coriander leaf was found to prevent Alzheimer's disease and memory loss[9,10]. There are many mazes that have been used to test hippocampal function. The Radial Arm Maze (RAM), T-maze and water maze are perhaps the most used among them. The present study was undertaken with an objective to find out the effect of oral administration of coriander extract in memory boosting and memory regaining.

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Materials and methods

Subjects

A total of 36 male and female wistar albino rats were used for this study. They were housed in groups, in propylene cages in an acclimatized (25-27oC) room and were maintained on a 12hr light / dark cycle. Food and water was given ad libitum until they aged 30 days at the beginning of the experiment. They were randomly assigned into control and coriander groups with18 rats in each group. Coriander was administered to Coriander group and milk without coriander was given to control group.

T-maze

The T-maze is made of wood with smooth polished surface. It consists of a stem (35 x 12 cm), a choice area (12 x 12 cm) and two arms (35 x 12 cm); at the end of each arm contain a food well. The side walls are 40 cm high. The choice area is separated from the arms by a sliding door.

Radial arm maze

Radial arm maze is made of Plexi glass; consist of eight equally spaced arms radiating from an octagonal central platform. Each arm was having a length of 56.2cm, width of 7.9 cm and height of 10 cm. The entire maze is elevated 80 m above the floor for easy locating of spatial cues by rats.

Coriander extract

Coriander (Coriandrum sativum) , also known as cilantro were washed, weighed (100g/L), and triturated with water in a blender for 7 minutes. The juice was filtered and frozen in an amber flask. Each flask was thawed daily at ambient temperature two hours prior to administration

Pharmacological drug

Buscopan® tablets manufactured by Cadila Healthcare limited, is used in the present study. Each Buscopan tablet contained Hyoscine (scopolamine) Butylbromide I P 10 mg and excipients (q. s.). The tablets were powdered and mixed with 50ml of sterile 0.9% w/v normal saline. It was administered to the rats as intraperitoneal injection at a dose of 1 mg / Kg. Deficits in short-term memory have been reported following scopolamine administration in monkeys and in humans[11]. Scopolamine appears to be less disruptive to long-term memory storage than to short-term memory[12]. Scopolamine is a muscarinic antagonist structurally similar to the neurotransmitter acetylcholine and acts by blocking the muscarinic acetylcholine receptors and is thus classified as an anticholinergic[13].

Experimental design

The rats in the coriander group were given 5mg/kg body weight of coriander leaf extract orally for 30 days continuously. The control rats were given equal quantity of milk for 30 days without coriander extract. All the rats were fed with pellets and water mixed with B complex tonic liberally in these 30 days. After 30 days, the rats were starved for 48 hours and after 48hours the behavioural task is performed on T-maze and radial arm-maze for acquisition. This task is continued till we recorded full score without any error. Now ten days gap was given for the retention of the task. In these ten days only pellets and water mixed with B-complex tonic was given to both the groups. On eleventh day behavioural task is performed on T-maze and radial arm-maze and number of trials required to get full score is recorded in both the groups to test memory boosting effect of coriander.

From the next day we have started administration of scopalamin intraperitoneally to both the groups to cause partial amnesia. This procedure continued for 9 days. Scopolamine administration was done at 10 am daily. Only water mixed with B complex tonic is given to both the groups during this 9 days. From tenth day administration of scopolamine is stopped and coriander is administered to coriander group where milk without coriander is given to the control group. This procedure continued for 30 days and food and water mixed with b complex was given to both the groups during these 30 days. On 31st day behavioural task is performed on T-maze and radial arm maze in both the groups for acquisition and number of trails required to get the full score is recorded. Now ten days gap is given where only food and water mixed with B complex is given to the rats in both the groups. On eleventh day behavioural tasks were performed on both the mazes to test the retention in both the groups and number of trails required to get the full score is recorded. The memory score was calculated by taking the difference between the number of trials required for acquisition test and number of trials for retention test. The body weight was maintained at 85% of the original body weight, throughout experiment. Behavioural experiments were conducted in the same room with the same allocentric cues, such as doors, windows, posters and investigators.

T-maze task

This was analogous to non-matching to sample task, where the rat was rewarded only if the current choice doesn't match the previous one. As reward is used it can also be considered as a learned alternation procedure. In the orientation phase, the starved rats were allowed to spend 10 minutes / day for three days in the T-maze and trained to collect food pellet from the food wells. During the acquisition test, all the rats were given six trials / day with an inter trial interval of one hour. Each trial consists of four sample and choice run. In the sample run, the rat was placed at the start end of the T-maze stem. Allowed to move towards one arm and collect the food pellet, while keeping the sliding door of other arm closed. In the choice run, the rat was placed at the start end of stem and both arms were kept open. If the rat visits the same arm as that of sample run, it was recorded as error and the rat was not rewarded with food. Instead, if the rat visits the alternate arm, it was recorded as correct score and the rat was allowed to eat food pellet (reward) in the food well. There was an interval of 30s between each run. Score was given for alternate selection of arm during choice run and a maximum score of '4' can be obtained per trial.

Radial arm maze task

All the eight arms of radial arm maze were baited with food pellets (corn flakes).The rats was placed in the centre of the maze and allowed to freely explore the maze for 15 minutes on the first day. The rats were required to take the food pellets from each arm without making a re-entry into the arm already visited. The trial was terminated when the animal takes the food reward from all the eight arms or after 10 minutes if all the eight arms were not visited. Correct score was given when the visits an arm and collects the food reward, and a maximum score of '8' can be attained per trial. When a rat reenters an already visited arm it was taken as a working memory error.

Data analysis

The analysis of data was done by Spss 20.0. The Independent-Samples t Test procedure compares means for two groups of cases. Ideally, for this test, the subjects should be randomly assigned to two groups, so that any difference in response is due to the treatment (or lack of treatment) and not to other factors.

Ethical approval

The Study protocol was approved by Institutional Ethics Committee of Little Flower Medical Research Centre, Angamaly.

Results

	Control group	Coriander group	p value
Acquisition	27.33±3.01	16.17±3.97	<.001
Retention	17.00±2.37	10.50±3.27	0.003

Tab.1: No of mean trials of acquisition and retention in control and coriander (R-maze memory boosting)

The number of mean trials of acquisition in control group is 27.33±3.01 and in coriander is 16.17±3.97,which indicates that coriander group is having more memory boosting effect than control group. This is statistically significant ($p<0.001$). The mean retention of control group is 17.00±2.37 and in coriander is 10.50±3.27, which indicates that coriander group is having more memory boosting effect than control group. This is statistically significant ($p<0.003$). (Table-1)

	Memory Loss in control	Memory regain Coriander	p value
Acquisition	40.83±1.94	28.17±5.12	<.001
Retention	20.50±1.87	19.17±4.54	0.521

Tab.2: No of mean trials of acquisition and retention in control and coriander (R-maze memory regaining)

The number of mean trials of acquisition in memory loss group is 40.83±1.94 and in coriander is 28.17±5.12, which indicates that coriander group is having memory regaining effect. This is statistically significant ($p<0.001$). The mean retention of memory loss group is 20.50±1.87 and in coriander is 19.17±4.54, which indicates that coriander group is having memory regaining effect. This is not statistically significant (p 0.521). (Table-2)

	Control	Coriander	p value
Acquisition	13.50±3.27	7.83±1.33	0.003
Retention	9±2.61	5.50±0.84	0.011

Tab.3: No of mean trials of acquisition and retention in control and coriander (T-maze memory boosting)

The number of mean trials acquisition in control group is 13.50±3.27 and in coriander is 7.83±1.33, which indicates that coriander group is having more memory boosting effect than control group. This is statistically significant ($p<0.003$) (Table-3). The mean retention of control group is 9±2.61 and in coriander is 5.50±0.84,

which indicates that coriander group is having more memory boosting effect than control group. This is statistically significant (p<0.011).

	Memory Loss in control	Memory regain Coriander	p value
Acquisition	24.17±3.66	14.00±1.41	<.001
Retention	13.83±2.48	10.17±1.72	0.014

Tab.4: No of mean trials of acquisition and retention in control and coriander (T-maze memory regaining)

The number of mean trials acquisition in memory loss group is 24.17±3.66 and in coriander is 14.00±1.41, which indicates that coriander group is having memory regaining effect. This is statistically significant (p<0.001). The mean retention of memory loss group is 13.83±2.48 and in coriander is 10.17±1.72, which indicates that coriander group is having memory regaining effect. This is statistically significant (p 0.014). (Table-4)

Discussion

It was reported that the leaves of coriander boosts memory, and the findings may point to a new treatment for Alzheimer's disease[14]. In another study on Reversal of memory deficits by Coriandrum sativum leaves in mice report that Coriander sativam leafs may be a useful remedy in the management of Alzheimer's disease on account of its multifarious effects such as, memory-improving property, cholesterol-lowering property and anticholinesterase activity[15]. Oral administration of coriandum sativum leaves in scopolamine induced rats showed improved memory. Moreover, coriandum sativum leaves also demonstrate AChE inhibitory activity[16]. This mechanism would require pharmacological action, including compound absorption and subsequent neuronal action. We agreed with this study as we have observed significant memory boosting and memory regaining effect of coriander when administered orally. This effect may be due to memory-improving property and anticholinesterase activity of coriander[10].

Conclusion

We conclude that oral administration of coriander is having memory boosting and memory regaining effects in rats. Hence we recommend that coriander can be used as a remedy in the management of Alzheimer's disease.

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