



Effects of *Juglans regia* and *Prunus dulcis* on amnesia model of Alzheimer's induced by Scopolamine in Albino rats

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(Received: 16 September 2024

Revised: 11 October 2024

Accepted: 04 November 2024)

KEYWORDS

Cognitive,
Morris,
water
means,
Spatial
learning

ABSTRACT:

Introduction: Over the last two decades, the pharmaceutical and pharmacological sciences have developed positively and at a very good rate. With continuous modifications and enhancement, the principles of the ancient Ayurvedic system of medicine are used nowadays in which better ideologies. The primary reason for this modification and enhancement is the development of the brain. understanding, knowledge, and different types of trial-and-error methods. in the field of neurological sciences, understanding cognitive properties and functionalities is one of the major studies and tasks which needs to be performed and require multiple things especially living organisms and as the targeted subject, and many types of instruments, models, and methodologies along with drugs and medical devices.

Objectives: The objective of present research work was to know more about cognitive enhancement, different types of apps and medicines used for cognitive enhancement, some reasons for cognitive impairment, and some major models and behaviour Oriel tests that are used for different types of cognitive studies

Methods: Along with this information, some more things also focused on getting proper information like which experimental animals are used for these types of in vivo studies, different properties, and functions of almonds and walnuts for comparative studies, and the Morris water maze test for checking up the level of cognitive enhancement. In the Morris water, maze test setup, the readers will get to know more about that specific test as it is specially designed for testing up the memory enhancement as well as cognitive enhancement along with spatial learning.

Results: The research work displayed the result as both the test components improves the cognition power and memory of the rats of both the sexes after a continuous administration of doses for a long period of time as compared to the controlled group. The rats were able to escape much faster as compared to the training session

Conclusions: The results from the current study exposed that the consumption of dry fruits like walnuts and almonds Does increase the level of cognition and memory enhancement in terms of control and coordination along with spatial learning. The presence of omega-3 fatty acids involve nuts, does provide strength to the brain in the hippocampus region and also reduces the oxidative stress.

1. Introduction

The word cognition may refer to a mental process that helps in doing several day-to-day life tasks like thinking, problem-solving, reasoning, control and coordination, and some voluntary and involuntary actions (Los, n.d.). A better cognitive enhancement is a very important aspect in terms of medical science [1] because I would cognition is responsible to do day-to-day life tasks (Mccullough, n.d.) which are better energy output and desired results and it is also responsible for creating some

specific types of medicines which are responsible for better focusing, alertness and quick reflexes to complete the work in a less time duration [2]. In the case of Alzheimer's disease, there is a cognitive decline or cognitive impairment seen in the patients due to multiple reasons in which the primary reason [3] is the deposit of amyloid beta and tau proteins in the intracellular and extracellular spaces which Are Jane converted into plaques which starts to Di generate the nerve cells(Guion, n.d.) and also the neurofibrillary tangling in



which results in causing dementia and amnesia along with cognitive impairment [4]

To counter the issue of cognitive impairment and Alzheimer's disease, many medications are available [5] which belong to different categories and are responsible for different pharmacological actions [6]. The chemically derived categories contain allopathic drugs, or mainly: cholinesterase inhibitors, NMDAR blockers, metal chelators, Ionophores, and Dendrimers. Galantamine, rivastigmine, Donepezil, and memantine are the four drugs that are widely accepted (Norman, n.d.) and used to treat Alzheimer's disease and also to get better cognitive repairment [7]. Apart from these, there are some also other categories that are specifically designed for better stimulation of the nervous system [8], especially the central nervous system, and also for cognitive enhancement and these are mainly CNS stimulants, nootropics, hormone promoters, etc (Duevel, 2019). These categories of drugs contain both allopathic as well as Ayurvedic medications [9]. Which are responsible for the same. along with these medications, some natural cognitive enhancers increase the performance of the brain very efficiently [10] and in a very good way and are also widely accepted as potent cognitive enhancers. Examples of these natural, cognitive enhancers are walnuts, almonds, hazelnuts, cod-liver, oil, mushrooms, turmeric, Holy Basil, etc. These cognitive answers generally increase the level of acetylcholine and contain vitamin E, OMEGA-3 fatty acids, and other phytoconstituents which reduce cognitive decline [11].

2. Objectives

The primary objective of this research is to investigate the potential neuroprotective effects of *Juglans regia* (Walnut) and *Prunus dulcis* (Almond) on memory impairment in an experimental model of Alzheimer's disease induced by Scopolamine in albino rats. Specifically, the study aims to: Evaluate the Cognitive Enhancing Properties: Assess the impact of *Juglans regia* and *Prunus dulcis* extracts on cognitive function, memory retention, and learning abilities in Scopolamine-induced amnesia in rats. Investigate the Mechanisms of Action: Explore the underlying biochemical and molecular mechanisms by which *Juglans regia* and *Prunus dulcis* exert neuroprotective effects, focusing on

oxidative stress, cholinergic function, and inflammatory pathways.

Examine the Role of Antioxidants: Analyze the antioxidant potential of the extracts and their ability to reduce oxidative stress markers in the brain, which are commonly elevated in Alzheimer's pathology. Assess Neuroprotective Effects: Determine whether *Juglans regia* and *Prunus dulcis* can mitigate neuronal damage and protect brain structures associated with learning and memory, such as the hippocampus. Compare Efficacy with Standard Treatments: Compare the effects of the plant extracts with standard anti-Alzheimer's treatments, particularly acetylcholinesterase inhibitors, in terms of their ability to alleviate memory deficits and neurodegeneration.

By achieving these objectives, the research aims to provide insight into the potential of *Juglans regia* and *Prunus dulcis* as complementary therapeutic agents for the treatment of Alzheimer's disease, particularly in combating memory impairment associated with the disease

3. Methods

Animals

Tha albino rats of either sexes were obtained from the animal house of Kalinga University, New Raipur (C.G) and weighing 160-220g. The animals were kept in cages with a relative humidity of 51% and a stable temperature of 24°C with a light-controlled cycle of 12:12 hours. and along with this, the animals were also given free access to water and food.

Chemicals and equipments

Completion of this research work demanded Pure walnut and almond edible oils as well as certain chemicals like Scopolamine (to induce AD) and some other chemicals also to create salt solution for administration side the animal's body. All of these solutions were administered orally with the help of micro syringes as well as with micro needles of different gauge sizes. All the animals projected with Scopolamine so that AD gets induced.

- **Group 1: the animals of this group were given with saline solution.**
- **Group 2: the animals of group 2 were administered with walnut oil.**



- **Group 3: the animals of group 3 were administered with almond oil.**

Carrying out this research work requires a complete knowledge of GLP along with instructions from CPCSEA and IAEC. To perform this research work, the experimental animals are kept inside animal houses in different cages with all the suitable facilities all the animals are provided with food (pallets of rice and bran) and pure drinking water along with a husk bed.

Behaviour study(Morris water maze test)

Experimental animals were divided into three groups: one controlled and the other two as test groups containing animals of both sexes and equal in number. To check the level of cognition and memory, the animals need a practice and training session in the Morris water maze test. The Morris water maze test (MWM) comprises a large water tub of a diameter of 1 meter in a circular shape, which is approximately 1.5 m deep and is situated 0.5 meters above the ground level. The water tub is filled with water along with a transparent platform situated in the middle of the tub with its apex just 1 inch above the level of water. The animal is now placed in the water carefully and is allowed to swim freely which it will find a way to Escape from the situation[Figure 1].



Figure 1: Pre Training of the Rat in the MWM setup in clean transparent water

The animal needs to find the Escape route to reach the platform. If the animal is unable to find out the route, it is then gently pushed and supported with hands to the direction of the platform, and if the animal is unable to climb on the platform, gently helps it to climb the

platform with both hands. The whole procedure is then repeated multiple times from all four directions for one minute with all the animals so that they will remember the same process.

After the training session is done with all the animals, the animals now need to be treated with the test compounds according to which they have been divided into categories. To administer the compound orally, micro syringes are used which are specially designed for feeding the animals so that they can easily swallow or drink the compound. The process of administering the compound is done regularly so it will help them to absorb the nutrients regularly and will gradually enhance their cognitive power. Now, when the process of treating the animals is complete, they are ready for the real test. After the completion of the pre-training, this time the whole setup will be as same as in the training round but now some amount of non-toxic powdered paint/non-fat milk powder will be added to the water which will make the water opaque for animals now the same process will be repeated with all the animals but now they will not be able to see their surroundings and will use their memory of what they have done previously[Figure 2].

Figure 2: Testing of the experiment with rats in non-fat milk powder dissolved in water



This will allow us to find out which group of animals is more likely to reach the platform, faster, and in less

interval of time. The complete process of the test is recorded in a camera that is situated vertically and approximately 1.5 to 2 m from the water tub so that the top view is captured and recorded to find out the observations as it relates to a computer system with specialized software. It was observed that the rats of both almonds and walnuts test groups escaped much faster as



compared to the controlled group Table 1 displayed the observations of the escape time of rats from the Morris water maze test setup which clearly shows that the rats of walnut test group exhibited high cognitive power and were also slightly faster than the almond based test groups. The controlled group showed weak responses in terms of cognition and memory enhancement because it contains only salt solution and not other compounds like Omega 3 fatty acids and vitamin e of walnuts and almonds respectively.

4. Results

The research work displayed the result as both the test components improves the cognition power and memory of the rats of both the sexes after a continuous administration of doses for a long period of time as compared to the controlled group. The rats were able to escape much faster as compared to the training session.

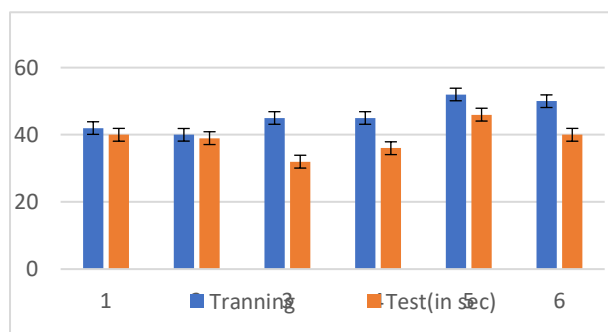


Figure 3 – Comparative View of Escape Time of Rats of All The 3 Groups Before and After Testing

GROUPS		Escape Time	
		Training	Test(in sec)
Group1	M1	42	40
	F1	40	39
Group2	M2	45	32
	F2	45	36
Group3	M3	52	46
	F3	50	40

Table No. 1 - Escape Time Of Rats (In Seconds) During the training period and after testing

Discussion

Cognitive impairment is a condition in which an organism is not able to perform work in terms of control and coordination as well as Making things remember with high level of disorientation. cognitive impairment happens usually in the case of Alzheimer's disease, which is a chronic disease which happens due to deposition of amyloid beta and tau proteins in the interest cellular and extra cellular spaces. Along with this, the neurofibrillary tangling also gives contribution in the decline of cognitive power. The optimised nano particles of medications does shows good response in terms of decline in cognitive impairment but still it can be used up to a certain extent because prolonged consumption of those medications with variable doses can lead to toxicity in specific organ systems like in gastrointestinal track as well as in cardiovascular system. The prolonged and high consumption of dry fruits like walnuts and almonds does choose good response in terms of re-enhancement and recovery of cognitive impairment because of the presence of biomolecules like omega-3 fatty acid and vitamin E. The results from the current study exposed that the consumption of dry fruits like walnuts and almonds Does increase the level of cognition and memory enhancement in terms of control and coordination along with spatial learning. The presence of omega-3 fatty acids involve nuts, does provide strength to the brain in the hippocampus region and also reduces the oxidative stress. The vitamin E enriched almonds also reduces the level of increased acetylcholine along with the reduction of oxidative stress, but as compared to walnuts, It displayed a slow response in terms of recognition and memory enhancement.

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