

"Assessment of Semecarpus Anacardium Seeds for Nootropic Activity"

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Abstract

Aim: The main goal of the study is to evaluate the Semecarpus anacardium seeds' ability to improve memory in wistar rats. **Materials and Methods:** The seeds of Semecarpus anacardium were extracted using a sequential solvent extraction process, and their potential to improve memory was assessed using the Morris water test and an elevated plus maze apparatus for a characteristic called transfer latency. **Result:** Using Semecarpus anacardium seeds extract, transfer latency was decreased dose dependently as compared to control group. **Conclusion:** The decrease in transfer latency, which was dose dependent, demonstrated its effectiveness against neurodegeneration and supported its nootropic properties.

1. Introduction

A steady beginning of dementia that is marked by a gradual decline in cognitive function, particularly in memory retrieval, is a hallmark of progressive neurodegenerative disorders. (1) The term cognition refers to people's mental capacity, which is a component of almost every conscious action. Cholinergic disturbances are a key component of neurodegenerative disorders. (2) To enhance memory, mood, and behavior, nootropic substances found in allopathic medicine and cholinesterase inhibitors like donepezil are often utilized. In response to this, the use of these agents has been curtailed due to negative side effects [3], therefore it makes sense to research the effectiveness of conventional medications in the treatment of a variety of cognitive disorders.

Ayurveda, the medicinal system practiced in ancient India, contains a treatment for mental problems known as Medha Rasayana that has shown effective for a range of illnesses in children and adults. These medications work by enhancing memory (*Smriti*), retention power (*Dhriti*), and intellect (*Dhi*). If so, then this group of nutrients can be thought of as neuro-nutrients that enhance brain metabolism by enhancing mental capacity, intelligence, memory, and cognitive functioning (4). These pharmacological classes typically reduce stress, calm the mind, and strengthen reasoning and rational thinking abilities. (5)

Numerous plants are claimed to have memory-enhancing properties in the Indian medical system. One of the well-known herbs that improves memory is

Semecarpus anacardium. Since there aren't any powerful meds in the allopathic clinical framework that make less side impacts, our fundamental objective is to evaluate its memory-upgrading movement involving a proper creature model without logical reports on its memory-further developing action.

2. 2. Materials and Methods:

Plant Material:

The *S. anacardium* seeds that were bought at the neighborhood market. Senior botanists validated and taxonomically categorized the seeds. In the department, a voucher specimen is kept for future use as a reference.

1. Successive Solvent Extraction Method

The seeds were cut into small pieces, dried in the shade, then ground into a coarse powder using a mechanical grinder. To completely remove all fats from the coarse seed powders, petroleum ether was used in a Soxhlet extraction process. The marc was dried before being extracted for 72 hours using water, butanol, methanol, and then chloroform. The concentrates were separated, focused, and dried after intensive extraction. The concentrates were all exposed to a starter phytochemical examination to check for the presence of unsaturated fats, steroids, flavonoids, glycosides, alkaloids, terpenoids, and so on.

Experimental Animals

Disease-free Swiss male pale skinned person mice, gauging somewhere in the range of 25 and 35 g, were purchased from a provider that had been approved by the Council with the end goal of Control and Supervision of Experiments on Animals (CPCSEA). Under suitable research center settings, animals were housed independently in polycarbonate confines in gatherings of 6-8 for every enclosure with exchanging light and dull patterns of 12 hours each. The Institutional Animal Ethics Committee (IAEC) gave its approval to the experimental methodology, and the government of India's Ministry of Environment and Forests' CPCSEA regulations were followed in caring for the animals.

2. Acute Toxicity study

The OECD guidelines-425 were followed when conducting the study on acute oral toxicity. The test drug was administered orally after the up and down procedure to adult female Charles Foster rats, who had fasted the night before. The rats were then individually monitored for a total of 48 hours to look for any behavioral or neurological changes as well as any signs or symptoms of mortality or toxic effects. (6)

3. Preliminary Phytochemical Analysis

Using a pharmacognostic method, the *semecarpus anacardium* seed concentration (SAS) was examined for the content of alkaloids, unsaturated lipids, terpenoids, steroids, flavonoids, and glycosides.. (7)

4. Experimental Design:

Six groups of six male wistar rats, weighing between 150 and 200g apiece, were formed. Both models' experimental setups were used as -

Group 1: Control group: Vehicle alone (Distilled water)

Group 2: Toxicant group: Diazepam (7mg/kg/i.p.) alone

Group 3: Low dose of SAS (100 mg/kg/p.o)

Group 4: Medium dose of SAS (200 mg/kg/p.o)

Group 5: High dose of SAS (400 mg/kg/p.o)

Group 6: Medium dose of SAS (200 mg/kg/p.o) + Diazepam (7mg/kg/i.p)

a) Elevated plus maze (EPM)

The Elevated Plus Maze (EPM), which utilizes transfer latency (TL) as a key measurement, is viewed as a clear methodology for surveying learning and memory. (8) various plants had their nootropic potential assessed using EPM. The constructed EPM is comprised of two inverse open arms estimating 50 by 10 cm that are crossed by two encased arms with walls that are 40 cm high. A focal square (10X10) that joined the arms offered the gadget a plus hint appearance. The maze was housed in a room with low lighting that was 50 cm off the ground. (9) Each rodent was positioned toward the finish of the open arm right off the bat (an hour and a half following the

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past measurement), confronting away from the stage in the center. How much time (seconds) it takes a creature with every one of the four legs to go from an open arm into a shut arm is known as transfer latency (TL). For every creature, the TL was noted during the principal instructional meeting. This showed assignment's (memory) retention was tried 24 hours after the primary day preliminary, or the 29th day, or 24 hours after the last portion of the four-week time frame. EPM was utilized to survey spatial memory in all guinea pigs an hour and a half following the past measurements. A huge decline in TL worth of retention demonstrates memory improvement.

b) Morris water maze (MWM)

The Morris water maze (MWM) test has been widely used to study the spatial learning and memory of rodents. The previously mentioned method and parameters were utilized to examine the memory and learning of mice in the Morris water maze (10, 11, 12).

This method is used to assess learning and memory in experimental 1-month-old male Wistar rats. Each animal completed four acquisition trials every day for four straight days following the final dose of four weeks, and their memory was evaluated on the fifth day after the stage was taken away (probe preliminary). A circular plastic swimming pool with a height of 60 cm and a diameter of 117 cm was filled with water. 200 milliliters of evaporated milk were added to the water to make it opaque, which also made it difficult to see the stage. By four on its perimeter, the pool was segmented into four quadrants (NW, NE, SE, SW): north (N), south (S), east (E), and west (W). One of the quadrants included an 8 × 8 cm Plexiglas platform in the center that was 1 cm below the water's surface and provided a platform for the rodent to jump to safety. The day before the test, each mouse was given access to the pool for 60 seconds so that it could get used to the training environment. From entering the water to emerging onto the stage,

each preliminary's latency (TL) was monitored. The rodent was physically placed on the stage briefly respite in the event that it had not found the stage after 120 seconds. The stage was taken down on the third day, which was the 30th day and 96 hours after the final dose of the 4-week course. The rodent was permitted to swim freely for 60 seconds. For evaluation, the variations in parameters like Transfer Latency (TL) were documented.

5. Statistical Analysis:

In Chart Cushion Prism, information were analyzed using analysis of variance and Tukey's post hoc test. It was deemed statistically significant when the p-value was 0.05. The mean and standard error of the mean are used to express all results.

6. Results:

A) Phyto-chemical testing of *semicarpus anacardium* seeds

A preliminary phyto-analysis revealed the presence of a number of active components, including amino acids, fat, carbohydrates, proteins, oils, glycosides, alkaloids, steroids, terpenoids, tannins, and other phenolic compounds.

B) Effect of *semicarpus anacardium* seeds using EPM:

The TL is defined as the amount of time it takes the animal to move with all four of its legs from the open arm into one of the covered arms. The significant decrease in TL value suggested memory improvement. *Semicarpus anacardium* seeds were given for successive 4 weeks, and by day 29, they dramatically decreased TL compared to the corresponding control groups, showing a considerable improvement in memory. As indicated in Table 1, the *semicarpus anacardium* seeds and benzodiazepine in group VI considerably increased the TL on the 29th day.

Treated Groups	TL after 24 Hour	TL after 28 Days
Group 1: Control group: Vehicle alone	49.58 ± 2.23	53.08 ± 2.85
Group 2: Toxicant group: Diazepam (7mg/kg/i.p.) alone	73.64 ± 1.62***	62.09 ± 1.16***

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Group 3: Low dose of SAS (100 mg/kg/p.o)	43.19 ± 1.28***	44.30 ± 0.80***
Group 4: Medium dose of SAS (200 mg/kg/p.o)	20.55 ± 0.84***	13.76 ± 0.9***
Group 5: High dose of SAS (400 mg/kg/p.o)	38.56 ± 1.18***	34.08 ± 2.73***
Group 6: Medium dose of SAS (200 mg/kg/p.o) + Diazepam (7mg/kg/i.p)	20.74 ± 0.90***	16.03 ± 1.24***

Values are shown as the mean standard error of the mean (SEM), with n = 6 for each group; * p 0.05; ** p 0.01; and *** p 0.001 compared to control.

C) Effect of *semicarpus anacardium seeds* using MWM:

According to the findings, which are shown in Table No. 2, learning and memory are linked to transfer latency. Rats' decreased TL in MWM suggests that their learning and memory have improved. as rats' EL levels were examined on Days 1, 15, and 30 after receiving various dosages of *Semicarpus anacardium*

seeds and diazepam (7 mg/kg, i.p.) for 4 weeks consecutively, they significantly lowered as compared to controls, and learning and memory significantly improved. The maximum dose of 300 mg/kg/p.o. affected TL substantially compared to the vehicle-treated control group.

Groups	TL - Day 1	TL - Day 15	TL - Day 30
Group 1: Control group: Vehicle	66.51 ± 2.81	27.23 ± 0.58	25.07 ± 0.58
Group 2: Toxicant group: Diazepam (7mg/kg/i.p.) alone	75.01 ± 2.81***	20.32 ± 2.24**	18.23 ± 0.96***
Group 3: Low dose of SAS (100 mg/kg/p.o)	51.41 ± 2.36***	25.42 ± 1.23	23.07 ± 2.55
Group 4: Medium dose of SAS (200 mg/kg/p.o)	28.50 ± 1.63***	23.14 ± 0.97	21.65 ± 1.93*
Group 5: High dose of SAS (400 mg/kg/p.o)	38.55 ± 2.77***	21.22 ± 1.88**	19.08 ± 0.63***
Group 6: Medium dose of SAS (200 mg/kg/p.o)+Diazepam (7mg/kg/i.p)	25.70 ± 1.16***	19.90 ± 3.23*	20.04 ± 2.83*

Values are shown as mean SEM, with n = 6 for each group; * p 0.05; ** p 0.01; and *** p 0.001 compared to control

7. Discussion:

The current study reveals the memory enhancing potential of various doses of *semicarpus anacardium seeds* in suitable Exteroceptive behavioral animal models. The extract was administered to all experimental animals at various dose levels and the effects were assessed on the basis of transfer latency. Extract's effects on memory were comparable to those of the benzodiazepine anxiolytic diazepam. As a behavioral model for evaluating memory and learning, the MWM and EPM were used. TL considerably

decreased during training and experimentation, indicating improved learning and memory, according to the extract.

The experiment was founded on the presence of biflavonoids, specifically biflavones A, C, A1 & A2, which demonstrated their effectiveness in oxidative stress (13) and inflammation (14).

Patients with Alzheimer's disease have persistent inflammation in specific areas of their brains, according to an immunohistochemical investigation.

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Anti-inflammatory medications were thought to be preventing both the onset and progression of Alzheimer's disease since inflammation can harm host tissue. (15) *Semicarpus anacardium's* anti-inflammatory properties may be crucial to neuroprotection.

The findings of the phytochemical study showed the presence of flavonoids, phenols, and triterpenoids. These compounds, together with the other primary constituents present, all had a protective role in the control of oxidative stress since the destruction of neurons causes dementia and memory loss.

It has been shown that memory impairment is linked to both decreased cholinergic transmission and the stimulation of central cholinergic transmission, which are both related with cognitive dysfunction. Cortical cholinergic neuron loss and dysfunction are closely associated to cognitive impairments in Alzheimer's disease. To treat dementia that is closely connected to Alzheimer's disease, medicines that enhance cholinergic function can be used.

The most crucial neurotransmitter in the control of cognitive processes is acetylcholine, according to studies (17). A hallmark of dementia of the Alzheimer's disease type has been described as the selective loss of cholinergic neurons or impaired acetylcholine production (18). The AchE potential of the main phytoconstituents, the biflavones A, C, A1, and A2, which are classified as antioxidant-flavonoids, demonstrated their effectiveness against neurodegeneration. (19).

So, from all these parameters and results obtained, we can claim as nootropic and as it is consumed largely without any potential adverse effect, the *semicarpus anacardium* seeds can be consider as neuro-nutrient.(20-37)

8. Conclusion:

This study supports the *semicarpus anacardium* seeds' claims of memory-improving properties according to Ayurveda and other medical systems. Rats' learning and memory were greatly improved, most likely through transfer latency, the GABA-benzodiazepine route, AChE inhibition, and anti-inflammatory effects. It is necessary to do more in-depth research to discover the various potential mechanisms for the treatment of cognitive disorders and their value in the

treatment of neurodegenerative and cognitive illnesses. *Semicarpus anacardium* seeds can also be utilized as nutraceuticals to treat Alzheimer's disease.

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