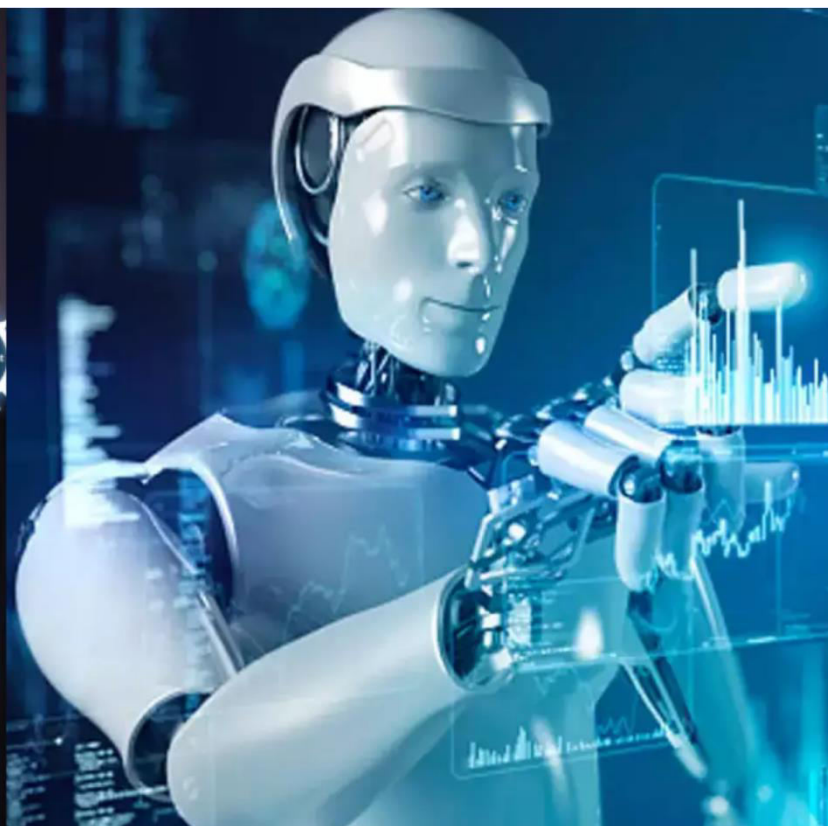




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EVALUATION OF NOOTROPIC ACTIVITY OF MANGIFERA INDICA STEM EXTRACT ON WISTAR ALBINO RAT

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ABSTRACT:

Aim: The objective of present study was to evaluate the nootropics activity of *M. indica* steam.

Method: In Morris water maze test, which was conducted by Wistar albino rat as an animal model, escape latency times were significantly decreased and time spent in target quadrant was increased when *M. indica* extract at dosages of 250 and 500 mg/kg were given orally for 28 days. The usual dosage of piracetam was 200 mg/kg, p.o. Animals in negative control group were given 0.4 mg/kg of scopolamine intraperitoneally. *M. indica* steam excerpt demonstrated nootropic effect in Morris water maze test via considerably lowering escape latency times and increasing time spent in the target quadrant.

Results and discussion: Nootropic activity of *M. indica* was much higher than that of the conventional medication. It was shown that the nootropic activity increased in tandem with the dose of the studied excerpt. By inhibiting muscarinic receptors and causing temporary memory impairment, scopolamine also impairs memory and cognition in both persons and experimental animals. Scopolamine causes cholinergic hypofunction, which reduces cerebral blood flow.

Conclusion: *M. indica* has the potential to treat amnesia because of its neuroprotective and memory-stimulating properties.

KEYWORDS: *Mangifera indica*, nootropics activity, amnesia, Morris water maze test.

I. AMNESIA

Memory loss is the hallmark of amnesia, a condition these can be brought on via a number of things, containing infections, head trauma, neurological conditions, or psychological issues. Amnesia is a ailment in which a person drops some or all of their memory for a variety of reasons, including illness, trauma, or brain injury. However, using different sedatives and hypnotics can also produce it momentarily. Depending on how much damage is done, the memory may be completely or partially lost.

The incapability to remember previous events and/ or learn novel information is the hallmark of amnesia, a selective memory disorder that starts limbic system, a region of brain that includes the hippocampus, amygdala, hypothalamus, and other components. One of the limbic system's functions is memory maintenance. There are three stages to this function^[1].

- a.** Always record events and experiences;
- b.** Encode the info received;
- c.** Recover the archived info.



Figure 1. Memory loss (Amnesia)

1.1. Types of amnesia:

These are various kinds of amnesia:

1.1.1. Retrograde Amnesia:

The loss of knowledge acquired previous to the beginning of amnesia is known as retrograde amnesia (RA). This condition, which impacts both episodic and semantic memory, is frequently identify following damage to medial temporal lobe ^[2].

1.1.2. Anterograde Amnesia:

The incapacity of an individual to form novel memoirs is known as anterograde amnesia (AA). In certain situations, patients permanently lose their capacity to acquire novel information. Anterograde amnesia can be either transitory or permanent, depending on the underlying causes.

1.1.3. Dissociative Amnesia:

About 1.0–2.6 percent of people suffer with dissociative amnesia, a form of psychological amnesia (Wikidoc, 2021). The memory lapses caused by dissociative amnesia are what set it apart (Leong et al., 2006 ^[3]).

1.1.4. Post-traumatic Amnesia:

Forgetfulness are develops right afterward a traumatic head damage is known as posttraumatic amnesia (PTA). Many sportsmen in sports experience this. An athlete may be rendered unconscious or possibly in a coma after suffering a severe blow to the head.

1.1.5. Childhood Amnesia: Infantile amnesia, another name for childhood amnesia, is the incapacity to recall early episodic memoirs. These kind of memory loss is very prevailing and is thought to be caused by the baby brain's underdevelopment (Vitelli, 2014) ^[4].

1.1.6. Transient Global Amnesia:

It is a brief type of amnesia known as transient global amnesia causes abrupt and total anterograde memory loss. With roughly 23.5–32 instances per 100,000 people, temporary global amnesia is most common in adults aged 50–80.

1.1.7. Korsakoff Syndrome:

The memory damage called as Korsakoff Syndrome is brought on through a severe thiamine (vitamin B-1) shortage. Alcohol misuse is primary and peak communal reason of Korsakoff's Syndrome, while there may be other contributing variables as well (Alzheimer's Association, n.d.)^[5].

1.2. Causes of Amnesia:

[A]. Loss of memory can be produced by brain injury

[B]. Vitamin B1 absence, which reasons (Wernicke's encephalopathy).

[C]. Traumatic head wound

[D]. Seizures

[E]. Anoxia

[F]. Dementias

[G]. Embolic occlusion on top of the basilar artery, which causes ischemia in the anterior medial temporal parts;

[H]. Encephalitis;

[I]. Intoxication through numerous materials (for example, long-lasting gulp of solvent, harmfulness from amphotericin B)

[J]. Hypothalamic cancers

[K]. Psychological pain or stress. Medial temporal injuries seem to be the cause of post-traumatic loss of memory for times instantaneously before and after disturbance, or modest or severe trauma

[L]. Senile aging is a normal process. Symbolizes the aging-related memory decline that happens naturally ^[6].

1.3. Signs and symptoms of amnesia:-

1.3.1. **Memory Loss:** The incapacity to create new memories or retrieve existing ones.

1.3.2. **Confusion:** Feeling disoriented and unsure of one's identity, position, or circumstances.

1.3.3. **Challenge Learning:** Having difficulty picking up new knowledge or abilities.

1.3.4. **Emotional Distress:** Anxiety, despair, or annoyance brought on by memory loss.

II. MATERIAL AND METHODS

2.1. Collection of plant materials:-

Plant was picked for proposal view of its customary, phytochemical profile was assembled from herbal garden of R.K. Pharmacy College, Sathion, Azamgarh, Uttar Pradesh.

2.2. Authentication of plant:-

Prof. N. K. Dubey, Department of Botany, Banaras Hindu University Varanasi, India, approved the plant. For future reference, a **voucher specimen no. Anacar 2025/01** was set at the herbarium of BHU Varanasi.

2.3. Requirements:-

Table No. 1. : Requirements:-

Instruments	Chemicals	Drugs
Digital pH meter	Mayer's, Wagner's, Benedict test	Piracetam
Soxhlet excerptor	Shinoda, Molisch's test reagents	Scopolamine
Heating mantle	Hager's, Methanol Reagents and Distilled Water	
Condenser	Lead acetate, Molisch's test reagents	

Desiccator	Biuret	
Grinder	Ninhydrin	
Morris water maze test	Foam test	
Syringe	Ferric chloride test	
Oral cannula	Keller-killiani test	

2.4. Preparation of extracts:-

Powdered (350g) stem of the plant was steeped in water at 25-30°C for 48 hour. Excerpt was sifted on whatman No. 1 filter paper. Solvent was completely removed under reduced pressure in a rotator vacuum evaporator to get a powdery mass. The concentrated excerpt was stored in vacuum desiccators for further use. HME was tried for nootropics activity by quantity stages of 250 & 500 mg per kg orally. The results were matched by standard nootropic agent Piracetam (200mg/kg). All the test materials were suspended in vehicle (water)^[7].

2.5. Experimental Animals:-

For this experiments utilize male wistar albino rats balancing 150-200 gms. In polypropylene cages (38 x 23 x 10 cm) with paddy husk as bedding was arrangement for all rats treatment groups. Organization Temperature of 25±2°C, comparative humidity of 50±5 percent rats housed. Monitored light (12 h dim / 12 h sunny period). Fresh water ad libitum, fed using normal pellet nutrition allowed to all animals. The experiments was performed following animals ethics guidelines of “Institutional Animals Ethics Committee” (Approval No: IAEC/RK/25/10)

Table No. 2. Grouping of Animals:

Sr. No.	Groups	No. of Animals
1	Normal control (Normal saline 10ml/kg p.o).	6
2	Negative control (Scopolamine 0.4 mg per kg i.p.)	6
3	Standard (Piracetam 200mg/kg p.o)+Scopolamine +0.4 mg/kg ip	6
4	Test-I (AEMI 250 mg per kg p.o)+ Scopolamine 0.4 mg/kg ip	6
5	Test-II (AEMI 500mg/kg p.o.)+Scopolamine 0.4 mg per kg ip	6

2.6. Morris water-maze test (Scopolamine-induced amnesia in rats):

Albino rats of both gender weigh up amongst 160 and 190 gm were placed into five groups of six rats each. Group 1 animals were given saline solution (10 ml/kg. oral), group 2 rats were receive Scopolamine (0.4 mg/kg i.p.), group 3 rats were given Piracetam (200 mg/kg, p.o.), and groups 4 and 5 rats were given the test drug, an aqueous excerpt of *M. indica* AEMI at doses of 250 and 500 mg per kg, p.o., respectively. The Morris water maze test was accompanied in a round pool of 120 cm in circumference and 45 cm in height.

The water-maze tank was equipped with four exterior visual cues and packed through water of a free from toxic white tint. Temperature of H₂O was kept between 23 and 25 degrees Celsius. A white platform (10cm in diameter and 30cm in height) was set in an equal-sized quadrant and submerged 2cm below the water's surface. A video tracking system (Ethovision System, Netherlands) measured the escape latency and time spent searching for the hidden platform during each trial session. During next four days of training, the rats were given three trials per day with the submerged platform in the pool. The rats were allowed to stay on the plated platform for an additional 10 seconds.

If rats did not find the hidden platform within 120 seconds, they were escorted to it and allowed to stay for an extra 10 seconds. On the final day, hidden platform was removed from the water maze tank and a probing test was conducted. Rats were permitted to swim for 90 seconds and their time spent in the maze quadrant with the previously located platform was recorded.

Group-I : Normal control (Normal saline 10ml/kg p.o)^[8].

Group-II Negative control (Scopolamine 0.4 mg per kg i.p.)

Group-III: Standard (Piracetam 200mg/kg p.o)+Scopolamine +0.4 mg/kg ip

Groups-IV: Test-I (AEMI 250 mg per kg p.o)+ Scopolamine 0.4 mg/kg ip

Groups-V: Test-II (AEMI 500mg/kg p.o.)+Scopolamine 0.4 mg per kg ip

All Agents are administered for 28 days.

2.7. Statistical analysis:-

Number of animals (n) = 6. The values are mean $\pm$ S.E.M.

*P < 0.05, **P < 0.01, ***P < 0.001 when matched through control group (One-way ANOVA followed via Newman-Keulspost hoc test).

III. RESULT

3.1. Phytochemical Screening:-

Mangifera Indica shown the occurrence of proteins and amino acids, alkaloids, flavonoids, Carbohydrate and Saponins. In order to address the existence of various phenolic mixes, such as polyphenols, flavonoids, phenolic acid, etc.

Table No. 3: Preliminary phytochemical investigation.

Phytochemicals	Name of the test	Observation	Result
Alkaloids	Mayer's	Creamy white ppt.	+
	Wagner's	Deep chocolate ppt.	+
	Hager's	Yellow crystalline precipate	+
Flavonoids	Shinoda	Development pink colour	+
	Specific	Orange to red	+
	Lead acetate	Yellow coloured	+
Proteins and Amino acids	Biuret	A pink coloured	+
	Ninhydrin	No precipitate	-
Saponins	Foam test	2 cm layer of foam	+
Tannins	Ferric chloride test	No precipitate	-
Glycosides	Keller-killiani test	No precipitate	-
Carbohydrate	Benedict test	Indicated by a red, or green ppt	+
	Molisch's test	Produced purple to violet ring	+

3.2. Morris water-maze test (Scopolamine-induced) amnesia in rats:

Table 4. Effect of Aqueous Excerpt of *Mangifera Indica* on Escape latency of normal rats by using MWM test.

Sr. No.	Group name	Escape latency (Sec.)			
		7 th day	14 th day	21 st day	28 th day
1	Normal control (Normal saline 10ml/kg p.o).	21.2 ± 1.45	19.7 ± 0.50	17.1 ± 1.33	18.7 ± 2.05
2	Negative control (Scopolamine 0.4 mg per kg i.p.)	71.1 ± 3.63	69.1 ± 2.61	73.9 ± 1.74	73.1 ± 4.04
3	Standard (Piracetam 200mg/kg p.o.)+ (Scp. 0.4 mg/kg i.p.)	33.4 ± 2.85*** (53.02% decrease)	28.8 ± 1.40*** (58.32% decrease)	19.1 ± 1.22*** (74.15 %decrease)	20.4 ± 2.57*** (72.09% decrease)
4	Test-I(AEMI-250 mg/kg p.o.)+ (Scp. 0.4 mg/kg i.p.)	68.1 ± 2.97 (4.21% decrease)	61.5 ± 2.04 (11.0% decrease)	46.4 ± 3.14*** (37.21 %decrease)	42.6 ± 1.08*** (41.72% decrease)
5	Test-II(AEMI-500 mg/kg p.o.)+ (Scp. 0.4 mg/kg i.p.)	44.2 ± 1.75*** (37.83 %decrease)	33.6 ± 1.01*** (51.37% decrease)	34.7 ± 1.74*** (53.04%decrease)	30.1 ± 0.92*** (58.82 % decrease)

Number of animals (n) = 6.

The values are mean ± S.E.M.

*P < 0.05, **P < 0.01, ***P < 0.001 when matched through control group (One-way ANOVA followed via Newman-Keuls post hoc test).

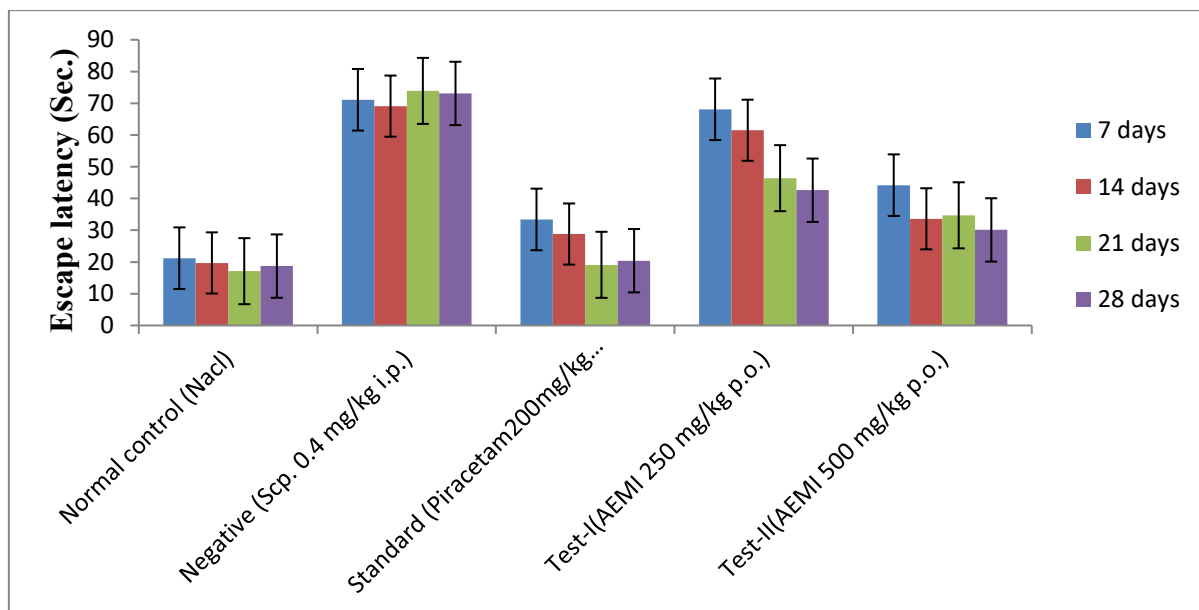


Figure no. 2. Effect of Aqueous Excerpt of *M. indica* on Escape latency (EL) of rats in MWM test.

Table no. 5. Effect of Aqueous Extract of *Mangifera Indica* on time spent in target quadrant (TSTQ) of normal rats in MWM test.

Sr. No.	Group name	Time spent in target quadrant (TSTQ) (Sec.)			
		7 th day	14 th day	21 st day	28 th day
1	Normal control (Normal saline 10ml/kg p.o).	107.4 ± 1.01	121.1 ± 1.45	128.3 ± 3.44	145.4 ± 1.05
2	Negative control (Scopolamine 0.4 mg/kg ip)	80.3 ± 0.22	83.8 ± 0.79	94.4 ± 3.01	81.4 ± 0.22
3	Standard (Piracetam 200mg/kg p.o.)+ (Scp. 0.4mg/kg ip)	116.2 ± 2.11** (44.70 % increase)	130.1 ± 3.68*** (55.25% increase)	137.2 ± 6.23*** (45.33% increase)	154.1 ± 2.05*** (89.31% increase)
4	Test-I (AEMI 250 mg/kg p.o.)+ (Scp. 0.4 mg/kg ip)	91.1 ± 6.62 (13.44 %increase)	115.9 ± 5.12** (38.30% increase)	128.2 ± 1.36** (35.80% increase)	132.1 ± 1.23*** (62.16% increase)
5	Test-II (AEMI 500 mg/kg p.o.) + (Scp. 0.4 mg/kg ip)	109.3 ± 3.60* (36.11% increase)	112.4 ± 1.36** (34.12% increase)	129.4 ± 1.49** (37.07% increase)	139.2 ± 9.09*** (71.0% increase)

Number of animals (n) = 6.

The values are mean ± S.E.M.

*P < 0.05, **P < 0.01, ***P < 0.001 when matched by control group (One-way ANOVA tracked via Newman-Keulspost hoc test).

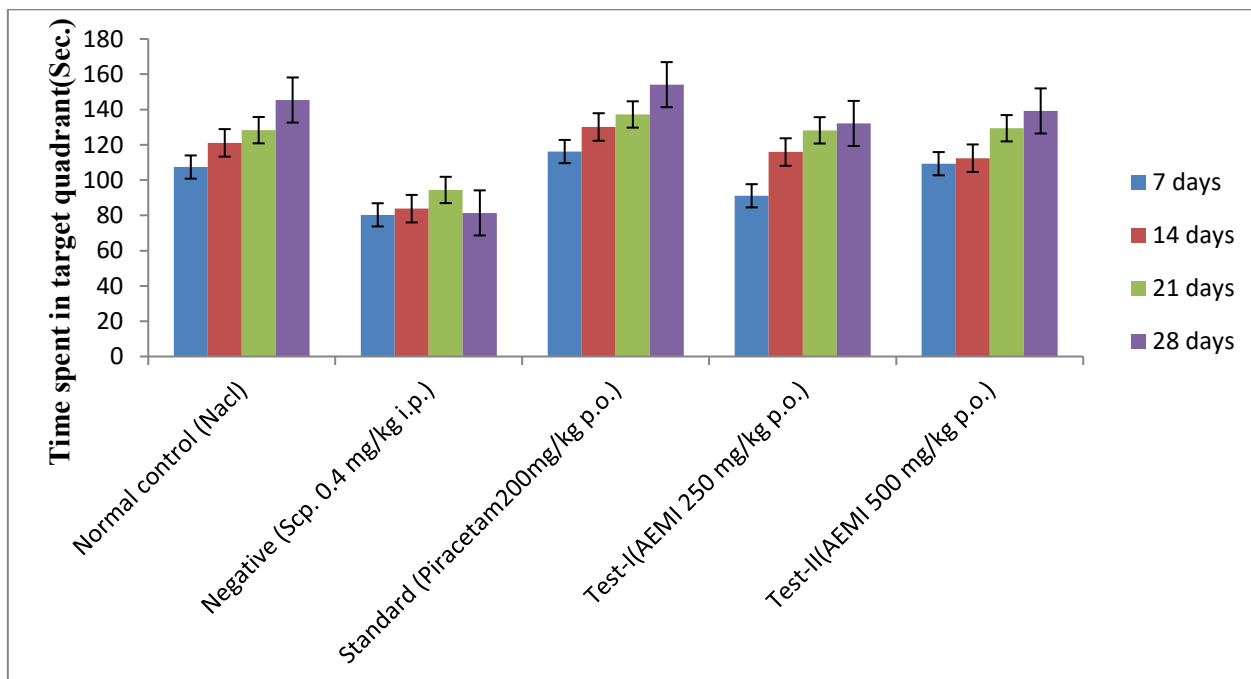


Figure no. 3. Effect of Aqueous Extract of *M. indica* on Time spent in target quadrant (TSTQ) of rats in MWM test..

IV. DISCUSSION

The results demonstrated that *Mangifera indica* possess nootropic action. Aqueous excerpts of plants were administered at two doses: a higher dose of 500 mg per kg and a lower dose of 250 mg per kg orally. In the Morris water maze test, escape latency times were significantly reduced compared to controls groups and Time spent in target quadrant is increased matched through control groups, suggesting improvements in spatial memory and learning [59]. Overall, the results demonstrate that the plant excerpts have effects on learning and memory in experimental rats, showing their potential as nootropics effects. However, further studies are needed to evaluate other pharmacological parameters like potential side effects, effects on specific organs, and determination of optimal doses. This will certify the safety and effectiveness of using these plant excerpts as nootropic supplements.

V. CONCLUSION

In conclusion, current trial advised that *M. indica* stem designated for assessment of nootropic action. *M.indica* stem Excerpt at dosage 250 and 500 mg per kg was managed orally for 28 days. *Mangifera indica* stem Excerpt possess nootropic activity by In Morris water maze test, escape latency times were significantly reduced compared to controls groups and Time spent in target quadrant is increased matched through control groups, suggesting improvements in spatial memory and learning. Therefore, current data specifies that *M.indica* is to be a harmless Neuroprotective, memory enhancer effect and could be used as a part of therapy to treat Amnesia.

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