Development, Physicochemical Characterization, Standardization, and Preclinical Evaluation of a *Merremia dissecta* Leaf Extract-Based Herbal Syrup for Neuroprotection Against Scopolamine-Induced Cognitive Impairment

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Abstract: Alzheimer's disease (AD), the most common form of dementia, is marked by a progressive loss of memory, cognition, and executive functioning. Disease progression results in increasing impairment of daily activities, loss of independence, and a significantly lower quality of life for the sufferer. The goal of the current study was to create and assess a herbal syrup based on *Merremia dissecta* leaf extract and examine its neuroprotective potential against scopolamine-induced memory impairment in Wistar albino rats (n = 25). The existence of flavonoids, phenolics, alkaloids, saponins, terpenoids, and steroids was verified by phytochemical screening after the hydroalcoholic leaf extract was made by Soxhlet extraction. The OECD Guideline 423 was followed in the assessment of acute oral toxicity. the prepared herbal syrup demonstrated acceptable physicochemical features and was deemed safe, with no mortality reported up to 2000 mg/kg. The Elevated Zero Maze and Elevated Plus Maze, Actophotometer, and histopathological analysis were used to assess neuroprotective activity. When compared to the scopolamine-treated group, *Merremia dissecta* syrup treatment considerably enhanced learning, memory retention, exploratory behavior, and locomotor activity while maintaining hippocampal neuronal architecture. These results imply that a herbal syrup made from *Merremia dissecta* leaf extract has encouraging neuroprotective and memory-boosting qualities and could be a viable natural treatment option for Alzheimer's. To verify its therapeutic effectiveness, more mechanistic and clinical research is needed.

Keywords: *Merremia dissecta,* herbal syrup, neuroprotective activity, scopolamine, memory impairment, Alzheimer's disease, behavioral activity, and histopathology.

1. Introduction

Alzheimer's disease (AD) is a brain disease that causes degeneration that results in a steady decline in neurological function. A gradual deterioration in behavior, memory, learning ability, and cognitive function are its hallmarks. [1, 2] It is the main cause of dementia in the elderly and a major burden on global health. The number of people with dementia is predicted to rise significantly as a result of population aging, according to recent estimates, making the creation of efficient treatment approaches a top research goal. [3, 4]

The complex pathophysiology of Alzheimer's disease is influenced by a number of variables, including oxidative stress, neuroinflammation, cholinergic dysfunction, hyperphosphorylated tau protein neurofibrillary tangles, and amyloid-β plaque development. [5]

Among these pathways, memory impairments and cognitive decline are largely caused by cholinergic neuron degeneration and decreasing acetylcholine levels. As a result, improving cholinergic neurotransmission is still a crucial therapeutic strategy for Alzheimer's disease. [6]

The broad-acting muscarinic receptor inhibitor scopolamine is frequently used to cause memory loss in lab animals. By interfering with cholinergic neurotransmission and raising oxidative stress, scopolamine injection causes learning and memory problems resembling those seen in Alzheimer's disease. As a result, the memory deficits induced by the scopolamine model is regarded as a trustworthy and reputable experimental model for assessing possible neuroprotective and cognition-enhancing substances. [7, 8]

Alzheimer's disease treatment primarily aims to mitigate symptoms rather than treat the illness. Acetylcholinesterase inhibitors and memantine, an NMDA receptor antagonist like donepezil, rivastigmine, and galantamine, are among the often-given medications. By boosting cholinergic neurotransmission and controlling glutamate activity in the brain, these drugs temporarily improve memory and cognitive performance. They cannot, however, halt or reverse the steady loss of neurons linked to Alzheimer's disease. In addition, extended use of these medications may cause unpleasant symptoms such headache, nausea, vomiting, diarrhea, lightheadedness, and appetite loss, which might reduce patient compliance. Due to these restrictions, there is increasing interest in investigating medicinal plants as alternative therapeutic agents because of their neuroprotective, anti-inflammatory, and antioxidant qualities, which may provide a safer method for managing Alzheimer's disease.

[9,10]

Merremia dissecta (Jacq.) Hallier f., a member of the family Convolvulaceae, is commonly known as Alamo vine or Kaliaphumari. It has a long history of use in a variety of therapeutic applications and is recognized to have important pharmacological properties. [12] Previous phytochemical investigations have confirmed the occurrence of terpenoids, alkaloids, tannins, phenolic compounds, and flavonoids, and β-caryophyllene in the plant. [13] The plant's β-caryophyllene may preserve neural cells and improve cognitive function by lowering oxidative stress and neuroinflammation. [13, 14]

Despite the therapeutic potential of medicinal plants in cognitive disorders, limited scientific information is available regarding the neuroprotective efficacy of *Merremia dissecta* against scopolamine-induced memory impairment. Furthermore, no study has reported the development and evaluation of a *Merremia dissecta* leaf extract-based herbal syrup for cognitive enhancement. Accordingly, the current investigation was undertaken to develop and evaluate a *Merremia dissecta* leaf extract-based herbal syrup and investigate its neuroprotective activity against scopolamine-induced memory impairment using behavioral and histopathological approaches.

2. Methodology

2.1 Procurement & Authentication of Plant – The fresh leaves of *Merremia dissecta* were gathered from the Nagpur region, a local area in Maharashtra, India, during the appropriate growing season. The plant specimen was authenticated by Dr. Satyendra Sen, Professor, Botanist, V.Y.T. Post Graduate Autonomous College, Durg, Chhattisgarh (C.G.), 490023, India. The authentication was completed on 27 December 2025.

2.2 Preparation of extract: - A mechanical grinder was used to coarsely powder the gathered leaves after they had been cleaned and shade-dried for two weeks. The powdered material (100 g) was subjected to extraction with a Soxhlet extraction device with a hydroalcoholic solvent (ethanol: water, 70:30 v/v). The extract was concentrated under lower pressure using a rotary evaporator. It was then dried to produce a semisolid mass and kept in an airtight container for further examination. The usual formula was used to determine the % yield. [13,15]

Percentage Yield [%] — weight of extract [gm] / weight of dry powder. [gm] × 100

2.3 Phytochemical analysis –Alkaloids, glycosides, tannins, flavonoids, steroids, proteins, and terpenes were found during preliminary phytochemical analysis using recognized qualitative techniques. [14]

2.4 Herbal Syrup Formulation –

Chemical / Reagent	Quantity	Use / Purpose
Merremia dissecta Extract	10 ml	Active ingredient
Distilled water	q.s. to 100 ml	Vehicle / q.s. to 100ml
Sucrose (66.7%)	66.7 g	Sweetening agent
Propylene glycol	5ml	Solubilizing agent
Vanillin	0.05g	Flavouring Agent
Glycerin	5ml	Humectant and Viscosity enhancer
Methyl paraben	0.1g	Antimicrobial Preservative
Propyl paraben	0.02g	Antifungal Preservative
Citric acid	0.1g	pH adjuster

Table No. 1 – Herbal syrup Formulation

The *Merremia dissecta* leaf extract-based herbal syrup was prepared using the simple syrup method. Sucrose was dissolved in distilled water to prepare the syrup base. The extract was mixed with propylene glycol, glycerin, and vanillin, while preservatives such as propyl and methyl paraben were added. The pH was adjusted by adding citric acid, and distilled water was added to get the total volume up to 100 mL. The prepared syrup was carefully blended, filtered, put into bottles with an amber hue, and kept at room temperature for further analysis. [15]

***2.5 In vitro* Evaluation of syrup:**

Organoleptic Properties—Color, taste, odor, and appearance were evaluated . [16]

pH Determination—The pH of syrup was determined using a digital pH meter. [17]

Viscosity—The viscosity was determined by placing 50 mL of the syrup in a Brookfield viscometer employing spindle No. 64 at a speed of 100 rpm at room temperature, with readings collected. [18]

Density: A pycnometer or specific gravity bottle was used to measure density. [19]

Stability Study: The prepared *Merremia dissecta* leaf extract's stability study Herbal syrup was carried out according to the requirements of ICH Guideline Q1A(R2) (New Drug Substances and Product Stability Testing). The mixture was put into sealed, amber-colored containers and kept in accordance with the guidelines. [20]

3. *In vivo* study -

Experimental Animals: The Rungta Institute of Pharmaceutical Sciences' animal house in Bhilai, Chhattisgarh, provided adult, healthy Wistar albino rats of both sexes, weighing between 180g-200g. The experimental animals were kept in a controlled environment with 12-hour cycles of light and dark, a relative humidity of 60 ± 5%, and an ambient temperature of 22 ± 2°C. Throughout the trial, the animals had unrestricted access to clean drinking water and were fed a standard laboratory diet. Before the studies began, the animals were allowed a week to get used to the lab setting.

The experimental procedure was reviewed and approved by the Institutional Animal Ethics Committee (IAEC) of

the Rungta Institute of Pharmaceutical Sciences in Bhilai, Chhattisgarh, on January 24, 2026 (Approval No. RIPS/IAEC/2025-26/01/10), in accordance with the rules of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). Before the inquiry began, each animal had been habituated to the lab environment for at least one week. After acclimatization, the rats were randomly assigned to five experimental groups, each consisting of five animals (n = 5), in order to minimize selection bias.

Experimental Design – The animals were divided into five groups at random, with five rats in each group. [21]

Group I - Normal control (0.9%)

Group II - Disease control [(scopolamine) (1 mg/kg) I.P. on 14th day]

Group III - Standard control [Piracetam (200 mg/kg) + Scopolamine (1 mg/kg) for 14 days orally].

Group IV - Low-dose test formulation: 200 mg/kg plus 1 mg/kg of scopolamine taken orally for 14 days

Group V - High-dose test formulation: 400 mg/kg plus 1 mg/kg scopolamine for 14 days

Pharmacological drug administration

Scopolamine hydrobromide manufactured by Yucca Enterprises and Piracetam manufactured by B.L. Chemical Products were selected for the present work.

Animals assigned to Group I served as vehicle controls and were given regular saline for 14 days in a row. For 14 days in a row, Group III, the standard, was given 200 mg/kg of piracetam, a memory enhancer. As test animals, Group IV and Group V were given 200 mg/kg and 400 mg/kg of the formulation, respectively, throughout a 14-day period. Groups II, III, IV, and V animals were given a one dose of 1 mg/kg of scopolamine on the fourteenth day, following ninety minutes of all medication administration. On day 14, 30 minutes before to the commencement of behavioral experiments, the rats were given an intraperitoneal injection of 1 mg/kg of scopolamine. Behavioral assessments were performed over a period ranging from 45 minutes to 24 hours. [22,23,24]

4. Behavioral Test

Elevated plus maze: The elevated plus maze model is made up of a pair of open arms that each measure 16 cm in length and 5 cm in width, along with a pair of closed arms that measure 16 cm × 5 cm × 12 cm. They are positioned opposite one another and have an open roof. All arms extend, connected to a central square area measuring 5 cm × 5 cm. The entire maze is raised around 25 cm above the ground in order to make the open arms more unpleasant and to make behavioral evaluation easier. The experimental model was based on the induction of memory impairment in rats through the intraperitoneal route of scopolamine (1 mg/kg), a muscarinic acetylcholine receptor antagonist known to produce cognitive deterioration by disrupting cholinergic neurotransmission. Behavioral performance were subsequently evaluated to examine treatment efficacy. Memory retention was assessed by one day after the initial training session to assess memory performance. [25, 26]

Elevated Zero Maze Test-The elevated zero maze comprises a circular runway elevated approximately 50 cm above the floor and partitioned into four identical quadrants, two open as well as two enclosed quadrants, organized alternately. The device is used to evaluate experimental animals' anxiety-related behavior and cognitive function. Scopolamine (1 mg/kg, i.p.) was given to establish a memory-deficit model in rats. Each rat was put separately within one of the maze's enclosed quadrants oriented toward the wall on the fourteenth day of the experiment. The animal was allowed unrestricted exploration of the maze for 5 min. Throughout the test period, behavioral responses were continuously recorded and documented. [26, 27]

Actophotometer—The actophotometer is used to evaluate the locomotor activity of experimental animals. The device consists of a square chamber fitted with photoelectric cells. The movement of the animal disturbs the light beams, and the interruptions are automatically recorded as activity counts. Scopolamine (1 mg/kg, i.p.) was administered to induce memory impairment in rats. rats were given scopolamine (1 mg/kg, i.p.) to cause memory impairment. Each rat was put separately in the actophotometer chamber on the fourteenth day of the experiment. The locomotor activity of the animal was recorded for a duration of 5 minutes. To eliminate olfactory signals and avoid interfering with later recordings, the chamber was cleaned after every observation. [28]

Histopathological analysis - At the end of the experimental period, the animals were sacrificed under deep halothane anesthesia, and brain samples were collected for histopathological examination. The tissues were washed in xylene, embedded in paraffin wax, dehydrated using progressively higher alcohol grades, and fixed in 10% neutral buffered formalin. Thin slices (4–5 µm) were made using a rotary microtome, deparaffinized, and stained with hematoxylin and eosin. Microscopic evaluation was performed to assess neuronal damage induced by scopolamine and the potential neuroprotective activity of the herbal syrup formulation. [8,29]

Brain sections were examined under a light microscope at 400× magnification.

Statistical Analysis - A mean ± standard deviation (SD) was used to illustrate the data. The Bonferroni post hoc test for multiple comparisons and one-way analysis of variance (ANOVA) were employed to statistically assess both behavioral measures. A p-value of less than 0.05 was considered to be statistically significant ($P < 0.05$). [22, 24]

5. Results

5.1 Extraction yield: % yield = weight of extract (gm)/weight of dry powder (gm) × 100

Weight of dried powder	100g
Weight of extract obtained	10g
Percent yield	10% (w/w)

Table N0. 2 – Extraction yield

5.2 Phytochemical tests — Preliminary phytochemical screening of the ethanolic leaf extract of A number of bioactive secondary metabolites were found in *Merremia dissecta.* Both Dragendorff's and Wagner's tests verified the identification of alkaloids, while the alkaline reagent test identified flavonoids. The Liebermann–Burchard test verified terpenoids, the ferric chloride test found phenolic chemicals, and the Salkowski test revealed steroids. The ethanolic extract has a wealth of physiologically active components that could help to its pharmacological activity, as all of the studied phytochemical groups showed good results.

5.3 Syrup Evaluation Parameter –

Parameter	**Result**
Appearance	Homogeneous
Color	Dark brown
Odor	Characteristics
pH	6.2
Specific gravity	1.28
Density	1.33g/mL

Table No.3 – Syrup evaluation parameter

5.4 Observation Table of Stability Studies:
The formulation's color, odor, and pH did not significantly alter during the stability study period, and no precipitation was seen, suggesting that the herbal syrup stayed stable.

Sr. No	**Parameter**	**Initial**	**15 day**	**30 day**
1	Odour	Aromatic	No change	No change
2	Color	Dark brown	No change	No change
3	pH	6.2	6.2	6.1
4	Density	1.33	1.33	1.32

Table No.4 —Observation table Stability study

5.5 Acute Toxicity Study (OECD-423) –
The prepared herbal syrup's acute oral toxicity was assessed using OECD Guideline 423. The formulation was given orally to healthy rats at dosages of 300, 1000, and 2000 mg/kg after they had fasted for the whole night. For the first four hours, the animals were observed, and for the next fourteen days, They were monitored daily for mortality, behavioral abnormalities, and indications of toxicity. The formulation was deemed safe for further pharmacological research due to the lack of treatment-related adverse effects or mortality up to 2000 mg/kg. [21]

Administrative Dose (mg/kg)	**No. of animals**	**Mortality**	**Behavioral Changes**	**Toxic Symptoms**
300	2	0/2	None	None
1000	2	0/2	None	None
2000	2	0/2	None	None

Table No – 5. Observation Acute toxicity study

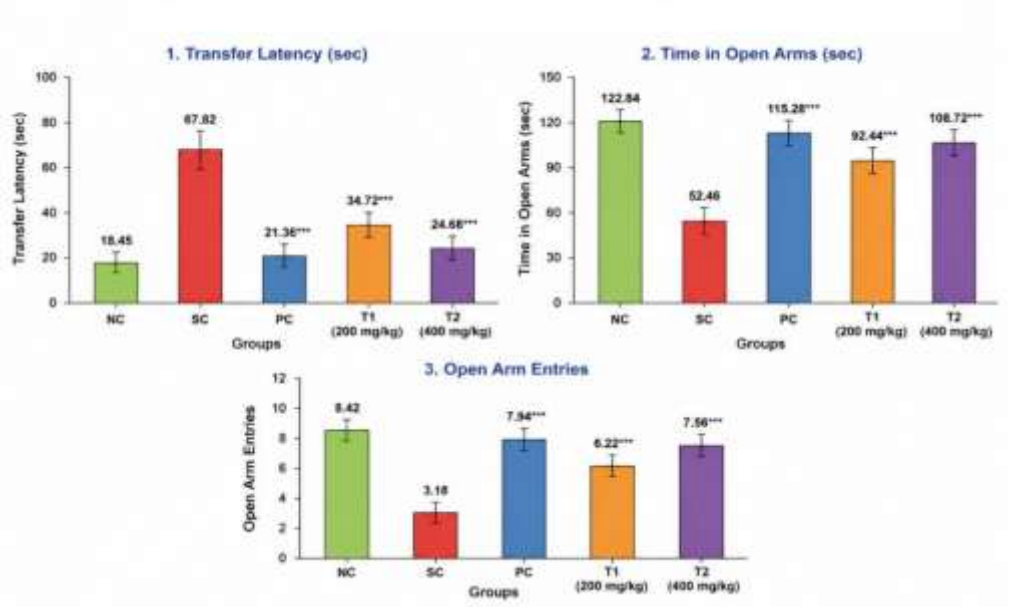
Result Interpretation - No mortality or treatment-related behavioral abnormalities were observed up to 2000 mg/kg. Therefore, the oral LD50 of the formulation was considered more than 2000 mg/kg, suggesting a large safety margin.

5.6 Behavioral test Elevated plus maze

Sr. No.	**Parameters**	**NC**	**SC**	**PC**	**T1(200 mg/kg)**	**T2 (400 mg/kg)**
1	Transfer Latency (sec)	18.45 ± 1.62	67.82 ± 3.45	21.36± 1.84***	34.72 ± 2.51***	24.68 ± 2.06***
2	Time in Open Arms (sec)	122.84 ± 6.12	52.46 ± 4.28	115.28 ± 5.36***	92.44±4.61***	108.72±5.22***

3	Open Arm Entries	8.42 ± 0.58	3.18 ± 14	7.94 ± 0.51***	6.22 ± 18***	7.56 ± 0.52***

Table No. 6 - Effect of drug on elevated plus maze (Day 14) (n=5).

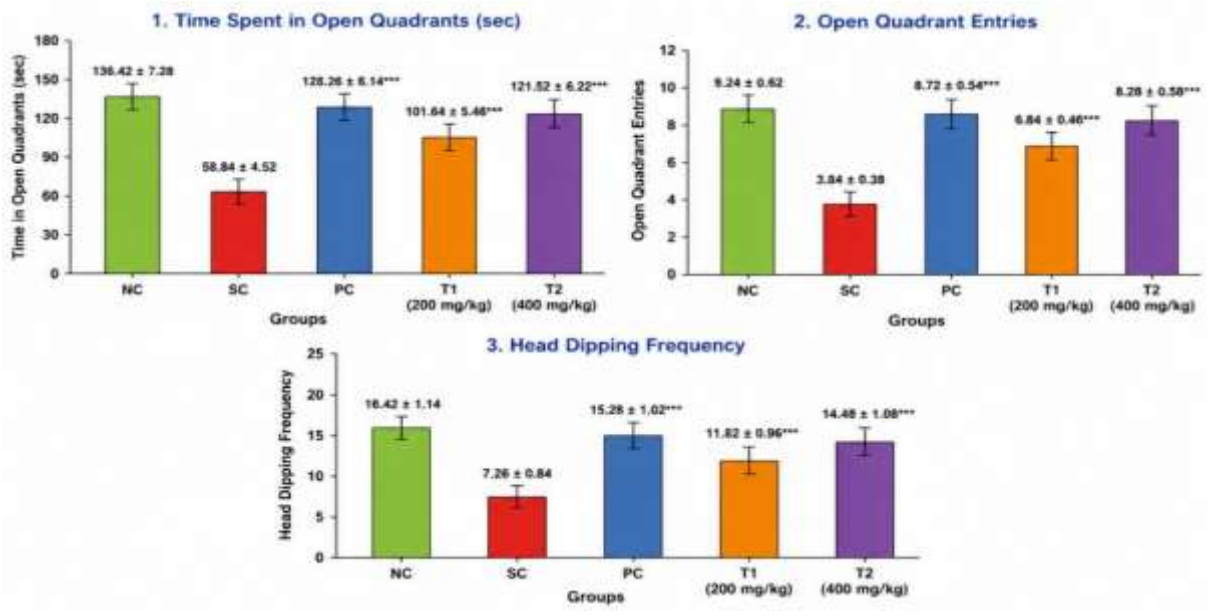


NC: Normal control, SC: Scopolamine control, PC: Piracetam 200 mg/kg.
T1: *Merremia dissecta* syrup 200 mg/kg; T2: *Merremia* disecta syrup 400 mg/kg.

Result Interpretation — Scopolamine administration significantly increased transfer latency and reduced exploratory behavior. Treatment with *Merremia dissecta* syrup improved retention and exploratory activity, with the high-dose group showing near-normal cognitive performance.

Elevated zero maze test

Sr. No.	Parameter	NC	SC	PC	T1(200 mg/kg)	T2 (400 mg/kg)
1	Time Spent in Open Quadrants (sec)	134.42 ±7.28	58.84 ±4.52	128.24 ± 4.14***	101.44 ± 5.44***	121.52 ± 4.22***
2	Open Quadrant Entries	9.24 ± 0.42	3.84 ± 0.38	8.72 ± 0.54***	4.84 ±14***	8.28 ± 0.58***
3	Head Dipping Frequency	14.42 ± 1.14	7.24+0.84	15.28 ± 1.02***	11.82 ± 0.94***	14.48 ± 1.08***



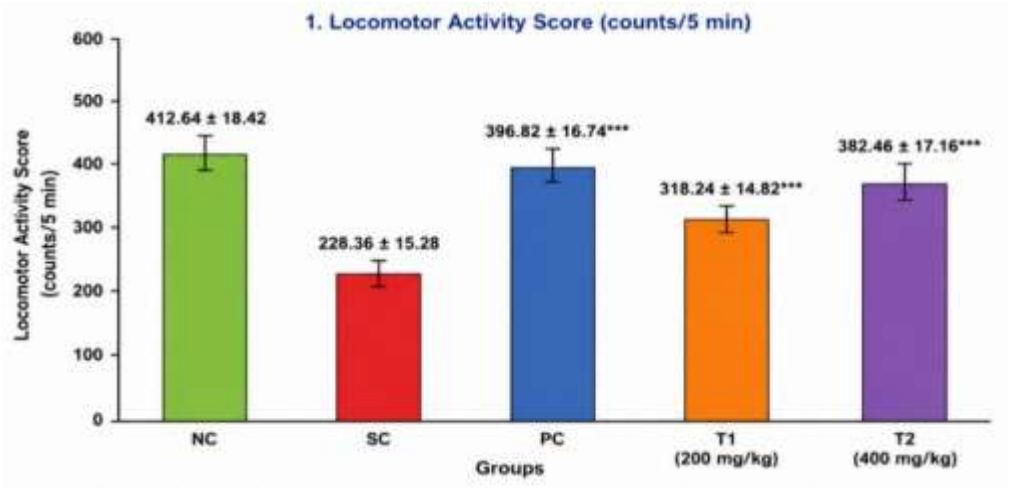
NC: Normal control, SC: Scopolamine control, PC: Piracetam 200 mg/kg.
T1: *Merremia dissecta* syrup 200 mg/kg; T2*: Merremia dissecta* syrup 400 mg/kg.

Result Interpretation - Scopolamine administration significantly reduced the time spent in open quadrants, open quadrant entries, and head-dipping behavior, indicating increased anxiety-like behavior and reduced exploratory activity. Treatment with *Merremia dissecta* syrup significantly improved all measured parameters in a dose-dependent manner. Animals receiving the 400 mg/kg dose exhibited behavioral responses comparable to those of the Piracetam-treated group. Increased open-area exploration and head-dipping frequency suggest anxiolytic effects and improved cognitive function. These observations further support the neuroprotective potential of *Merremia dissecta* syrup against scopolamine-induced behavioral deficits.

Actophotometer –

Sr. No.	Parameter	NC	SC	PC	T1 (200 mg/kg)	T2 (400 mg/kg)
1	Locomotor Activity Score (counts/5 min)	412.44 ± 18.42	228.34 ± 15.28	394.82 ± 14.74***	318.24 ± 14.82***	382.44 ± 17.14***

Table No.8 - Effect of drug on actophotometer activity (Day 14) (n=5).



NC: Normal control, SC: Scopolamine control, PC: Piracetam 200 mg/kg
T1: *Merremia dissecta* syrup 200 mg/kg, T2: *Merremia dissecta* syrup 400 mg/kg

Result Interpretation— When differed the normal control group, scopolamine injection dramatically decreased locomotor activity, indicating impaired exploratory behavior and central nervous system dysfunction. Treatment with Merremia dissecta syrup significantly increased locomotor counts in a way that is reliant on concentration. Activity levels comparable to those seen in the group treated with piracetam were obtained by the 400 mg/kg dose, indicating improvement in motor coordination, alertness, and overall behavioral performance. These findings indicate that the formulation does not produce sedative effects and may enhance central nervous system function.

Histopathological Evaluation of Brain Tissue-

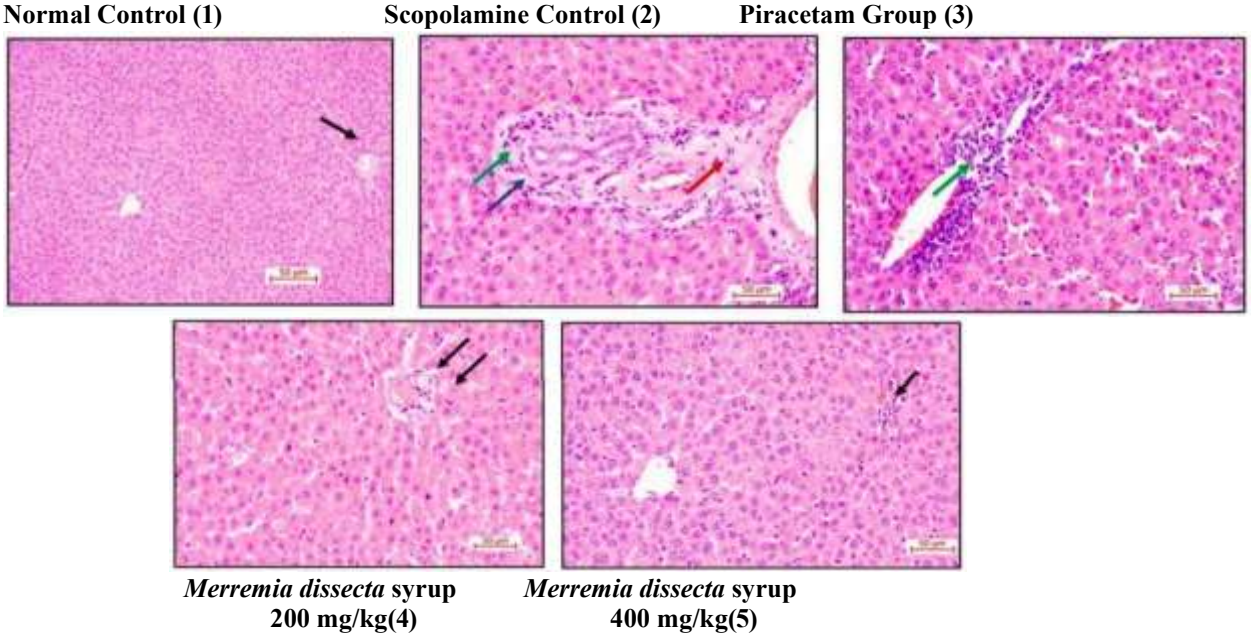


Fig.No. 1 - Histopathological examination of hippocampal tissue (H&E staining, 400× magnification)

Normal Control (1)
Normal hippocampus structure and undamaged pyramidal neurones were observed in brain slices.
Scopolamine Control (2)
Sections showed significant hippocampus injury, pyknotic nuclei, cytoplasmic vacuolation, neuronal degeneration, and decreased neuronal density.
Piracetam Group (3)
Marked restoration of neuronal architecture with minimal degeneration and preserved hippocampal integrity.
***Merremia dissecta* syrup 200 mg/kg (4)**
Moderate neuronal morphology repair with enhanced neuronal density and decreased cellular degeneration.
***Merremia dissecta* syrup 400 mg/kg (5)**
Near-normal hippocampal architecture with substantial reduction in neuronal degeneration, indicating significant neuroprotective activity.

Discussion

The present investigation indicated that the *Merremia dissecta* leaf extract-based herbal syrup possesses considerable neuroprotective efficacy against scopolamine-induced memory impairment in Wistar albino rats. Scopolamine is extensively used to produce cognitive deficits by inhibiting central muscarinic cholinergic receptors, inducing memory impairment and oxidative stress comparable to those reported in Alzheimer's disease. [8, 9] In the current study, learning, memory retention, exploratory behavior, and locomotor activity were all severely hampered by scopolamine, but they were considerably and dose-dependently enhanced by administration with *Merremia dissecta* syrup. These results show that the formulation successfully reduced the cognitive impairment caused by scopolamine.

The behavioral improvements found in the Elevated Plus Maze, Elevated Zero Maze, and Actophotometer are in keeping with prior results on medicinal plants examined in scopolamine-induced amnesia models. [36] According to Yadang et al., in mice given scopolamine, *Carissa edulis* considerably enhanced memory function, decreased oxidative stress, and maintained hippocampus neurons. [8] Similar findings were reported by Kulkarni et al., where Prunus amygdalus significantly improved cognitive function in scopolamine induced amnesia in rats. [25] Pawar et al. also demonstrated improved locomotor and memory performance in scopolamine-induced rats following herbal treatment. [28] Similarly, in mice treated with scopolamine, Kouémou et al. showed that *Dichrocephala integrifolia* reduced acetylcholinesterase activity and neuronal degeneration while enhancing learning and memory. [29] *Marsilea quadrifolia* extract exhibited significant anti-Alzheimer's activity by improving cognitive function in experimental animals [30]. Furthermore, the combined extract of *Mentha piperita* and *Cornus officinalis* protected against neuronal cell death and ameliorated scopolamine-induced memory impairment, supporting the role of phytochemical-rich herbal formulations in neuroprotection [31]. These findings align with the present study, where *Merremia dissecta* herbal syrup improved behavioral performance and preserved hippocampal architecture in a dose-dependent manner.

The phytochemical screening revealed that Merremia dissecta contained flavonoids, phenolic compounds, alkaloids, steroids, and terpenoids. These metabolites are well known for their anti-inflammatory and antioxidant qualities [13,14]. While β-caryophyllene, a significant terpenoid found in *Merremia* species, activates cannabinoid CB2 receptors and reduces neuroinflammation, flavonoids and phenolic substances can scavenge reactive oxygen species, prevent lipid peroxidation, and strengthen endogenous antioxidant defenses. The combined effect of these phytochemicals may explain the considerable increase in cognitive function seen in the present investigation. [32] The antioxidant, anti-inflammatory, and cholinergic protective qualities of flavonoids and related phytochemicals have also been highlighted in recent studies as potential neuroprotective drugs. [15, 37]

The behavioral observations are further corroborated by the histological results. While treatment with *Merremia dissecta* syrup retained hippocampus architecture and significantly decreased neuronal damage, especially at the 400 mg/kg dose, brain sections from the scopolamine-treated group displayed neuronal degeneration, cytoplasmic vacuolation, and decreased neuronal density. For *Dichrocephala integrifolia*, comparable histological protection has been documented, with pretreatment reducing hippocampus neuronal death and maintaining brain architecture after scopolamine injection. Similarly, *Marsilea quadrifolia* extract has also demonstrated significant neuroprotective and memory-enhancing effects in experimental Alzheimer's disease models. Likewise, the combined extract of *Mentha piperita* and *Cornus officinalis* protected against neuronal cell death and improved cognitive function in scopolamine-induced memory impairment. These findings are consistent with the present study, in which *Merremia dissecta* herbal syrup preserved hippocampal architecture and significantly improved behavioral performance. [29, 31]

Additionally, the prepared herbal syrup showed acceptable physicochemical properties and held steady during the course of the investigation. Furthermore, the acute oral toxicity study demonstrated no mortality or treatment-related toxicity up to 2000 mg/kg, suggesting a good safety record. Similar outcomes have been reported for various herbal formulations developed for neuroprotective uses, demonstrating that plant-based syrups can provide an effective and safe dosage form for long-term administration. [21]

It is important to recognize these limitations even if the current findings show a strong neuroprotective effect.

Conclusion

This study successfully demonstrated developed and evaluated an herbal syrup containing *Merremia dissecta* leaf extract. The formulated syrup showed satisfactory physicochemical characteristics and was suitable for oral administration. Preliminary phytochemical evaluation demonstrated that the extract contain diverse bioactive metabolites, such as flavonoids, phenolic compounds, and terpenoids.

The herbal syrup demonstrated beneficial effects against scopolamine-induced memory impairment in experimental animals, as evidenced by improvement in behavioral and histopathological parameters observed during the Actophotometer, Elevated Zero Maze, and Elevated Plus Maze tests. the protective effects of the extract may be attributed to the existence of phytochemicals possessing antioxidant and neuroprotective properties.
Overall, the findings suggest that *Merremia dissecta* possesses promising memory-enhancing and neuroprotective potential and may emerge as a potential herbal agent for the management of memory impairment, neurodegenerative disorders. Further histopathological and clinical research is warranted to establish its mechanism of action and therapeutic efficacy.

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