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PHARMOCOLOGICAL EVALUATION OF METHANOLIC EXTRACT OF *DESMOSTACHYA BIPINNATA* AGAINST SCOPOLAMINE INDUCED DEMENTIA OF ALZHEIMER'S TYPE IN ALBINO WISTAR RATS

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Abstract:

One of the most common cause of dementia is Alzheimer's disease. The word dementia includes memory loss, difficulties in thinking, problem-solving or language, decrease in social activity. None of the treatments available today for Alzheimer's disease stops the malfunction and death of neurons in the brain that cause Alzheimer's symptoms. In traditional use of medicine, many plants are available to treat the symptoms of Alzheimer's. Desmostachya bipinnata belongs to family of Poacea, is proved for having anti anxiety, anti oxidant, anti inflammatory etc. The present study was designed to evaluate the protective effect of methanolic extract of Desmostachya bipinnata (MEDB) against Scopolamine induced Alzheimer's type dementia in Albino wistar rats. Alzheimers type dementia was screened by observing behavioural parameters using actophotometer (locomotory activity), morris Water Maze (spatial learning), y maze (exploratory behaviour) and biochemical estimations such as catalase, glutathione, acetyl cholinesterase, malondialdehyde. The MEDB shown that the decrease in the symptoms of Alzheimer's type dementia by ameliorating locomotory activity, spatial learning, exploratory behaviour and increased antioxidant enzyme levels in the brain

Keywords: *Desmostachya bipinnata, Actophotometer, Morris water maze, Y maze, Catalase, Acetyl cholinesterase, Glutathione, Malondialdehyde.*

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INTRODUCTION:

Alzheimer's disease (AD) is the most common cause of dementia, accounting for 70–80% of all cases and affecting people aged 60 or older with an incidence of 25–50%. Statistics in 2015 indicated that the number of people with dementia related cases was about 47.47 million[1]. Alzheimer's disease is named after Dr. Alzheimer. S Aloi. In 1906, Dr. Alzheimer noticed changes in the brain tissue of a woman who had died of unusual mental illness. Her symptoms included memory loss, language problems, and unpredictable behaviour. It is a progressive neural disorder, characterized by memory loss and severe impairment of other intellectual capabilities. AD is connected with the reduced level of Acetylcholine (Ach) and loss of cholinergic neurons in the brain. The loss of function of Ach is implicated to the development of AD. The Acetylcholinesterase (AchE), an enzyme that breaks the neurotransmitter Ach into acetate and choline, hampers the normal neurotransmission. it was Characterized by pathological aggregation of Tau proteins and Amyloid beta peptide Plaques[2]. There are other mechanisms involved that Gluatamate channels also invoved in Alzheimer's Disease. Exact mechanism is not known. In the search for new therapeutic products for the treatment of neurological disorders, medicinal plant research has progressed constantly representing the pharmacological effectiveness of diverse plant species in a variety of animal model.

Desmostachya bipinnata belongs to family of Poacea, commonly known as Daabh, Darbha, Halfa grass, Big cord grass. From literature Survey it was found that *Desmostachya bipinnata* has hepatoprotective, anti ulcer, anti diabetic, anti anxiety, anti oxidant, anti inflammation, anti microbial, anti obese, anti pyretic, diuretic activities & used in treatment of dysentery, menorrhagia, jaundice, asthma[3]. There was no data available on pharmacological evaluation in treatment of Alzheimer's type Dementia. Thus this study was intended to perform the pharmacological evaluation of *Desmostachya bipinnata* in Scopolamine induced Alzheimer's type Dementia.

MATERIALS AND METHODS:

Animals:

Male Wistar rats (150-250 g) were procured from institutional animal house and they were retained in the groups of six under the standard laboratory conditions (temp 23±2◦c, relative humidity 50-60% and 12:12 h for light-dark hour cycle), with standard pellet diet and water ad libitum. Experiments were performed only after the animals had acclimated to the laboratory conditions for at least seven days. The experimental protocol was approved by institutional animal ethical committee [439/PO/S/01/CPCSEA].

Plant material collection and extraction:

The leaves of *Desmostachya Bipinnata* were collected from rural areas of Rajahmundry. They were identified and authenticated by P. Prasanna kumari, Head of the department of Botany, DNR College, Bhimavaram. The leaves of *Desmostachya bipinnata* were cleaned, reduced to small fragments, air dried under shade at room temperature and coarsely powdered in a mixer. This powder was used for solvent extraction. About 100 gms of the powdered plant material was subjected to soxhlet extraction using 200 mL solvent methanol. This cycle was repeated many times, over hours or a few days, until the colour of the solvent in the siphon of the soxhlet faded away. The extract was concentrated using rotary vacuum flask evaporator by removing the excess solvent present[4].

The Alcholic extract of *Desmostachya bipinnata* suspended in water and administered orally.

Phytochemical Screening:

The dried methanolic extract of MEDB was subjected to various phytochemical tests to identify chemical constituents such as flavanoids, alkaloids, proteins, amino acids, carbohydrates, steroids etc[5].

Methods for Invitro Antioxidant activity:

Free radical scavenging activity (DPPH):

DPPH is one of the free radicals widely used for testing preliminary radical scavenging activity of the plant extract. Scavenging of DPPH radical is related to the inhibition of lipid peroxidation. DPPH is usually used as a substance to evaluate the antioxidant activity. Antioxidants either transfer an electron or a hydrogen atom to DPPH thus neutralizing its free radical character.DPPH test, which is based on the ability of DPPH a stable free radical, to decolorize in the presence of antioxidants, is a direct and reliable method for determining radical scavenging action. The DPPH assay has been largely used as a quick, reliable and reproducible parameter to search the in vitro general antioxidant activity of pure compounds as well as plant extracts.

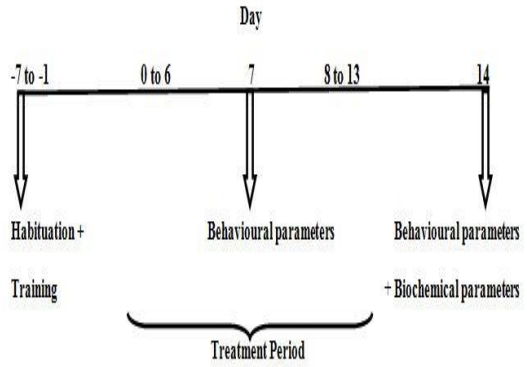
DPPH solution was prepared by dissolving 4 mg in 100 mL of methanol. Different concentrations of Ascorbic acid and extract were prepared. Prepared solutions were mixed in DPPH and stored in dark place for 30 min. Absorbance of the mixture was seen at 517 nm, absorbance is repeated for three times. The graph was extrapolated to find the 50% inhibition concentration of test sample and ascorbic acid, percentage inhibition was calculated[6].

% Inhibition = Absorbance of control – Absorbance of sample / Absorbance of control × 100

Treatment Groups

Group I: Control group received Vehicle (Veh) Saline (1mL, i.p.)
Group II: Disease Control received Scopolamine (Scop) (5 mg/kg, i.p.)
Group III: Standard group received Donepezil (Dpz) (2 mg/kg, i.p.)
Group IV: Test group received MEDB (500 mg/kg, p.o.)
Each group contains 6 rats.

Study Protocol



Behavioural studies

Locomotory Activity (Actophotometer)

Locomotory activity is assessed by Actophotometer. Turn on the actophotometer (check and make sure that all photocells are working for accurate recording) and place individually each animal in activity cage for 10 mins. Note their basal activity score. Inject drug or test compound after 30 mins. Re-test each animal for activity score for 10 mins. Note the difference before and after the administration of drug or test compound. Calculate the Activity score (Number of counts)[7].

Spatial learning (Morris water maze)

It is the most widely used tasks in behavioural neuroscience for studying the psychological processes and neural mechanism of spatial learning and memory. Escape latency time (sec) is measured. Scoring had been conducted live by monitoring movement through apparatus via computer screen by using software Maze Master 1.2.0. Animals usually rats or mice, were placed in a large circular pool. Place a 15 cm diameter platform in the pool. Fill the pool with water until the platform is 5 cm below the water surface. Divide the pool into 4 quadrants. Place the platform in one of the quadrant and 3 visual clues shall be provided along the perimeter of the pool. If the rat finds the platform in 120 sec, allow the rat to stay on the platform for 5 sec then return it to its home cage. If the rat does not find the platform, place the rat on the platform and allow it to stay there for 10 sec before returning it to its home cage. Time required to escape from water onto a hidden platform is measured and the time spent in target quadrant is noted (probe trial)[8].

Exploratory behaviour (Y maze)

Y maze is used to evaluate exploratory behaviour in mice and rats. Generally, Rats investigate to explore new arm rather than previously entered arm. Name the arms as A,B,C. one arm is selected as home arm. Animal was placed just inside arm B facing away from center and allowed to move through apparatus for 10 mins. Trial begins immediately and ends when defined duration has elapsed. Scoring consists of recording each arm entry (defined as all four paws entering arm). Return the animals to home cage. Total number of entries shall be recorded and % Alteration is calculated[8].

% Alteration = [(Number of Alterations) / (Total arm entries – 2)] × 100

Preparation of brain homogenate

On day 14 of Protocol Schedule, Animals were sacrificed by cervical dislocation, brains removed and rinsed with ice cold isotonic saline solution. Brain tissue samples were then homogenized with 10 times (w/v) ice cold 0.1 M phosphate buffer (pH 7.4). The homogenate was centrifuged at 10,000 × g for 15 min, supernant was seperated and aliquots were used for biochemical estimations.

Biochemical Estimation

Assay of Acetyl cholinesterase activity (Ellman method)

AChE activity estimated by using Acetyl thio choline following colorimetric method The Reaction mixture contains 1 mL of phosphate buffer (0.1 M, pH 7.4) post mitochondrial fraction of hippocampus region, ACh iodide and 5 Di Thio Nitro Benzoic acid (DTNB) The degradation of Acetyl thio choline iodide was measured at 412 nm[9].

Assay of Catalase

Catalase is assayed by using H_2O_2 mixture contain 1.95 mL of Phosphate buffer (0.05 M, pH 7) + 1 mL H_2O_2 (0.01 M) + 0.05 mL sample. Change in absorbance is recorded at 240 nm[10,11]

Assay of Glutathione

10% homogenate was deproteinized with equal volume of TCA. Allow to stand at 40C for 1 hr. Then contents were centrifuged at 3000 rpm for 15 min The supernant (0.5 mL) was added to 2 mL of Tris HCl buffer (0.4 M, pH 8.9) containing EDTA

(0.02 M, pH 8.9) followed by addition of 5 DTNB (0.01 M)Volume made to 3 mL by adding distilled water (0.5 mL) Absorbance is measured at 412 nm.

Estimation of Malondialdehyde

0.6 mL of tissue homogenate incubated at 1h at 37◦c. then, 1.2 mL of 28% W/V TCA was added and by adding 1.2 mL of water, the final volume was made to 3 mL. Centrifuge at 3000×g for 10 min. 2.5 m L of supernant was collected. Colour was developed by addition of 0.5 mL of 1% W/V thiobarbituric acid dissolved in 0.05 N NaoH keeping solution in boiling water bath. Absorbance is measured at 532 nm[12].

Histopathology

Because of the important role of hippocampus in the memory, its histopathology was investigated. Rats hippocampal tissues were fixed in 10% neutral buffered formaldehyde for 24 hours, embedded in paraffin and cut into 5 µm thick sections by a microtome. The slides were stained with Hematoxylin and Eosin (H&E) according to the procedure of Wilson et al. Then viewed under a light microscope for the structure and morphology of cells[13].

Statistical Analysis:

All the results were expressed as Mean ± S.E.M. (n=6) using GraphPad® prism (version 8.1.2(332)) software. Statistical analysis was performed using two way ANOVA and one way ANOVA followed by Tukey's multiple comparison test. $P < 0.05$ was considered as statistically significant.

RESULTS:

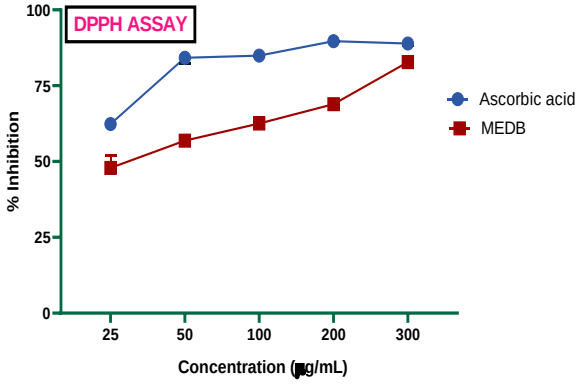
Phytochemical Analysis of MEDB

Phytochemical Screening of MEDB showed the presence of Alkaloids, Carbohydrates, Flavanoids, Tannins, Glycosides, Steroids and Triterpinoids, Volatile oils and Amino acids.

Phytochemical constituent	Result
Alkaloids	+
Amino acids	+
Carbohydrates	+
Tannins	+
Glycosides	+
Steroids	+

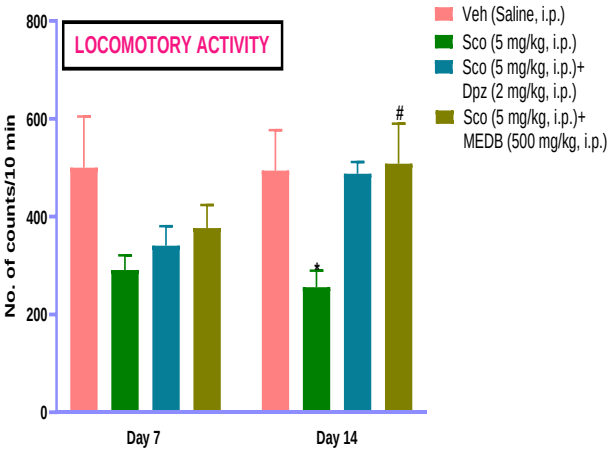
+ = Present

Effect of MEDB on Free radical scavenging activity (DPPH)



MEDB showed IC50 30 µg/mL which is comparable to Ascorbic acid IC50 15 µg/mL.

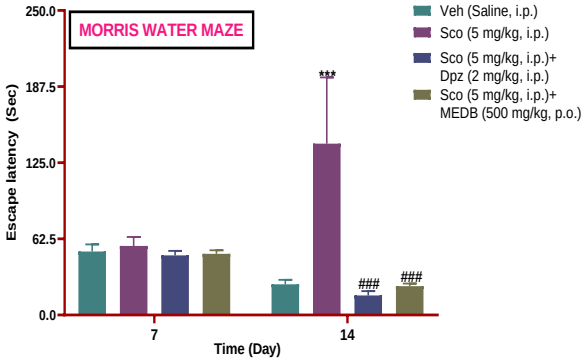
Effect of MEDB on Locomotory activity



Values were expressed as Mean ± S.E.M., n=6 in each group. Statistical analysis was carried out by two way ANOVA followed by Tukey's multiple comparison test. Significant difference #$p < 0.05$ when compared to Scoplamine treated group and *$p < 0.05$ when compared to normal Vehicle group.

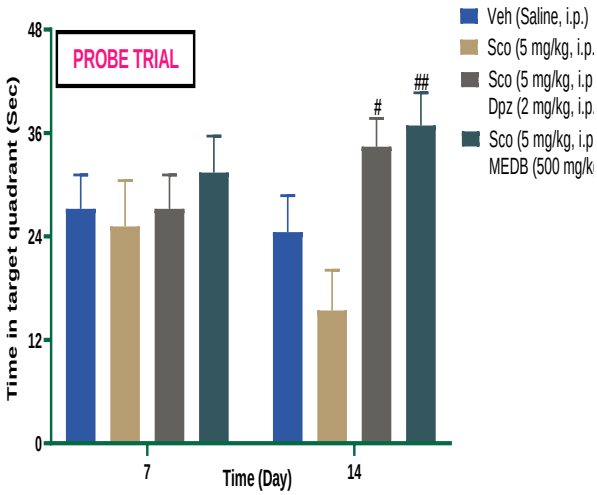
Inference: Locomotory activity is evaluated by using Actophotometer. There was decrease in locomotor activity of Scopolamine treated group (255.6 ± 33.768*****) was ameliorated in MEDB treated group (508.3 ± 69.81#) on day 14.

Effect of MEDB on Spatial learning



Values were expressed as Mean ± S.E.M., n=6 in each group. Statistical analysis was carried out by two way ANOVA followed by Tukey's multiple comparison test. Significant difference ###p < 0.05 when compared to Scoplamine treated group and ***p < 0.05 when compared to normal Vehicle group.

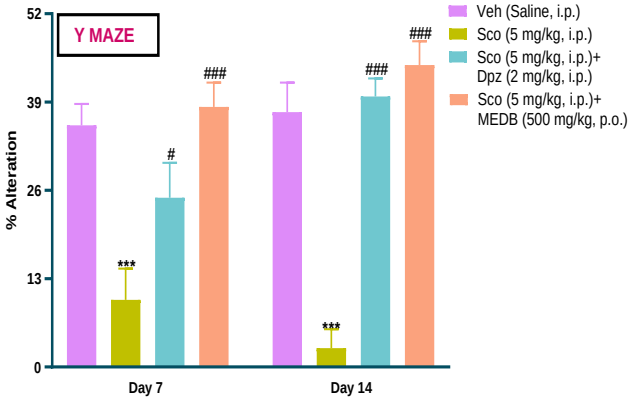
Inference: The Escape latency time was evaluated by using Morris water maze. The time spent by the rat to find the hidden platform is known as Escape Latency Time (ELT). There was decrease in the Escape Latency time (sec) in MEDB treated group (27 ± 2.11###) when compared to diseased group (140.65 ± 25.58***) showed that spatial learning was improved.



Values were expressed as Mean ± S.E.M., n=6 in each group. Statistical analysis was carried out by two way ANOVA followed by Tukey's multiple comparison test. Significant difference #p < 0.05, ## p < 0.05 when compared to Scoplamine treated group.

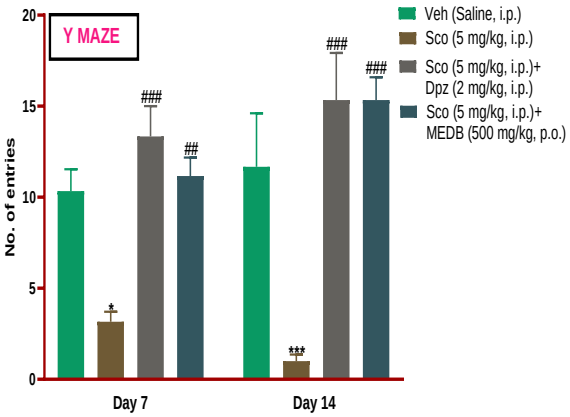
Inference: The retension time in target quadrant is known as Probe trial i.e. measuring the time spent by the rat in target quadrant without hidden platform. There was a significant increase of retension time in MEDB treated group (36.93 ± 3.91**##)** when compared to Scopolamine treated group (25.16 ± 2.13).

Effect of MEDB on Exploratory behaviour



Values were expressed as Mean ± S.E.M., n=6 in each group. Statistical analysis was carried out by two way ANOVA followed by Tukey's multiple comparison test. Significant difference ###p < 0.05, #p < 0.05 when compared to Scoplamine treated group and ***p < 0.05 when compared to normal Vehicle group.

Inference: The Exploratory behaviour is evaluated by using Y maze. There was a significant increase in % Alteration in MEDB treated group (44.44 ± 3.51###) when compared to Scopolamine treated group (2.77 ± 3.04***) indicating that increased exploratory behaviour in MEDB treated group.

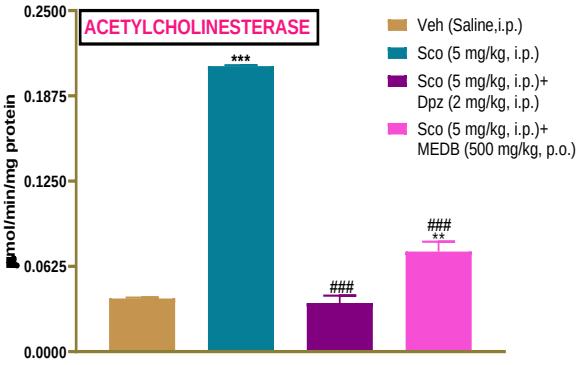


Values were expressed as Mean ± S.E.M., n=6 in each group. Statistical analysis was carried out by two way ANOVA followed by Tukey's multiple comparison test. Significant difference ###p < 0.05, ## p < 0.05 when compared to Scoplamine treated group and *p < 0.05, ***p < 0.05 when compared to normal Vehicle group.

Inference: No. of entries in Y maze indicates Locomotory activity. No. of entries in Scopolamine treated group (1.00 ± 0.4***)** was decreased

significantly on day 14 is increased in MEDB treated group (15.33 ± 1.25###) which was similar to Donepezil treated group **(**15.33 ± 3.66**###).**

Biochemical Estimations

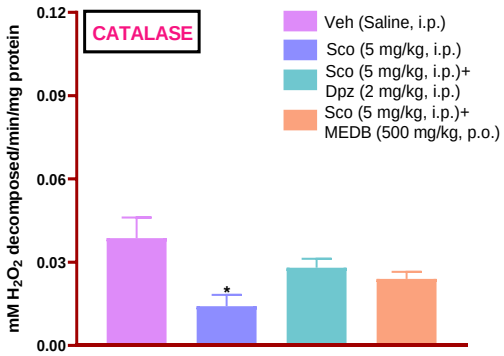


Effect of MEDB on Acetylcholinesterase

Values were expressed as Mean ± S.E.M., n=3 in each group. Statistical analysis was carried out by one way ANOVA followed by Tukey's multiple comparison test. Significant difference ###p < 0.05 when compared to Scoplamine treated group and **p < 0.05, ***p < 0.05 when compared to normal Vehicle group.

Inference: The Acetylcholinesterase enzyme levels were increased in Scopolamine treated group (0.209333 ± 0.000667***) was significantly decreased in MEDB treated group (###0.073333 ± 0.007333**) similar to Donepezil treated group(###0.035667 ± 0.005364**) reveals that MEDB may possess anti acetylcholinesterase activity.

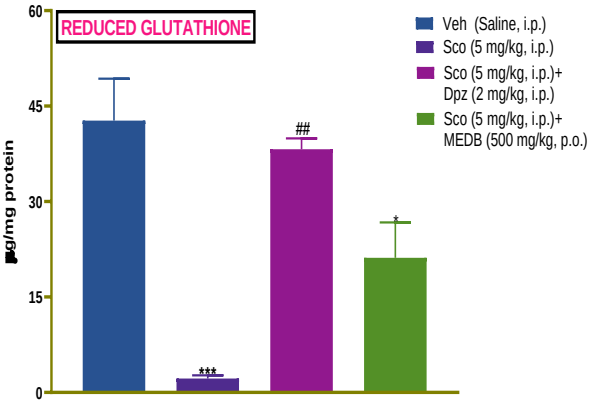
Effect of MEDB on Catalase



Values were expressed as Mean ± S.E.M., n=3 in each group. Statistical analysis was carried out by one way ANOVA followed by Tukey's multiple comparison test. Significant difference *p < 0.05 when compared to normal Vehicle group.

Inference: The Catalase levels were increased in MEDB treated group (0.024 ± 0.002517) similar to Donepezil treated group (0.294667 ± 0.269669) when compared to Scopolamine treated group (0.014333 ± 0.004003*****) reveals that MEDB possess antioxidant properties.

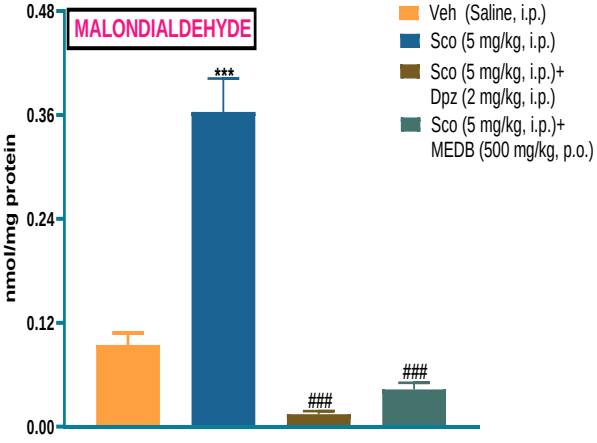
Effect of MEDB on Glutathione



Values were expressed as Mean ± S.E.M., n=3 in each group. Statistical analysis was carried out by one way ANOVA followed by Tukey's multiple comparison test. Significant difference ##p < 0.05 when compared to Scoplamine treated group and ***p < 0.05, *p < 0.05 when compared to normal Vehicle group.

Inference: The Reduced Glutathione levels were increased in MEDB treated group (21.15 ± 5.563905*****) similar to Donepezil treated group (38.23 ± 1.69741##) when compared to Scopolamine treated group (2.19 ± 0.49813*******) reveals that MEDB possess antioxidant properties.

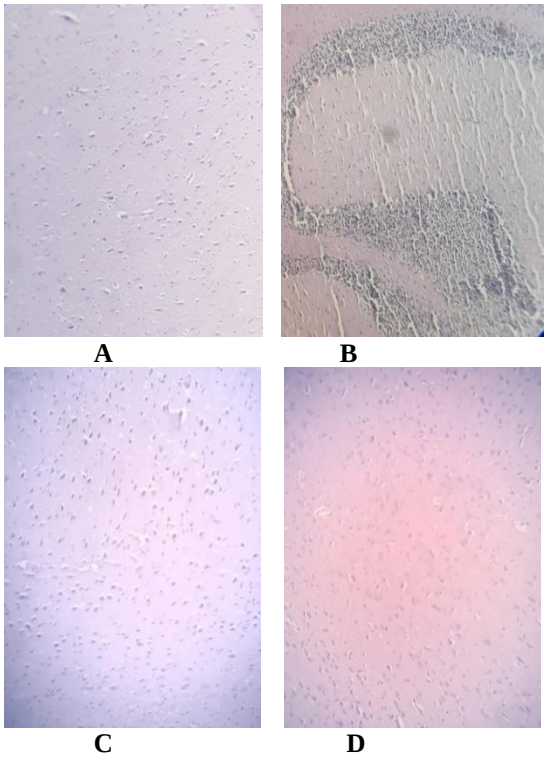
Effect of MEDB on Malondialdehyde



Values were expressed as Mean ± S.E.M., n=3 in each group. Statistical analysis was carried out by one way ANOVA followed by Tukey's multiple comparison test. Significant difference ###p < 0.05 when compared to Scoplamine treated group and ***p < 0.05, when compared to normal Vehicle group.

Inference: The Malondialdehyde levels (end product of Lipid peroxidation) were increased in Scopolamine treated group (0.363667 ± 0.038429***) was significantly decreased in MEDB treated group (0.043 ± 0.007767###) similar to Donepezil treated group (0.014333 ± 0.003712###) reveals that MEDB decreases Lipid peroxidation.

Histopathology



A) Normal treated rat showing normal histological structure of hippocampus.
B) Scopolamine induced dementia rat showing severe congestion of blood capillaries with perivascular edema (Scars) and amyloid plaques in hippocampus.
C) Scopolamine induced dementia rat treated with Donepezil showing less formation of plaques.
D) When compared with Scopolamine induced dementia rat, MEDB treated rat show less formation of amyloid plaques in hippocampus region of brain.

DISCUSSION:

Medicinal plants are store house of phytochemicals for treatment of countless major and minor diseases. In the treatment of the neurodegenerative diseases particularly AD the phytoconstituents of medicinal plants plays a crucial role. The Scopolamine induced dementia and oxidative stress in animal models is widely used as a primary screening test for the determination of anti Alzheimer effect of plants or drugs. *Desmostachya bipinnata* is proved for having Anti oxidant, Anti inflammation and Anti anxiety activities [37]. Some of the chemical constituents in MEDB like Flavanoids (Quercetin, Kaempferol), Xanthenes and some essential oils were proved for having neuroprotective properties (Anti anxiety)[38]. In this study, MEDB administration for 14 days showed significant neuroprotective effect by improving memory, learning, anti-acetylcholinesterase activity and increasing antioxidant enzymes in rats brain. This was the first study showing neuroprotective activity of MEDB against Scopolamine induced Alzheimer's of dementia type in rats by using various behavioural and biochemical studies.

Scopolamine, which used as a inducing agent of dementia of Alzheimer's type is an anti muscarinic agent, competitively antagonizes the effect of ach on the muscarinic receptors by occupying the post synaptic receptor sites with high affinity and increases AchE activity in the cortex and hippocampus. Scopolamine dimnishes cerebral blood flow due to cholinergic hypo function. Scopolamine additionally triggers ROS, inducing free radical injury and an increase in a MDA levels and detoriation in antioxidant status. Scopolamine induces the neuro inflammation by promoting high level of oxidative stress and pro inflammatory cytokines in the hippocampus. Scopolamine is proven to increase levels of APP and Tau.

Donepezil, which used as a standard drug is an reversible inhibitor of AchE, is neuroprotective due to not only activation of cholinergic transmission but also by reducing the amount of the toxic forms of amyloid β fibrils. Donepezil ameliorted the Scopolamine induced memory impairment by reducing AchE activity and oxidative stress and restoring cerebral circulation.

The phytochemical screening proved that MEDB contains flavonoids, alkaloids, tannins, essential oils which have various neuroprotective properties.

The oxidative stress is measured by DPPH scavenging Assay. DPPH scavenging activity of plant extract (IC50 30) showed IC50 value close to the ascorbic acid (IC50 15).

Locomotory activity is evaluated by using Actophotometer. There was decrease in locomotor activity in Scopolamine treated group (255.6 ± 33.768*) was ameliorated in MEDB treated group (508.3 ± 69.81#) showed that locomotory activity was increased in MEDB treated group. Spatial learning is evaluated by MWM in which the measured parameters were ELT and Time spent in target quadrant. The time spent by the rat to find the hidden platform is known as Escape Latency Time (ELT). There was decrease in the Escape Latency time (sec) in MEDB treated group (27 ± 2.11###) when compared to diseased group (140.65 ± 25.58***). The retension time in target quadrant is known as Probe trial i.e. measuring the time spent by the rat in target quadrant without hidden platform. There was a significant increase

of retension time in MEDB treated group (36.93 ± 3.91**##)** when compared to Scopolamine treated group (25.16 ± 2.13) showed that spatial learning was improved.
The Exploratory behaviour is evaluated by using Y maze. There was a significant increase in % Alteration in MEDB treated group (44.44 ± 3.51###) when compared to Scopolamine treated group (2.77 ± 3.04*******) indicating that increase in exploratory behaviour in MEDB treated group. No. of entries in Y maze indicates Locomotory activity. No. of entries in Scopolamine treated group (1.00 ± 0.4*****) was** decreased significantly on day 14 is increased in MEDB treated group (15.33 ± 1.25###) which was similar to Donepezil treated group **(**15.33 ± 3.66**###).** AchE levels were determined by Ellman method. AchE decrease the acetylcholine levels in cholinergic nerve endings, causing the Ach breakdown. In this study, treatment with MEDB (###0.073333 ± 0.007333**) widely decreased AchE level, increased brain Ach levels which is similar to Donepezil treated group (###0.035667 ± 0.005364******) when compared to Scopolamine treated group (0.209333 ± 0.000667***). Oxidative stress has been implicated in the pathogenesis of AD. Scopolamine induced dementia resulted in the elevation of cortical and hippocampal MDA content, the final product of lipid peroxidation and subsequent reduction of the endogenous anti-oxidant namely GSH, due to elevated Reactive Oxygen Species (ROS). Scopolamine associated oxidative stress accounts for memory impairment in the study. Treatment with MEDB (0.043 ± 0.007767###) widely decreased MDA level, when compared to Scopolamine treated group (0.363667 ± 0.038429*******) which is similar to Donepezil treated group (0.014333 ± 0.003712###). The GSH levels were decreased in Scopolamine treated group (2.19 ± 0.49813*******) was significantly increased in MEDB (21.15 ± 5.563905*****) which is similar to Donepezil treated group (38.23 ± 1.69741##).
CAT, which is present virtually in all mammalian cells, is responsible for the removal of H2O2. Therefore, one of the oxidative stress indices was estimated in rat brain that is CAT. The levels of CAT which was decreased by Scopolamine (0.014333 ± 0.004003*****) was significantly increased by treatment with MEDB (0.024 ± 0.002517). The neuroprotective activity of the plant may be due to its antioxidant property, which reinforces Anti-Alzheimer's activity of *Desmostachya bipinnata.* Treatment with MEDB decreased Scopolamine associated oxidative stress. This reveals that ameliorative effect of MEDB on Scopolamine-induced dementia in rats may be due to its antioxidant activity. Several studies have also demonstrated the neuroprotective of MEDB against oxidative stress associated with experimentally-induced anxiety.

In present study, Scopolamine administration caused a significant decrease in the activity of Catalase, Glutathione and decreased the locomotory activity, exploratory behaviour and spatial learning. The administration of Methanolic extract of *Desmostachya bipinnata* increased the levels of antioxidant enzymes and significantly increased locomotory activity, exploratory behaviour, and spatial learning. So, we can conclude that the MEDB possesses the neuroprotective activity in rats similar to Donepezil.

CONCLUSION:

The MEDB inhibited oxidative stress by increasing the antioxidant enzyme levels in rat brain and increased the locomotion, exploratory behaviour and spatial learning in Scopolamine treated rats. From the histopathological study, MEDB showed less formation of amyloid plaques when compared to Scopolamine treated rat. The present study clearly demonstrates that MEDB has a protective role against AD type dementia. Therefore, this extract can be a potential novel therapeutic strategy for controlling neurodegenerative dementia especially AD. Yet, advance studies are needed to expose the possible mechanism of action.

CONFLICT OF INTERESTS

Declare none

REFERENCES:

1. Benson Opare A B et al, Alzheimer's Disease – The Past, the Present and the Future, Science Journal of Clinical Medicine 2017; 6(1): 1-19
2. Filip I. Bapista et al, Flavanoids as Therapeutic Compounds Targeting Key Proteins Involved in Alzheimer's Disease, American Chemical Society Neuroscience 2014; 5: 83-92
3. Ali E et al, Pharmacological and therapeutic importance of *Desmostachya bipinnata*- a review. Indo American Journal of Pharmaceutical sciences 2017; 4 (01): 60-66
4. Nikhal SB et al, Hydroalcoholic extraction of *Mangifera indica* (leaves) by Soxhletion. International Journal of Pharmaceutical Sciences 2010; 2 (1): 30-32
5. Kokate C. K. et al., Pharmacognosy, 53rd Edition
6. Md. NurAlam et al, Review on in vivo and in vitro methods evaluation of antioxidant activity, Saudi Pharmaceutical Journal 2013; 21(2): 143-152
7. Experimental pharmacology by S K Kulkarni 2015; 4: 131

8. Yasushi H et al, Asian Pacific Journal of Tropical Medicine 2016; 9(7): 662-667
9. Ellman GL et al, A new and rapid colorimetric determination of acetylcholinesterase activity, Biochemical Pharmacology 1961; 7: 8895
10. Chelikani P et al, Diversity of structure and properties among Catalases, Journal of cell molecular science 2004; 61(12): 192-208
11. Claiborne A et al, A handbook of method of oxygen free radicle research 1985: 283-285
12. Sajjadian M et al, Protective effects of cannabidol on cuprizone induced demylienation in C57BL/6 mice, Journal of contemporary Medical Science; 3(11): 278-283
13. Halaf Z et al, Naringenin protects against Scopolamine induced dementia in rats, Bulletin of Faculty of Pharmacy, Cairo University 2014; 52: 15-25