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Research

Effect Of Ethanolic Extract Of Catharanthus Roseus Flower On Scopolamine Induced Amnesia

Sankar N[1*], Dr. V. Suresh[2], Seema Maheswari A[3]

[1]Scholar, Department of Pharmacology, J.K.K. Munirajah Medical Research Foundation, Annai J.K.K. Sampoorani Ammal College Of Pharmacy, B. Komarapalayam-638183.
[2]Professor and Head, Department of Pharmacology, J.K.K. Munirajah Medical Research Foundation, Annai J.K.K. Sampoorani Ammal College Of Pharmacy, B. Komarapalayam-638183.
[3]Nursing Tutor, College Of Nursing, All India Institute Of Medical Sciences, Raipur (Chhattisgarh)-492099.

*Author for Correspondence: Sankar N
Email: sansee19611@gmail.com

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Abstract

Amnesia is a memory loss disorder due to brain injury, shock, fatigue, repression or illness. *Catharanthus roseus* is one plant recognized well in Ayurveda. It is known for its antitumour, anti-diabetic, anti-microbial, anti-oxidant and anti mutagenic effects. It is an evergreen plant first originated from islands of Madagascar. It produces nearly 130 alkaloids mainly ajmalcine, vinceine, resperine, vincristine, vinblastine and raubasin. Vincristine and vinblastine are used for the treatment of various types of cancer such as Hodgkin's disease, breast cancer, skin cancer and lymphoblastic leukemia. The present investigation has been undertaken to investigate the effect of ethanolic extract of *Catharanthus roseus* flower on Scopolamine induced amnesia. In the present study, *C roseus* administered orally for 15 days improved the memory of mice as reflected by diminished escape latency and percentage alteration values as compared to control animals. There is an increase in escape latency in negative control group when compared with the control group ($P<0.001$) of the four groups of amnesia induced animals, both showed decreased time to the escape platform. Epidemiological studies have almost confirmed that non-steroidal anti-inflammatory drugs reduce the incidence of Amnesia. *Catharanthus roseus* has been shown to produce anti-inflammatory action of mice. Oxygen free-radicals are implicated in the process of age-related decline in cognitive performance and may be responsible for the development of Amnesia in elderly persons. The study results conclude the significant increase effect of *Catharanthus roseus* flower extract on memory also.

Keywords: catharanthus roseus**,** alkaloids, amnesia.

INTRODUCTION

Catharanthus roseus is one plant recognized well in Ayurveda. It is known for its anti tumour, anti-diabetic, anti-microbial, anti-oxidant and anti mutagenic effects. It is an evergreen plant first originated from

islands of Madagascar. The flowers may vary in colour from pink to purple and leaves are arranged in opposite pairs. It produces nearly 130 alkaloids mainly ajmalcine, vinceine, resperine, vincristine, vinblastine and raubasin. Vincristine and vinblastine are used for the treatment of various types of cancer such as Hodgkin's disease, breast cancer, skin cancer and lymphoblastic leukemia. It is an endangered species and need to be conserved using techniques like micro propagation. It has high medicinal values which need to be explored extensively. Mishra. et al, 2017; conducted study with *Catharanthus Roseus* a Medicinal plants have a long history of usage in traditional medicine. Ethno-botanical information on medicinal plants and their usage by indigenous cultures is useful in the conservation of traditional cultures, biodiversity, community health care and drug development. Catharanthus roseus. L (G.) Don, is an important medicinal plant belonging to the Apocynaceae family; this plant is a dicotyledonous angiosperm and synthesizes two terpene indole alkaloids: vinblastine and vincristine that are used to fight cancer. Peckolt, in 1910, described the use in Brazil of an infusion of the leaves to control hemorrhage and scurvy, as a mouthwash for toothache, and for the healing and cleaning of chronic wounds.

The hypoglycemic and antibacterial activities have not been confirmed, although one of the alkaloids isolated from this plant, ajmalicine, has been reported to possess transient depressor action on arterial blood pressure Periwinkle" or *Catharanthus roseus* (Family Apocynaceae), commonly known as "Nayantara" or "Sadabahar", the word *Catharanthus* derives from the Greek language meaning "pure flower." While, roseus means red, rose or rosy

Memory enhancement activity

Vinpocetine has been reported to have a variety of actions that would hypothetically be beneficial in Alzheimer's disease (AD). The only study investigating this agent in a well-defined cohort of AD patients found no benefit. Metaanalysis of older studies of vinpocetine in poorly-defined dementia populations concluded that there is insufficient evidence to support its clinical use at this time. Vinpocetine has been well tolerated at doses up to 60 mg/d in clinical trials of dementia and stroke, and no significant adverse events.

Medicinal plants were the potent source of various novel pharmaceutical products that shows ect causing potent pharmacological effect on the human beings. Instead of using the side effects causing chemical drugs, the ancient medicine could be explored to identify the novel drug formulations that are more effective with lesser side effects and also cheaper cost. Though, many of the traditional drugs were used without understanding the basic mechanism, their effect could be proved further with the help of the present technology and tools. The active compound that is responsible for the pharmacological effect could be found very easily and also commercialized as a drug product itself with proper approval from the respective organizations. *Catharanthus roseus* is one of the 21000 important medicinal plants found. It is used for the cure of a number of diseases such as diabetes, sore mouth, mouth ulcers, and leukemia. It produces about 130 alkaloids such as reserpine, vinceine, raubasin and ajmalcine. Anti-leukemic activity is shown by vinblastine and vincristine. Different parts of this plant produce different amounts of alkaloids, out of which root bark produces the maximum i.e. nearly 1.79%. There are a number of reports supporting its anti-microbial activity against Staphylococcus albusi, Bacillus megatarium, Shigella, Pseudomonas, etc. Its anti-oxidant and antimutagenic effects have also been reported. Further studies need to be done to explore its anti-tumour effects.

In Europe related species have been used for the proprietary suppression of the flow of milk. In the British West Indies it has been used to treat diabetic ulcer and in the Philippines has been reported as being an effective oral hypoglycemic agent. More recently, Chopra et al. have reported that the total alkaloids possess a limited antibacterial activity as well as a significant and sustained hypotensive action. Mishra. et al, 2017.

What is amnesia?

A person's ability to recall events and experiences involves a variety of complex brain processes. Researchers still do not understand exactly what happens when a person commits something to memory or retrieves information stored in the brain. When a person develops amnesia, they often lose memories of important milestones, key events or people in their life, and vital facts they have learned. Most people with amnesia are lucid and have a sense of self. In some cases, they may have full memories up to a certain point in time but have difficulty remembering things afterward. In other cases, they will lose memories from before a point in time. More often, the memory loss is patchy, with a person losing memories of certain events. Some people with amnesia find it hard to imagine the future. This is because the human brain constructs future scenarios based on its recollections of past experiences.

Common Symptoms of Amnesia

The following are common symptoms of different types of amnesia:

-impaired ability to learn new information (anterograde amnesia)

-impaired ability to remember past events and previously familiar information (retrograde amnesia)

-experiencing false memories, which are either completely invented memories or real memories misplaced in

time a phenomenon known trusted source as confabulation trusted source
-impaired short-term memory
-partial or total loss of all memory
-Confusion

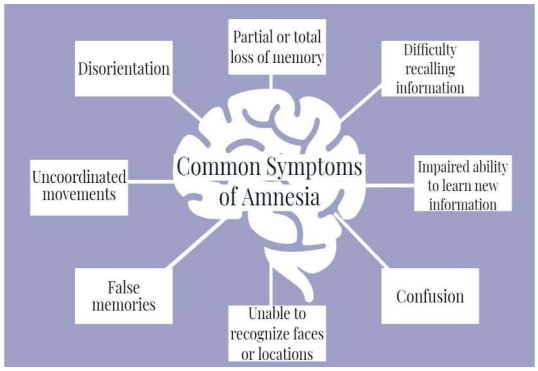


Fig 1: Over view

Causes of Amnesia

- Concussion
- Migraines
- Hypoglycemia
- Epilepsy
- Electroconvulsive shock therapy
- Specific brain lesions (i.e. surgical removal)
- Ischemic events
- Drugs (esp. anesthetics)
- Infection
- Psychological
- Nutritional deficiency
- **Lack of Sleep!**

different conditions involve amnesia, and there are many types of amnesia. Some features of different types of amnesia can overlap, and a person can have more than one type. Amnesia can be temporary or long lasting.

Preventing amnesia

A person can help reduce the risk of amnesia by:

- wearing protective headgear during activities that could result in a brain injury, such as cycling, skating, skiing, or playing contact sports
- getting medical attention if there's a high fever, stiff neck, or severe headaches, which can be a sign of an infection affecting the brain
- wearing a seatbelt while traveling in a motor vehicle, and never driving while under the influence of alcohol or drugs
- having eyes checked annually to help prevent falls, especially if above the age of 65 years
- exercising regularly to reduce the risk of a stroke
- eating a healthy diet that includes leafy green vegetables and avoids saturated fats to help prevent cardiovascular problems that can contribute to memory problems
- getting psychological treatment or encouraging a friend or loved one to seek treatment if they have experienced trauma

Aim And Objective

The study aimed to investigate the effect of ethanolic extract of Catharanthus roseus flower on Scopolamine induced amnesia.

- literature review
- Plant collection and authentication
- To extract the flower of *Catharanthus roseus* by continuous hot extraction using Soxhlet apparatus
- Phytochemical evaluation of *Catharanthus roseus ehanolic extract.* # OECD Guideline
- Neurotransmitters estimation
- To evaluate the neurotransmitter estimation of ethanol flower extracts of Catharanthus roseus

- *In vivo model*
- Histopathological examination

To investigate the significant effect of ethanolic extract of catharanthus roseus flower on scopolamine induced amnesia

Plant Profile

*Catharanthus roseus L. (*Apocyanaceae) is used for the treatment of various diseases like diabetes, and tumors in all over the world from the last several decades. Every part of Catharanthus like root, stem, bark and flower are rich sources of several bioactive compounds. Several studies already published on the alkaloids and their pharmaceutical properties however still more works are require to increases the production of theses alkaloids at large scale.

Scientific classification
Botanical Name(s) : *Vinca Rosea* (*Catharanthus roseus*)
Family Name : Apocynaceae
Kingdom : Plantae
Division : Magnoliophyta (Flowering plants)
Class : Magnoliopsida (Dicotyledons)
Order : Gentianales
Family : Apocynaceae
Genus : Catharanthus
Species : *C. roseus*

Vernacular names
English : cayenne jasmine, old maid, periwinkle
Hindi : sada bahar, sadabahar
Kannada : batla hoo, bili kaasi kanigalu, ganeshana hoo, kempu kaasi kanigalu
Malayalam: banappuvu, nityakalyani, savanari, usamalari
Marathi : sadaphool, sadaphul, sadaphuli
Sanskrit : nityakalyani, rasna, sadampuspa, sadapushpi
Tamil : cutkattu malli, cutukattu malli, cutukattuppu
Telugu : billaganneru
Gujarati : Barmasi
Bengali : noyontara

Geographical Source

The plant is a native of Madagascar and is found in many tropical and subtropical countries especially in India, Australia, South Africa and North and South America. The plant is cultivated as garden plant in Europe and India.

Leaves: Green in colour
Flowers: are either violet, pinkish white or carmine red
Root: Sare pale grey in colour
Flowers: Hermaphrodite (have both male and female organs) and are pollinated by bees.
Fruit: follicles with numerous black seed


Fig 4: C.roseus whole plant, Fig : C.roseus flower

Uses

In traditional medicine, the periwinkle has been used for relieving muscle pain, depression of the central nervous system, also used for applying to wasp stings and to heal wounds. Its application ranges widely from the prevention of diabetes to treatment of stomach ache (Gajalakshmi et al., 2013). The plant is exploited and studied as a medicinal plant as it was found to produce more than 100 monoterpenoid indole alkaloids that contain the two major vital cytotoxic dimeric alkaloids that are used for cancer chemotherapy treatment, also many alkaloids have a medicinal role. The compounds include the anti cancer compounds: Vinblastine and Vincristine (Magnotta, 2006). The alkaloid vincristine has a role for treating leukemia in children. This plant also can be use as ornamental plant in garden and homes across warmer places, or can be grow in glasshouse throughout cold season.

Methodology

Collection And Authentication Of Plant

The C roseus (L) G. Don flower collected from the surrounding areas of Erode district, Tamilnadu, India. during the month of November authenticated certificate (KASC-Botany/Plant Authentication/JKKM/28) from Dr.V.Aravindhan**,** Assistant professor, Department of Botany, Kongunadu Arts and Science College. This study was focused on the structural feature of the flower and microscopic features, physicochemical parameters, extractive value determination, preliminary phytochemical screening. These characteristics would be useful in identification and differentiation of these plants from its substitutes and adulterants. For the standardization of the plant flower of Catharanthus roseus following parameters have been determined.

Physiochemical parameters

For quantitative analysis, viz. loss on drying, total ash, acid insoluble ash, water soluble ash, crude fibre content, extractive value were assayed, according to standard Indian Pharmacopoeia methods[2]. Successive soxhlet extractives of the drug were carried out with various solvents like petroleum ether, chloroform, ethyl acetate and methanol and weight, colour/consistency of the extractives were also determined The liquid part or constituent inherent in sample is the moisture content. The calculation for percentage moisture content (% MC).

For standardization of plant material following parameter has been studied

(1) **Loss on drying**

Determination of water and volatile matter in crude drug is very essential for standardization of product. Loss on drying is employed in the European Pharmacopoeia, BP, and USP. It determines the presence of excess of water in crude drug that encourages microbial and fungal growth, attack by insects and mites' etc. leading to deterioration of the drug. Therefore a set of limit for water content in plant material is essential. Drying can be carried out by heating the drug to 30-40 ºC to constant weight 2-5 g of air dried flower powder was accurately weighed and placed in a previously dried and tarred petridish. The sample was dried in oven at 30- 40 ºC for 1 hr, till two consecutive weighing does not differ by more than 5 mg. The loss of weight was calculated in mg/g of air dried material. For material containing considerable amount of volatile materials, drying may be accomplished by spreading the weighed material over glass plate and placing in desiccators over phosphorus pentaoxide under atmospheric pressure or reduced pressure and at room temperature

(2) Ash value
(3) Extractive value
(4) Phytochemical screening
(5) Fluorescence analysis
(6) Crude fibre content
(7) Test of extraneous material
(8) Preliminary phytochemical screening
(9) Physiochemical parameters

The obtained extracts were subjected to chemical investigation and pharmacological screening for amnesic activity.

Screening for amnesic activity

Different Parameter for memory impairment has been investigated in vivo by using healthy Albino mice (20-25 g) of either sex

(1) Acute toxicity studies were carried out for lethal dose and effective dose.

(2) Test for learning and memory

a. Morris water maze test
b. Pole climbing test
c. Elevated plus maze test

d. Social recognition test
e. Y-MAZE
f. Passive avoidance test

(3) Scopolamine-induced memory impairment in mice.
(4) Intracerebral Scopolamine-induced memory impairment in mice.
(5) Spontaneous locomotor activity.

Drugs/Chemicals

Scopolamine, sodium hydroxide, acetylthiocholine iodide, sodium chloride (NaCl),, 5,5′- dithiobis(2-nitro-benzoic acid) (DTNB), hydrochloric acid, trichloroacetic acid and 2- thiobabituric acid (TBA) were purchased from Sigma-Aldrich (St. Louis, MO, USA). Piracetam (Nootropil®) was purchased from UCB Ltd, Mumbai, India.

Animals

The experiments were carried out with adult male and Swiss albino mice (20-25 g) depending on the objective. They were kept in polyacrylic cages (22.5×37.5 cm) and were maintained under standard housing conditions: (room temperature, 24-27°C and humidity, 60–65 %) with a 12-h light: 12 dark cycle. Foods and water were available ad libitum. The study was approved by the Institutional Animal Ethics Committee (IAEC) according to the regulation of Committee for the Purpose of Control and Supervision of Experiments on Animals and ethical norms were strictly followed during all experimental procedures.

METHODS

The experimental procedure for behavioral and memory tests, administration of drugs and biochemical studies in brain areas is discussed in the following sections.

Behavioural Tests

Memory function was evaluated by Morris water maze test, Social recognition test, Pole climbing test and Elevated plus maze tests. Locomotor activity was tested in mice and rats using Medicraft Photo Actometer.

Spontaneous locomotor activity

The locomotor activity of each rat and group of mice was determined using Medicraft Photo Actometer animal activity monitor. The activity was counted every minute and all counts were summed for a period of 15 minutes each. The locomotor activity was tested in rats and mice after the completion of the behavioural studies to access the effect of scopolamine or streptozotocin or drug treatments on animal behaviour

Test for learning and memory

Learning and memory was assessed by Morris water maze test, social recognition test, Pole climbing test and Elevated plus maze test. These tests are most commonly used to study learning and memory functions in rodents.

Animal Grouping

Experiments were carried out in mice. were used for scopolamine-induced amnesia model while mice were used for Scopolamine-induced memory deficit model.

Grouping of rats

The mice were randomly divided as follows with 6 per group.Each group contain 6 animal.

Species	Swiss albino mice
Age	6-8 week
No: of animals	30
Body weight	25-30g

OECD guidelines Maximum dose don't produce the any toxicity.so we fixed the depends upon the dose 200mg, or 400mg ,250mg or 500mg, depends upon the concentration. Already the same compound responded and many times they are did accurate toxicity 425, so we are follow the same thing directly. No evidence for the toxicity.so we go the further evaluation.

Group (n=30)	TREATMENT
Group I	(Control) received normal saline (0.9% NaCl) once daily for 18 days.
Group II	(Inducing Control or Negative Control) Received normal saline (1 mg/kg i.p.) for 15 days followed by scopolamine (1 mg/kg i.p.) for 3 days.
Group III	Received scopolamine (1 mg/kg i.p.) for 3 days followed byDonepezil (std drug) (5 mg/kg p.o.) for 15 days

Group IV	Received scopolamine (1 mg/kg i.p.) for 3 days followed by EECR (200 mg/kg p.o.) for 15 days
Group V	Received scopolamine (1 mg/kg i.p.) for 3 days followed by EECR (400 mg/kg p.o.) for 15 days

Drug administration

Drug administration in Scopolamine model

Scopolamine-induced memory impairment model was validated by clinically used nootropic agent . It was administered at a dose of 200 mg/kg, i.p. for 15 days. The *C roseus* flower extract were uniformly suspended in 1% carboxymethyl cellulose (CMC) dissolved in water and administered orally (p.o.). They were administered at doses of and 400 mg/kg for 15 days. The group administered with CMC (1 ml/kg, p.o.) for 1 week and normal saline (p.o.) on last days served as vehicle group. 1 hr after the administration of vehicle or Donepezilor extracts, the Scopolamine was injected to induce memory impairment in mice

Biochemical Estimation

The biochemical parameters of oxidative stress and cholinergic function were estimated in all the groups of drug treatment after the completion of behavioral studies. These estimations were done in cerebellum, cortex and hippocampus as described in the following section

Evaluation Parameters

Estimation Of Brain Neurotransmitter

Estimation Of Dopamine

Sodium acetate buffer (pH 6.9): 0.72 mL of 1 M acetic acid (6 µL of glacial acetic acid up to 1000 µL with distilled water) + 6.84 mL of 0.3 M sodium acetate (0.408 g of sodium acetate in 10 mL distilled water) and volume were made up to 25 mL with distilled water. pH was adjusted with sodium hydroxide solution. 5 M sodium hydroxide: 5 g of NaOH pellets dissolved in distilled water and volume was made up to 25 mL with distilled water. M Iodine solution (in Ethanol): 1 g of potassium iodide + 0.65 g of iodine dissolved in ethanol and volume was made up to 25 mL. Sodium thiosulphate solution: 0.625 g Na2SO3 in 2.5 mL H2O + 22.5 mL 5 M NaOH 10 M Acetic acid: 14.25 mL of glacial acetic acid dissolved in distilled water and made upto 25 Ml.

Procedure

To 1 mL of aqueous phase, 0.25 mL 0.4 M HCl and 0.5 mL of Sodium acetate buffer (pH 6. 9) were added followed by 0.5 mL iodine solution (0.1 M in ethanol) for oxidation. The reaction was stopped after 2 min by the addition of 0.5 mL Na2SO3 solution. 0.5 mL Acetic acid was added after 1.5 min. The solution was then heated to 100°C for 6 min. When the sample reached room temperature, excitation and emission spectra were read from the spectrofluorimeter. The readings were taken at 330-375 nm for dopamine. Blanks for the assay were prepared by adding the reagents of the oxidation step in reversed order (sodium sulphite before iodine). Different concentration of dopamine and nor-adrenaline (1 mg/ml) was used as standard. (Schlumpt M *et al.,* 2014).

Estimation of Serotonin

The serotonin content was estimated by the OPT method Reagents O-phthaldialdehyde (OPT) reagent: (20 mg in 100 ml conc. HCl)

Procedure

To 1.4 mL aqueous extract, 1.75 mL of OPT reagent was added. The fluorophore was developed by heating to 100°C for 10 min. After the samples reached equilibrium with the ambient temperature, readings were taken at 360-470 nm in the spectrofluorimeter. Concentrated HCI without OPT was taken as blank. Serotonin (1 mg/mL) at different concentration was used as standard. (Pal DK *et al.,* 2009)

STATISTICALANALYSIS

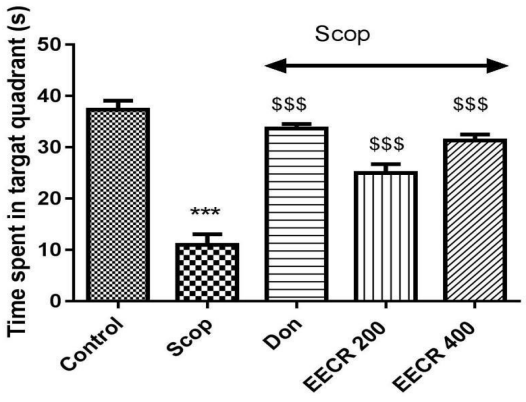
The statistical analysis was carried out by using PRISM version 5 software. The data's of all parameters were analysed by means of one way ANOVA followed by Dunnett's test. The results were expressed as mean ±SEM.

RESULTS

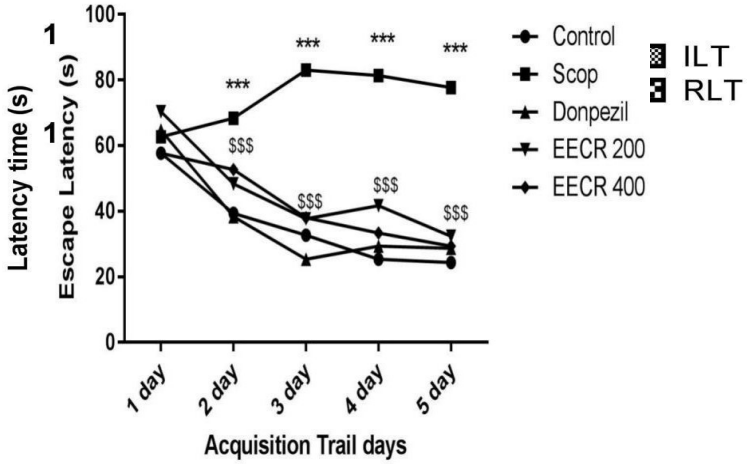
Preliminary Phytochemical Analysis
Phytochemical analysis of EECR

S.No	Phytochemical Constituents	Eecr
1.	Alkaloids	Highly present Indole indoline alkaloids Vinblastin, vincristine
2	Glycoside	present
3	Monoterpenes	present

Passive avoidance test

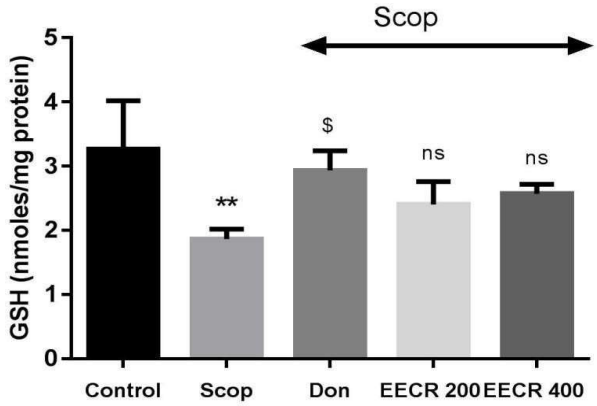


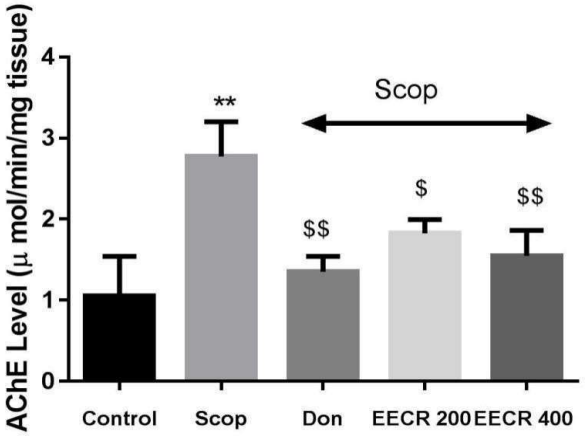
Morris water Maze



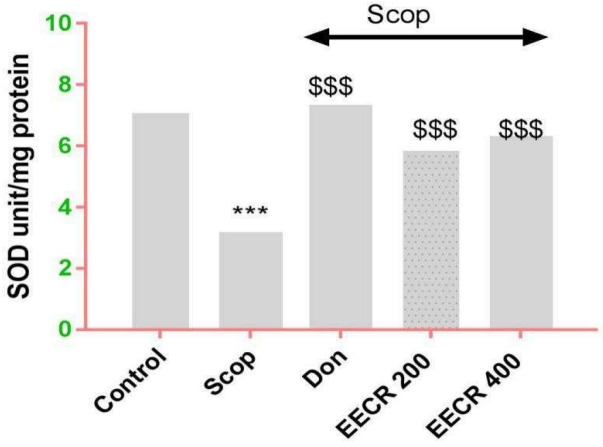
Gsh (Estimation Of Reduced Glutathione)

Estimation of Glutathione Reductase The reaction mixture containing 1 mL of phosphate buffer, 0.5 mL of ethylenediamine tetra acetic acid (EDTA), 0.5 mL of oxidized glutathione and 0.2 mL of NADPH was made up to 3 mL with distilled water. After the addition of 0.1 mL of tissue homogenate, the change in optical density at 340 nm was monitored for 2 min at 30 s intervals. One unit of the enzyme activity was expressed as nmoles of NADPH oxidized/min/mg protein.

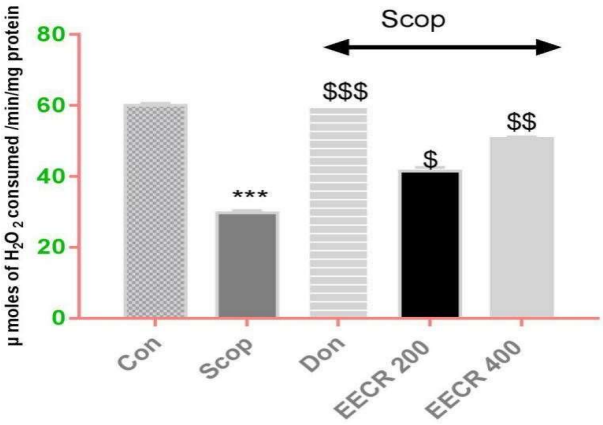




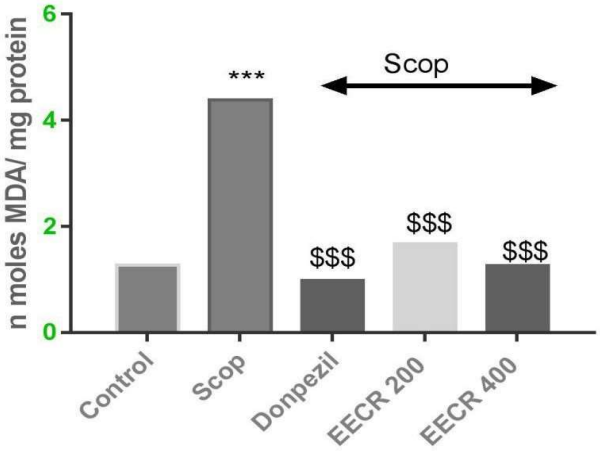
SOD (Estimation of Superoxide Dismutase)



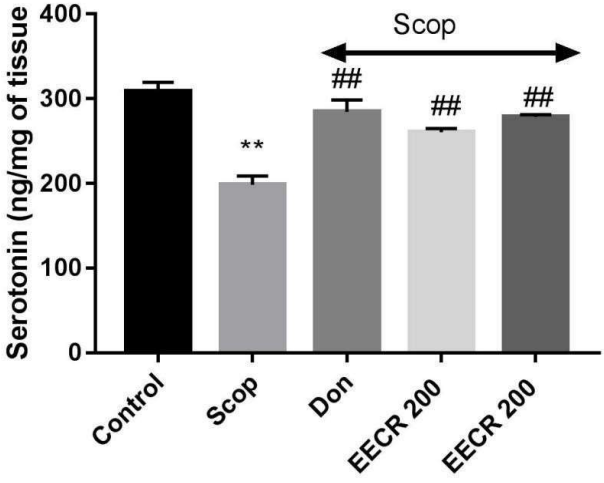
CAT- Estimation of Catalase



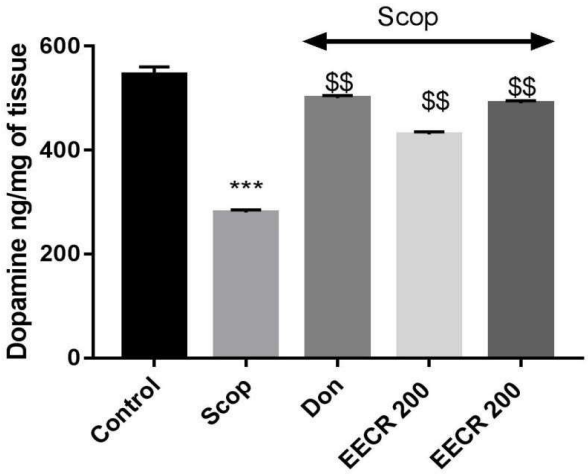
LPO- Estimation of Lipid peroxidation



Serotonin-Estimation of Serotonin



DOPAMINE- Estimation of Dopamine



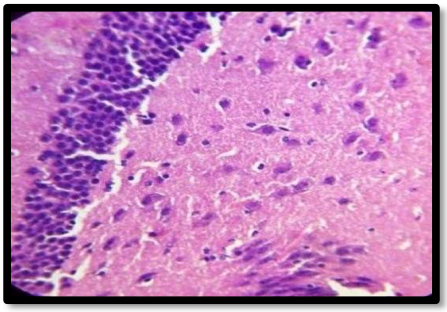
Histopatology

Group1: Density of the neuronal cells are more and organised, and form regular distribution of cells. Group 2: Significantly decresed in density of the neuronal cells is observed. Group 3: Restoration of neuronal cells to the normal pattern is observed.

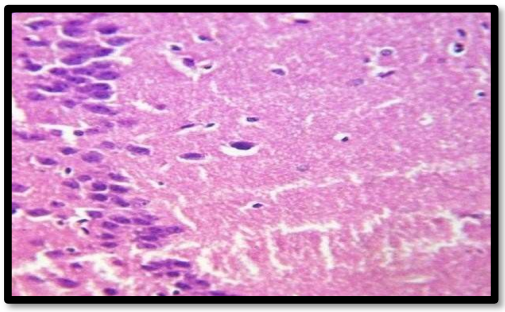
Group 4: Regeneration of neuronal cells are observed.

Group 5: Normalization of neuronal cellular arrangement is observed.

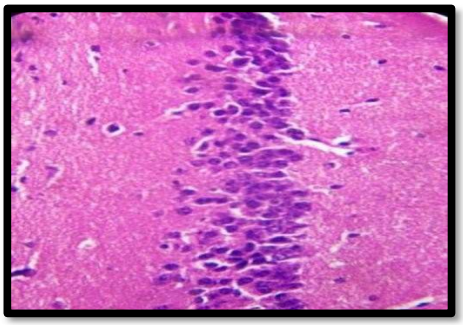
Group 1-control



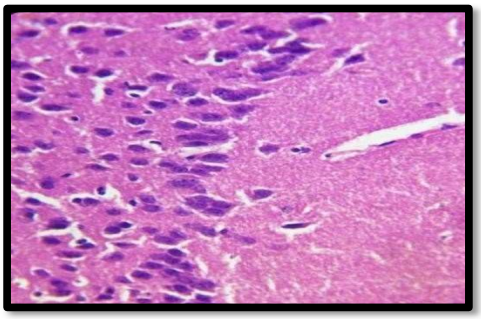
Group 2-Negative control



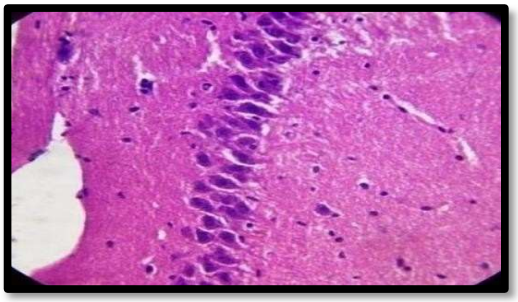
Group 3- standard drug



Group 4-Test 1



Group 5-Test 2



Group I- Shows normal neuronal arrangements in brain region.
Group II- Show neuronal cell with spongy arrangement in brain region.
Group III- Shows the degeneration of neuronal cells and exhibits the differentiation when compared with normal cells. It also exhibits decrease in number of cell arrangement in striatal region of mice brain when compared to control group.
Group IV- Exhibits the regeneration of neuronal cells with the constructive arrangement in brain region.
Group V- Shows the increase in neuronal cell arrangement indicating the regeneration and also cell viability in brain region.

DISCUSSIONS

Amnesia is the loss of memories. These memories may be of events and experiences that happened in the past few seconds, in the past few days, or even in the distant past. You may also be unable to recall experiences after the event that caused your amnesia Therefore we were motivated to explore the potential of medicinal plants to manage this deadly disease (Amnesia). *C roseus* flower were extracted with various solvents like , ethanolic extract based on its polarity by continuous hot percolation method. The ethanolic solvents given more percentage of yields for *in vivo* and *methods*.

In the present study, *C roseus* extract administered orally for 18days improved the memory of mice as reflected by diminished escape latency and percentage alteration values as compared to control animals. There is an increase in escape latency in negative control group when compared with the control group ($P<0.001$) of the two groups of amnesia induced animals, both showed decreased time to escape onto the escape platform. The amnesia induced group (negative control) indicated decrease in the alternation of behavior. The results presented by the treatment groups was showed significance by($p<0.001$) increase in alteration of behavior in respect of 200mg/kg and 400mg/kg of EECR compared with that of the disease control group. The significance of ($P<0.001$) respectively. There is a decrease in serotonin activity in disease control group when compared with the control group ($P<0.001$) of the four groups of amnesia induced animals, both showed decreased in serotonin activity. The group treated EECR 200mg and 400mg showed increased serotonin activity compared with disease control group. The significance of($P<0.001$) respectively. There is an increase in AChE activity in disease control group when compared with the control group ($P<0.001$) of the 4 groups of amnesia induced animals, both showed decreased in AChE activity. Nootropic represent a new class of psychotropic agents with selective facilitatoryeffect on integrative functions of the central nervous system, particularly on intellectual performances, learning capability and memory. Epidemiological studies have almost confirmed that non-steroidal anti- inflammatory drugs reduce the incidence of Amnesia. *Catharanthus roseus* has been shown to produce anti-inflammatory action in rodents. Oxygen free-radicals are implicated in the process of age-related decline in cognitive performance and may be responsible for the development of Amnesia in elderly persons. *Catharanthus roseus* has been reported to possess antioxidant property as well.

CONCLUSION

Catharanthus roseus has anti-cancer, anti-viral, anti-oxidant, anticancer, anti- bacterial, anti-fungal, and anti-plasmodium activities, and so they are used in many biomedical applications. It is used for the cure of a number of diseases such as diabetes, sore mouth, mouth ulcers, and leukemia. It produces about 130 alkaloids such as reserpine, vinceine, raubasin and ajmalcine. Anti-leukemic activity is shown by vinblastine and vincristine. Different parts of this plant produce different amounts of alkaloids, out of which root bark produces the maximum i.e. nearly 1.79%. The memory activity of ethanolic extract of *Catharanthus roseus* flower by *in*

vivo (Morris water maze and Y maze) method was evaluated Further studies can be carried out in the future to elucidate the other neurotransmitter are to evaluate and then mechanism of action, clinical studies may for carried out to establish its efficacy in humans.

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