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Research Paper

Ameliorative Potential Effect Of Ethanolic Extract From Leaves Of *Lanata Camara L* In A Rotenone-Induced Parkinson's Disease Model In Wistar Albino Rats

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ABSTRACT:
Parkinsonism is a neurodegenerative disorder that primarily affects the dopaminergic neurons in the substantia nigra region of the brain. This condition is characterized by a range of motor symptoms, including tremors, bradykinesia (slowness of movement), rigidity, and postural instability. In stark contrast, animals subjected to Ethanol Leaf Extract of Lantana Camara L (ELLC), administered in both low and high doses, exhibit an intriguing augmentation in muscular rigidity and locomotor activity. ELLC treatment reduced the level of neuro-inflammation and increased the level of various anti-oxidant enzymes like SOD, CAT, MDA, Nitrite in group IV & V. It also increased activity muscular rigidity, activity and memory improvement. The study reveals the therapeutic potential of ELLC against retenone induced behavioral and neuropathological deficits in wistar albino rats. The primary aim of this investigation is to assess the capacity of ELLC in promoting remyelination and neuroprotection in animals treated with retenone, a model exhibiting notable demyelination and neurodegeneration reminiscent of Parkinson's disease. To gauge the effectiveness of ELLC, the well-established Parkinson's disease treatment, Levodopa + Carbidopa, serves as the standard drug. Remarkably, ELLC at a high dose (400 mg/kg) demonstrates effects comparable to the standard drug. Nevertheless, further research is imperative to delve deeper into the comprehensive potential of ELLC and unravel the intricate molecular pathways governing its actions. These insights are crucial for advancing our understanding of the compound's therapeutic applications and facilitating its potential translation into clinical contexts for the benefit of individuals grappling with neurodegenerative disorders.

Keywords: *Lantana Camara L, In vitro assays, Medicinal plant, Ethanolic extract, Levodopa,*

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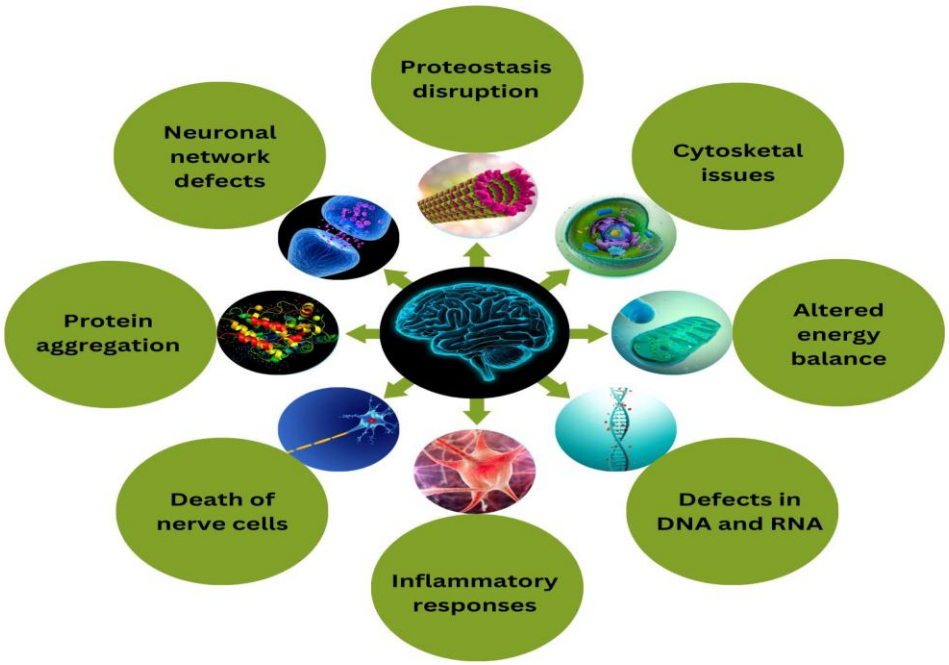
I. INTRODUCTION:

Neurodegenerative diseases pose significant medical challenges, representing conditions and emergencies marked by neural dysfunction. These disorders entail the degeneration of the nervous system, impacting critical areas such as the brain or the entire neural network. While each disease under this umbrella term exhibits distinct symptoms, a common thread emerges they relentlessly prey on individuals, gradually undermining their nervous systems. The insidious nature of these conditions becomes apparent as symptoms surface after a prolonged incubation period, often leaving medical interventions futile due to delayed detection.

1.1 Indicators Of Neurodegenerative Disorders:

Fig: 1 Indicators Of Neurodegenerative Disorders



1.2 Parkinson's Disease:

Parkinsonism, characterized by features like bradykinesia, muscular rigidity, resting tremor, and impaired postural balance, is a clinical syndrome associated with Parkinson's disease. Described by James Parkinson in 1817 as "Shaking Palsy" or "paralysis agitans," PD primarily affects individuals over 55 years old.

Parkinson's disease (PD) is a chronic degenerative disorder affecting the central nervous system, impacting both motor and non-motor systems. This progressive condition stems from the degeneration of nerve cells in the substantia nigra, a brain region crucial for movement control, resulting in impaired dopamine production. Symptoms typically manifest after an 80 percent or greater loss of dopamine-producing cells in this region.

Neurons in the substantia nigra generate dopamine, a neurotransmitter, and play a role in transmitting messages that coordinate and regulate body movements. The coordination of body movement entails intricate decision-making among interconnected nerve cell groups known as ganglia. Information converges at the central region of the brain, the striatum, collaborating with the substantia nigra to exchange impulses between the spinal cord and the brain. The smooth and fluid execution of movement is overseen by the basal ganglia and cerebellum.

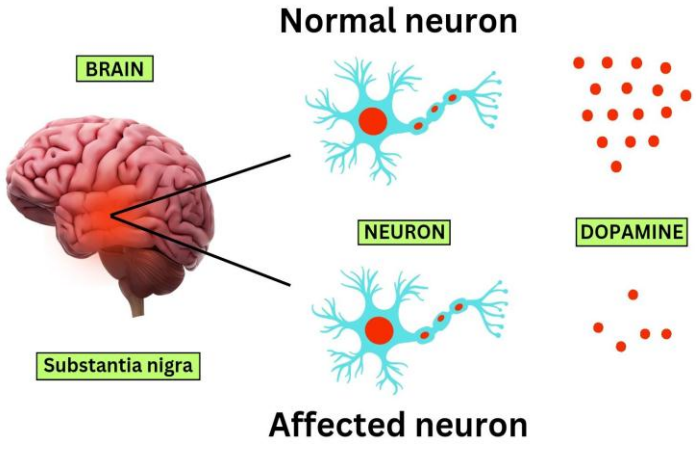


Fig: 2 Brain Neuron

1.3 Pathophysiology Of Parkinson's Disease:

Parkinson's disease (PD) is characterized by the degeneration of dopaminergic nerve cells in the substantia nigra pars compacta, impacting movement regulation and reward responsiveness. Neuroinflammation plays a pivotal role in PD progression, linked to the accumulation of misfolded α-synuclein proteins. The aggregation of misfolded proteins forms Lewy bodies and Lewy neurites, considered pathological signatures of PD. Recent immunological research suggests T lymphocytes infiltrate the substantia nigra, producing pro-inflammatory cytokines and accelerating dopaminergic neuron demise. PD progression involves a complex constellation of pathogenic mechanisms, including abnormal α-synuclein deposition, disrupted autophagy, apoptosis, protein malfunction, mitochondrial dysfunction, and oxidative stress.

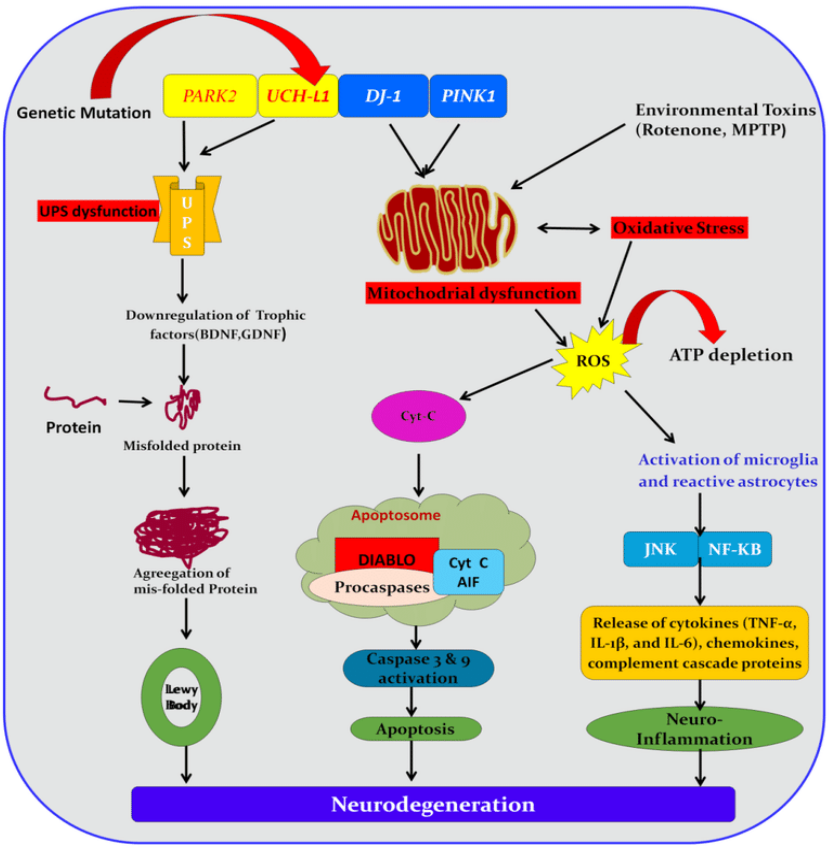


Fig: 3 Pathophysiology Of Parkinson's Disease

1.4 Parkinson's Disease Symptoms:

Parkinson's warning signs can manifest as motor (movement-related) symptoms like slow movements, tremors, or stiffness. Additionally, non-motor symptoms may emerge, with many appearing years or even decades before motor symptoms. However, these non-motor symptoms can be unclear, posing challenges in linking them to Parkinson's disease. Possible non-motor early warning signs include:

- Autonomic nervous system symptoms: Light headedness upon standing (orthostatic hypotension) and constipation.
- Loss of sense of smell (anosmia).
- Sleep issues such as periodic limb movement disorder (PLMD), rapid eye movement (REM) behavior disorder, and restless legs syndrome.

Fig: 4 Parkinson's Disease Medications

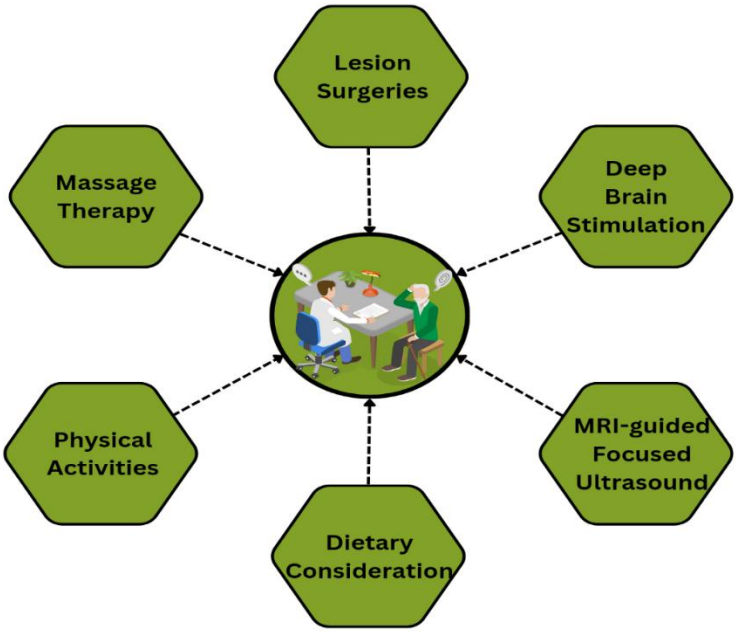


Fig: 5 Parkinson's Disease Management

II. PLANT PROFILE:

2.1 Plant Description:

Lantana camara Linn. is a species of flowering plant in the verbena family, Verbenaceae. It is commonly known as lantana and is native to the American tropics but has spread globally.

- **Binomial Name:** *Lantana camara Linn.*
- **Synonyms:** *Lantana aculeata Linn., Camara vulgaris Benth., Lantana scabrida S.Moore*
- **Common Names:** Lantana, Spanish Flag, Tick Berry, Sleeper Weed, Wild Sage

- **Tamil Name:** Unni Chedi

Fig: 6 ***Lantana camara Linn***

2.2 Taxonomical Classification:

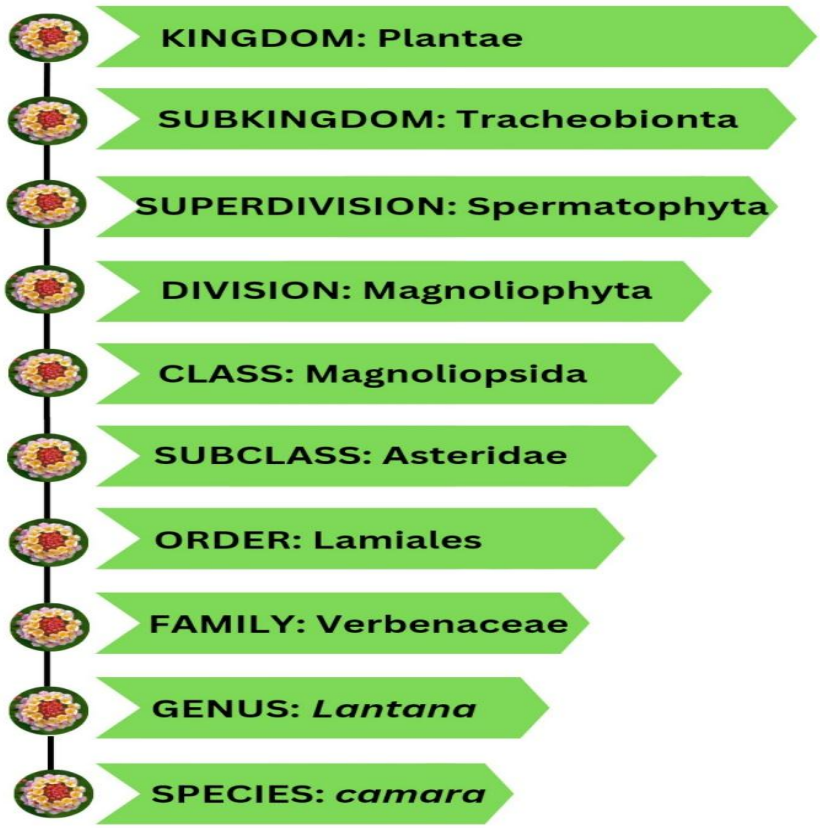


Fig: 7 ***Lantana camara Linn*** **(Taxonomical Classification)**

2.3 Geographical Distribution:

- Lantana camara, a tropical plant, originally hails from Central and Northern South America and the Caribbean.
- It has extended its presence to around 60 countries.

- The plant is widely distributed in regions including Uttarakhand, Uttar Pradesh, Himachal Pradesh, and the North-Eastern states of India.

2.4 Pharmacological Profile Of *Lantana Camara*:

- Anti-bacterial Activity
- Anti-fungal Activity
- Hemolytic Activity
- Anti-motility Activity
- Anti-mutagenic Activity
- Anti-oxidant Activity
- Anti-urolithiatic Activity
- Anthelminthic Activity
- Anti-protozoal Activity
- Anti-viral Activity
- Anti-inflammatory
- Analgesic
- Sedative
- Antipyretic
- Anti-fertility Activity
- Anti-coagulant Activity
- Anti-ulcerogenic Activity

III. MATERIALS AND METHODS:

3.1 Rotenone (Inducing Agent):

Numerous processes, including altered calcium signalling, mitochondrial malfunction, oxidative damage, accumulation of α-synuclein, and cell death, are linked to rotenone. Rotenone is an inducer that mimics the neurological symptoms and motor deficits of Parkinson's disease in humans. Rotenone is a crystalline isoflavone with no smell or colour that is used as a broad-spectrum pesticide, piscicide, and insecticide. It naturally exists in the roots of numerous different Fabaceae species as well as in the seeds and stems of a number of plants, including the jicama vine. It was the first member of the rotenoids chemical compound family to be described.

Rotenone finds application as a non-selective piscicide (fish killing), insecticide, and pesticide. Indigenous peoples have traditionally used rotenone to catch fish. When plants belonging to the Fabaceae family of legumes are crushed and added to a body of water, they release rotenone, which hinders cellular respiration. This causes the afflicted fish to come to the surface and try to breathe, making them easier to catch. Additionally, rotenone is applied in powder form to treat parasite mites on poultry, cattle, and domestic animals, as well as scabies and head lice on people.

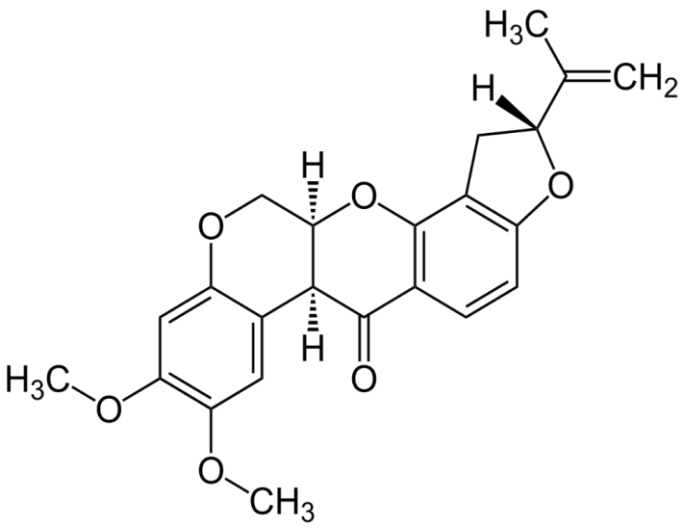


Fig: 8 Structure Of Rotenone

3.2 Collection Of Selected Herb:

The plant material collected was identified and authenticated by by Dr. KN Sunil kumar Research officer HOD Department of pharmacognosy, Dr. P.Elankani Research officer (Siddha), Sci IV-Incharge, SIDDHA CENTRAL RESEARCH INSTITUTE (Central Council for Research in Siddha, Chennai, Ministry of AYUSH, Government of India) Anna Govt. Hospital Campus, Arumbakkam, Chennai – 600106,
Certified that the sample submitted by Bharathi. M, M.Pharm - Final year, Aadhibhagavan College of Pharmacy, Thiruvannamalai district - 604407 was identified as:

Authentication Certificate For 672.15122302

- **Form No:** PCOG002-ACF
- **Code:** L15122302C (*Lantana camara L*),
- **Part:** *Leaf.*
- **Date:** 15.12.2023

3.3 Preparation Of Ethanolic Extracts:

Collect dryed plant of *Lantana camara L.* were cleaned with water & shade dried until a constant weight was obtained & subsequently powdered & sieved mash no 40. Powdered material 5kg was extracted with of water at 50 degree in soxhlet apparatus 1L for 72hr. dark brown semi – solid residues. 525g was obtained by evaporating the ethanolic extract under reduced pressure.

Fig: 9 Ethanolic Extract Of *Lantana Camara L*

3.4 Phytochemical Studies:

Shade dried powdered plant materials for used for the determination of the physiochemical constants in accordance with the WHO guidelines.

- Determination Of Ash Values
- Total Ash
- Acid Insoluble Ash
- Determination Of Extractive Values
- Determination of water soluble extractive

3.5 Phytochemical Test:

The ethanolic extracts of ***Lantana camara L***. were subjected to the following preliminary phytochemical analysis.

- Test for Carbohydrates
- Test for Alkaloids
- Test for Steroids and Sterols
- Test for Glycosides
- Test for Saponins
- Test for Flavonoids

- Test for Tri-terpenoids
- Test for Terpenoids
- Tests for Tannins and Phenolic Compounds
- Test for Gums and Mucilage
- Test for Proteins and Amino acids
- Test for Fixed Oils and Fatty acids

3.6 Experimental Design:

- **Animal:** Wistar albino Rat
- **Sex:** Male
- **Age:** 6-8 weeks
- **Animal number:** 25 Nos
- **Inducing agent :** Rotenone (2 mg/kg) administered subcutaneously (s.c.)
- **Test drug**: Ethanolic extract of *Lantana camara L (ELLC)* Low dose (200 mg/kg) and High dose (400 mg/kg)
- **Vehicle :** 0.5 % Carboxy Methyl Cellulose (CMC) (5ml/Kg) administered orally (p.o.)

Sunflower oil (1ml/kg) administered through subcutaneously (s.c.)

3.7 Acute Toxicity Studies:

Acute toxicity studies were performed according to OECD-423 (Organization of Economic and Cooperation Development) guidelines. Male Wistar albino Rat selected by random sampling technique were employed in this study. The animals were fasted for 4h with free access to water. The Ethanolic Extract of *Lantana camara* (ELLC) was administered orally at a dose of 5 mg/kg initially and mortality if any was observed for first 24 hrs and after 72 hrs.

If mortality was observed in two out of three animals, then the dose administered was considered as toxic dose. However, if the mortality was observed in only one animal out of three animals then the same dose was repeated again to confirm the toxic effect. If no mortality was observed then higher (50, 300, 2000 mg/kg) doses of the plant extracts were employed for further toxicity studies.

3.8 Study Design:

Totally 25 male wistar albino rats were randomly divided into five groups each group contains five animals (n=5)

Group I (Control groups) (n=5) – receives 0.5% CMC administered orally (p.o.) for about 28 days + sunflower oil (1mg/ml) was administered through subcutaneously (s.c.) for about 28 days (Both are administered simultaneously for about 28 days)

Group II (Negative Control groups) (n=5)- receives rotenone (2mg/kg) emulsified in sunflower oil (2mg/ml) were given subcutaneously (s.c.) for about 28 days.

Group III (Standard groups) (n=5)- received levodopa + Carbidopa (100mg/kg + 25 mg /kg) dissolved in 0.5% CMC for about 28 days.

Group IV (Low dose groups) (n=5)- received rotenone (2mg/kg) emulsified in sunflower oil (2mg/ml) were given subcutaneously (s.c.) + Ethanolic extract of *Lantana camara* (ELLC) (200 mg/kg) administered orally (p.o.) for about 28 days.

Group V (High dose groups) (n=5)- received rotenone (2mg/kg) emulsified in sunflower oil (2mg/ml) were given subcutaneously (s.c.) + Ethanolic extract of *Lantana camara* (ELLC) (400 mg/kg) administered orally (p.o.) for about 28 days.

3.9 Pharmacological Study:

- Actophotometer
- Catalepsy Bar Test
- Rotarod
- Digital Grip Force Meter
- Narrow Beam Walking Test
- Rearing Behaviour Test
- Moris Water Maze Test
- Passive Avoidance Test

- Assessment Of Malondialdehyde
- Assessment of Serum Superoxide Dimutase
- Assessment of Serum Catalase (CAT)
- Assessment Of Nitrite level

IV. RESULTS AND DISCUSSION:

4.1 Extraction Appearance And Percentage Yield:

Drug	*Leaves Part of Lantana camara L*
Solvent	Ethanol 90%v/v
Colour	Dark Greenish Yellow
Consistency	Semi solid
Percentage yield	14.5 % w/w

Table No: 1 Appearance and Percentage Yield Of ELLC

4.2 Preliminary Phytochemical Analysis:

S.No	Physio-Chemical Constant	*Lantana Camara L*
1	**Total Ash**	8.3±1.8
2	**Acid Insoluble Ash**	1.3±1.5
3	**Water Soluble Extractive**	28.3±1.6
4	**Loss On Drying**	8.6

Table No: 2 Preliminary Phytochemical Analysis

4.3 Preliminary Phytochemical Screening:

Results of the Preliminary Phytochemical Constituents present in Ethanolic extract of *Lantana Camara L*

S. No	Constituents	*Lantana Camara L* Ethanolic Extract
1.	Alkaloids	+
2.	Carbohydrates	_
3.	Protein	_
4.	Terpinoids	+
5.	Phenols	+
6.	Tannins	+
7.	Flavanoids	+
9.	Glycosides	+
10.	Saponins	_

+ = Present - = Absent

Table No: 3 Preliminary Phytochemical Screening

4.4 Pharmacological Activities:
4.4.1 Effect Of ELLC On Actophotometer:

S.NO	GROUPS	Locomotor Index		
		DAY 14	DAY 21	DAY 28
1	Control	82 ±1.095	81.4 ±0.678	78.2 ±1.019
2	Negative control	54 ±0.894	43 ± 1.414	30.6 ±1.122
3	Standard	77.8±1.152	78.6 ± 1.122	79 ± 1.516
4	Low dose 200 mg/kg	58.2±0.969****	63.4 ±0.927****	62.6 ±0.812****
5	High dose 400 mg/kg	71.8±1.157**	78.8 ± 1.496ns	82.4 ±1.077ns

Table No: 4 Effect Of ELLC On Actophotometer

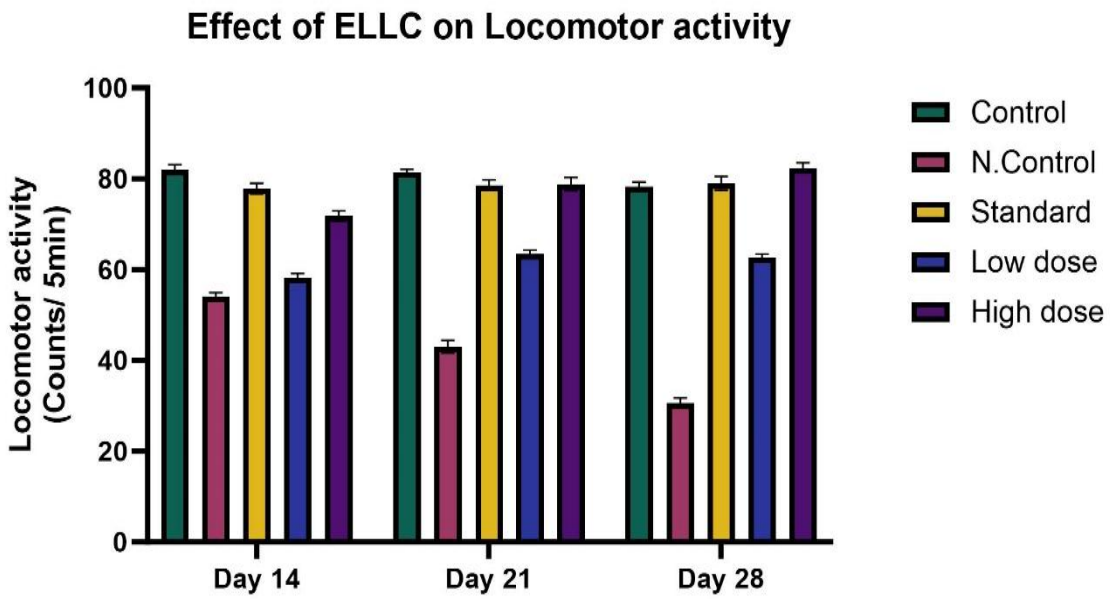


Fig: 10 Graph 1: Effect Of ELLC On Locomotor Activity

4.4.2 Effect of ELLC On Catalepsy Bar Test:

S.NO	GROUPS	Catalepsy Behaviour		
		DAY 14	DAY 21	DAY 28
1	Control	2.6 ±0.245	3 ±0.316	3 ±0.316
2	Negative control	15.6 ±0.4	20.2 ±0.5	30.4 ±1.2
3	Standard	12.8 ±1.06****	7.8 ±0.374****	5 ±.312****
4	Low dose 200 mg/kg	19.4 ±0.4****	12.2 ±0.3****	8.2 ±0.58**
5	High dose 400 mg/kg	13.6±0.812****	8 ±0.316 ****	4.4 ±0.4****

Table No: 5 Effect Of ELLC On Catalepsy Bar Test

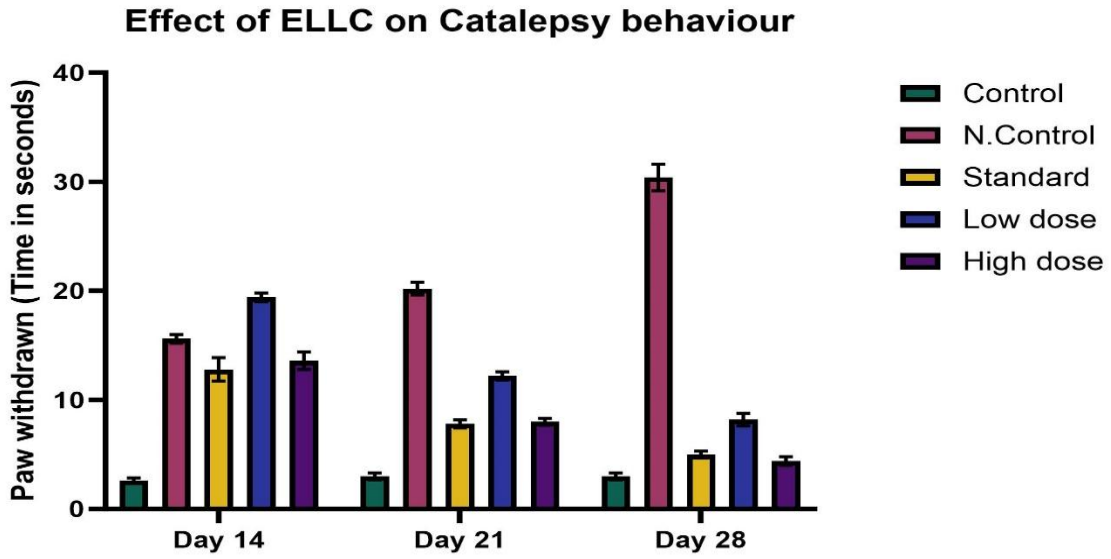


Fig: 11 Graph 2: Effect Of ELLC On Catalepsy Behaviour

4.4.3 Effect Of ELLC On Rotarod Activity:

S.NO	GROUPS	Fall-off Latency (Time in seconds)		
		DAY 14	DAY 21	DAY 28
1	Control	278.8 ±3.184	2.84 ±0.927	290.2 ±0.860
2	Negative control	155.4 ±0.927	90.6 ±1.631	99.6 ±1.778
3	Standard	149 ±0.871*	217 ±2.864****	251 ±1.393****
4	Low dose 200 mg/kg	139.4 ±0.7****	164 ±1.703****	201.8 ±2.08****
5	High dose 400 mg/kg	142.6 ±0.67****	210.6 ±2.97****	260.6 ± 1.96****

Table No: 6 Effect Of ELLC On Rotarod Activity

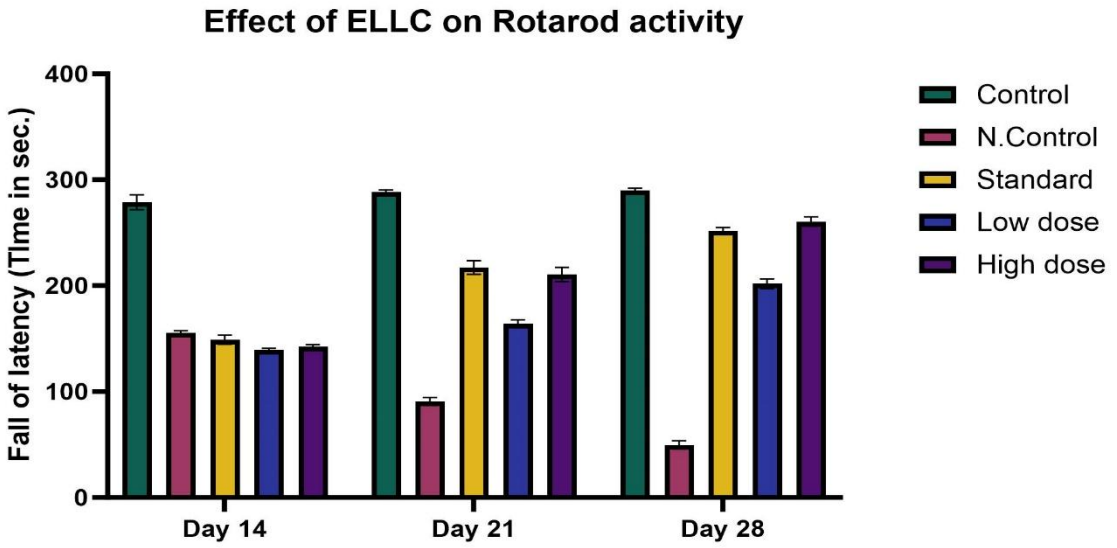


Fig: 12 Graph 3: Effect Of ELLC On Rotarod Activity

4.4.4 Effect Of ELLC On Grip Strength Using Digital Grip Force Meter:

S.NO	GROUPS	DAY 14	DAY 21	DAY 28
1	Control	1.483 ± 0.026	1.485 ± 0.094	0.485 ± 0.041
2	Negative control	0.96 ± 0.039	0.692 ± 0.019	0.404 ± 0.025
3	Standard	1.01 ± 0.04^{ns}	1.434 ± 0.01****	1.470 ± 0.017****
4	Low dose 200 mg/kg	1.027 ± 0.038^{ns}	1.222 ± 0.007****	1.342 ± 0.0752****
5	High dose 400 mg/kg	1.030 ± 0.046^{ns}	1.384 ±0.004****	1.408 ±0.20****

Table No: 7 Effect Of ELLC On Grip Strength

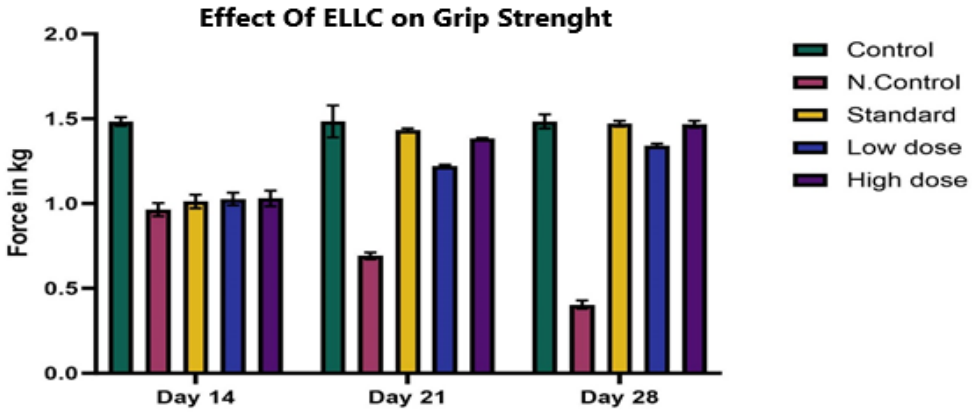


Fig: 13 Graph 4: Effect Of ELLC On Grip Strength

4.4.5 Effect Of ELLC On Narrow Beam Walking Test:

S.NO	GROUPS	Time To Cross Narrow Beam In Seconds		
		DAY 14	DAY 21	DAY 28
1	Control	3.4 ± 0.245	4.2 ±0.374	5.2 ±0.583
2	Negative control	15.8 ±0.374	226 ±0.678	29.25 ±0.587
3	Standard	12.8 ±0.583**	10 ±0.316****	6.8 ±0.735****
4	Low dose 200 mg/kg	25 ±1.517****	10.8 ±0.374****	8 ±0.417****
5	High dose 400 mg/kg	14.2 ±0.374^{ns}	7.8 ±0.38****	4.85 ±0.2****

Table No: 8 Effect Of ELLC On Narrow Beam Walking Test

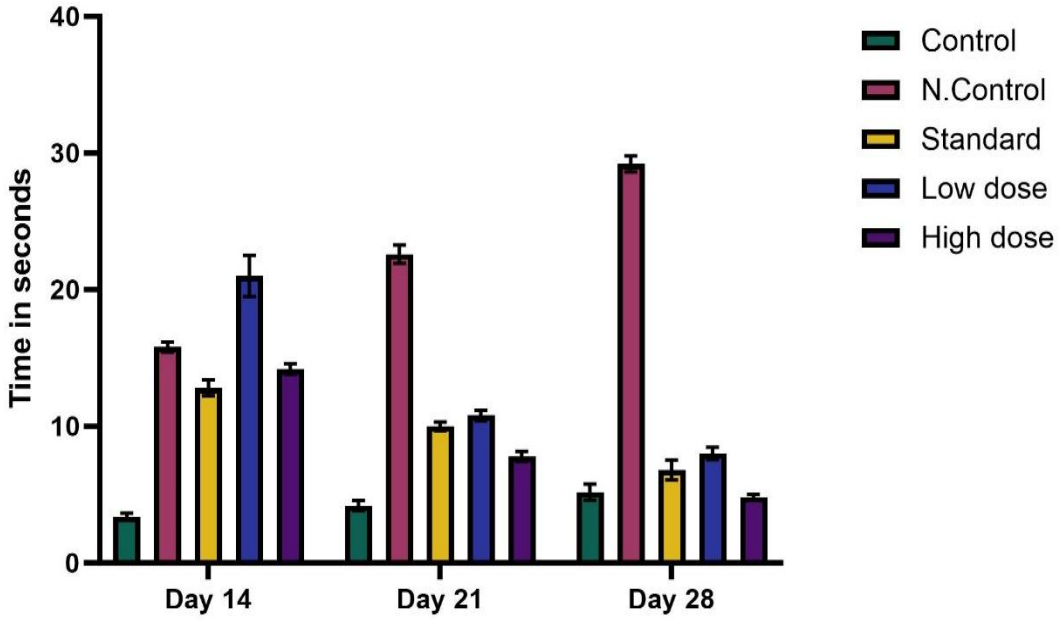


Fig: 14 Graph 5: Effect Of ELLC On Narrow Beam Walking Test (Time To Cross)

4.4.6 Effect Of ELLC On Narrow Beam Walking Test (No. Of. Slips):

S.NO	GROUPS	No. of. slips in seconds		
		DAY 14	DAY 21	DAY 28
1	Control	1.6 ± 0.245	1.2 ±0.2	1.8 ± 0.374
2	Negative control	10.6 ±0.245	13.6 ±0.215	17.8 ±0.2
3	Standard	11.8 ±0.735^{ns}	8.25 ±0.2****	5.2 ±0.3
4	Low dose 200 mg/kg	13***	12.4 ±0.223^{ns}	8.4 ±0.4
5	High dose 400 mg/kg	13.2 ±0.583***	7.4 ±0.245****	4.2 ±0.3

Table No: 9 Effect Of ELLC On Narrow Beam Walking Test (No. Of. Slips)

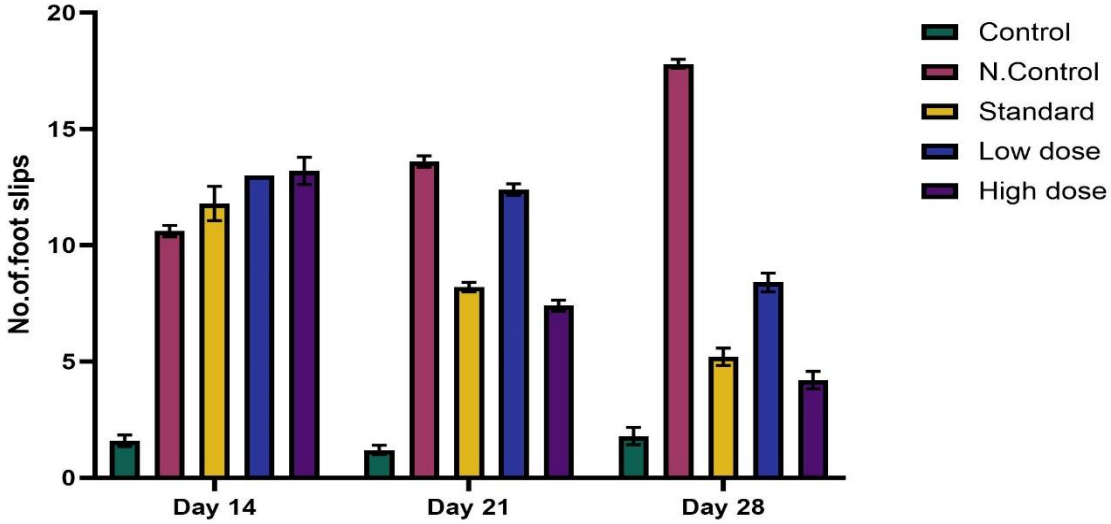


Fig: 15 Graph 6: Effect Of ELLC On Narrow Beam Walking Test (No. Of. Slips)

4.4.7 Effect Of ELLC On Rearing Behaviour Test:

S.NO	GROUPS	No. of. Rearing in 5 min.		
		DAY 14	DAY 21	DAY 28
1	**Control**	33.21±1.068	33.8±0.8	31.5±1.140
2	**Negative control**	8±0.316	5.6±0.245	3.4±0.245
3	**Standard**	21.4±0.510****	18.6±0.245****	16.6±0.245****
4	**Low dose 200 mg/kg**	15±0.316****	13.6±0.510****	9.6±0.245****
5	**High dose 400 mg/kg**	18.2±0.374**	15±0.316***	11.8±0.490****

Table No: 10 Effect Of ELLC On Rearing Behaviour Test

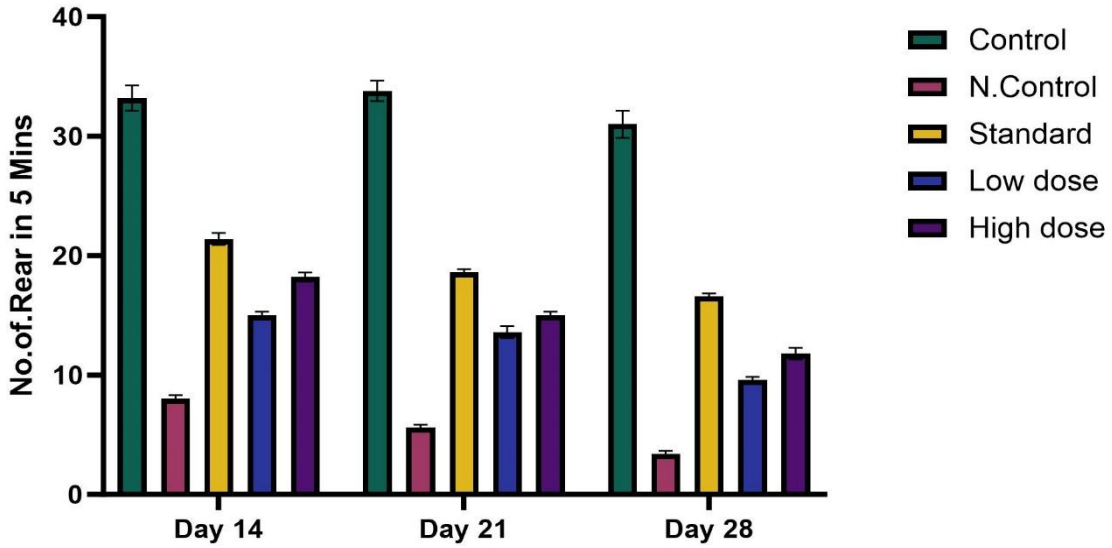


Fig: 16 Graph 7: Effect Of ELLC On Rearing Behaviour Test

4.4.8 Effect Of ELLC On Morris Water Maze Test:

S.NO	GROUPS	Escape latency (seconds)		
		DAY 14	DAY 21	DAY 28
1	**Control**	19.6 ±0.400	20.4 ±0.510	20.6 ±0.927
2	**Negative control**	66.2 ±0.735	82.6 ±1.435	117.8 ±2.267
3	**Standard**	34.4 ±0.872****	26.8 ±0.663****	23.6 ±0.748****
4	**Low dose 200 mg/kg**	54.4 ±1.503****	46.4 ±1.077****	38.25 ±0.374****
5	**High dose 400 mg/kg**	43.2 ±0.490****	34.2 ±0.583****	27.8 ±0.860****

Table No: 11 Effect Of ELLC On Morris Water Maze Test

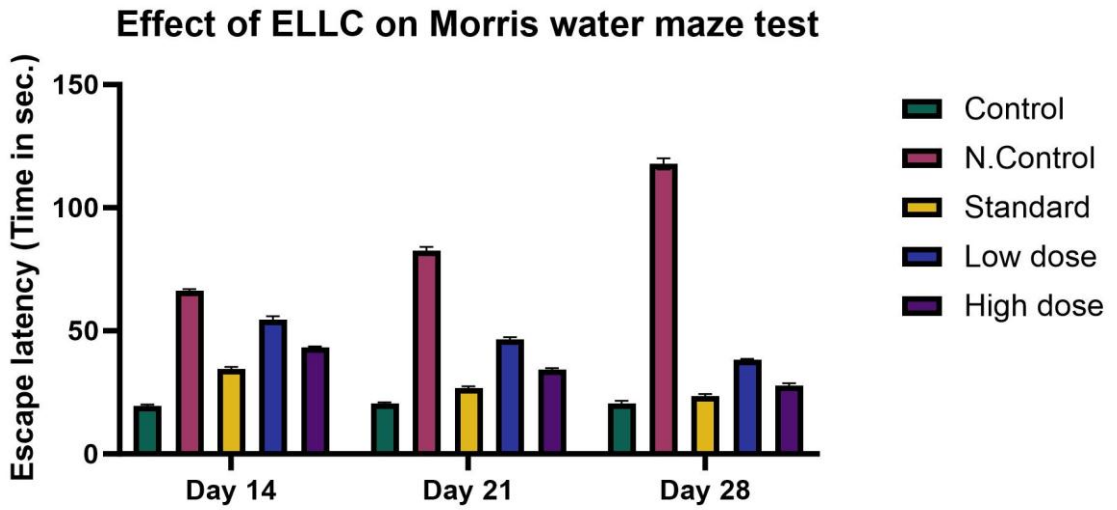


Fig: 17 Graph 8: Effect Of ELLC On Morris Water Maze Test

4.4.9 Effect Of ELLC On Passive Avoidance Test:

S.NO	GROUPS	% Alterations		
		DAY 14	DAY 21	DAY 28
1	Control	305 ± 4.472	296.8 ±1.715	302.4 ±1.435
2	Negative control	105.8 ±1.744	72.4 ±1.077	40.6 ±1.208
3	Standard	186.2 ±2.518****	227.4 ±2.502****	279.2 ±2.518****
4	Low dose 200 mg/kg	154.2 ±1.158****	174.2 ±1.393****	199.4 ±3.370****
5	High dose 400 mg/kg	180.2 ±1.020****	229.8 ±3.397 ****	277.6 ±1.166 ****

Table No: 12 Effect Of ELLC On Passive Avoidance Test

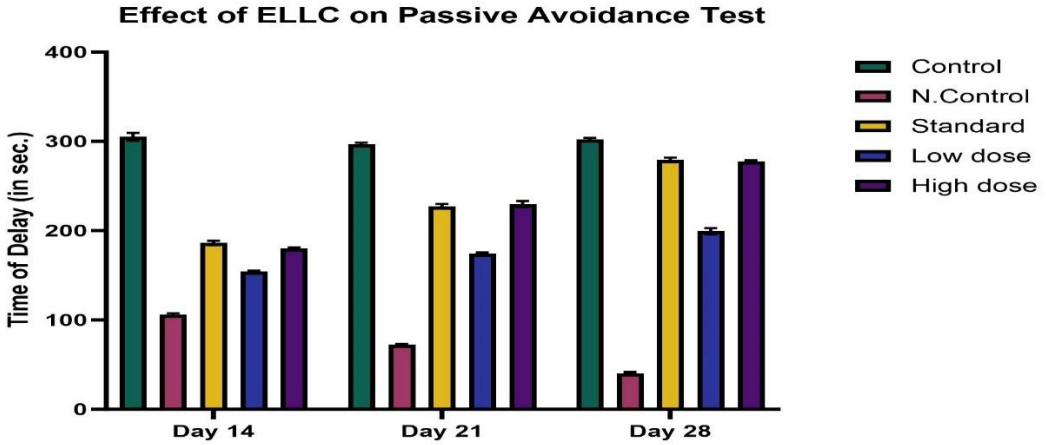


Fig: 18 Graph 9: Effect Of ELLC On Passive Avoidance Test

4.4.10 Effect Of ELLC On (MDA), (SOD), (CAT), Nitrite Level:

S.NO	GROUPS	MDA level (n mol/mg pr)	SOD Values (U/mg)	CAT Values (Moles 0f H_2O_2 Consumed/min)	Nitrite level (µg/ml)
1	**Control**	2.109 ± 0.032	97.83 ± 1.498	306.1± 1.976	135.6 ± 2.779
2	**Negative Control**	7.448 ± 0.183	44.94 ± 0.5014	191.0± 1.168	293.5 ± 6.022
3	**Standard**	3.980 ± 0.092****	87.09 ± 0.5176	277.6± 3.450	161.9 ± 2.862****
4	**Low dose 200 mg/kg**	6.274 ± 0.101****	63.45 ± 0.9732****	227.0± 1.882****	254.8 ± 2.010****
5	**High dose 400 mg/kg**	4.477 ± 0.090****	77.82 ± 0.9265****	253.8± 2.339****	209.9 ±4.081****

Table No: 13 Effect Of ELLC On (MDA), (SOD), (CAT) Nitrite Level

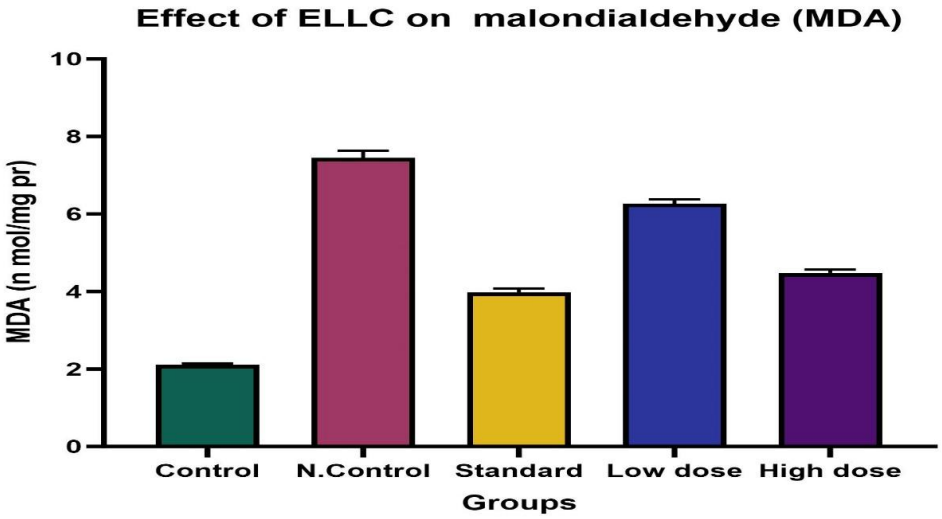


Fig: 19 Graph 10: Effect Of ELLC On MDA

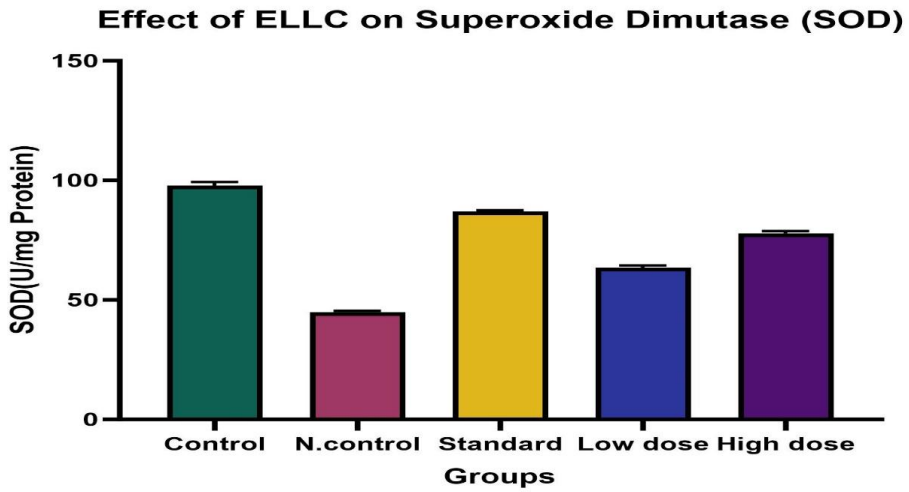


Fig: 20 Graph 11: Effect Of ELLC On SOD

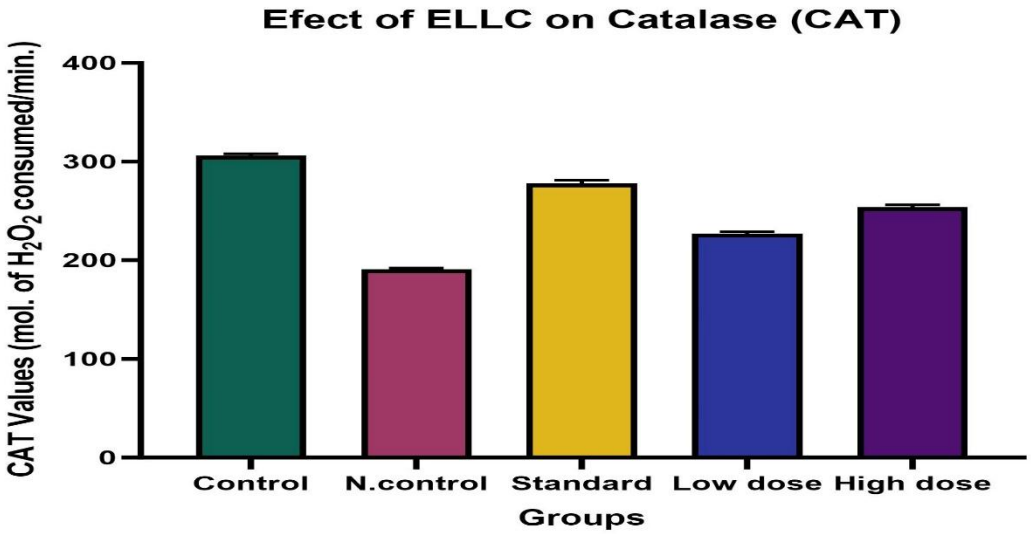


Fig: 21 Graph 12: Effect Of ELLC On CAT

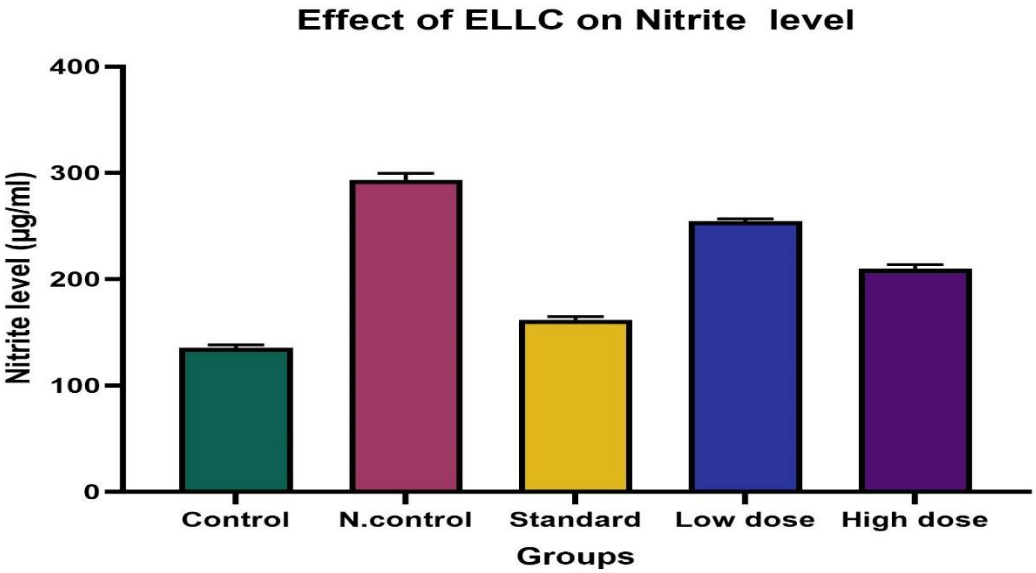


Fig: 22 Graph 13: Effect Of ELLC On Nitrite Level

4.5 Histopathology Report:

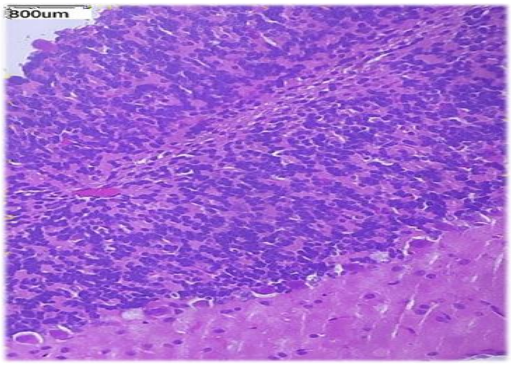
Group I (Control Group):
The cerebellum of the controlled animal reveals a distinctly organized and healthy configuration of neurons. The neuronal arrangement in this brain region appears robust and well-structured, indicative of overall neurological well-being.

Group II (Negative Group):
The brain of animals treated with retenone displays complete disarray and degeneration of neurons, accompanied by evident signs of inflammation.

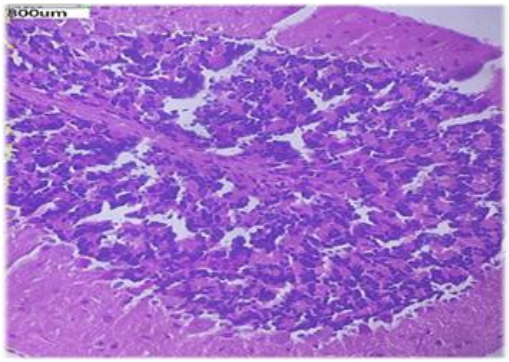
Group III (Standard Group):
Following the administration of Levodopa + Carbidopa to animals exposed to retenone, there is observable remyelination and rearrangement of neurons in their brains. This indicates a positive impact on neural structures, suggesting potential therapeutic effects of the treatment in mitigating the detrimental effects of retenone.

Group IV (Low dose Group):
The brains of animals treated with a low dose (200 mg/kg) following exposure to retenone show a partial restoration of neuronal cells and a reordering of neurons.

Group V (High dose Group):
Following exposure to retenone, animals treated with a modest dose (400 mg/kg) showcase a noteworthy recuperation of neuronal cells along with a reorganization of neurons in their brains. This indicates a partial reversal of the neurobiological impact, suggesting a potential therapeutic effect of the treatment in mitigating the consequences of retenone exposure on neuronal structures**.**

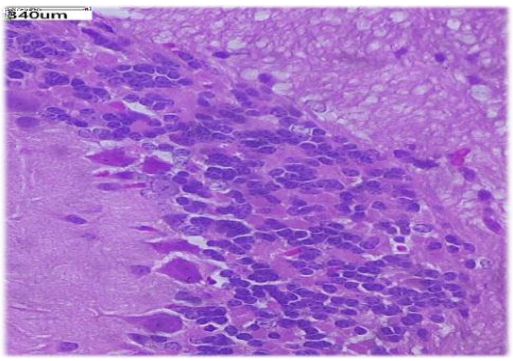


Control Group

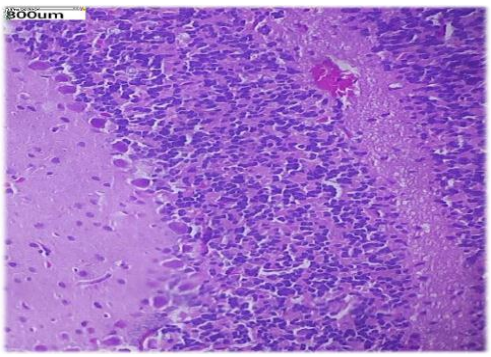


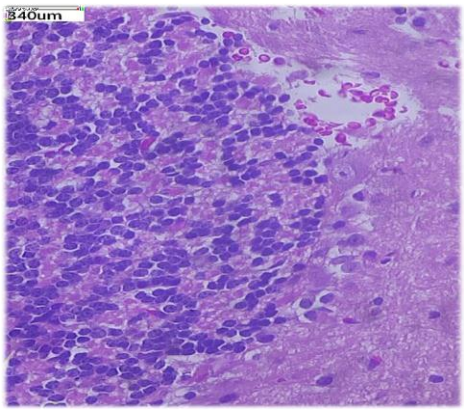
Negative Group

Standard Group



Low Dose Group





High Dose Group

Fig: 23 Histopathology Report

V. DISCUSSION:

Parkinsonism is a neurodegenerative disorder that primarily affects the dopaminergic neurons in the substantia nigra region of the brain. This condition is characterized by a range of motor symptoms, including tremors, bradykinesia (slowness of movement), rigidity, and postural instability. The main hallmark of Parkinsonism is the depletion of dopamine, a neurotransmitter responsible for regulating movement and coordination.

The exact cause of Parkinsonism is not fully understood, but both genetic and environmental factors are believed to play a role. The accumulation of abnormal protein aggregates, such as alpha-synuclein, in the brain is a common pathological feature observed in Parkinson's disease, a specific type of parkinsonism.

Levodopa, a precursor of dopamine, is a standard and effective medication used to alleviate symptoms and replenish dopamine levels in the brain. However, long-term use can lead to complications such as motor fluctuations and dyskinesias. Other therapeutic approaches, including deep brain stimulation and various medications, aim to manage symptoms and improve the quality of life for individuals with Parkinsonism.

In the experimental context, animals allocated to the negative group, characterized as Group II, present a discernible depletion of neuroinflammation specifically within the substantia nigra. In stark contrast, animals subjected to Ethanol Leaf Extract of ***Lantana Camara L*** (ELLC), administered in both low and high doses, exhibit an intriguing augmentation in muscular rigidity and locomotor activity. This observed increase in motoric functions in response to ELLC administration implies a potential modulatory effect on the neurological and neuromuscular systems. Moreover, animals treated with ELLC extract showcase a notable enhancement in memory and learning capabilities, indicating a positive impact on cognitive function compared to the negative group.

Interestingly, when evaluating the effects of ELLC against a standard group, it becomes evident that ELLC, particularly at both low and high doses, manifests Parkinsonism activity. This finding suggests a potential therapeutic or exacerbating role of ELLC in Parkinson's disease or related conditions. The comprehensive analysis of biochemical markers further supports these observations. Parameters such as malondialdehyde (MDA), nitrite levels, and the enzymatic activities of Superoxide Dismutase (SOD) and Catalase (CAT) provide additional insights into the biochemical milieu associated with ELLC administration and its potential impact on oxidative stress, inflammation, and antioxidant defenses within the experimental framework. This multifaceted examination contributes to a more nuanced understanding of the complex interplay between ELLC and various physiological and pathological aspects, shedding light on its potential pharmacological implications.

Research continues to explore potential neuroprotective strategies and novel treatments to modify the progression of the disease. Early diagnosis and a multidisciplinary approach involving medication, physical therapy, and lifestyle modifications are crucial for optimizing patient care. Additionally, ongoing efforts are directed towards understanding the underlying mechanisms of Parkinsonism to develop targeted therapies and, ultimately, find a cure for this challenging neurodegenerative disorder.

VI. CONCLUSION:

In conclusion, this study underscores the significant potential of the ethanolic extract of Lantana camara (ELLC) in promoting remyelination and neuroprotection in a rotenone-induced animal model exhibiting demyelination and neurodegeneration akin to Parkinson's disease. The comparison with Levodopa + Carbidopa, a standard drug for Parkinson's disease treatment, reveals that ELLC in a high dose (400 mg/kg) exhibits effects comparable to the established medication. ELLC not only prevents cell death but also accelerates the regeneration of neuronal cells in the brain, coupled with enhancements in the antioxidant defense system. While these findings highlight the promising neuroprotective and remyelinating properties of ELLC, the precise molecular mechanisms underlying these effects remain to be elucidated. This study lays the groundwork for considering ELLC as a potential therapeutic agent for neurodegenerative conditions, especially in the realm of parkinsons disease.

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