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Evaluation Of Anti-Anxiety And Anticonvulsant Potential Of *Ochna Vibecarpa* Leaf Extracts

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Abstract: Medicinal plants are an important source of bioactive compounds with potential therapeutic applications in neurological disorders. The present study aimed to evaluate the anti-anxiety and anticonvulsant activities of leaf extracts of *Ochna vibecarpa*, a plant belonging to the family *Ochnaceae* and traditionally used for various medicinal purposes. Preliminary phytochemical screening of the aqueous extract revealed the presence of carbohydrates, tannins, proteins, and resins. The anxiolytic activity was assessed using Elevated Plus Maze (EPM) and Open Field Test (OFT) models in Wistar rats, while anticonvulsant activity was evaluated using Maximal Electroshock (MES) and Pentylenetetrazole (PTZ)-induced seizure models. The animals were treated with two doses of *Ochna vibecarpa* extract (100 mg/kg and 200 mg/kg), and their effects were compared with standard drugs such as diazepam and phenytoin. The results demonstrated a significant increase in open arm entries and time spent in open arms in the EPM test, along with increased locomotor activity in the OFT, indicating notable anxiolytic effects. In anticonvulsant studies, the extract produced a dose-dependent reduction in seizure duration in MES models and significantly delayed seizure onset in PTZ-induced convulsions, with 100% protection observed at both dose levels. The higher dose (200 mg/kg) showed effects comparable to standard drugs.The findings suggest that *Ochna vibecarpa* leaf extract possesses significant anti-anxiety and anticonvulsant activities, which may be attributed to its phytochemical constituents and possible modulation of neurotransmitter systems. This study supports its traditional use and highlights its potential as a natural therapeutic agent for neurological disorders.

Keywords: Ochna vibecarpa, Anti-anxiety activity, Anticonvulsant activity, Elevated Plus Maze, Pentylenetetrazole (PTZ), Maximal Electroshock (MES)

1. INTRODUCTION

1.1 Medicinal Plants and Their Therapeutic Importance

Medicinal plants have served as a cornerstone of healthcare systems since ancient times and continue to play a vital role in both traditional and modern medicine. A significant proportion of the global population, particularly in developing countries, relies on plant-based remedies for primary healthcare due to their accessibility, affordability, and cultural acceptance. According to the World Health Organization, nearly 80% of the population in developing regions depends on herbal medicine for basic health needs [1]. In recent years, there has been a renewed interest in phytopharmaceuticals as potential alternatives or complementary therapies to conventional drugs, driven by the increasing prevalence of drug resistance, adverse drug reactions, and the high cost of synthetic medications [2].

Medicinal plants are rich sources of bioactive compounds such as alkaloids, flavonoids, glycosides, tannins, and terpenoids. These phytoconstituents are known to exert a wide range of pharmacological activities including antioxidant, anti-inflammatory, antimicrobial, anticancer, and neuroprotective effects [3]. The structural diversity and biological activity of natural products make them valuable candidates for drug discovery and development.

1.2 The Genus Ochna and Its Pharmacological Significance

The genus *Ochna* (family *Ochnaceae*) comprises approximately 85 species of evergreen trees, shrubs, and small bushes distributed across tropical regions of Asia, Africa, and America [4]. Several species of this genus are well known in traditional medicine systems for their therapeutic properties. In India, about eleven species of Ochna have been reported and are used for the treatment of various ailments such as asthma, dysentery, epilepsy, gastrointestinal disorders, menstrual irregularities, and skin diseases [5]. Phytochemical investigations of Ochna species have revealed the presence of a diverse array of secondary metabolites, including biflavonoids, anthranoids, triterpenes, steroids, and phenolic compounds [6]. These compounds have been associated with multiple biological activities such as analgesic, anti-inflammatory, antimicrobial, antimalarial, anti-HIV, and cytotoxic effects [7]. The wide spectrum of pharmacological activities exhibited by Ochna species supports their traditional use and highlights their potential as a source of novel therapeutic agents.

1.3 Anxiety Disorders : Prevalence and Challenges

Anxiety disorders are among the most prevalent psychiatric conditions worldwide, affecting a substantial proportion of the population across all age groups. Epidemiological studies suggest that approximately 25–30% of individuals experience anxiety disorders at some point in their lives [8]. These disorders are characterized by excessive fear, apprehension, and behavioral disturbances that significantly impair daily functioning and quality of life [9]. Although several pharmacological treatments are available, including benzodiazepines, selective serotonin reuptake inhibitors (SSRIs), and other anxiolytic agents, their use is often associated with limitations such as sedation, tolerance, dependence, and withdrawal symptoms [10]. Additionally, many patients do not respond adequately to existing therapies or experience relapse after treatment discontinuation. These challenges necessitate the exploration of safer and more effective alternatives, particularly from natural sources with fewer side effects.

1.4 Epilepsy and the Need for Novel Anticonvulsants

Epilepsy is a chronic neurological disorder characterized by recurrent, unprovoked seizures resulting from abnormal electrical activity in the brain. It affects over 50 million people worldwide and represents a major public health concern [11]. Seizures are broadly classified into partial (focal) and generalized types, depending on their origin and spread within the brain [12]. Despite the availability of several antiepileptic drugs such as phenytoin, carbamazepine, and diazepam, approximately one-third of patients remain resistant to current treatments [13]. Moreover, long-term use of these drugs is often associated with adverse effects including cognitive impairment, sedation, and systemic toxicity. Therefore, there is a pressing need to develop new anticonvulsant agents that are more effective, safer, and accessible. Natural products have gained considerable attention in this context due to their potential to modulate key neurotransmitter systems involved in seizure activity, such as gamma-aminobutyric acid (GABA) and glutamate pathways. Several medicinal plants have been reported to possess anticonvulsant properties, making them promising candidates for further investigation [14].

1.5 Rationale for the Study on *Ochna vibecarpa*

Ochna vibecarpa, a member of the family *Ochnaceae*, is traditionally used in herbal medicine for the treatment of various conditions including fever, cough, skin diseases, and neurological disorders. Despite its ethnomedicinal importance, scientific evidence supporting its neuropharmacological activities, particularly its anti-anxiety and anticonvulsant effects, remains limited. Preliminary phytochemical studies indicate the presence of bioactive constituents such as tannins, carbohydrates, proteins, and resins, which may contribute to its therapeutic effects. Given the increasing demand for plant-based neuroprotective agents and the limitations of current pharmacological treatments, it is essential to evaluate the potential of *Ochna vibecarpa* using scientifically validated experimental models.

Taxonomical Classification

Kingdom: Plantae

Phylum: Tracheophyta or Streptophyta

Class: Magnoliopsida or Equisetopsida

Order: Malpighiales

Family: Ochnaceae

Genus: *Ochna*

1.6 Aim of the Study

The present study was designed to evaluate the anti-anxiety and anticonvulsant potential of *Ochna vibecarpa* leaf extracts using established *in vivo* models such as the Elevated Plus Maze (EPM), Open Field Test (OFT), Maximal Electroshock (MES), and Pentylenetetrazole (PTZ)-induced seizure models in Wistar rats. The study also aims to provide scientific validation for its traditional use and explore its potential as a natural therapeutic agent for neurological disorders.

Objective:

1. The method includes processes of purifying, drying, and grinding the leaf extract from *Ochna vibecarpa* into a powder.
2. Assessment of the Anti-Anxiety and Anticonvulsant Properties of *Ochna vibecarpa* Leaf Extracts.
3. The research aims to investigate the studies conducted on the Anti-Anxiety and Anticonvulsant Properties found in the Leaf Extract sourced from *Ochna vibecarpa.*

2. MATERIALSANDMETHODS

2.1 Collection and Authentication of Plant Material

Leaves of *Ochna vibecarpa* were obtained from Ayurvedic manufacturers and used for the study. The collected material was authenticated and processed for experimental purposes. The leaves were cleaned to remove impurities, dried under suitable conditions, and pulverized into a fine powder using a mechanical grinder. The powdered material was stored in airtight containers for further analysis.

S. No	Phytoconstituents	*OCHNA VIBECARPA* Aqueous Extract (D.H_2O)
1.	Carbohydrate	Present
2.	Glycosides	Absent
3.	Alkaloids	Absent
4.	Steroids	Absent
5.	Tannins	Present
6.	Flavonoids	Absent

7.	Phenols	Absent
8.	Saponins	Absent
9.	Saponification	Absent
10.	Flavanoglycosides	Absent
11.	Gums	Absent
12.	Resins	Present
13.	Carboxylic acid	Absent
14.	Protein	Present
15.	Biuret	Absent

2.2 Preparation of Extract

The dried leaf powder of *Ochna vibecarpa* was subjected to aqueous extraction. The extract was prepared using distilled water, followed by filtration to remove insoluble matter. The filtrate was concentrated and dried to obtain a solid extract, which was preserved for phytochemical and pharmacological studies.

2.3 Phytochemical Screening

Preliminary qualitative phytochemical screening of the aqueous extract was carried out using standard methods to detect the presence of various bioactive constituents. The analysis revealed the presence of carbohydrates, tannins, proteins, and resins, while alkaloids, flavonoids, glycosides, steroids, phenols, and saponins were absent.

2.4 Experimental Animals

Healthy Wistar albino rats (180–200 g) of either sex were used for the study. The animals were housed in polypropylene cages under standard laboratory conditions (22 ± 3°C temperature, 12-hour light/dark cycle) and were acclimatized for seven days prior to the experiment. They were provided with standard pellet diet and water ad libitum. All experimental procedures were conducted between 9:00 AM and 3:00 PM under controlled environmental conditions.

2.5 Experimental Design for Anxiolytic Activity

A total of 24 rats were divided into four groups (n = 6):

- **Group I:** Vehicle control (0.5% sodium carboxymethyl cellulose)
- **Group II:** Standard drug (Diazepam, 2 mg/kg, p.o.)
- **Group III:***Ochna vibecarpa* extract (100 mg/kg, p.o.)
- **Group IV:***Ochna vibecarpa* extract (200 mg/kg, p.o.)

The treatments were administered once daily for seven days. On the test day, behavioral assessments were performed 60 minutes after administration.

2.6 Elevated Plus Maze (EPM) Test

The Elevated Plus Maze apparatus consisted of two open arms (50 × 10 cm) and two closed arms (50 × 10 × 40 cm), elevated 50 cm above the floor. Each rat was placed individually at the center of the maze, facing an open arm, and observed for 5 minutes. The number of entries into open arms and the time spent in open arms were recorded as indicators of anxiolytic activity.

2.7 Open Field Test (OFT)

The Open Field apparatus consisted of a wooden box (68 × 68 × 45 cm) divided into 16 equal squares. Each rat was placed in a corner of the arena and observed for 5 minutes. Behavioral parameters such as the number of squares crossed (locomotor activity) and rearing frequency were recorded. Increased activity was considered indicative of reduced anxiety.

2.8 Experimental Design for Anticonvulsant Activity

Animals were divided into four groups (n = 6):

- **Group I:** Vehicle control (0.5% CMC)

- **Group II:** Standard drugs (Phenytoin 20 mg/kg for MES; Diazepam 5 mg/kg for PTZ)
- **Group III:***Ochna vibecarpa* extract (100 mg/kg, p.o.)
- **Group IV:***Ochna vibecarpa* extract (200 mg/kg, p.o.)

Treatments were administered once daily for seven days, and tests were conducted 60 minutes after administration.

2.9 Maximal Electroshock (MES) Induced Seizure Test

Seizures were induced by applying an electrical stimulus (150 mA for 0.2 seconds) through ear electrodes. The animals were observed for various seizure phases including tonic hind limb flexion, tonic hind limb extension, clonus, and stupor. Reduction in the duration of tonic hind limb extension was considered an indicator of anticonvulsant activity.

2.10 Pentylenetetrazole (PTZ) Induced Seizure Test

After treatment, animals were administered PTZ (60 mg/kg, i.p.) to induce seizures. The onset of clonic and tonic convulsions and the number of animals protected from seizures were recorded. Increased latency and survival rate were considered indicative of anticonvulsant activity.

2.11 Statistical Analysis

All data were expressed as mean ± standard error of mean (SEM). Statistical analysis was performed using one-way ANOVA followed by Tukey–Kramer multiple comparison test using GraphPad Prism software (version 6.0). A value of $p < 0.05$ was considered statistically significant.

3. RESULTSANDDISCUSSIONS

3.1. PHYTOCHEMICAL SCREENING

S. No	Phytoconstituents	***OCHNA VIBECARPA***
		Aqueous Extract (D.H_2O)
1.	Carbohydrate	Present
2.	Glycosides	Absent
3.	Alkaloids	Absent
4.	Steroids	Absent
5.	Tannins	Present
6.	Flavonoids	Absent
7.	Phenols	Absent
8.	Saponins	Absent
9.	Saponification	Absent
10.	Flavanoglycosides	Absent
11.	Gums	Absent
12.	Resins	Present
13.	Carboxylic acid	Absent
14.	Protein	Present
15.	Biuret	Absent

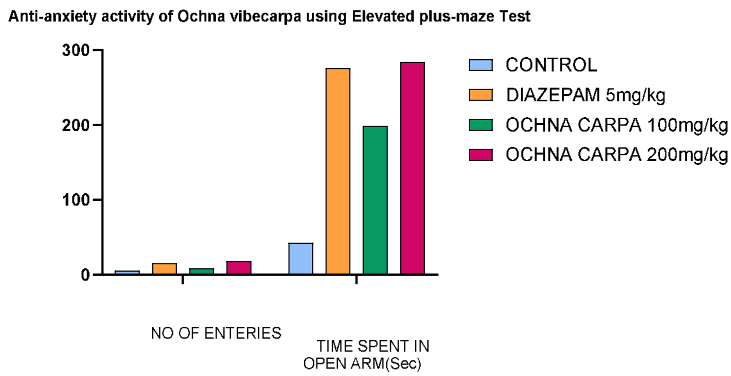
3.2 ANXIOLYTICACTIVITY

Anti-anxiety activity of *Ochna vibecarpa* using Elevated plus-maze Test(Table:1)

Group	Treatment	Noofentriesin openarm	TimespentinOpen Arm
I	Control(0.5%CMC)	5.33 ± 0.42	42.83±2.66
II	Diazepam(2mg/kg)	15.17±0.60***	276.17 ±4.68***
III	*Ochna vibecarpa* (100mg/kg)	08.33±0.49**	198.83 ± 5.33***
IV	*Ochna vibecarpa* (200mg/kg)	18.17 ±0.47***	284.33± 5.98***

Values are presented as mean±SEM, where(n=6),*p<0.05,**p<0.01, ***p<0.001comparedtocontrolgroup

Figure 3.1



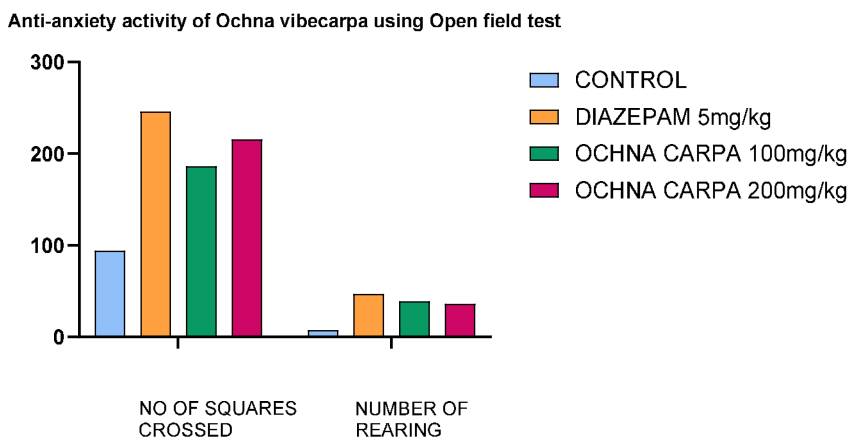
After treatment with *Ochna vibecarpa* in rat there was significant increase in the number of open arm entries as well as time spent in the open arm at dose levels of 100mg/kg and 200 mg/kg of *Ochna vibecarpa* when compared to control in Elevated plus maze (EPM) test. Moreover, the anxiolytic effect of the *Ochna vibecarpa* at high dose (200 mg/kg)was comparable to that of Diazepam.

Anti-anxiety activity of *Ochna vibecarpa* using Open field test in rat(Table:2)

Group	Treatment	Number of squares crossed (frequency)	Number of rearing
I	Control (0.5%CMC)	94.16±10.15	7.57±1.62
II	Diazepam(2mg/kg)	245.83±6.87***	47.17±3.57***
III	*Ochna vibecarpa* (100mg/kg).	186.33±7.93***	38.83±4.85***
IV	*Ochna vibecarpa* (200mg/kg)	215.67±7.98***	36.16±1.45***

Values are presented as mean±SEM,where(n=6),*p<0.05,**p<0.01,***p<0.001comparedtocontrol.

Figure-3.2



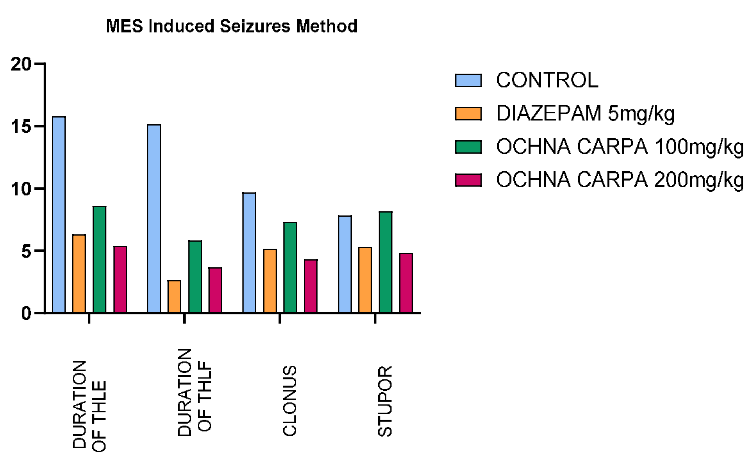
In the open field test (OFT), diazepam and *Ochna vibecarpa* 100 and 200 mg/kg p.o.treated rat showed significant increase in the number of rearing and number of squares crossed during 5-min interval as compared to vehicle-treated control group. Whereas,anxiolytic effects of *Ochna vibecarpa* (200 mg/kg) was comparable to that of diazepam 2 mg/kg(Table-2).

3.3 Anti-convulsant Effect of *Ochna vibecarpa* by MES Induced Seizures Method(Table:3)

Group	Treatment	Duration ofTonicHindLimbFlexion(Sec.)	Duration ofTonic HindLimbExtension (Sec.)	Clonus(Sec)	Stupor(Sec)
I	Control(0.5% CMC)	15.80±0.86	15.16±1.94	9.67±0.88	7.83 ±1.57
II	Phenytoin (20mg/kg)	6.20±0.40***	2.66±0.52***	5.17±0.40***	5.33±1.03***
III	*Ochna vibecarpa* (100mg/kg).	8.60±0.71***	5.83±0.75***	7.33±0.75***	8.17±0.75***
IV	*Ochna vibecarpa* (200mg/kg)	5.40±0.84***	3.68±0.82***	4.33±0.52***	4.83±0.75***

Values are presented as mean±SEM,where(n=6),*p<0.05,**p<0.01, ***p<0.001comparedtocontrol.

Figure-3.3



The *Ochna vibecarpa* (100 and 200 mg/kg) produced a dose dependent delay in seizure induced by MES method. The effect of *Ochna vibecarpa* at dose 200 mg/kg was found to be similar to that of standard drug phenytoin.

Anticonvulsant Effect of *Ochna vibecarpa* using PTZ Induced Convulsion(Table:4)

Group	Treatment	OnsetofClonus convulsion(s)	Onsetof Tonicconvulsion(s)	No. ofanimals survived	% Protection
I	Control(0.5%cmc) + PTZ(60mg/kg)	55.50±1.52	68.33±2.05	0/6	0.0
II	Diazepam(5mg/kg) +PTZ(60mg/kg)	ND	ND	6/6	100
III	*Ochna vibecarpa* (100mg/kg) +PTZ(60mg/kg)	187.83±3.00***	ND	6/6	100
IV	*Ochna vibecarpa*	206.83±3.62***	ND	6/6	100

	(200mg/kg) +PTZ(60mg/kg)				

ND-Not Detected ;Values are presented as mean+SEM,where(n=6),*p<0.05,

p<0.01,p<0.001comparedtocontrol.*

Figure-3.4

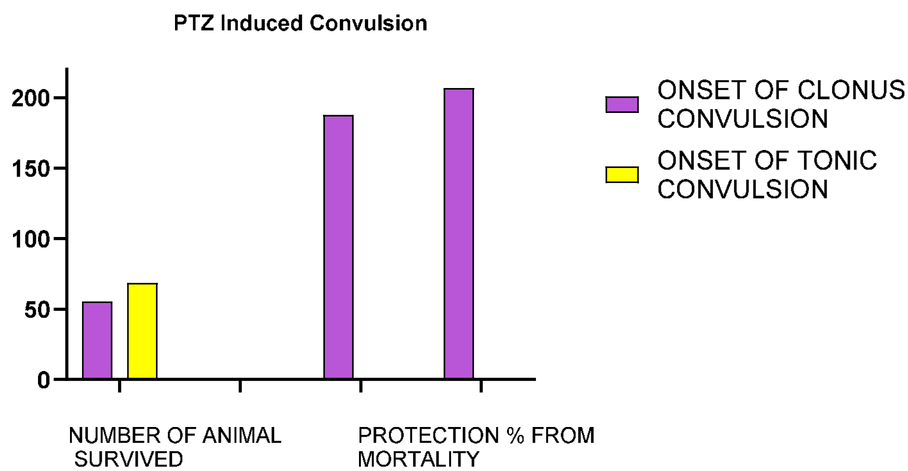
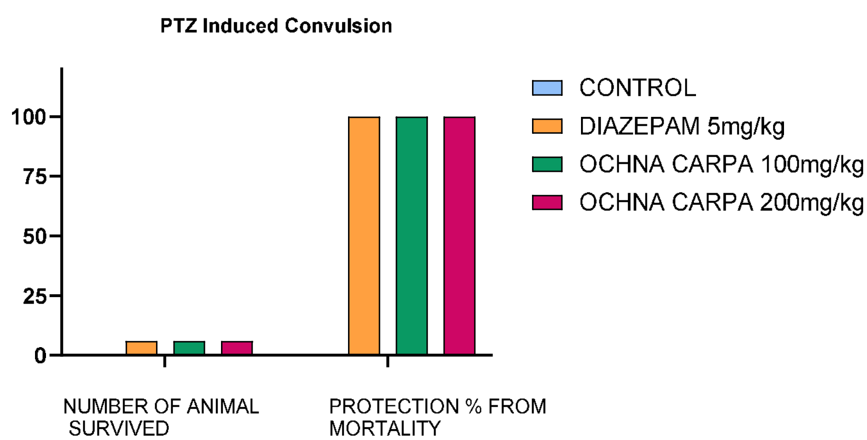


Figure-3.5



A dose of 100 & 200 mg/kg of *Ochna vibecarpa* protected 100 % *Ochna vibecarpa* protected of the rat against seizures and increased the latency of the seizuresas like Diazepam(Table 4).The Treated animals survived and shows100% protection.

4. DISCUSSIONS

In the present study, anxiety activity of *Ochna vibecarpa* was evaluated by two different screening models. Elevated plus maze test is used to evaluate psychomotor performance and emotional aspects of rodents. The open field model examines anxiety-related behavior characterized by the normal aversion of the animal to an open, brightly lit area. Thus, animals removed from their acclimatized cage and placed in environment express anxiety and fear, by showing alteration in all or some parameters. *Ochna vibecarpa* at dose level of 100 and 200 mg/kg showed significant increase in time spent as well as number of entries into open arms when compared to control as in case of elevated plus maze test and significant increase in number of squares crossed and number of rearing when compared to control in case of open field test, suggesting the anxiolytic activity of *Ochna vibecarpa*. Moreover, the anxiolytic effect of the *Ochna vibecarpa* at 200 mg/kg was comparable to that of standard drug diazepam. In this study, anti-convulsant activity of *Ochna vibecarpa* was evaluated against MES induced convulsions and PTZ-induced convulsions in rat. The *Ochna vibecarpa* (100 and 200 mg/kg) produced a dose dependant delay in seizure induced by MES method. The effect of *Ochna vibecarpa* at dose 200mg/kg was found to be similar to that of standard drug phenytoin. A dose of 100 & 200 mg/kg of *Ochna vibecarpa* protected 100 % *Ochna vibecarpa* protected of the rat against seizures and increased the latency of the seizures as like Diazepam. The Treated animals survived and shows 100% protection. The basic and major mechanisms associated with epilepsy are increased synaptic connectivity of neurons (such as excitatory glutaminergic neurons), channelopathies (weakening of potassium channels and/ or more persistent sodium channels, changes in voltage- gated ion channels), perturbance in synaptic receptors (suppressed GABAergic receptors, altered nicotinic,receptors),decrease in inhibitory neurotransmission(decreased GABA levels),enhanced excitatory neurotransmission (enhanced glutamate levels). Pentylenetetrazole have excitatory effects associated GABA antagonism that induces seizures in rodents. One of the pathophysiological mechanisms of epileptic seizures is an imbalance between excitatory and inhibitory amino acids in the brain. Therefore, many of the anti epileptic drugs are used to ameliorate this imbalance Glutamate and γ-amino butyric acid (GABA) are the major excitatory and inhibitory neurotransmitters in the central nervous system, respectively. Literature suggested that natural product quercetin may contribute γ-amino butyric acid (GABA) and glutamate receptors balance. Its shows natural product *Ochna vibecarpa* mechanism of action may similar to Phenytoin and Diazepam.

5. CONCLUSION

A number of natural Products have been found as potent neurobehavioral substances and those could be served as alternatives to modern medicine. The results of the present investigation are significant and encouraging towards the goal for future utilization and standardization of *Ochna vibecarpa*. Our *in vivo* experiment results show that the higher dose(200mg/kgb.wt.) of Ochna vibecarpa has significant -anxiety and anti-convulsant activity. The present study is the first evidence of the anti-anxiety and anti-convulsant properties of *Ochna vibecarpa.* It is concluded that neuro-protective effects of *Ochna vibecarpa* might be due to the presence of antioxidant and anti-inflammatory activity.

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