World Journal of Pharmaceutical Science and Research
www.wjpsronline.com
Research Article
ISSN: 2583-6579
SJIF Impact Factor: 5.111
Year - 2025
Volume: 4; Issue: 6
Page: 340-359

EVALUATION OF ANTI-ANXIETY ACTIVITY OF *Sechium edule* LEAF EXTRACT ON EXPERIMENTAL ANIMALS

Ananya M. N.*[1], Karunakar Hegde[2]

[1]PG Scholar, Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Mangalore- 574143.
[2]Professor and HOD, Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Mangalore- 574143.

Article Received: 29 October 2025 | | Article Revised: 19 November 2025 | | Article Accepted: 10 December 2025

***Corresponding Author: Ananya M. N.**
PG Scholar, Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Mangalore- 574143.
DOI: https://doi.org/10.5281/zenodo.17939968

How to cite this Article: Ananya M. N., Karunakar Hegde (2025) EVALUATION OF ANTI-ANXIETY ACTIVITY OF *Sechium edule* LEAF EXTRACT ON EXPERIMENTAL ANIMALS. World Journal of Pharmaceutical Science and Research, 4(6), 340-359. https://doi.org/10.5281/zenodo.17939968

ABSTRACT

Anxiety is a complex emotional state triggered by uncertain or perceived threats and is characterized by behavioural, physiological, and subjective alterations that enhance threat detection. It plays a central role in several psychiatric disorders, including panic disorder, obsessive-compulsive disorder, post-traumatic stress disorder, depression, and specific phobias. Despite the availability of pharmacological agents such as SSRIs, SNRIs, benzodiazepines, tricyclic antidepressants, and monoamine oxidase inhibitors, many existing therapies are associated with significant adverse effects, tolerance, and limited long-term efficacy. Consequently, interest in complementary and plant-based treatments has increased, although strong clinical evidence remains limited. *Sechium edule* has been traditionally used to alleviate symptoms such as nervousness and headaches; however, no scientific data exist supporting its anxiolytic potential. Therefore, the present study is designed to evaluate the anti-anxiety activity of *Sechium edule* leaves using appropriate experimental animal models.

KEYWORDS: Anxiety disorders; *Sechium edule*; Anxiolytic activity; Experimental animal models.

INTRODUCTION

Anxiety is a state that people experience in reaction to uncertain or distant risks. It is characterised by alterations in a person's conduct, physiology, and subjective state that make it easier to identify possible threats in their surroundings. Because these physiological and behavioural alterations collectively known as defensive responses are conserved across species, it is easier to describe defensive circuitry using translational models.[1]

Anxiety is a disordered emotional state in which the sense of fear is not consistent with the danger. The emotional feeling that makes up the subjective characteristic of anguish is accompanied by an emotional stress that suggests behaviour, expression, and physiological characteristics such as avoiding the source of danger, assuming defensive positions, and elevated blood pressure in response to threatened situations. It is a legitimate emotional response to a danger. This feeling is considered a serious, chronic, and insufficient illness. Anxiety plays a role in a number of mental illnesses, including post-traumatic stress disorder, obsessive compulsive disorder, phobias, depression, and panic attacks.[2] The symptoms of anxiety disorders, which affect 4–6% of people worldwide, include increased blood pressure, an elevated heart rate, perspiration, exhaustion, unpleasant feelings, tension, impatience, and restlessness.[3]

Millions of individuals worldwide suffer from anxiety disorders, which are becoming more and more common in contemporary culture. These conditions, which are typically linked to excessive glutamate neurotransmission, can be brought on by a number of environmental variables as well as international emergencies like COVID-19.[4]

A growing understanding of the burden of anxiety disorders and the consequences of untreated illness has contributed to a surge in research interest in these conditions during the past ten years. According to clinical evaluations, having an anxiety illness increases the likelihood of developing additional mood and anxiety disorders as well as substance dependence. According to research, the emergence of comorbidities complicates the management of primary and secondary diseases and raises the risk of suicide, poor prognosis, and low remission rates.[5]

Anxiety is elevated in people with panic disorder, and they are vulnerable to panic episodes brought on by a variety of pharmaceutical substances. Autonomic imbalance, increased adenosine receptor function, raised cortisol levels, decreased benzodiazepine receptor function, and altered serotonin hormone action are all possible causes of this illness, which is thought to have a genetic component.[6] Selective serotonin reuptake inhibitors, selective serotonin and norepinephrine reuptake inhibitors, pregabalin, tricyclic antidepressants, buspirone, benzodiazepines, and monoamine oxidase inhibitors are among the medications used to treat anxiety disorders.[7]

Serotonin, dopamine, noradrenaline, GABA, and other brain chemicals are all involved in anxiety. Despite significant adverse effects such drowsiness, muscular relaxation, ataxia, forgetfulness, ethanol and barbiturate potentiation, and tolerance, benzodiazepines continue to be the most often given medication for anxiety.[8] Because of this, scientists are now searching for safer and less harmful medications.[9]

For an estimated 43% of people worldwide who use complementary therapy to supplement their treatment for anxiety disorders, plant-based medications are the most widely used treatment. Nevertheless, despite their widespread use, there is little proof that herbal treatments are effective when tested in controlled clinical settings.[10] *Sechium edule* is one such herb that has long been used to treat symptoms like nervousness and excruciating headaches.[11]

But there is no proof in literature for anti-anxiety activity of *Sechium edule* leaves. Hence the present study is designed to study the anti- anxiety activity of *Sechium edule* leaves using suitable experimental animal models.

Need of the study

Since anxiety disorders are widespread, a large portion of the variation in prevalence estimates can be explained by the substantive and methodological issues mentioned here. About 7–30% of people worldwide suffer from this most common mental health issue, which is also one of the most frequent issues seen in outpatient psychiatry.[12]

In the past, there has been a lot of research interest in the prevalence of anxiety.[12,13,14] Among the most prevalent mental illnesses are anxiety disorders. However, they share a purposefully persistent course and a substantial functional impact with other mental diseases, and they typically manifest early in childhood. The well-being and quality of life of the populace are seriously threatened by the rising incidence of anxiety worldwide.[13]

Anxiety disorders can present in a variety of clinical ways. Some people develop phobias as a result of it being connected to particular environmental triggers. Others, like those with panic disorder, may suffer from acute episodic distress.[15]

The prefrontal cortex and amygdala interpret these sensations as threats, which sets off a fight-or-flight reaction that may show up as a psychophysiological reaction like sweating, lightheadedness, and elevated heart rate.[16]

Chronic anxiety can lead to a number of additional health problems, including dementia, cardiovascular disease, and high blood pressure, if treatment is not received.[17,18]

The World Health Organisation (WHO) estimates that 450 million individuals suffer from behavioural or mental illnesses. The population has an extremely high prevalence of anxiety, with women experiencing it more frequently than men.[19]

People between the ages of 10 and 25 appear to be most susceptible to anxiety disorders.[20] Large population-based surveys indicate that 33.7% of people will experience an anxiety condition at some point in their lives.[21]

Major depressive disorder and anxiety disorders were the leading causes of disease burden even prior to the COVID-19 pandemic, and the mental health care systems in the majority of countries were underfunded and poorly organised in their provision of services. As a result, most countries will face immediate hurdles in addressing this increasing mental health burden, but it also presents a chance for a broader re-evaluation of mental health. Because the pathophysiology of anxiety disorders is not entirely known, incorrect diagnoses result in higher rates of morbidity and death. Early identification is key to identifying anxiety disorders, and psychotherapy and medication, such as benzodiazepines, are effective treatments.[22]

Researchers are evaluating novel molecules, particularly plant-based medications with fewer unpleasant effects, because conventional pharmacological therapy has a tight margin of safety between the anxiolytic benefit and negative side effects.[23]

Objectives of the study

The main objectives of the present study are as follows:

- ✓ Collection and authentication of the leaves of *Sechium edule.*
- ✓ Ethanolic extraction of *Sechium edule* leaves.
- ✓ Preliminary phytochemical investigation of extract.
- ✓ To study the anti-anxiety activity of ethanolic extract of *Sechium edule* leaves on experimental mice using following models,

1. Elevated Plus Maze Test
2. Light and Dark Exploration Test

METHODOLOGY

Material selection

Collection and authentication of plant material *Sechium edule*

Sechium edule leaves were taken from the Shivamogga district and authenticated by Dr. Siddaraju M. N. Ph. D., Assistant Professor and Research Guide of Department of Botany, University College of Mangalore.

Preparation of extract of *Sechium edule* leaves[24]

Ground air-dried *Sechium edule* leaves were macerated in ethanol (1:5 of 96% ethanol) for 2 days with intermittent shaking at room temperature. The preparation was filtered through What-man no. 4 filter paper, the ethanol was evaporated to yield the crude extract.

Preliminary phytochemical screening of the extract

The ethanolic extract of *Sechium edule* leaves was subjected to phytochemical screening for the detection of alkaloids, flavonoids, carotenoids, triterpenoids, saponins, phenolic acids, and other constituents.

Table No.4: Preliminary Qualitative Phytochemical Analysis.

Carbohydrates	**a) Molisch test** 1ml extract + add 2-3 drops of alpha naphthol. Mix well. Add 2ml of conc. H_2SO_4 from sides of the test tube.	Reddish violet ring at the junction is formed	Carbohydrates present
	b) Benedict's test Extract + equal volumes of Benedict's reagent. Boiled for 2-5 minutes.	Red precipitate is formed	Carbohydrates present
Alkaloids	**a) Wagner's Test** 2-3 ml extract + few drops Wagner's reagent.	Formation of reddish-brown precipitate.	Alkaloids present
	b) Dragendorff's Test 2-3 ml extract+ few drops. Dragendorff's reagent.	Formation of orange brown precipitate.	Alkaloids present
	c) Mayer's test 1ml of extract + Mayer's reagent	Cream colour precipitate	Alkaloids present
	d) Hager's test 1ml of extract + Hager's reagent	Yellow precipitate	Alkaloids present.
Flavonoids	**a) Shinoda's test** Little of the powdered drug was heated with alcohol and filtered. To the test solution magnesium turnings and few drops of concentrated Hcl was added + boil for 5min	Red or orange colour is obtained	Flavonoids present
	b) H_2SO_4 test Dilute ammonia 5ml added to extract and add 1ml of con. H_2SO_4	Yellow or orange colour, which may turn brown with time.	Flavonoids present
Glycosides	**a) Modified Borntrager's test** Plant extract + ferric chloride solution + boil for 5min. + cooled +	Pink colour was observed in ammoniacal layer	Anthraquinone glycosides are present

	equal volume of benzene + benzene layer is separated+ Ammonia solution. **b) Keller Killani test** Plant extract + glacial acetic acid + 1 drop 5% $FeCl_3$ + conc.H_2SO_4.	Blue colour was observed in the acetic acid layer	Cardiac glycosides are present
Steroids	**a) Liebermann- Burchard's test** 2mg extract + acetic anhydride, heated to boiling, cooled and then 1ml of concentrated sulphuric acid was added along the sides of the test tube. **b) Salkovski's test:** A few drops of concentrated sulphuric acid was added to the extract shaken well and kept aside	Formation of green colour. The lower chloroform layer turned red	Steroids Present Steroids present
Phenolic compounds	**Ferric chloride test:** A small quantity of powdered drug was extracted with water. To alcoholic extract few drops of ferric chloride solution was added	Bluish black colour was obtained	Phenolic compounds present
Tannins	**Ferric chloride test:** Plant extract +5% of $FeCl_3$ solution **Lead acetate test:** To the test solution add a mixture of 10% lead acetate	Deep blue- black colour. White precipitate	Tannins present Tannins present
Saponins	Foam test: 0.5g of plant extract+ 2ml of water (Vigorously shaken)	Persistent foam for 10min	Presence of Saponins

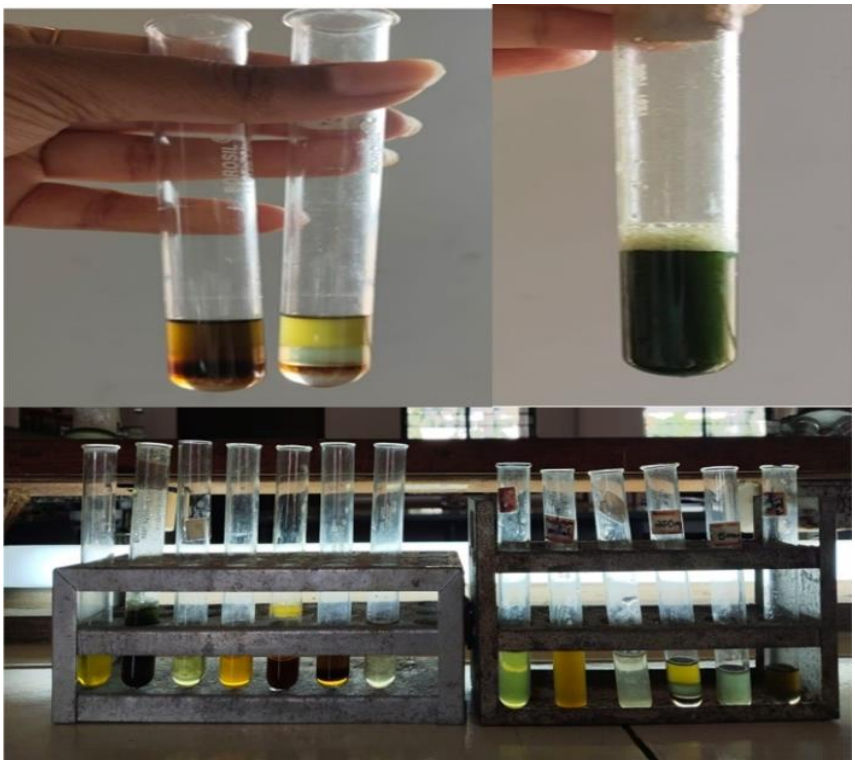

Fig. No. 19: Preliminary qualitative phytochemical analysis of ethanolic extract of *Sechium edule* leaves.

EXPERIMENTAL ANIMALS

Animal selection

Healthy Swizz albino mice (20 to 25g) of both sexes were sourced from the animal house of Srinivas College of pharmacy, Mangalore, for the experiment. The mice were maintained under controlled conditions, with a temperature of 22 ± 2°C, relative humidity of 60 ± 5%, and a 12-hour light/ dark cycle. They were provided with unrestricted access to standard pellet diet and water. The animal was housed in sanitized polypropylene cages with sterile paddy husk bedding. The experimental protocol was reviewed and approved by the Institutional Animal Ethics Committee (Approval no. **SCP/IAEC/JUL/2024-250**), in compliance with guidelines from the Committee for Control and Supervision of Experiments on Animals (CCSEA). All procedures adhered to the "Guide for the Care and use of Laboratory Animals" by the National Academy of sciences, as published by the National Institute of Health. The mice were acclimatized for at least one week prior to the experiment.

CHEMICALS AND INTRUMENTS USED

Chemicals

- Ethanol

Instruments

- Elevated plus maze
- Light and dark model

PREPARATION OF STOCK SOLUTION OF THE EXTRACT FOR DOSING

The ethanolic extract of *Sechium edule* leaves was weighed and suspended in distilled water. Each time fresh preparation of the extract was prepared before administration. The extract was administered post orally at a constant volume of 100mg/kg and 200mg/kg for each animal.

DOSE SELECTION[25]

A dose of 100 mg/kg and 200 mg/kg of body weight was taken as per the previous work.

ANXIOLYTIC ACTIVITY

Preparation of animals

The animals were chosen to ensure they were free from illness, injury, and disease, and were housed in their cages for a minimum of 5 days before dosing to allow for acclimatization to the laboratory environment. Only healthy animals with weights ranging from 20 to 25g were selected and maintained under standard laboratory conditions.

Preparation and administration of doses

The test doses were prepared using distilled water and administered orally for 21 consecutive days. The standard dose (diazepam 1 mg/kg) was administered intraperitoneally on 21st day. The extract was administered at a constant volume of 100 mg/kg and 200 mg/kg (p.o) for each animal of respective group.

Fig. No. 20: Oral administration of *Sechium edule* leaf extract in mice.

Fig. No. 21: Intraperitoneal administration of diazepam in mic.

OBSERVATIONS

Animals were observed initially following dosing, at least once within the first 30 minutes, and periodically over the first 24 hours. Additional observations included changes in skin and fur, eyes and mucous membranes, as well as respiratory, circulatory, autonomic, and central nervous systems, somatomotor activity, and behavior patterns. Special attention was given to any signs of tremors and convulsions.

ANXIOLYTIC MODELS

ELEVATED PLUS MAZE[26,27]

Fig. No. 22: Elevated Plus Maze Model.

PURPOSE AND RATIONALE

This rodent model of anxiety has been widely utilized to assess novel anxiolytic agents and explore the psychological and neurochemical mechanisms underlying anxiety. It has been designed for the selective identification of both anxiety reducing and anxiety inducing drugs. Anxiolytic compounds, by lowering anxiety, lead to increased exploration of the open arms, while anxiogenic compounds produce the opposite effect. The key indicators are the ratio of entries into the open arms and the duration spent in the open arms, expressed are a percentage of the total time spent in both open and closed arms.

APPARATUS

The plus maze features two open arms measuring 35 x 5 cm and two enclosed arms measuring 35 x 5 x 15 cm, all extending from a central platform of 5 x 5 cm. The maze is dark brown, mounted on a wooden base, and elevated 30 cm above the floor in a dimly lit room.

EXPERIMENTAL DESIGN

The *Swiss albino* mice (20-25g) of either sex was selected. The mice were divided into following groups (n=6) as follows:

Group I: Received 1ml control (p.o.)

Group II: Received 1 mg/kg Diazepam (i.p.)

Group III: Received 100mg/kg of *Sechium edule* leaves extract (p.o.)

Group IV: Received 200mg/kg of *Sechium edule* leaves extract (p.o.)

PROCEDURE

Prior to starting the experiment, the mice were handled daily to reduce stress. Two hours after the oral administration of the test drugs and 30 min after the intraperitoneal administration of diazepam, the animal was placed in the center of the maze, facing one of the open arms.

Thereafter, the number of entries and time spent in the open and closed arms were recorded during the next 5 min. An arm entry is defined when all four paws are inside the arm.

The following parameters were measured:

1. Number of entries into open and closed arms.
2. Time spent in open and closed arms in seconds.

At the end of each trial, the apparatus was wiped clean in order to eliminate any olfactory clues, which might modify the behavior of the next animal.

TREATMENT

The test extract and vehicle were administered for 21 consecutive days, while diazepam was given only on the 21st day. Behavioral evaluation was carried out 2 hours after administration of the test extracts/vehicle and 30 minutes after administration of diazepam.

EVALUATION

The previously mentioned parameters of the standard, control and test compounds were thoroughly assessed and compared to determine the anxiolytic activity of the test compound.

LIGHT AND DARK MODEL[26,27]

Fig. No. 23: Light and Dark Model.

PURPOSE AND RATIONALE

The light-dark box model is a straightforward behavioral test in mice used to identify compounds with anxiolytic properties. Mice naturally explore new environments but will avoid the aversive nature of a brightly lit open area in favor of the dark, enclosed section. After treatment with anxiolytic agents, mice exhibit increased movement between the two chambers, along with heightened overall locomotor activity. The number of transitions between the light and dark compartments is measured as a key indicator.

APPARATUS

The Light and Dark model used in this study consists of two chambers, one brightly illuminated and the other kept dark, connected by a small square opening that allows free movement of the animals. The overall dimensions of the apparatus are 45 × 27 × 27 cm and the connecting opening measures about 8 × 8 cm. Illumination in the light chamber is provided by a 40 watt bulb while the dark chamber remains enclosed, creating a clear contrast between the two environments for assessing anxiety related behavior in mice.

EXPERIMENTAL DESIGN

The *Swiss albino* mice (20 - 25g) of either sex was selected. The mice were divided into following groups (n=6) as follows

Group I: Received 1ml Control (p.o.)

Group II: Received 1 mg/kg Diazepam (i.p)

Group III: Received 100mg/kg of *Sechium edule* leaves extract (p.o)

Group IV: Received 200mg/kg of *Sechium edule* leaves extract (p.o)

PROCEDURE

In this two chambered system, where the animals can freely move between a brightly lit open chamber and a dark chamber, they show more crossings and more locomotor activity after treatment with anxiolytics.

The numbers of crossings between the light and dark sites were recorded. Movements through the partition and the time spent in the dark and light chamber were counted. Mice were treated 30 minutes before the experiment with the test extract or vehicle orally and with diazepam intraperitoneally. Each mouse was placed in the experimental apparatus and observed for 5 minutes. Each treatment group consisted of six mice.

The following parameters were measured:

1) The number of entries into dark and light chamber.
2) Time spent in dark and light chambers in seconds.

TREATMENT

The test extract and vehicle were administered for 21 consecutive days, while diazepam was given only on the 21st day. Behavioral evaluation was carried out 30 minutes after administration of the doses.

EVALUATION

The above-mentioned parameters of standard, control and test compounds were carefully evaluated and compared to find the anxiolytic activity of the test compound.

STATISTICAL ANALYSIS

Results were presented as Mean ± SEM. One-way ANOVA was conducted for multiple comparisons, followed by Dunnett's test.

ANOVA (Analysis of variance)

In statistics, ANOVA encompasses a set of statistical models and procedures that partition the observed variance into components attributable to different explanatory variables. At its core, ANOVA provides a statistical test to determine whether the means of multiple groups are equal, thereby extending Dunnett's multiple comparison tests to accommodate more than two groups.

RESULTS

Extraction of the plant material

Table.No.5: Percentage yield of crude extract of *Sechium edule* Leave.

Solvent	Extraction method	Colour	Percentage yield
Ethanol	Maceration	Dark green	7.33% w/w

PRELIMINARY PHYTOCHEMICAL SCREENING

Table No. 6: Preliminary phytochemical investigation of ethanolic extract of *Sechium edule* leaves.

Sl. No.	Test	Result
1	Carbohydrates	+
2	Flavonoids	+
3	Phenolic compounds	+
4	Proteins and Amino acids	+
5	Reducing sugars	+
6	Saponins	+
7	Steroids	+
8	Tannins	+
9	Triterpenoids	+
10	Alkaloids	-
11	Cardiac glycosides	-

(+ = Present in test, - = Absent in test)

The extract's preliminary phytochemical examination, which is displayed in Table No.6, identified the following phytochemicals: Carbohydrates, Flavonoids, Phenolic compounds, Proteins and Amino acids, Reducing sugars, Saponins, Steroids, Tannins, Triterpenoids.

SCREENING OF ETHANOLIC EXTRACT OF *Sechium edule* FOR IT'S ANXIOLYTIC ACTIVITY

In the present study, anxiolytic models such as the Elevated Plus Maze test and the Light- Dark Exploration test were utilized.

Elevated plus maze test

The EPM test has been proposed for selective identification of anxiolytic drugs. Anxiolytic compounds decrease anxiety and increase open arm exploration time.

In EPM, mice treated with a low dose of SELE (100mg/kg) showed a significant increase in the number of entries into open arm, while the higher dose (SELE 200mg/kg) produced a stronger, dose dependent effect when compared to the control. Both doses of SELE (100mg/kg and 200mg/kg) showed a significant increase in time spent in the open arm. At the same time, both doses of SELE showed a significant, dose dependent decrease in the time spent in the closed arm when compared to the control. Mice treated with diazepam (1mg/kg) as expected, showed an increase in the number of entries and time spent in the open arm.

Table No. 7: Effect of SELE on Elevated Plus Maze Test in mice.

Group NO.	Drug treatment	Dose	Number of entries (Mean ±SEM)		Time spent in seconds (Mean ±SEM)	
			Open arm	Closed arm	Open arm	Closed arm
I	Control	1ml	2.05±1.67	8.82±2.14	58.92±3.11	220.45±3.67
II	Diazepam	1mg/kg	12.45±1.72***	2.58±1.52***	229.74±5.09***	64.41±4.41***
III	SELE	100mg/kg	4.88 ± 1.58*	5.45±2.21*	97.91 ± 1.42***	171.13±3.39***
IV	SELE	200mg/kg	10.39±1.45***	4.01±1.39***	215.45±2.14***	59.36±3.28***
Values are expressed as Mean ± SEM; (n=6). Data analysis was performed using Dunnett's test. Where *p < 0.05, ***p < 0.001 vs. control group animals.						

Light and Dark Exploration Test

The light-dark test is a simple behavioral model in mice used to identify compounds with anxiolytic properties. Mice naturally explore new environments but prefer to avoid the discomfort of a brightly lit open space. In a two-chamber arrangement, where animals can move freely between a well-lit area and a darkened corner, they typically exhibit increased crossings between chambers and enhanced locomotor activity after treatment with anxiolytic agents.

In the light-dark test, mice treated with two doses of SELE (100 mg/kg and 200 mg/kg) showed a significant increase in the number of entries into the light chamber, along with a significant decrease in the number of entries into the dark chamber when compared to the control.

Both doses of SELE (100mg/kg and 200mg/kg) showed a significant, dose dependent increase in the time spent in the light chamber and a decrease in the time spent in the dark chamber when compared to the control.

Mice treated with diazepam (1mg/kg) as expected, showed a marked increase in both number of entries and time spent in the light chamber, along with a decrease in the dark chamber.

Table No. 8: Effect of SELE on Light and Dark Exploration Test in mice.

Group NO.	Drug treatment	Dose	Number of entries (Mean ±SEM)		Time spent in seconds (Mean ±SEM)	
			Dark hamber	Light chamber	Dark chamber	Light chamber
I	Control	1ml	16.87±2.55	2.05±0.72	233.02 ±2.44	60.18±2.87
II	Diazepam	1mg/kg	5.16±1.41***	13.81±2.24***	59.75±3.15***	231.03±2.61***
III	SELE	100mg/kg	8.43±3.41***	6.78±1.62**	179.88±1.59**	99.76±1.73***
IV	SELE	200mg/kg	6.17±1.74***	10.95±1.49***	51.41±1.46***	226.84±2.55***
Values are expressed as Mean ± SEM; (n=6). Data analysis was performed using Dunnett's test. Where *p < 0.05, **p <0.01, ***P < 0.001 vs. control group animals.						

A. Elevated Plus Maze Test

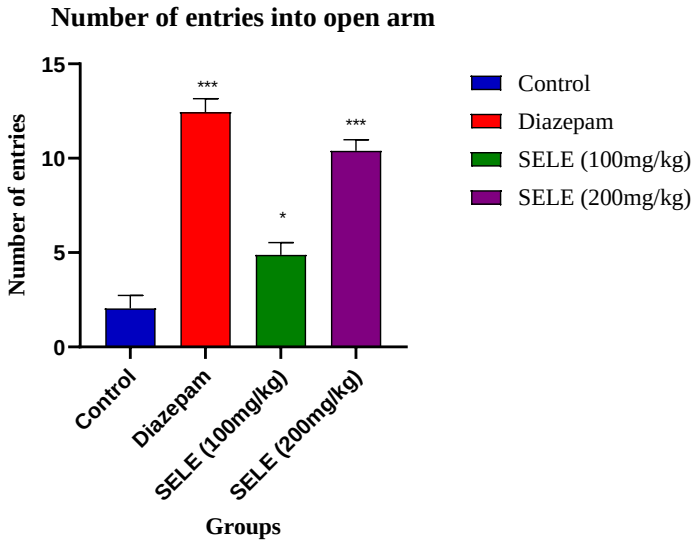

Fig. No. 25: Comparative profile of number of entries into open arm in EPM after oral administration of 100 mg/kg and 200 mg/kg of SELE.

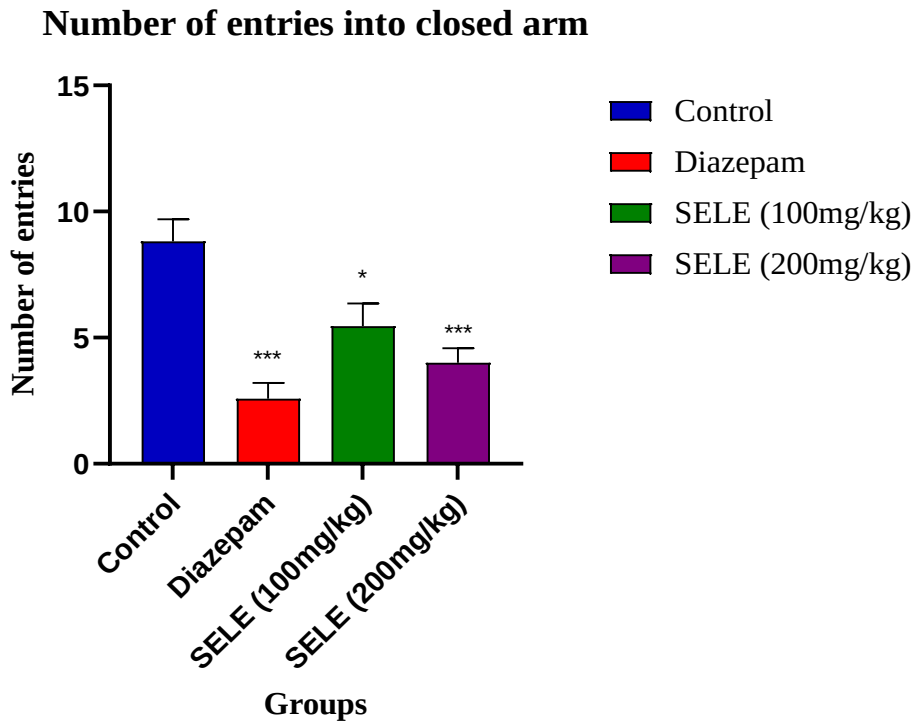

Fig. No. 26: Comparative profile of number of entries into closed arm in EPM after oral administration of 100 mg/kg and 200 mg/kg of SELE.

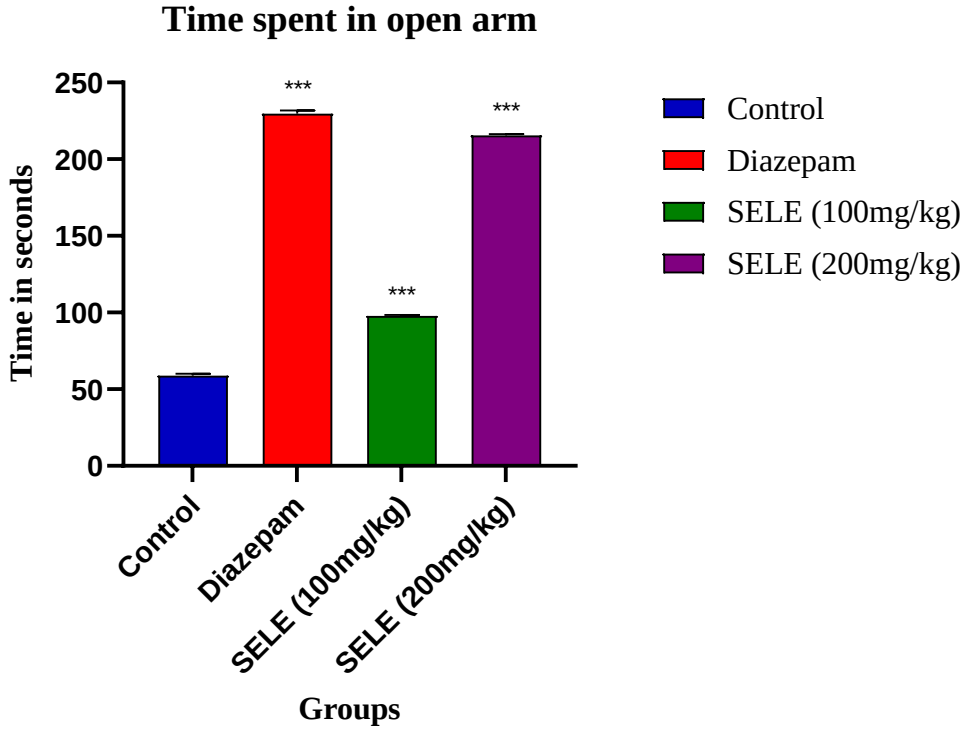

Fig. No. 27: Comparative profile of time spent in open arm in EPM after oral administration of 100 mg/kg and 200 mg/kg of SELE.

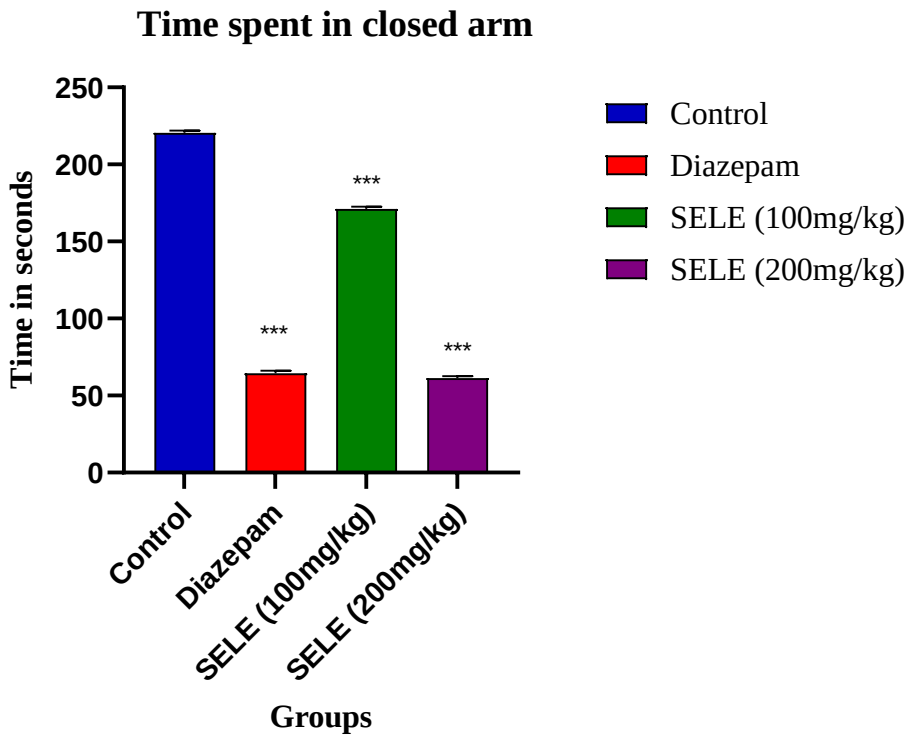

Fig. No. 28: Comparative profile of time spent in closed arm in EPM after oral administration of 100 mg/kg and 200mg/kg of SELE.

B. Light dark Test

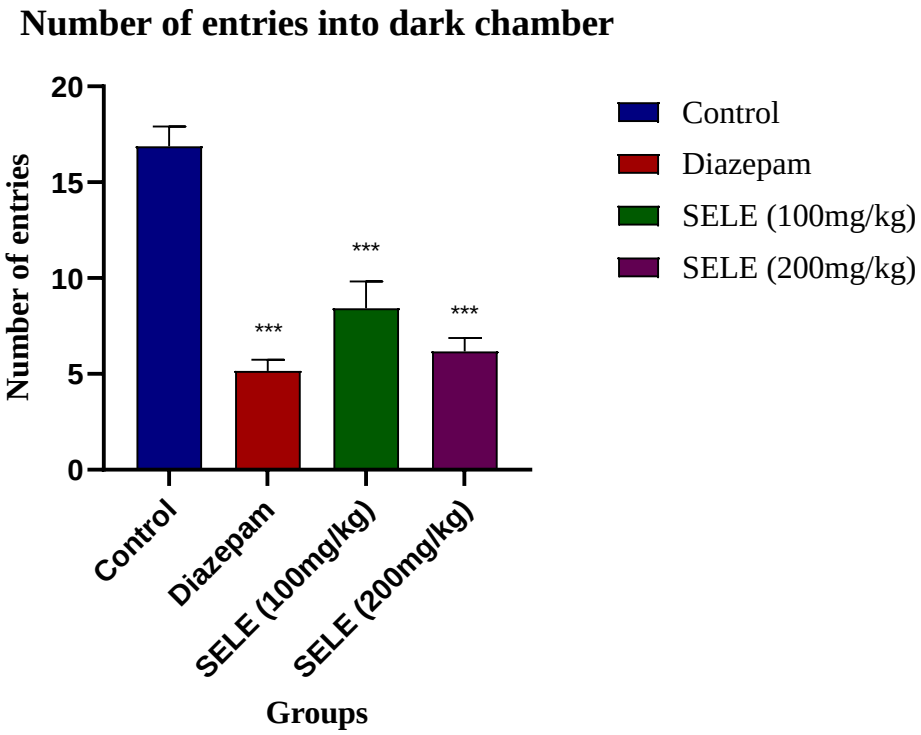

Fig. No. 28: Comparative profile of number of entries into dark chamber in LDT after oral administration of 100 mg/kg and 200 mg/kg of SELE.

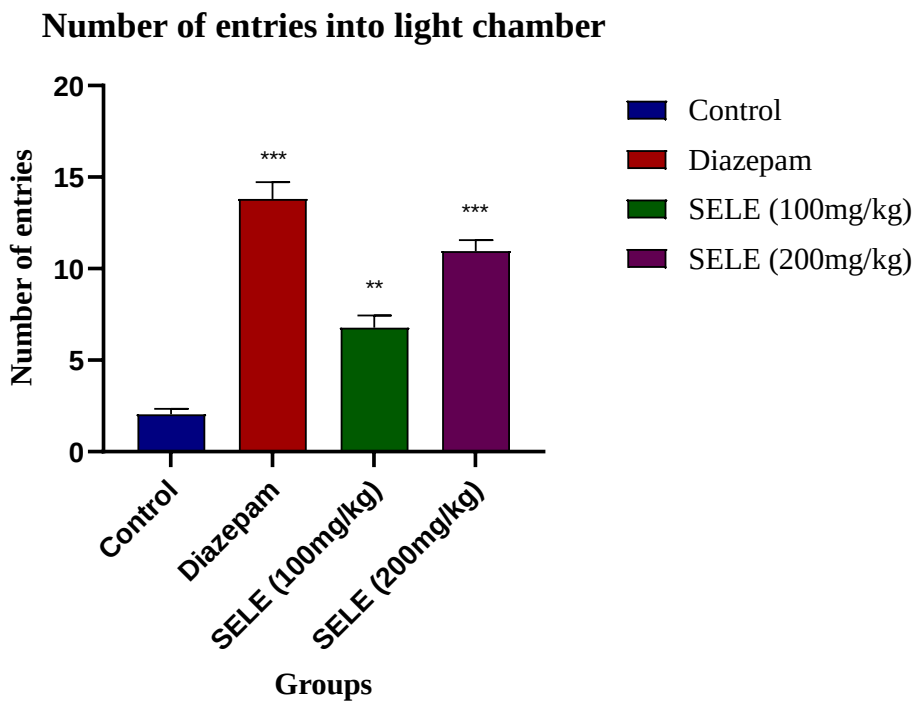

Fig. No. 29: Comparative profile of number of entries into light chamber in LDT after oral administration of 100 mg/kg and 200 mg/kg of SELE.

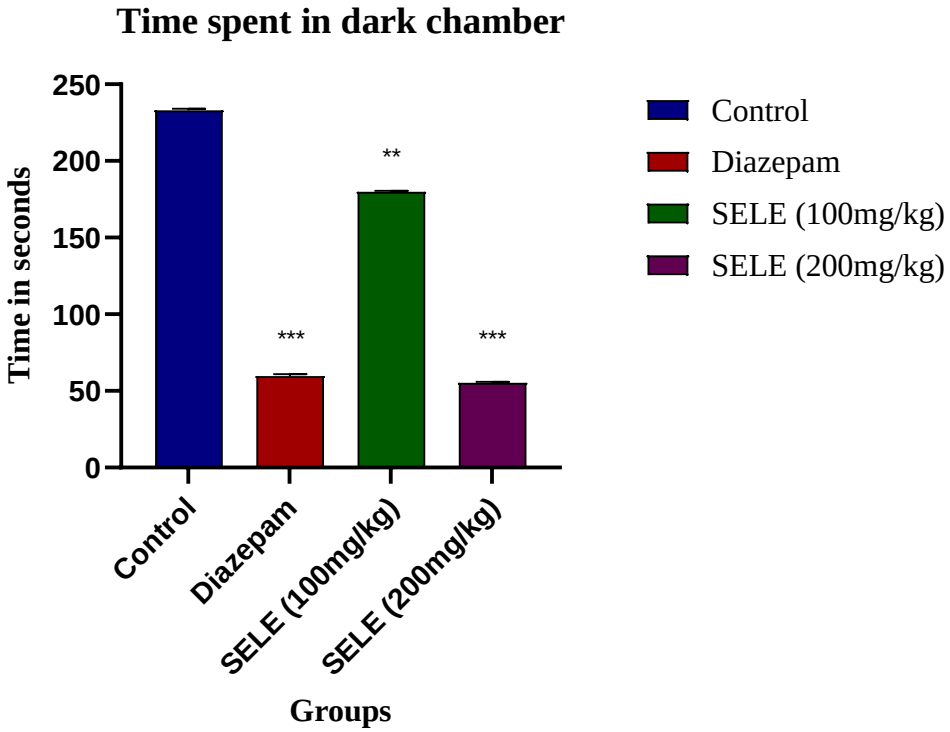

Fig. No. 30: Comparative profile of time spent in dark chamber in LDT after oral administration of 100 mg/kg and 200 mg/kg of SELE.

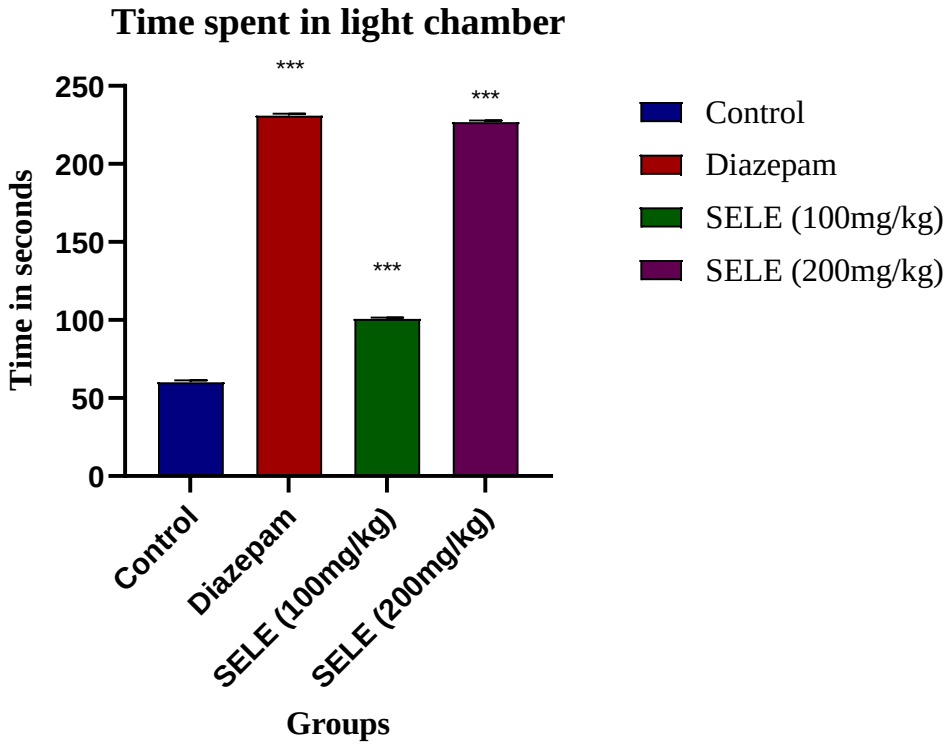

Fig. No. 31: Comparative profile of time spent in light chamber in LDT after oral administration of 100 mg/kg and 200 mg/kg of SELE.

DISCUSSION

Plant based medicines represent the most popular treatment for an estimated 43% of the worldwide population that use complementary therapy to augment their treatment for anxiety disorders. Conventional drug therapy has a narrow margin of safety between the anxiolytic effect and unwanted side effects, thus prompting researchers to evaluate new compounds especially plant based drugs having less undesirable effects.[23] One such plant is *Sechium edule* which has been traditionally used in the management of symptoms such as severe headaches, nervousness.[11]

But there is no proof in literature for anti-anxiety activity of *Sechium edule* leaves. Hence the present study is designed to evaluate the anti- anxiety activity of *Sechium edule* leaves using suitable experimental animal models.

Elevated plus maze (EPM) is common and most simplified test which is used to evaluate behaviour related to anxiety disorder in rodents. In this task, behaviour reflects a conflict between in their living preference for protected areas that is closed arms and their innate motivation to explore novel environments that is open arms. The elevated plus maze (EPM) helps in rapid screening of drugs which modulate anxiety without involvement of complex schedules or training. It has an advantage over other models or behavioural tests which uses food or water deprivation or shock administration to assess anxiety.[28]

According to previous studies, diazepam increased both the percentage of time spent in the open arms and the number of entries into the open arms. Antidepressants and benzodiazepines are the two medication classes with the strongest evidence for the treatment of anxiety, though there is also a role for nonbenzodiazepine anxiolytics and atypical antipsychotics.[29]

In this study the effects of 100 mg/kg and 200 mg/kg doses of the ethanolic extract of *Sechium edule* leaves on the elevated plus maze was nearly comparable to those observed with 1 mg/kg of diazepam. Anxiolytic property of the *Sechium edule* leaf extract was evident at both 100 mg/kg and 200 mg/kg doses in mice. These findings strongly suggest that *Sechium edule* leaves possesses significant anxiolytic properties.

The pharmacological, behavioral and physiological measurements have validated the Two-compartment exploratory model (light and dark exploration). This model is a balance between natural mouse curiosities to explore something new and aversion of an illuminated compartment. Some of the quantifiable displays of anxiety are assessed in this system which are the numbers of crossings between the two chambers, the general locomotor activity, the frequency of rearing, and the duration spent in the dark part of the apparatus.[28]

The light and dark box is generally a standard way of screening anxiolytic or anxiogenic drugs among rodents. It exploits the tendency of rodents to avoid areas which are bright and their instinct to explore when they are subjected to mild amounts of stress like new surroundings and being subjected to light. Research findings have indicated that the duration in the light compartment and the number of transitions is a more reliable exponent in the measurement of anxiolytic effect.[30] This study used *Sechium edule* leaf extract at doses 100 mg/kg and 200 mg/kg which demonstrated further confirmation of anxiolytic potential to increase the time spent in the light area.

The mode of action through which the *Sechium edule* leaves achieves anxiolytic effects can be similar to that of diazepam since the flavonoids and the diazepam can show structural resemblance in terms of aromatic rings. The anxiolytic action with flavonoids has been reported in a number of species of plants that are used in folk medicine. In the present research the oral administration of SELE resulted in significant anxiolytic effects relative to the control group, which implied its possible high efficacy in these models.

Earlier researches on the chemical content of plants and pharmacological activity reveals that the flavonoids, alkaloids, phenolic acids, and tannins were present in plant species where the plants were found to be active against several disorders of the central nervous system. It is likely the effects of *Sechium edule* leaves as an anxiolytic agent are a result of combination of these various phytochemicals: flavonoids, alkaloids, phenolic acids and tannins all of which are known to have therapeutic value on central nervous system. Together, these compounds are the contributors to the anxiolytic effects that have been observed through various animal models.

Findings of the current research gave substantial evidence that ethanolic extract of the *Sechium edule* leaves displays substantial anxiolytic composition which is why they are being used traditionally in folk medicine to treat anxiety related disorders.

Although the results are quite promising, more research is needed to clarify how *Sechium edule* leaves achieves the anxiolytic effect and what exact bioactive compounds are involved in its mechanisms. The study of these mechanisms will not only advance our knowledge of the effective use of *Sechium edule* leaves in a clinical practice but also induce the new pharmacological treatments of anxiety disorders. Further research on its pharmacological and active components may yield in useful information about its potential as an alternative natural therapeutic drug in the management of anxiety.

SUMMARY

The study was conducted to evaluate the anxiolytic potential of SELE using two standard anxiety models: Elevated Plus Maze (EPM) and Light and Dark Exploration test.

Both test doses SELE (100mg/kg and 200 mg/Kg) showed a significant increase in the time spent and number of entries into the open arms of EPM, along with a significant decrease in the time spent and number of entries into the closed arms indicating an anxiolytic effect.

Similarly, in the light and dark exploration test, SELE at both doses (100mg/kg and 200mg/kg) significantly increased the time spent and the number of entries into the light chamber, while reducing the time spent and the number of entries into the dark chamber, further supporting its anxiolytic activity.

The rise in the values of both models was dose dependent respectively.

The results are in keeping with the anxiolytic properties of the extract. The research was dedicated to the evaluation of anxiolytic property of SELE in Elevated Plus Maze (EPM) and Light and Dark Exploration Test models of anxiety.

CONCLUSION

The study was conducted to evaluate the anxiolytic potential of the ethanolic extract of *Sechium edule* (SELE) leaves in *Swiss albino* mice using two animal models of anxiety, namely the Elevated Plus Maze and the Light and Dark Exploration Test.

The results obtained were satisfactory and conclusive, successfully meeting our objectives. The current evidence suggests that SELE significantly reduced anxiety like behavior in mice, thereby supporting the traditional belief in its calming effects.

The possible phytochemicals responsible for the anxiolytic effect of the ethanolic extract of *Sechium edule* leaves include flavonoids, carbohydrates, phenolic compounds, tannins, steroids, saponins, and triterpenoids.

The exact mechanism of the anxiolytic action is still unclear nevertheless, it appears to be associated with the active compounds present in SELE. Therefore, further studies are required to identify the specific constituents responsible for the anxiolytic effect.

REFERENCES

1. Kenwood MM, Kalin NH, Barbas H. The prefrontal cortex, pathological anxiety, and anxiety disorders. Neuropsychopharmacol. 2022; 47(1): 260-75.
2. Gupta MA, Mishra MK, Singh MK, Shukla MN. Pharmacological evaluation of anxiolytic activities of *Plecranthus amboinicus* and *Trigonella foenum graecum* (methi seeds). Ann Rom Soc Cell Biol. 2021; 25(6): 14981-91.
3. Fajemiroye JO, da Silva DM, de Oliveira DR, Costa EA. Treatment of anxiety and depression: medicinal plants in retrospect. Fundam Clin Pharmacol. 2016; 30(3): 198-215.
4. Saini S, Kumar V, Haldar S, Chauhan S, Demiwal P, Ghosh S, et al. Shramahara Mahakasya, a traditional polyherbal formulation, induces anti-anxiety activity in hippocampal neurons by effectuating SOD2-mediated

protection against oxidative stress. Phytomed Plus. 2025; 5(1): 100682.

5. Remes O, Brayne C, van der Linde R, Lafortune L. A systematic review of reviews on the prevalence of anxiety disorders in adult populations. Brain Behav. 2016; 6(7): e00497.
6. Spytska L. Anxiety and depressive personality disorders in the modern world. Acta Psychol. 2024; 246: 104285.
7. Kenda M, Kočevar Glavač N, Nagy M, Sollner Dolenc M. Medicinal plants used for anxiety, depression, or stress treatment: an update. Molecules. 2022; 27(18): 6021.
8. Mahendra P, Poonam, Bisht S. Anti-anxiety activity of *Coriandrum sativum* assessed using different experimental anxiety models. Indian J Pharmacol. 2011; 43(5): 574-7.
9. Kunovac JL, Stahl SM. Future directions in anxiolytic pharmacotherapy. Psychiatr Clin North Am. 2000; 18(2): 895-909.
10. Sharma A, Cardoso-Taketa A, García G, Villarreal ML. A systematic updated review of scientifically tested selected plants used for anxiety disorders. Botanics Targets Ther. 2012; 2012: 21-39.
11. Flick GJ Jr, Burnette FS, Aung LH, Ory RL, St. Angelo AJ. Chemical composition and biochemical properties of mirlitons (*Sechium edule*) and purple, green, and white eggplants (*Solanum melongena*). J Agric Food Chem. 2018; 26(5): 1000-5.
12. Quek TC, Tam WS, Tran BX, Zhang M, Zhang Z, Ho SH, et al. The global prevalence of anxiety among medical students: a meta-analysis. Int J Environ Res Public Health. 2019; 16(15): 2735.
13. Racine N, McArthur BA, Cooke JE, Eirich R, Zhu J, Madigan S. Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: a meta-analysis. JAMA Pediatr. 2021; 175(11): 1142-50.
14. Johns G, Samuel V, Freemantle L, Lewis J, Waddington L. The global prevalence of depression and anxiety among doctors during the COVID-19 pandemic: systematic review and meta-analysis. J Affect Disord. 2022; 298: 431-41.
15. Santomauro DF, Herrera AM, Shadid J, Zheng P, Ashbaugh C, Pigott DM, et al. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. Lancet. 2021; 398(10312): 1700-12.
16. Pan Y, Cai W, Cheng Q, Dong W, An T, Yan J. Association between anxiety and hypertension: a systematic review and meta-analysis of epidemiological studies. Neuropsychiatr Dis Treat. 2015; 11: 1121-30.
17. Celano CM, Daunis DJ, Lokko HN, Campbell KA, Huffman JC. Anxiety disorders and cardiovascular disease. Curr Psychiatry Rep. 2016; 18(11): 101.
18. Gulpers B, Ramakers I, Hamel R, Köhler S, Oude Voshaar R, Verhey F. Anxiety as a predictor for cognitive decline and dementia: a systematic review and meta-analysis. Am J Geriatr Psychiatry. 2016; 24(10): 823-42.
19. Baxter AJ, Scott KM, Vos T, Whiteford HA. Global prevalence of anxiety disorders: a systematic review and meta-regression. Psychol Med. 2013; 43(5): 897-910.
20. Mahamuni SP, Shenoy PA, Nipate SS, Bandawane D, Chaudhari P. Preclinical evaluation of anxiolytic agents: an overview. J Pharm Res Opin. 2011; 1(2): 7-22.
21. Michael T, Zetsche U, Margraf J. Epidemiology of anxiety disorders. Psychiatry, 2007; 6(4): 136-42.
22. Bandelow B, Michaelis S. Epidemiology of anxiety disorders in the 21st century. Dialogues Clin Neurosci. 2015; 17(3): 327-35.
23. Shri R. Anxiety: causes and management. J Behav Sci. 2010; 5(1): 100-18.
24. Ordoñez AA, Gómez JD, Cudmani NM, Vattuone MA, Isla MI. Antimicrobial activity of nine extracts of *Sechium*

edule. Microb Ecol Health Dis. 2003; 15(1): 33-9.

25. Mumtaz SM, Paul S, Bag AK. Effect of *Sechium edule* on chemically induced kidney damage in experimental animals. Bangladesh J Pharmacol. 2013; 8(1): 28-35.
26. Sahoo S, Brijesh S. Anxiolytic activity of *Coriandrum sativum* seeds aqueous extract on chronic restraint stressed mice and effect on brain neurotransmitters. J Funct Foods, 2020; 68-9.
27. Mani V, Sajid S, Rabbani SI, Alqasir AS, Alharbi HA, Alshumaym A. Anxiolyticlike and antidepressant-like effects of ethanol extract of *Terminalia chebula* in mice. J Tradit Complement Med. 2021; 11(6): 493-502.
28. Sarkar D. A review of behavioral tests to evaluate different types of anxiety and anti-anxiety effects. Clin Psychopharmacol Neurosci. 2020; 18(3): 341.
29. Barnhill JW. Overview of anxiety disorders. MSD Manuals. 2023; 1(1): 1-8.
30. Imaizumi M, Suzuki T, Machida H, Onodera K. A fully automated apparatus for a light/dark test measuring anxiolytic or anxiogenic effects of drugs in mice. Jpn J Psychopharmacol. 2018; 14: 83–91.