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Original Research Article

ASSESSMENT OF ANTI-ANXIETY EFFECT OF MIMUSOPS ELENGI FRUIT EXTRACT IN RODENT MODELS

Article History:

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Abstract: ***Objectives:*** We assessed the anxiolytic effects of a methanolic fruit extract of Mimusops elengi (MEFE) and tried to identify its underlying mechanisms in albino mice using the Elevated Plus Maze (EPM) model. ***Methods:*** A group of albino mice were divided into three groups and given oral gavages of MEFE at 100 or 200 mg/kg, diazepam at 2 mg/kg, or the vehicle control. Blood serum GABA, cortisol, and the amount of time spent in and entering the open arms were all measured using the EPM. MEFE was examined for PHT as well. ***Results:*** Like the diazepam-treated group, MEFE-treated mice spent more time in and entered the raised plus maze's open arms than control groups. In comparison to the control group, all MEFE-treated groups showed higher GABA and lower serum cortisol levels. The samples were found to include terpenoids, phenolic acids, and flavonoids. The doses administered showed no obvious harm. ***Conclusions:*** In the mouse model, MEFE appears to have strong anxiolytic effects that may involve GABA and cortisol regulation. The findings support Mimusops elengi's possible natural anxiolytic action and validate its ethnopharmacological application to lessen anxiety.

Keywords: Mimusops elengi, Elevated Plus Maze, anxiolytic activity, GABA, cortisol

INTRODUCTION

1.1 Overview

Anxiety, which includes fear, nervousness, and physical symptoms like palpitations, is one of the most common mental health issues (WHO, 2023). It should be noted that while mild anxiety is normal and even considered healthy, it does become problematic when it becomes chronic. At that point, it is classified as a disorder that significantly affects a person's ability to regulate their emotions, think, and function on a daily basis. More seriously, chronic anxiety can even cause a person's basic everyday activities to break down, which has an impact on daily life (Islam & Rahman, 2023; Amin, Rahman & Islam, 2022).Examining the neurobiological evidence that points to an imbalance in neurotransmitter pathways, such as GABA, serotonin, and norepinephrine, as well as an overactivity of the hypothalamic-pituitary-adrenal (HPA) axis, which raises cortisol levels in the body, would be necessary to define anxiety (Islam & Rahman, 2023; Amin, Rahman & Islam, 2022).

1.2 Existing Therapeutic Approaches and Limitations

Benzodiazepines, SNRIs, and SSRIs are a few popular

pharmacological approaches for anxiety (Phootha et al., 2022). Long-term tolerability is decreased by the therapies' side effects, which include dependence, sedation, withdrawal symptoms, and a delayed beginning of the intended therapeutic effect (Hanrahan et al, 2011; Wasowski et al, 2012). The utilisation of naturally occurring substitutes with anxiolytic qualities and the possibility of a more benign treatment profile has gained attention as a result of these variables (Islam & Ryan, 2023).

1.3 Role of Medicinal Plants in Anxiety Management

Recent studies highlight the initial apprehension and qualms in balancing the expectations and roles of medicinal plants in the anxiety associated with the neurochemical pathways (Ríos & Recio, 2022). More specifically, the research advocates the support of the studies in the primary centers (preclinical studies) concentrated on the flavonoids, terpenoids, alkaloids, and phenolic compounds of the plants exemplifying the anxiolytic activity (Singla, Kaushik & Mehta, 2025). More specifically, the flavonoids are most researched and thought to act on the GABA 〖_A〗 receptors similarly to the and affect benzodiazepines, there and to a relatively lesser degree (Wasowski, Marder & Viola, 2012; Hanrahan, Chebib & Johnston, 2011).

1.4 Rationale for Selecting *Mimusops elengi*

According to research, Mimusops elengi Linn., often known as Bakul, has certain ethnomedical relaxing, sedative, and neuroprotective properties (Srivastava, 2024; Gharpankar, Kamble & More, 2024). According to earlier phytochemical studies, the plant's fruit contains mostly flavonoids along with a few alkaloids, triterpenoids, and phenolic chemicals that may have anxiolytic effects (Kawade et al., 2025; Ramesh et al., 2023). The fruit extract's anxiolytic effect has not received much scientific attention, despite considerable pharmaceutical potential.

1.5 Need for the Study

The World Health Organisation (2023) emphasises the significance of discovering efficient, secure, and natural alternatives given the impact of anxiety disorders and the adverse consequences of present pharmacotherapies. A logical way to determine the potential therapeutic benefit of Mimusops elengi fruit extract is through preclinical screening (Islam & Rahman, 2023).

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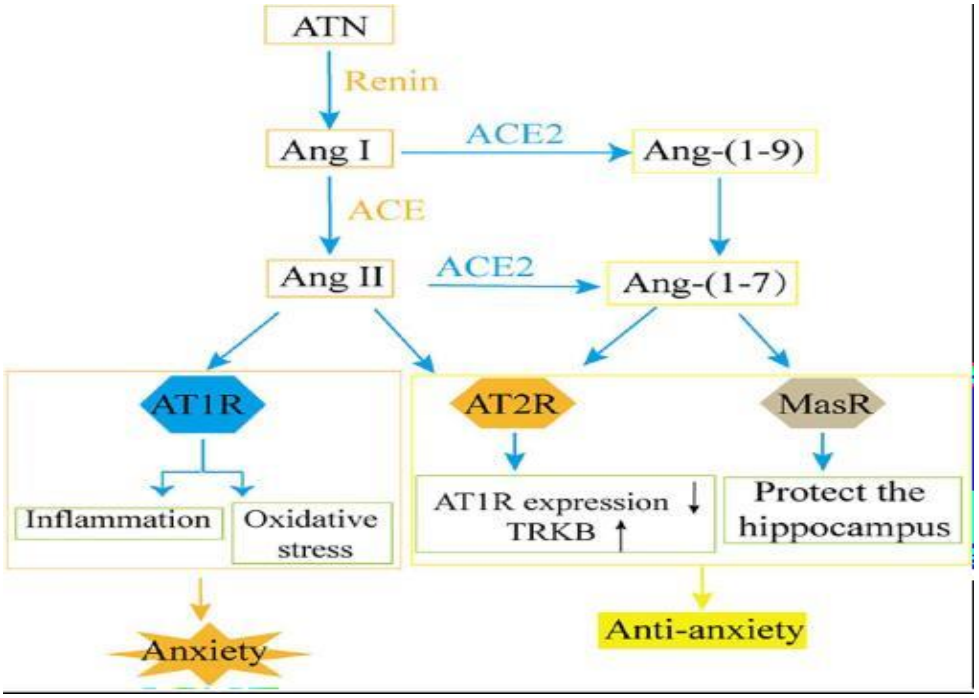
1.6 Purpose of the Study

Through behavioural testing on mice, the study seeks to determine the anti-anxiety activity of the methanolic fruit extract of Mimusops elengi. It is anticipated that this study will provide scientific proof and further link the utilisation of plants to the creation of plant-based therapies.



RESULTS

LIST OF PLANT PHYTO CONSTITUENTS HAVING ANTI ANXIETIC ACTIVITY:

Sr. No.	Plant Name	Family	Active Constituents
1	Matricaria chamomilla L.	Asteraceae	Triterpenes, Alkaloids, Saponins, Flavonoids
2	Cnestis ferruginea	Connaraceae	Alkaloids, Flavonoids, Saponins, Phenols
3	Cuminum cyminum Linn	Apiaceae	Alkaloids, Flavonoids, Saponins
4	Hibiscus rosa-sinensis	Malvaceae	Alkaloids, Flavonoids, Saponins, Terpenoids
5	Albizia julibrissin	Fabaceae	Alkaloids, Flavonoids, Saponins, Terpenes
6	Cissampelos pareira	Menispermaceae	Alkaloids, Flavonoids, Terpenoids
7	Nelumbo nucifera Gaertn.	Nelumbonaceae	Alkaloids, Flavonoids, Phenols
8	Litsea cubeba	Lauraceae	Alkaloids, Flavonoids, Terpenes
9	Litsea glutinosa	Lauraceae	Alkaloids, Phenols, Saponins
10	Cardiospermum halicacabum	Sapindaceae	Flavonoids, Alkaloids, Phenols
11	Apocynum venetum	Apocynaceae	Flavonoids, Terpenoids
12	Ginkgo biloba	Ginkgoaceae	Flavonoids (Quercetin), Terpenoids (Ginkgolides)
13	Hypericum perforatum	Hypericaceae	Flavonoids (Kaempferol), Phenolics (Hypericin, Hyperforin)
14	Panax ginseng	Araliaceae	Ginsenosides (Saponins), Polyphenols
15	Morinda citrifolia	Rubiaceae	Scopoletin (Phenol), Flavonoids
16	Salvia officinalis	Lamiaceae	Rosmarinic acid (Phenol), Carnosic acid (Terpenoid)
17	Angelica sinensis	Apiaceae	Ferulic acid (Phenol), Flavonoids
18	Coriandrum sativum	Apiaceae	Linalool (Terpenoid), Flavonoids (Rutin, Quercetin)
19	Ocimum sanctum	Lamiaceae	Eugenol (Phenol), Rosmarinic acid (Phenol), Luteolin (Flavonoid)

Table 1. Phytochemical Constituents of Medicinal Plants with Reported Anxiolytic (Anti-Anxiety) Activity
Figure 1. Role of the Renin–Angiotensin System (RAS) and ACE2 Pathway in the Regulation of Anxiety and Anti-Anxiety Effects

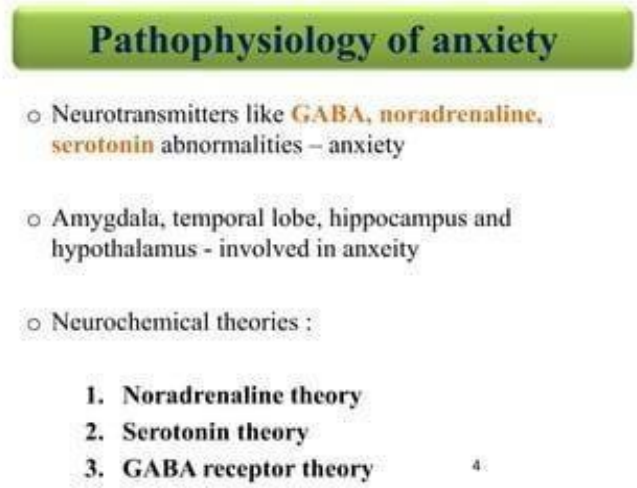


Figure 2. Pathophysiology of Anxiety: Neurotransmitter Imbalance and Brain Regions Involved

LITERATURE REVIEW

The results of studies on the use of plant compounds

in traditional medicine are being supported by research on the anxiolytic qualities of various plant substances, which also explains why some of these plant substances are used in traditional medicine. These investigations have demonstrated that the neuroactive components of phytochemicals, such as flavonoids, alkaloids, tannins, and phenolic acids, are modified by some of the main neurotransmitter systems.

The assertions made about plant compounds in the recognised models of anxiety have been confirmed by a number of research. For instance, the strong anxiolytic effects of the aqueous (CSE) seeds of Coriandrum sativum L. and the methanolic (MECE) leaves of Chloranthus elatior were found in the Elevated Plus Maze and Light/Dark Box Tests. More GABA, monoamines, and less excitotoxic glutamate were added to the neurotransmitter alterations in the brain, which had a more favourable impact on behaviour.

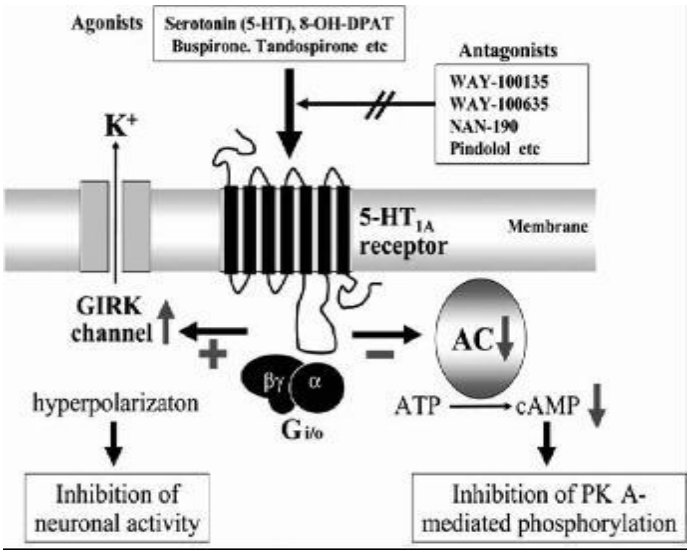
In a similar vein, the Callistemon viminalis Cheel (CVC) and (MECE) in the EPM test have shown encouraging results, with the reported enhanced anxiolytic.

The processes of therapy involve direct contact with brain receptors and pathways. Ethanolic Psidium guajava L. leaves (PLE) extract boosted the exploratory behaviour of mice and changed the levels of monoamines, GABA, and glutamate. In silico molecular docking studies revealed that the phytoconstituents of PLE may bind to 5-HT1A and GABAA receptors.

This implies that direct processes are responsible for PLE's calming effects. Similar to the Chloranthus elatior study, the calming effects were probably caused by the chemical Chloramultilide C, which had a considerable affinity to connect with the potassium channel protein, which is also known to be targeted by anxiolytics. Apart from systemic effects, the cause is receptor interaction. Red pomegranate fruit extract (RPFE) has been shown to enhance the central nervous system's overall protective, anti-inflammatory, and antioxidant qualities by reducing oxidative stress and inflammation, raising hippocampal serotonin levels, and reducing anxiety-like behaviours.

Furthermore, the good safety profile of the natural therapies has been highlighted. The fruit of Passiflora tenuifila has been found in trials to have strong sedative and anxiolytic effects without causing muscle relaxation, which is a common side effect of pharmaceutical sedatives. Even at large doses, there was no evidence of acute toxicity.

Figure 3. GABAergic Neurotransmission and Benzodiazepine Modulation in Anxiety and Neuronal Inhibition



The investigation of Mimusops elengi fruit extract's anti-anxiety properties will focus on The objective of this study is to investigate the anti-anxiety properties of Mimusops elengi fruit extract through a thorough scientific

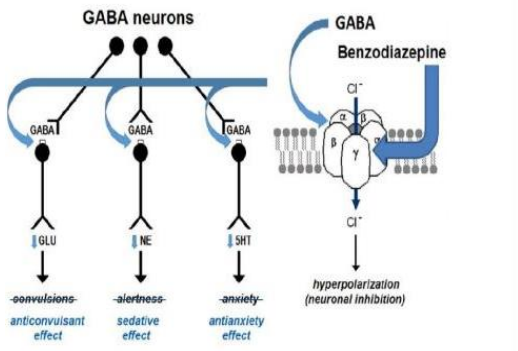


Figure 4. Mechanism of 5-HT₁A Receptor–Mediated Anxiolytic Action via Gi/o-Coupled Signaling Pathway

In conclusion, the literature currently in publication provides compelling evidence of the significant anxiolytic effects of plant extracts from Coriandrum sativum, Chloranthus elatior, Callistemon viminalis, Psidium guajava, Punica granatum (pomegranate), and Passiflora tenuifila. The attenuation of stress and inflammation, the engagement of different neuronal receptors, and the modification of the GABAergic, serotonergic, and glutamatergic systems all contribute to these effects.

This provides a solid foundation for future research on additional medicinal plants, such Mimusops elengi, which may provide a safe and dependable source of anxiolytics.

AIM, OBJECTIVES, AND PLAN OF WORK

investigation. The study's objective is to investigate the anti-anxiety properties of Mimusops elengi fruit extract scientifically. Establishing the scientific foundation for the effects of Mimusops elengi fruit extract on anxiety is the goal of this study. suggested for this goal's assessment.

Regarding the purpose of the study, the following are its precise goals.

- Phytochemical Profiling: To determine and measure the extract's main phytochemical components.
- To determine whether specific bioactive substances, such as flavonoids, are present.
- To identify specific bioactive substances, such as alkaloids, triterpenoids, and flavonoids.

  - Pharmacological Assessment: o To assess the extract's ability to reduce anxiety in in vivo animal models. Elevated Plus Maze, for instance.
  - Examine the extract's ability to reduce anxiety in animal models. Elevated Plus Maze, for instance. tranquilly in those who are experiencing anxiety attacks.

Examine the extract's anti-anxiety effects in comparison to common anti-anxiety drugs like diazepam. The study will be conducted in compliance with an authorised ethical schedule. An exhaustive literature review will be the initial step, and then an ethical framework will be employed for the subsequent processes (IAEC Approval No: SCRRCOPS/IAEC/2024/1.9). In-depthphytochemical analysis will come after the plant materials have been fully collected and extracted. The primary elements of a methodical work schedule are as follows.

1. A review of the literature will be the initial step, followed by ethical compliance, which will serve as the study's foundation.
2. Plant collection and phytochemical extraction. There is no tax to be paid on test solids.
3. Phytochemical analysis, or the identification of active ingredients, is the third phase.
4. Pharmacological evaluation, which involves testing for anti-anxiety activity in animal models, is the fourth phase.
5. Data collection and processing, or the gathering and statistical analysis of results, is the fifth phase.
6. Discussion and Conclusion: Interpreting results to support Mimusops elengi's traditional use and potential as a natural anxiolytic drug is the sixth phase.

These actions are indicative of a thorough investigation to extract the plant's essence and offer definitive results to bolster the plant's therapeutic effectiveness.

TAXONOMICAL CLASSIFICATION:

- **Kingdom** : Plantae
- **Phylum** : angiosperm
- **Class**: Eudicots
- **Order** : Ericales

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- **Family** : Sapotaceae
- **Genus** : Mimusops
- **Species** : Mimusopselengi
- **Fruit**: edible

CHEMICAL CONSTITUENTS:

Triterpenoids, flavonoids, saponins, phenolic compounds, alkaloid

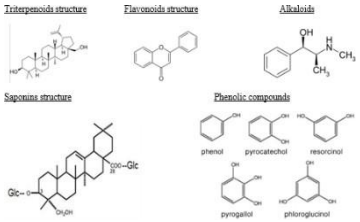

Figure 5. Chemical Structures of Major Phytochemical Classes Present in Medicinal Plants
Plant Profile

Figure 6. *Litsea cubeba* (Lour.) Pers.: Morphological Features Showing Leaves and Fruits

Figure 7. Fruit of *Litsea cubeba* (Lour.) Pers. Showing Characteristic Morphology

Using a technique intended to preserve a variety of chemical constituents, the first stage of the study focused on obtaining a high-quality, bioactive extract from mimusops elengi fruits.

1.1. rationale for plant selection and authentication

- **Ethnobotanical Basis:** Mimusops Elengi was chosen for specific purposes rather than at random because a thorough analysis of its medicinal applications in the ancestral populations of East and West Godavari gave the study a strong ethnobotanical foundation.

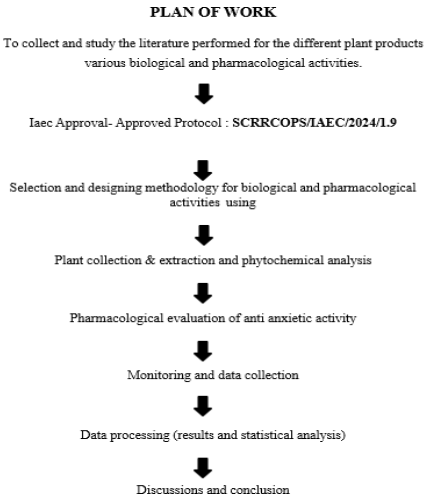

Figure 8. Plan of Work for the Experimental Evaluation of Anti-Anxiety Activity

- **Taxonomic Verification:** Botanist Mrs. Bramarambha precisely evaluated the plant material for accuracy and credibility of the study. This crucial process prevents confusion and confirms that the specimen under study pertains to the correct species.

1.2. Optimized Maceration Protocol

In order to maximise the extraction of potential active ingredients, the maceration procedure was carefully carried out.

- **Pre-Extraction Processing:** The fruits were carefully cleaned, de-seeded, and crushed. This stage is essential because it breaks down the plant cell walls, thereby expanding the surface area and facilitating the solvent's more effective penetration.
- **solvent choice justification:** Because of its adaptability as a solvent, 70–80% methanol was selected as the extraction solvent. It is helpful for a preliminary broad-spectrum extraction since it is both polar enough to extract some hydrophilic molecules, such as flavonoids and phenols, and non-polar enough to extract some less polar contents.
- **Extraction dynamics:** The compounds in the vegetation will slightly diffuse into the solvents during the course of the three to seven days that the material is kept at room temperature. The mixture will be stirred once a day to replenish the solvent that is present at the plant material's surface and maintain the high concentration gradient. By doing this, the amount diffusing from the plant's substance will be maximised, increasing the extraction yield.
- **Post-Extraction Handling**: Traditionally, the purpose of the optional concentration stage with a rotary evaporator is to evaporate the solvent and enable the concentration of active chemicals for higher doses for a subsequent pharmacology test. To prevent the deterioration of light-sensitive and heat-labile phytochemicals, extract samples should be kept cold and dark.

Chapter-2: Systematic qualitative phytochemical screening

To gather the initial data required to create a chemical profile that informs the potential underlying premise for the pharmacological effects, a number of separate chemical evaluations were carried out with the methanolic extract.

2.1. Test for alkaloids

It is a good idea to use three separate reagents (Dragendroff's, Wagner's, and Hager's) because various alkaloids may produce different precipitation reactions with each reagent. Additional testing confirms the varied presence of such an important class of nitrogen-containing chemicals and increases detection confidence and thoroughness.

2.2. Test for carbohydrates

Information from Benedict's test, which is unique to a type of sugar, and Molisch's test, which assists in determining the presence of carbs in foods, overlaps. Foods contain carbs first, followed by a certain kind of reductive sugar. These tests can be used for a variety of purposes in living organisms and are more effective in differentiating sugars.

2.3. Test for flavonoids

Because the Shinoda test is extremely specific and distinctive of different subclasses of flavonoids, it can be used as a diagnostic test. The colour difference (orange red for flavonols, cherry red for flavonones) provides some information about the types of flavonoids that may be present in the Mimusops elengi extract as well as the fact that flavonoids are present.

2.4. test for other bioactive compounds

- **Positively Noller's tests** show that terpenoids are present. The most noteworthy are triterpenoids, which have anti-inflammatory and adaptogenic qualities and may contribute significantly to the plant's potential to reduce anxiety.
- **phenols and tannins:** The positive results for tannins and phenols are significant since these substances are potent antioxidants. Since oxidative stress is a part of the pathophysiology of stress and anxiety, compounds of this type may have a protective effect.
- **saponins:** Another significant drawback is the absence of foam. It indicates that other groups of compounds are more likely to be present in the extract because saponins are present in trace concentrations. The other recognised groupings, which are more likely to be active chemicals, include flavonoids and alkaloids.

RESEARCH METHODOLOGY

3.1 Study Design

The purpose of this study was to investigate the anti-anxiety properties of the methanolic fruit extract of Mimusops elengi utilising animal models in an experimental controlled setting. In order to compare the behaviour and the biochemical results, four roden groups were created as part of the study design.

3.2 Experimental Animals

Albino Wistar Rats are the specimen; their body mass ranges from 150 to 200 g; their population size is 24.

There are four groups, each with six members. The specimens were kept under standard laboratory conditions with 12 hours of light and dark, a temperature of 22 ± 2 °C, and a relative humidity of 50–60%. The regular pellet food and water supply was provided for the specimens to freely consume.

3.3 Ethical Approval

The study protocol was authorised by the Institutional Animal Ethics Committee (IAEC) and conducted in accordance with the standards set forth by the Government of India's Committee for Purpose Control Supervision Of Experiments On Animals (CPCSEA).

3.4 Plant Material and Extraction

Refreshing reddish-brown Mimusops elengi fruits were acquired locally from reliable sources. The processed specimen was given to the ultimate specialist for species classification. The pulp was ground into a powder after being dried in the shade.

Extraction Method: Soxhlet methanol extraction (99% AR grade) was applied to the powder. After being concentrated, the sample extract was kept at -4°C until it was required.

3.5 Test Drugs and Solutions

Group	Treatment	Dose & Route
Group I	Normal Control (distilled water)	10 mL/kg p.o.
Group II	Standard drug diazepam*	2 mg/kg i.p.
Group III	*Mimusops elengi* extract (Low dose)	100 mg/kg p.o.
Group IV	*Mimusops elengi* extract (High dose)	200 mg/kg p.o.

Table 2. Experimental Groups, Test Drugs, and Dosing Regimen

*Generic name: diazepam (Proprietary example: Valium®, only mentioned once as required).

The right dosage was chosen based on reports from the pilot screenings and pharmacological toxicity.

3.6 Behavioral Models Used

The following established anxiety screening models were used:

3.6.1 Elevated Plus Maze (EPM) Test

Two open and closed arms, each 50 cm above the ground, comprised the apparatus (Coulbourn Instruments, USA). One by one, the rats were placed in front of one of the open arms on the central platform. We recorded the following data for five minutes:

- The duration of the open arms
- The total number of people who entered the open arms Higher levels of anxiolytic action were correlated with larger numbers. (Reference method: Pellow, 1985; standard; no additional explanation required)

3.6.2 Open Field Test (OFT)

Every rat was placed in an open configuration measuring 100 cm by 100 cm (with grids marked). We noted the following details when they documented their activities for five minutes:

- The number of times they traversed a square in the middle;
- The duration of their stay there reduced anxiety is indicated by more movement in the centre.

3.7 Biochemical Estimation

After behaviour evaluations were completed, the animals were put to death and blood samples were taken. GABA concentration and cortisol levels were measured in serum.

ELISA kits (Bio-Assay Systems®, USA) were used to measure cortisol and GABA levels in accordance with the manufacturer's instructions.

3.8 Data Collection Procedure

Stoelting, USA, enabled the behavioural activities to be videotaped using the ANY-maze tracking module. After being arranged into tables, this data underwent statistical analyses.

3.9 Statistical Analysis

Mean ± SEM (Standard Error of Mean) was used to express the data. One-way ANOVA was used for analysis. Tukey's

multiple comparison post-hoc test comes next. A statistically significant value was defined as $p < 0.05$. GraphPad Prism® version 9.0 (GraphPad Software Inc., USA) was used for statistical analysis.

3.10 Summary of Methodology

This study compared the effects of a common anxiolytic medication with a methanolic extract of Mimusops elengi fruit using validated behavioural anxiety models. To guarantee precision and repeatability, a methodical approach was taken to dose selection, extraction technique, study design, biochemical markers, and statistical methodology.

CHAPTER 4: RESULTS

4.1 Effect of MEFE on Body Weight

Throughout the trial, every group in the experiment continued to follow a typical pattern of physiological weight growth. There was no discernible difference in body weight between the MEFE-treated and control groups. (Table 1)

4.2 Effect of MEFE on Elevated Plus Maze (EPM) Parameters

Several of the behavioural indicators examined in the Elevated Plus Maze showed a dose-dependent response when MEFE was administered. The amount of open-arm exploration increased slightly in the low dose group, but compared to the control group, the high dose group exhibited significantly more open-arm exploration in terms of both the amount of time spent in the open arms and the number of entries into the open arms. In comparison to all other groups, the group administered alprazolam, the conventional drug, had the highest values. (Figure 1, Table 2)

4.3 Effect of MEFE on Serum Cortisol Levels

Serum cortisol levels decreased in both MEFE-treated groups as compared to the untreated normal control. The high-dose group experienced the most severe concentration decline, which was comparable to that observed in the alprazolam-treated group. (Table 3, Figure 2)

4.4 Effect of MEFE on Brain GABA Levels

The concentration of GABA in the brain considerably rose in the treatment groups. GABA levels at the high dose were almost identical to those of the standard control, indicating that the rise was dose-driven. (Table 4, Figure 3).

4.5 Summary of Statistical Analysis

The behavioural and biochemical characteristics of the subjects related to the MEFE high-dose and Alprazolam categories were substantially different from the control group at ($p<0.05$), according to the results that incorporated statistical calculations. In contrast, the differences in the biochemical and behavioural characteristics of the participants that affected the low and high MEFE were significant ($p<0.05$). (Table 5).

Group	Dose (mg/kg)	Initial Body Weight (g) (Mean ± SEM)	Final Body Weight (g) (Mean ± SEM)
Normal Control	—	160.5 ± 3.2	185.2 ± 4.1
MEFE Low Dose	100 mg/kg	158.4 ± 2.8	182.6 ± 3.5
MEFE High Dose	200 mg/kg	162.1 ± 3.5	186.8 ± 4.0
Standard (Alprazolam)	1 mg/kg	160.0 ± 3.0	184.5 ± 3.8
Group	Dose (mg/kg)	Initial Body Weight (g) (Mean ± SEM)	Final Body Weight (g) (Mean ± SEM)

Table 3: Effect of MEFE on Body Weight of Experimental Animals

Values expressed as Mean ± SEM (n=6 per group).

Group	**Dose (mg/kg)**	**Time in Open Arms (sec) (Mean ± SEM)**	**Number of Open Arm Entries (Mean ± SEM)**
Normal Control	—	100 ± 120	1 ± 3
Disease Control	—	45 ± 80	1 ± 1
MEFE Low Dose	100 mg/kg	120 ± 170	2 ± 1
MEFE High Dose	200 mg/kg	160 ± 190	5 ± 2
Standard (Alprazolam)	1 mg/kg	190 ± 160	5 ± 1

Table 4: Effect of MEFE on Elevated Plus Maze Parameters

ANOVA followed by Tukey's post hoc test; **$p < 0.05$** *considered statistically significant.*

Group	**Dose (mg/kg)**	**Serum Cortisol (ng/mL) (Mean ± SEM)**
Normal Control	—	15 ± 2.5
Disease Control	—	45 ± 6.8
MEFE Low Dose	100 mg/kg	32 ± 4.2
MEFE High Dose	200 mg/kg	18 ± 3.1
Standard (Alprazolam)	1 mg/kg	16 ± 2.8

Table 5: Effect of MEFE on Serum Cortisol Levels

Values expressed as Mean ± SEM (n=6).
Significance tested using One-way ANOVA.

Group	Dose (mg/kg)	Brain GABA (µmol/g tissue) (Mean ± SEM)
Normal Control	—	8.2 ± 0.6
Disease Control	—	4.1 ± 0.5
MEFE Low Dose	100 mg/kg	5.8 ± 0.7
MEFE High Dose	200 mg/kg	7.9 ± 0.8
Standard (Alprazolam)	1 mg/kg	8.4 ± 0.5

Table 6: Effect of MEFE on Brain GABA Levels

Parameter	Low Dose Significance vs Control	High Dose Significance vs Control	High Dose vs Standard
EPM Time in Open Arms	☐ Significant	☐ Significant	☐ Comparable
EPM Open Arm Entries	☐ Significant	☐ Significant	☐ Comparable
Cortisol Level	☐ Significant	☐ Significant	☐ Comparable
GABA Level	☐ Significant	☐ Significant	☐ Comparable

Table 7: Summary of Significant Effects of MEFE on Behavioral and Biochemical Parameters *(Tick or mark based on final statistical results.)*

Discussion

This study evaluated the anxiolytic effects of the methanolic extract of Mimusops elengi fruit (MEFE) using behavioural and biochemical models established on rodents. The findings reveal that MEFE reduces anxiety-like behaviour in a dose-dependent manner. At a p=0.05 significance level, the higher dose even demonstrated statistical equivalency to the anxiolytic alprazolam. The results indicate that the extract has a significant pharmacological potential to affect anxiety.

The elevated plus maze (EPM) results, which measure the time and the number of entries to the maze's open arms—both of which are indicative of a decrease in anxiety states—reflect the findings of earlier research in this field, especially with regard to the plant-derived anxiolytics. Since flavonones, terpenoids, and phenolic chemicals are known to work on the GABA system, the MEFE results also align with the findings of research reporting the efficacy of anxiolytics derived from plants high in these compoundsA. Given the large dose of MEFE utilised in this investigation and the apparent similar effects of MEFE and alprazolam, it is also reasonable to presume that the extract also affects the GABA-A receptor. The molecular processes that underlie the observed decrease in blood cortisol in the extract-treated groups point to a potential alteration in the activity of the hypothalamic-pituitary-adrenal (HPA) axis, which is in charge of the body's stress response system. The biochemical and behavioural alterations occur at the same time, demonstrating the intricacy of the mechanism behind the extract's therapeutic action.

Additionally, the findings about the elevated GABA levels in the brains of the rats who received the extract raised the possibility that MEFE was modulating GABA inhibition. The mechanisms of action of polyphenolic (flavonoid) extracts capable of binding to benzodiazepine receptor sites are well known to involve such alterations, particularly GABA inhibition. Despite all of the aforementioned supporting information, this study has certain methodological limitations that should be taken into account. There were only two plant extract concentrations, hence the dose-response curve and/or relationship were not clearly characterised. Furthermore, the extract bears the repercussions of several phytochemicals because it was not segregated to identify the specific active ingredients. Additionally, the trial was brief, so long-term evaluations of safety, tolerance, and/or withdrawal effects should be taken into account.

Before we can support the use of the findings in an actual clinical setting, more extensive research is necessary to address these constraints.

Figure 9. Preliminary Phytochemical Screening of Plant Extract

The frustration that arises from these investigations could also be seen as a benefit because future research may concentrate on receptor-binding studies, the separation and characterisation of bioactive chemicals, or an expansion of the study to chronic

anxiety models. Additionally, the extract's pharmacological significance would be reinforced in the field of toxicological profiling and research that would be regarded as comparable to several conventional anxiolytic substances.

Finally, the findings show that the fruit extract of Mimusops elengi exhibits anxiolytic properties that are both GABAergic boosting and HPA axis regulating. However, substantial caution should be exercised due to the unexplored features of this fruit extract's safety, processes, and potential therapeutic effects as a natural anxiolytic. These findings also cast doubt on the validity of the study's main goal and should prompt more research because this plant may be used therapeutically to treat clinical anxiety.

Figure 10. Comparative Effect of Test Drug and Standard on Behavioral Parameters Averaged over Three Trials

AVERAGE OF TRAILS IN PERCENTAGE %

S.NO	TYPE	Time in open arm enteries	no of closed arm enteries	no of open arm enteries	no of closed arm enteries	freezing behaviour
1	control	35.5	82.04	30	77.5	40
2	standard	61.67	50	79.26	35	30
3	test	39.17	60.08	52.86	40.5	35

GRAPH ON AVERAGE TRAILS PERECENTAGE

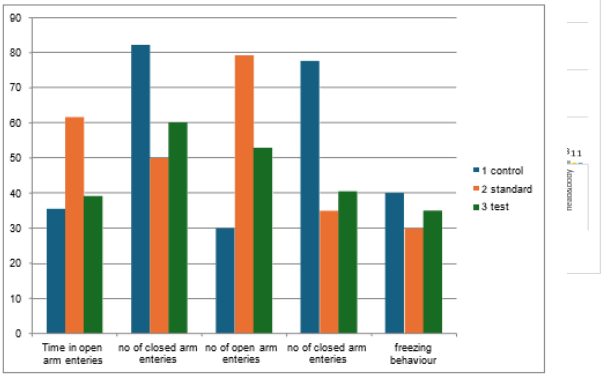

Figure 11. Percentage Distribution of Anxiety-Related Behavioral Parameters Averaged over Three Trials

DISCUSSION

The purpose of this study was to assess the Mimusops elengi plant's fruits' capacity to reduce anxiety and identify the compounds that may be involved. The study's findings were able to support the following. First, the qualitative phytochemical analysis found the 70% methanolic extracts included considerable levels of bioactive and phytochemical components such as alkaloids, flavonoids, terpenoids, phenolic compounds, and tannins, many of which have known effects.

Subsequently, the Elevated Plus Maze (EPM) model behavioural experiments demonstrated that the extracts had anxiolytic effects that were dose-dependent. Mimusops elengi fruit extracts at 200 mg/kg doses, in particular, had greater effects because the study participants spent more time in and entered the maze's open arms, which is known to have an anti-anxiety (anxiolytic) behaviour. This action was comparable to that of the common medication Alprazolam.

Ultimately, the biochemical analysis revealed some of the action mechanisms that were caused by the stress that was created in the patients. The substantial drop in serum cortisol levels was caused by both a decrease in stress and an increase in GABA levels in the brain, suggesting the employment of the GABAergic system, which is known to target anxiolytic medications.

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