



(RESEARCH ARTICLE)



EVALUATION OF ANXIOLYTIC ACTIVITY OF PAPAVER SOMNIFERUM AND MATRICARIA CHAMOMILLA USING THE ELEVATED PLUS MAZE

P. Vijay Kumar *, Betini Tanvi Chowdary, Nagulagani Guru varun ji, Pogu Srinidhi, Kotoju Vyshnavi and Moturu Ruchithasree.

Department of Pharmacology, Malla Reddy Institute of Pharmaceutical Sciences, Maisammaguda, Dhulapally, Post via Kompally, Secunderabad- 500 100.

* Corresponding Author

ORCID Details

Pallanti Vijay Kumar: <https://orcid.org/0009-0004-2523-5962>

World Journal of Advanced Research and Reviews, 2026, 32(01), 566–574

Publication history: Received on 01 September 2026; revised on 06 October 2026; accepted on 08 October 2026

Article DOI: <https://doi.org/10.30574/wjarr.2026.32.1.2579>

Copyright © 2026 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution License 4.0

ABSTRACT

Anxiety disorders are among the most common neuropsychiatric disorders worldwide and are characterized by excessive fear, apprehension, and behavioural disturbances. Benzodiazepines are widely used for anxiety management. However, long-term use may result in sedation, tolerance, dependence, and withdrawal symptoms. Medicinal plants have gained increasing attention as potential alternatives due to their traditional use and relatively favourable safety profile. In the present study the *Papaver somniferum* and *Matricaria chamomilla* were evaluated and compared using the Elevated plus Maze model, a well-established behavioural assay for anxiety related responses. The study involved behavioural assessment based on exploratory activity in the apparatus following treatment with standard and plant-based interventions. Both extracts demonstrated measurable anxiolytic like effects, reflected by increased open arm exploration compared to control, indicating reduced anxiety related behaviour. Among the two *papaver somniferum* exhibited a more pronounced effect than *Matricaria chamomilla*, though both remained less potent than the standard drug. The findings suggest that these plant sources may contain bioactive constituents contributing to anxiolytic activity, supporting their potential role in the development of alternative therapeutic strategies for anxiety disorders and warranting further phytochemical investigation.

Keywords: Anxiety, Elevated Plus Maze, Papaver somniferum, *Matricaria chamomilla*, Diazepam, Wistar rats.

1 INTRODUCTION

Anxiety is a psychological condition characterized by fear, nervousness, and excessive worry that can affect both mental and physical wellbeing. Conventional anti-anxiety drugs such as benzodiazepines are effective but may produce side effects including sedation, tolerance, and dependence after prolonged use.

Medicinal plants have been traditionally used for calming and sedative purposes because of their natural therapeutic properties. Chamomile (*Matricaria chamomilla*) and poppy seeds (*Papaver somniferum*) contain several phytochemical constituents that may influence the central nervous system and reduce anxiety-related behaviour.

The Elevated plus Maze (EPM) is a commonly used experimental model for evaluating anxiolytic activity. Rodents naturally avoid open and elevated spaces due to fear and anxiety; therefore, increased exploratory behaviour in open arms indicates reduced anxiety levels.

The present study was undertaken to evaluate the anxiolytic activity of selected herbal extracts using the Elevated plus Maze model [1][2].

1.1 EXPERIMENTAL ANIMALS

Wistar Rat are one of the most commonly used experimental animals in pharmacological and toxicological studies. They are preferred because of their calm nature, easy handling, rapid growth, and well-known physiological responses.

Role in Anxiolytic Activity Study: In the evaluation of Anxiolytic activity using poppy seed extract, chamomile extract, Wistar rats are used as experimental models to assess coordination and relaxation effects[3].

1.2 Characteristics of Wistar Rats

- Species: *Rattus norvegicus*
- Color: Albino (white)
- Weight used in studies: 150–200 g
- Age: 6–8 weeks
- Nature: Calm and easy to handle
- Housing: Maintained under controlled temperature and 12-hour light/dark cycle

1.3 Wistar Rats are Used because

- Their nervous and muscular systems respond well to neural relaxants.
- They are suitable for behavioral and pharmacological experiments.
- Results obtained are reliable and reproducible.
- They are widely accepted in preclinical drug evaluation studies

1.4 Experimental Design

The rats are usually divided into five groups:

- Control group
- Standard group (Diazepam)
- Chamomile extract group
- Poppy seed extract group

Each group generally contains 3 animals.



Figure 1: Wistar Rats

2 MATERIALS AND METHODS

2.1 Materials Required

2.1.1 Chemicals

- Ethanol
- Diazepam
- Distilled water
- Normal saline

2.2 Instruments

- Soxhlet apparatus
- Elevated plus maze
- Weighing balance
- Beakers and glassware

2.3 PREPARATION OF EXTRACTS

2.3.1 Method 1: Ethanolic Extract of Chamomile Flower



Figure 2: Chamomile Flower powder

Chamomile is a medicinal herb widely used for anxiety, insomnia, muscle spasms, and inflammation. Chamomile contains flavonoids such as apigenin, terpenoids, and essential oils that exhibit sedative and relaxant activity through benzodiazepine receptor interaction [4].

Table 1: Scientific Classification of Chamomile

Category:	Details:
Botanical name	<i>Matricaria chamomilla</i>
Common name	Asteraceae
Family	Chamomile
Part used	Flowers

2.4 Extraction Procedure

- Fresh chamomile flowers were collected and washed thoroughly to remove dust and impurities.
- The flowers were shade dried at room temperature for several days to prevent degradation of active constituents.
- The dried flowers were powdered using a mechanical grinder to obtain a coarse powder.
- The powdered material was transferred into a thimble and placed inside the Soxhlet apparatus.
- Ethanol was added into the round bottom flask as the extraction solvent.

- The extraction process was carried out continuously for 6-8hours using controlled heating.
- After completion of extraction, the using whatman filter paper.
- The filtrate was concentrated to obtain a semisolid extract and stored in an airtight container [5].



Figure 3: Soxhlet Extraction using Ethanol



Figure 4: Chamomile extract in an air tight container

2.4.1 METHOD 2: Cold Extract of Poppy Seeds



Figure 5: Cold Extract of Poppy Seeds

Poppy seeds obtained from *Papaver somniferum* contain alkaloids, phenolic compounds, flavonoids, carbohydrates, proteins, and fatty acids. Traditionally, poppy seeds are known for sedative, analgesic, and calming effects. Certain alkaloids present in poppy influence neurotransmitter activity and may produce relaxation [6].

Table 2: Scientific Classification of Poppy

Category	Details
Botanical Name	<i>Papaver somniferum</i>
Family	Papaveraceae
Common Name	Poppy
Part Used	Seeds

2.5 Extraction Procedure

- Poppy seeds were taken and ground into a coarse powder.
- The powdered material was transferred into a clean conical flask.
- Suitable solvent was added to the powdered poppy seeds for cold extraction.
- The mixture was kept undisturbed at room temperature for extraction of active constituents.
- The solution was stirred occasionally using a glass rod to ensure proper mixing.
- After completion of extraction, the mixture was filtered using Whatman filter paper.
- The filtrate obtained was collected and stored in a clean container for further experimental use[6][13].



Figure 6: Poppy seeds are grounded using a grinder

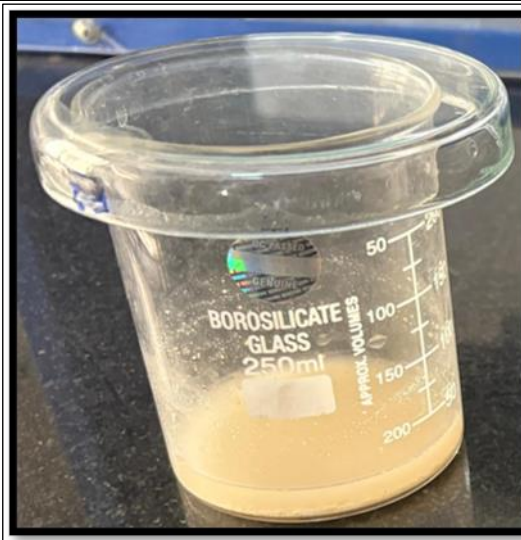


Figure 7: Extract was concentrated and stored

Table 3: PHYTOCHEMICAL SCREENING

TEST NAME	CONSTITUENT	PROCEDURE	OBSERVATION	INFERENCE
Ferric chloride Test	Flavonoids	Few drops of ferric chloride solution is added to the test solution	Green, dark green, brownish green colour	Presence of flavonoids
Tschugaeff test	Terpenoids	A few drops of tschugaeff reagent (picric acid and sodium hydroxide) is added to the test solution	Orange brown/ deep yellow	Presence of terpenoids
Keller killian test	Glycosides	Few drops of keller killian reagent (glacial acetic acid and sulphuric acid)	Reddish brown colour	Presence to glycosides
Mayers test	Alkaloids	Few drops of Mayer's reagent is added to test solution.	Brownish colour	Absence of Alkaloids



Figure 8: FLAVANOIDS ✓



Figure 9: GLYCOSIDES ✓



Figure 10: TERPENOIDS ✓



Figure 11: ALAKALOIDS ✗

Table 4: Experimental Design

Group	Treatment
Group I	Control (Normal saline)
Group II	Diazepam (4 mg/kg)
Group III	Chamomile extract (200 mg/kg)
Group IV	Poppy extract (200 mg/kg)

2.6 ELEVATED PLUS MAZE METHOD

2.6.1 Procedure

- Animals were divided into control, standard, and test groups.
- Each group received its respective treatment.
- The Elevated plus Maze apparatus containing two open arms and two closed arms was prepared.
- Each animal was placed individually at the center of the maze facing an open arm.
- Movement activity, open arm entries, and exploratory behavior were observed for a fixed duration.
- Increased movement and open arm activity were considered indicators of anxiolytic activity[7][11].



Figure 12: Elevatedplusmaze Method

Table 5: Observation Table

Group	Treatment	Open arm activity (no. of movements)	Behavioral interpretation
Group 1	Normal saline (control)	0	High anxiety, strong avoidance of open arms
Group 2	Diazepam (standard)	15	Very low anxiety; high exploration (strong anxiolytic effect)
Group 3	<i>Matricaria chamomilla</i> extract	5	Mildly reduced anxiety; slight increase in exploration.
Group 4	<i>Papaver somniferum</i> extract	10	Moderately reduced anxiety; noticeable increase in exploration.

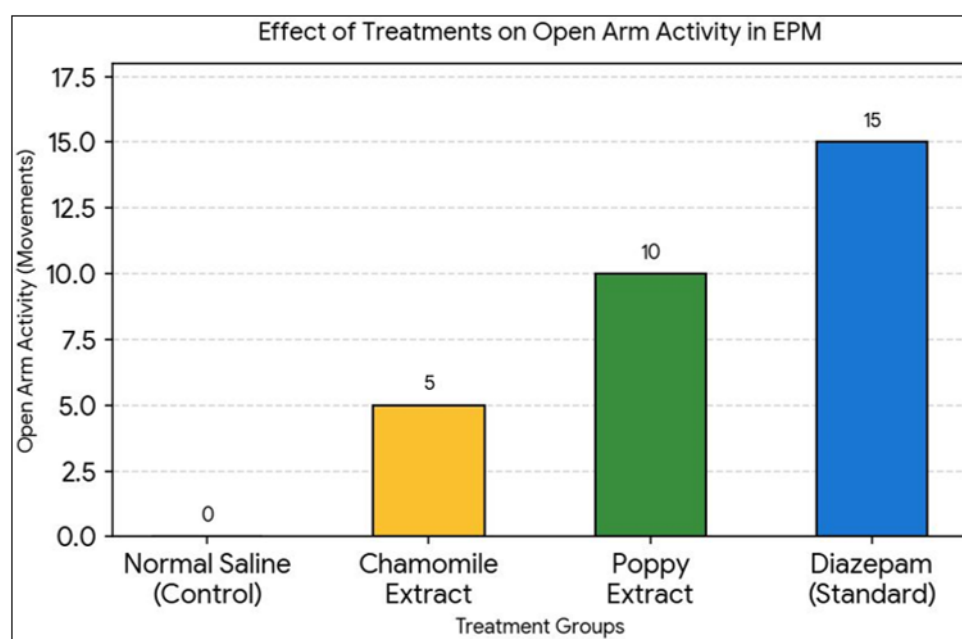


Figure 13: Effect of Treatments on open Arm Activity in EPM

3 RESULTS

- Normal Saline Group: The mice or rats did not venture into the open arms at all (0 movements). They chose to stay entirely within the safe, enclosed areas, which shows a high baseline level of fear and anxiety [8].

- Chamomile_Extract_Group: This group made 5 movements into the open arms. This slight increase shows that the chamomile helped lower their anxiety just enough to make them a little more adventurous.
- Poppy Extract Group: With 10 movements, this group showed a much more noticeable reduction in fear. They explored the open arms twice as much as the chamomile group.
- Diazepam Group: As expected, this standard anti-anxiety medication had the strongest effect, leading to the highest level of exploration with 15 movements [9] [12].

4 DISCUSSION

The Elevated plus Maze works by testing a rodent's natural conflict: they want to explore new surroundings, but they are also deeply afraid of open, high spaces. When an animal spends more time moving into the open arms, it is a clear sign that its anxiety levels have dropped. In our experiment, the Normal Saline group acted exactly as expected for a control group. By avoiding the open arms entirely, they proved that the maze was properly inducing fear. On the other end of the scale, Diazepam acted as a perfect benchmark. It drastically reduced the animals' fear, allowing them to explore freely. Diazepam achieves this in the brain by boosting GABA, a chemical messenger that calms down nerve activity. The most interesting part of the study is how the plant extracts performed. Chamomile showed a mild calming effect, which aligns with what we know about its natural ingredients, like apigenin, which gently soothe the central nervous system. Poppy extract, however, was significantly more effective, cutting their anxiety down even further. This stronger reaction is likely due to the active plant chemicals (alkaloids) found in poppy that can interact with the brain's calming or pain-relief pathways[9].

5 CONCLUSION

In conclusion, this study proves that both plant extracts have genuine anti-anxiety properties. While Chamomile provides a mild calming effect, Poppy extract is notably more powerful. Neither extract completely matched the strength of the clinical drug Diazepam, but both show great promise as natural options for reducing anxiety. Future studies should focus on isolating the exact compounds within these plants to understand exactly how they work.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgments

The authors would like to acknowledge their institution and all individuals who provided support and assistance during the research and preparation of the manuscript.

Disclosure of conflict of interest

The authors declare no conflict of interest regarding this manuscript.

Statement of ethical approval

All ethical considerations were followed during the conduct of the research in accordance with applicable institutional guidelines and ethical principles.

REFERENCES

- [1] Pellow S, Chopin P, File SE, Briley M. Validation of open: closed arm entries in an elevated plus-maze as a measure of anxiety in the rat. *Journal of Neuroscience Methods*. 1985; 14(3):149–167.
- [2] Shepherd JK, Grewal SS, Fletcher A, Bill DJ, Dourish CT. Behavioural and pharmacological characterization of the elevated zero-maze. *Psychopharmacology*. 1994; 116:56–64.
- [3] McKay DL, Blumberg JB. A review of the bioactivity and potential health benefits of chamomile tea. *Phytotherapy Research*. 2006;20(7):519–530.
- [4] Srivastava JK, Shankar E, Gupta S. Chamomile: A herbal medicine of the past with a bright future. *Molecular Medicine Reports*. 2010;3(6):895–901.
- [5] File SE. The use of social interaction as a method for detecting anxiolytic activity of chlordiazepoxide-like drugs. *Journal of Neuroscience Methods*. 1980;2(3):219–238.
- [6] Bourin M, Hascoet M. The mouse light/dark box test. *European Journal of Pharmacology*. 2003;463(1–3):55–65.

- [7] Cryan JF, Holmes A. The ascent of mouse: advances in modelling human depression and anxiety. *Nature Reviews Drug Discovery*. 2005; 4:775–790.
- [8] Pellow, S., Chopin, P., File, S. E., & Briley, M. (1985). Validation of open: closed arm entries in an elevated plus-maze as a measure of anxiety in the rat. *Journal of Neuroscience Methods*, 14(3), 149–167.
- [9] Shepherd, J. K., Grewal, S. S., Fletcher, A., Bill, D. J., & Dourish, C. T. (1994). Behavioural and pharmacological characterization of the elevated zero-maze. *Psychopharmacology*, 116, 56–64.
- [10] McKay, D. L., & Blumberg, J. B. (2006). A review of the bioactivity and potential health benefits of chamomile tea. *Phytotherapy Research*, 20(7), 519–530.
- [11] Srivastava, J. K., Shankar, E., & Gupta, S. (2010). Chamomile: A herbal medicine of the past with a bright future. *Molecular Medicine Reports*, 3(6), 895–901.
- [12] File, S. E. (1980). The use of social interaction as a method for detecting anxiolytic activity of chlordiazepoxide-like drugs. *Journal of Neuroscience Methods*, 2(3), 219–238.
- [13] Bourin, M., & Hascoët, M. (2003). The mouse light/dark box test. *European Journal of Pharmacology*, 463(1–3), 55–65.