

Neuropharmacological Evaluation of *Hippophae Rhamnoides L.* for Antidepressant and Cognitive Protective Effects in Wistar Rats

Supriya Fatnani¹, Mamta Sharma², Priya³

¹Research Scholar, Jaipur College of Pharmacy, Jaipur, Rajasthan, India

²Associate Professor, Jaipur College of Pharmacy, Jaipur, Rajasthan, India

³Research Director, Axico Healthcare Pvt. Ltd, Delhi, India

Received: 11-08-2026 / Revised: 15-09-2026 / Accepted: 08-10-2026

Corresponding author: Supriya Fatnani

Conflict of interest: Nil

Abstract

Background: *Hippophae Rhamnoides L.* (sea buckthorn) contains diverse phytochemicals and has been investigated for potential neuroprotective effects. The present work evaluated behavioral effects of a hydroalcoholic root extract (CPE) in rodent models relevant to antidepressant-like and anxiety-related activity.

Methods: Root material purchased in Jaipur, India, was extracted by Soxhlet extraction using a hydroalcoholic solvent, giving a reported yield of 6.3%. Preliminary qualitative phytochemical tests were reported for resins, saponins, tannins, flavonoids and alkaloids. Behavioral outcomes were extracted from the supplied study record for the forced swim test (FST), tail suspension test (TST), elevated plus maze (EPM), and light–dark transition test (LDT). CPE was administered orally at 200 or 400 mg/kg. The reported sample size was n=6 per group; data were expressed as mean $\pm$ SD.

Results: CPE at 200 and 400 mg/kg was associated with lower immobility times than vehicle control in the FST (78.0 ± 2.57 and 73.6 ± 1.31 s vs 143.33 ± 6.7 s) and TST (116.0 ± 3.5 and 105.3 ± 4.3 s vs 165.5 ± 5.8 s). In the EPM, open-arm time was 47.0 ± 3.20 and 62.43 ± 7.51 s for CPE 200 and 400 mg/kg, respectively, compared with 12.36 ± 1.66 s for control. Time in the bright chamber in the LDT was 19.0 ± 3.78 and 23.1 ± 1.79 s for CPE 200 and 400 mg/kg, compared with 12.0 ± 0.76 s for control.

Conclusion: The supplied results suggest antidepressant-like and anxiety-related behavioral effects of hydroalcoholic *H. rhamnoides* root extract in rodents. Interpretation is limited by inconsistencies in the source methods and incomplete reporting of ethics identifiers, group allocation, model induction, and cognitive-test numerical results.

Keywords: *Hippophae Rhamnoides*; Sea Buckthorn; Hydroalcoholic Extract; Forced Swim Test; Tail Suspension Test; Elevated Plus Maze; Light–Dark Transition Test; Rodent Behavior.

DOI: 10.25258/ijcpr.18.10.24

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Depression and anxiety are major contributors to the global burden of mental ill-health and are frequently associated with impaired cognition and reduced quality of life. Available pharmacotherapies are beneficial for many patients, but treatment response and tolerability vary, motivating investigation of candidate compounds with complementary biological activities [1–5].

Oxidative stress, neuroinflammatory signaling, altered neurotransmission and changes in neuroplasticity have been implicated in aspects of depressive and cognitive disorders. Plant-derived mixtures containing phenolics and flavonoids are therefore studied as sources of bioactive molecules; however, preclinical behavioral findings alone

cannot establish clinical efficacy or mechanism [5–8].

Hippophae rhamnoides L., commonly known as sea buckthorn, is a member of the Elaeagnaceae family and contains flavonoids, phenolic compounds, carotenoids, vitamins and fatty acids. Its phytochemical composition varies with plant part, geographical origin and extraction conditions. The present study record describes a hydroalcoholic extract prepared from roots and reports behavioral outcomes from rodent assays.

Materials and Methods

Plant Material and Extraction: *Hippophae rhamnoides* root material was purchased from a local market in Jaipur, India, in January and

reportedly authenticated at the Botanical Department, University of Rajasthan, India. The manuscript source leaves the voucher-specimen accession number blank; this must be completed from the authentication record. The roots were coarsely powdered, and 1 kg of powdered material was subjected to Soxhlet extraction with a hydroalcoholic solvent. The source describes the solvent composition ambiguously as “alcohol 90: Water (70:30)”; the exact solvent identity and ratio must be confirmed from the laboratory notebook. The concentrated extract yield was reported as 6.3%.

Preliminary Phytochemical Screening:

Qualitative screening was reported using standard color/precipitation tests. Positive reactions were recorded for resins (turbidity test), saponins (foam and haemolytic tests), tannins (lead acetate and 5% ferric chloride tests), flavonoids (Shinoda, lead acetate, alkaline reagent and ferric chloride tests), and alkaloids (Dragendorff, Mayer and Wagner tests). These are qualitative observations; no quantitative total phenolic or total flavonoid content was supplied.

Animals and Ethical Considerations: The methods file describes male Swiss albino mice (30–35 g; 7–8 weeks old) for behavioral experiments, housed at 25 ± 2 °C, 50–60% relative humidity and a 12 h light/dark cycle, with one week of acclimatization and six animals per cage.

Experimental Groups and Treatment: For antidepressant-like behavior, the source describes five groups (n=6): vehicle control (saline, 2 mL/kg orally), model control (saline, 2 mL/kg orally), imipramine standard (reported as 10 mg/kg in the methods), CPE 200 mg/kg orally and CPE 400 mg/kg orally. However, the results table lists imipramine at 20 mg/kg and presents only four groups, without a separate model-control group.

This discrepancy must be resolved using original records. For anxiety-related tests, the results table lists vehicle control, diazepam 1 mg/kg, CPE 200 mg/kg and CPE 400 mg/kg. The source does not consistently document the induction procedure or distinguish control groups across tests.

Behavioral Assessment

Forced swim test (FST): Animals were placed individually in a cylinder containing water at 25 ± 1 °C. The source describes a 6-min session and measurement of immobility during the final 4 min, with treatment administered approximately 60 min before testing. The stated dimensions and species should be checked against the actual protocol. **Tail suspension test (TST):** The source describes suspension by the tail for 6 min and recording immobility during the final 4 min.

Elevated plus maze (EPM): Open-arm entries, total arm entries, time spent in open and closed arms, and rearing were tabulated. The supplied results section contains this table, although some figure captions incorrectly label EPM results as Morris water maze outcomes.

Light–dark transition test (LDT): Animals were observed for 6 min in adjoining dark and bright chambers. Bright-chamber entries, time in the bright chamber, rearing and immobility were reported.

Morris water maze (MWM): The methods describe a submerged-platform protocol and measurement of escape latency, target-quadrant time and platform-site crossings.

Statistical Analysis: The source states that data were expressed as mean $\pm$ SD and analyzed by one-way ANOVA followed by Dunnett’s and Tukey’s tests, with $p < 0.05$ considered statistically significant. The source tables report $n=6$ and use significance symbols, but do not provide exact p-values, ANOVA statistics, degrees of freedom, assumption checks, or adjusted pairwise comparisons.

Results

Extraction yield and phytochemical screening: Soxhlet extraction of 1 kg of root powder reportedly yielded 6.3% hydroalcoholic extract. Qualitative tests were positive for resins, saponins, tannins, flavonoids and alkaloids (Table 1).

Table 1: Qualitative phytochemical screening of the hydroalcoholic *H. rhamnoides* root extract

Phytochemical class	Reported test(s)	Observation
Resins	Turbidity test	+ (positive)
Saponins	Foam test; haemolytic test	+ (positive)
Tannins	Lead acetate; 5% ferric chloride	+ (positive)
Flavonoids	Shinoda; lead acetate; alkaline reagent; ferric chloride	+ (positive)
Alkaloids	Dragendorff; Mayer; Wagner	+ (positive)

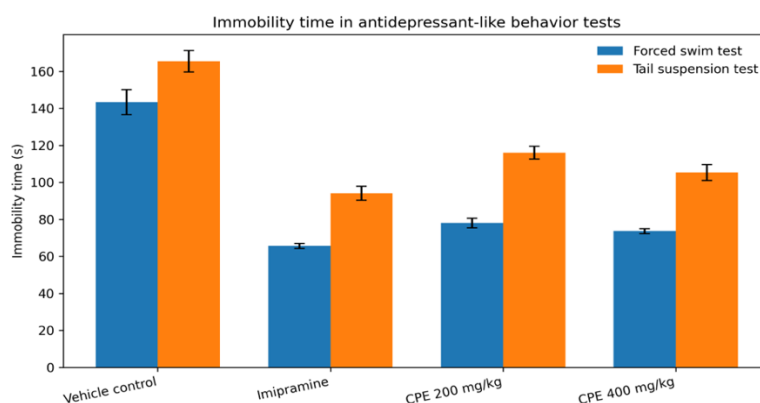
Antidepressant-like activity in FST and TST:

The supplied data show lower immobility times in CPE-treated groups than in vehicle controls in both tests (Table 2; Figure 1). In the FST, immobility was 78.0 ± 2.57 s at 200 mg/kg and 73.6 ± 1.31 s at 400 mg/kg, compared with 143.33 ± 6.7 s in the

control group. In the TST, corresponding values were 116.0 ± 3.5 s and 105.3 ± 4.3 s, compared with 165.5 ± 5.8 s. Imipramine-treated animals had reported immobility times of 65.6 ± 1.4 s in the FST and 94.0 ± 3.76 s in the TST.

Table 2: Immobility time in the forced swim and tail suspension tests

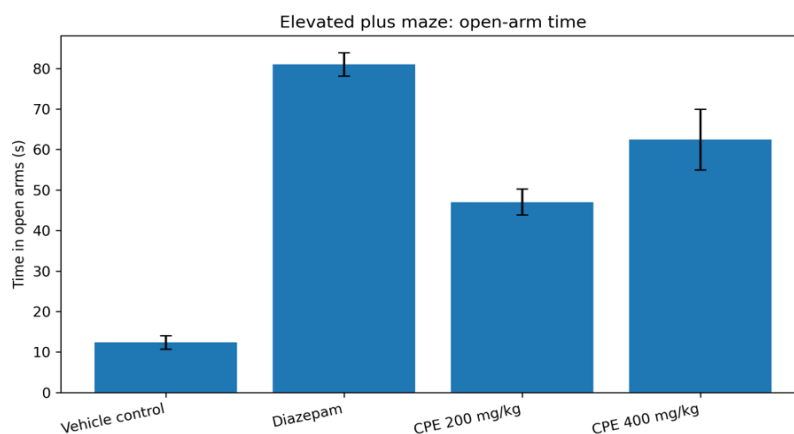
Treatment	Dose	FST immobility (s)	TST immobility (s)
Vehicle control	Saline	143.33 ± 6.7	165.5 ± 5.8
Imipramine	20 mg/kg in results table	$65.6 \pm 1.4^{**}$	$94.0 \pm 3.76^{**}$
CPE	200 mg/kg	$78.0 \pm 2.57^{**}$	$116.0 \pm 3.5^{**}$
CPE	400 mg/kg	$73.6 \pm 1.31^{**}$	$105.3 \pm 4.3^{**}$

**Figure 1: Reported immobility times in the FST and TST**

Anxiety-related behavior in the elevated plus maze: The EPM table reports an increase in open-arm time in diazepam and CPE groups relative to vehicle control. Open-arm time was 47.0 ± 3.20 s for CPE 200 mg/kg and 62.43 ± 7.51 s for CPE 400 mg/kg, compared with 12.36 ± 1.66 s in controls. Closed-arm time was lower in the treated groups than in controls.

Table 3: Elevated plus maze behavioral outcomes

Treatment	Dose	Open-arm entries	Total arm entries	Open-arm time (s)	Closed-arm time (s)	Rears in open arms
Control	Saline	1.7 ± 0.34	5.16 ± 0.47	12.36 ± 1.66	298.66 ± 6.99	1.6 ± 0.34
Diazepam	1 mg/kg	$3.8 \pm 0.32^{*}$	6.83 ± 0.47	$81.0 \pm 2.87^{**}$	$173.0 \pm 0.90^{**}$	3.0 ± 0.36
CPE	200 mg/kg	1.76 ± 0.33	4.56 ± 0.49	$47.0 \pm 3.20^{**}$	$216.5 \pm 5.43^{**}$	3.30 ± 0.54
CPE	400 mg/kg	2.3 ± 0.36	5.18 ± 0.47	$62.43 \pm 7.51^{**}$	$192.5 \pm 6.14^{**}$	3.57 ± 0.48

**Figure 2: Time spent in open arms in the elevated plus maze**

Light–dark transition behavior: In the LDT, time spent in the bright chamber was reported as 19.0 ± 3.78 s and 23.1 ± 1.79 s for CPE 200 and 400 mg/kg, respectively, compared with 12.0 ± 0.76 s in controls.

Diazepam-treated animals spent 28.0 ± 4.18 s in the bright chamber. The reported immobility duration was 65.5 ± 3.46 s for CPE 200 mg/kg and 69.56 ± 3.52 s for CPE 400 mg/kg, compared with 85.16 ± 2.80 s in controls.

Table 4: Light–dark transition test outcomes

Treatment	Dose	Bright-chamber entries	Time in bright chamber (s)	Rears in bright chamber	Immobility duration (s)
Control	Saline	1.8 ± 0.22	12.0 ± 0.76	4.0 ± 0.36	85.16 ± 2.80
Diazepam	1 mg/kg	$3.8 \pm 0.42^{**}$	$28.0 \pm 4.18^{**}$	4.36 ± 0.30	73.66 ± 2.41
CPE	200 mg/kg	1.75 ± 0.40	$19.0 \pm 3.78^{*}$	2.49 ± 0.34	$65.5 \pm 3.46^{*}$
CPE	400 mg/kg	1.83 ± 0.22	$23.1 \pm 1.79^{**}$	3.5 ± 0.51	$69.56 \pm 3.52^{**}$

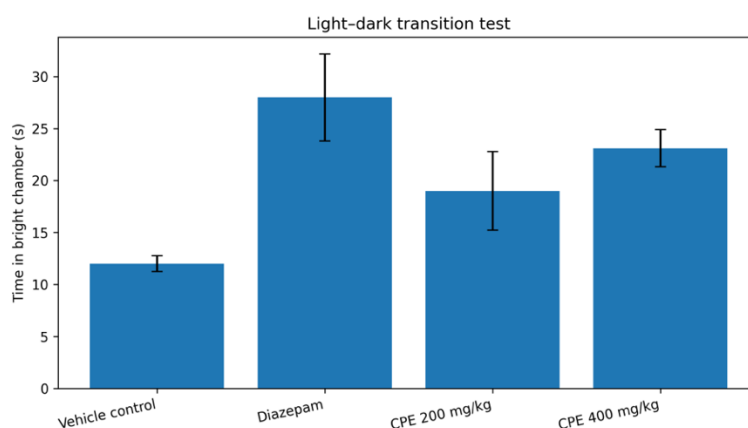


Figure 3: Time spent in the bright chamber during the light–dark transition test

Discussion

The reported FST and TST findings show lower immobility in animals receiving the hydroalcoholic *H. rhamnoides* root extract than in vehicle controls. The numerical pattern is consistent with antidepressant-like behavioral activity in these screening paradigms, with the 400 mg/kg group showing somewhat lower immobility than the 200 mg/kg group. The EPM and LDT results show greater bright/open-area exploration in extract-treated groups than in the control group. These outcomes may be compatible with reduced anxiety-like behavior, but they should be interpreted alongside locomotor activity, validated apparatus procedures, and complete statistical analysis. The source contains labeling inconsistencies:

EPM figures are at points captioned as MWM, and the LDT immobility duration is difficult to reconcile with the stated observation interval. The qualitative screening suggests that the extract contains multiple classes of phytochemicals, including flavonoids and tannins. These results provide a preliminary basis for further chemical characterization but do not identify active constituents or quantify their concentrations. A stronger mechanistic study would include quantitative total phenolic and flavonoid content,

chromatographic fingerprinting, locomotor controls, brain oxidative-stress markers, neurotransmitter measurements, and blinded histopathological evaluation.

Conclusion

The supplied results indicate that hydroalcoholic *H. rhamnoides* root extract at 200 and 400 mg/kg was associated with reduced immobility in the FST and TST and increased open-arm/bright-chamber exploration in the EPM and LDT. These findings support further investigation of antidepressant-like and anxiety-related behavioral effects in preclinical models. The evidence presented does not establish clinical efficacy, a specific mechanism, or a quantitative cognitive-protective effect.

References

1. World Health Organization. World mental health report: Transforming mental health for all. Geneva: World Health Organization; 2022.
2. Santomauro DF, Mantilla Herrera AM, Shadid J, et al. Global prevalence and burden of depressive and anxiety disorders in 2020 due to the COVID-19 pandemic. *Lancet*. 2021;398(10312):1700–1712.
3. Ferrari AJ, Santomauro DF, Aali A, et al. Global, regional, and national burden of mental

- disorders in 204 countries and territories, 1990–2019. *Lancet Psychiatry*. 2022;9(2):137–150.
4. Malhi GS, Mann JJ. Depression. *Lancet*. 2018;392:2299–2312.
 5. Troubat R, Barone P, Leman S, et al. Neuroinflammation and depression: a review. *Eur J Neurosci*. 2021;53(1):151–171.
 6. Nabavi SF, Sureda A, Habtemariam S, et al. Medicinal plants and neuroprotection: mechanisms and therapeutic perspectives. *Pharmacol Res*. 2020;159:104896.
 7. Olas B. Sea buckthorn (*Hippophaerhamnoides* L.)—a source of bioactive compounds with neuroprotective potential. *Nutrients*. 2023;15(9):2086.
 8. Steru L, Chermat R, Thierry B, Simon P. The tail suspension test: a new method for screening antidepressants in mice. *Psychopharmacology (Berl)*. 1985;85:367–370.
 9. Porsolt RD, Bertin A, Jalfre M. Behavioral despair in mice: a primary screening test for antidepressants. *Arch Int Pharmacodyn Ther*. 1977;229:327–336.