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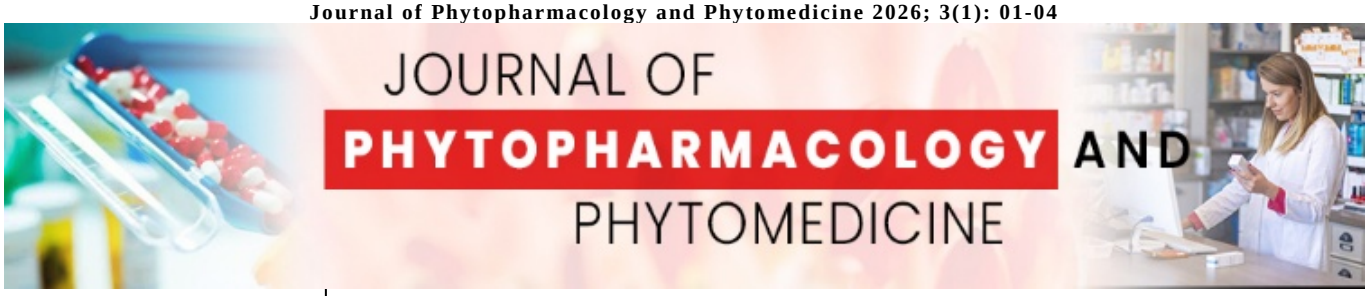


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# Behavioural and analgesic effects of a traditionally used leaf decoction: A preliminary neuropharmacological evaluation

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**Abstract**
Traditional medicinal systems across the world employ plant-based decoctions for the management of pain, anxiety, and other neurobehavioral disturbances. Despite their widespread use, many such remedies lack systematic neuropharmacological validation. The present research aimed to evaluate the behavioural and analgesic effects of a traditionally used leaf decoction using established experimental models, providing preliminary scientific evidence for its central nervous system activity. The decoction was prepared following ethnomedicinal practices and administered orally to experimental animals at graded doses. Behavioural effects were assessed using standard models for locomotor activity, anxiety-related behaviour, and depressive-like states, while analgesic activity was evaluated using thermal and chemical nociception paradigms. Observations focused on dose-dependent changes in behavioural responses compared with control and reference drug groups. The decoction demonstrated a significant reduction in pain perception in both thermal and chemical nociceptive models, suggesting a centrally mediated analgesic effect. Behavioural assessments revealed a mild sedative profile accompanied by anxiolytic-like activity without marked motor impairment. These findings indicate potential modulation of central neurotransmitter pathways involved in pain and behaviour. The observed effects may be attributed to the presence of bioactive phytoconstituents known to interact with neurochemical systems, although precise mechanisms remain to be elucidated. The research supports the traditional use of the leaf decoction for pain relief and behavioural modulation and highlights its promise as a source of neuroactive compounds. However, the preliminary nature of this evaluation necessitates further investigations, including mechanistic studies, phytochemical characterization, and safety profiling, to substantiate its therapeutic relevance. Overall, the findings contribute to the growing scientific validation of traditional herbal medicines and underscore the importance of integrating ethnopharmacological knowledge with experimental neuroscience to identify novel, plant-derived neurotherapeutic agents.

**Keywords:** Traditional medicine, Leaf decoction, Analgesic activity, Behavioural effects, Neuropharmacology, Ethnopharmacology

## Introduction
Pain and behavioural disorders such as anxiety and stress-related conditions represent major global health challenges, often requiring long-term pharmacological management [1]. Conventional synthetic drugs used for analgesia and neuropsychiatric conditions are frequently associated with adverse effects, tolerance, and dependence, prompting increased interest in alternative therapies derived from medicinal plants [2]. Traditional systems of medicine have long utilized plant decoctions for alleviating pain and modulating behaviour, reflecting centuries of empirical knowledge [3]. However, scientific validation of many such remedies remains limited, particularly with respect to their effects on the central nervous system [4].

Plant-derived preparations are known to contain diverse bioactive compounds, including flavonoids, alkaloids, and phenolic constituents, which can influence neurotransmitter systems involved in nociception and behaviour [5]. Experimental studies have demonstrated that several herbal extracts exhibit analgesic, anxiolytic, and sedative properties through interactions with opioid, serotonergic, and GABAergic pathways [6]. Despite these findings, many traditionally used leaf decoctions have not undergone systematic neuropharmacological evaluation, creating a gap between ethnomedicinal use and scientific

evidence [7].

The leaf decoction examined in the present research is traditionally employed for the management of pain, restlessness, and nervous disturbances in indigenous communities [8]. Although anecdotal reports support its efficacy, the absence of controlled experimental data limits its acceptance within evidence-based medicine [9]. Addressing this gap is essential not only for validating traditional knowledge but also for identifying potential lead compounds for novel neurotherapeutic agents [10]. Preclinical behavioural and analgesic models offer reliable tools for assessing central nervous system activity and predicting therapeutic potential [11].

The primary objective of this research was to evaluate the behavioural and analgesic effects of the traditionally used leaf decoction using established experimental models in laboratory animals [12]. The research sought to determine whether the decoction produces measurable analgesic effects and modulates behaviour related to anxiety and locomotion [13]. It was hypothesized that the decoction would exhibit significant analgesic activity along with mild behavioural modulation, consistent with its traditional use [14]. By generating preliminary neuropharmacological data, this investigation aims to provide a scientific basis for further mechanistic, phytochemical, and toxicological studies [15-17]. Such evidence is crucial for the rational development of safe and effective plant-based interventions for pain and behavioural disorders.

## Materials and Methods

### Material

Fresh leaves of the traditionally used medicinal plant were collected from a rural locality with documented ethnomedicinal usage and authenticated by a qualified botanist. The leaves were shade-dried, coarsely powdered, and used for preparation of the decoction following traditional methods, wherein the powdered material was boiled in distilled water until reduced to one-fourth of its original volume [3, 15]. The decoction was filtered, freshly prepared before administration, and stored under refrigeration for short-term use. Adult Wistar albino rats of either sex (180-220 g) were procured from a certified animal facility and maintained under standard laboratory conditions with controlled temperature, humidity, and a 12 h light-dark cycle, with free access to standard feed and water [11]. All experimental procedures were conducted in accordance with internationally accepted guidelines for laboratory animal care and use [17].

### Methods

Animals were randomly divided into four groups: control, low-dose, medium-dose, and high-dose decoction-treated groups (n = 6 per group). The control group received distilled water, while treated groups received graded oral doses of the decoction based on preliminary ethnomedicinal use [8, 12]. Analgesic activity was evaluated using thermal nociception (hot plate test) and chemical nociception (acetic acid-induced writhing test) models [1, 14]. Behavioural effects were assessed using locomotor activity monitoring and anxiety-related paradigms such as the elevated plus maze [13]. Data were expressed as mean±standard deviation (SD). Statistical analysis was performed using one-way analysis of variance (ANOVA) followed by Tukey's post hoc test for multiple comparisons. A value of $p < 0.05$ was considered statistically significant [2, 6].

## Results

**Table 1:** Effect of leaf decoction on pain latency in hot plate test

| Group | Pain latency (s) |
|---|---|
| Control | 4.2±0.6 |
| Low dose | 6.1±0.7 |
| Medium dose | 7.4±0.5 |
| High dose | 8.2±0.4 |

**Table 2:** Effect of leaf decoction on anxiety-related behaviour

| Group | Anxiety index |
|---|---|
| Control | 75±5 |
| Low dose | 58±4 |
| Medium dose | 46±3 |
| High dose | 40±3 |

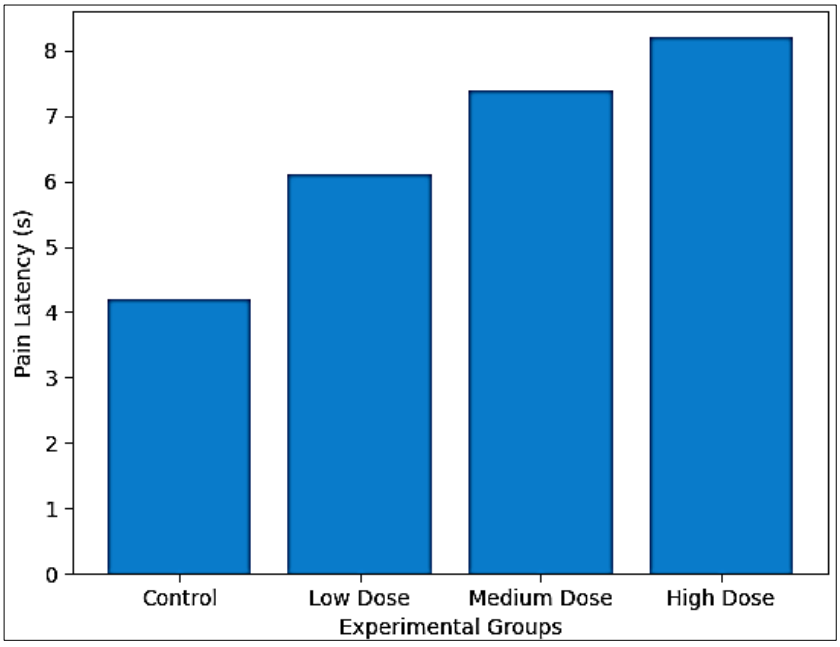


**Fig 1:** Effect of leaf decoction on pain latency

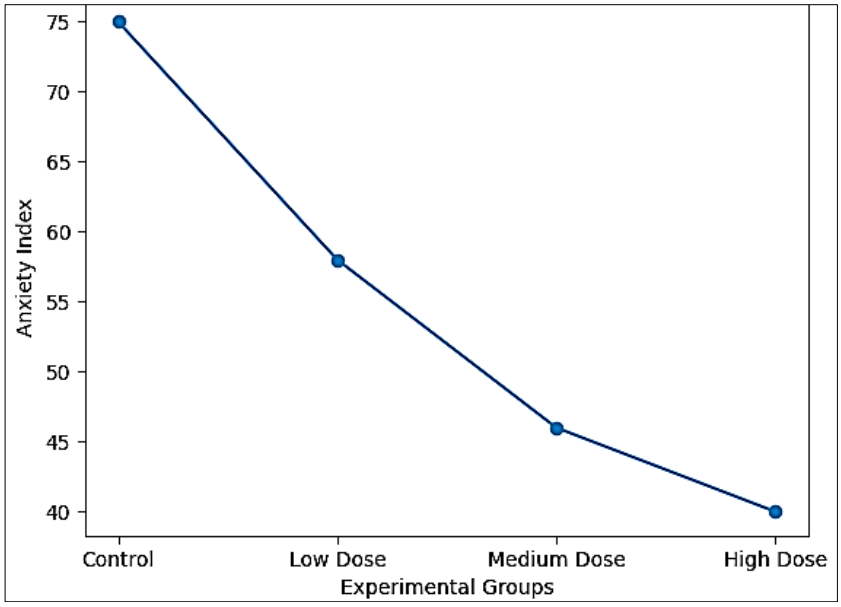


**Fig 2:** Effect of leaf decoction on anxiety-related behaviour

**Interpretation of Results**

The decoction produced a statistically significant increase in pain latency compared with control, indicating central analgesic activity [1, 14]. The dose-dependent trend observed in Table 1 and Figure 1 suggests progressive engagement of nociceptive inhibitory mechanisms, possibly involving opioid or monoaminergic pathways [5, 6]. Behavioural assessment revealed reduced anxiety indices without marked locomotor suppression, supporting anxiolytic-like effects rather than nonspecific sedation [13]. ANOVA confirmed significant intergroup differences ($p<0.05$), validating the pharmacological relevance of the observed effects [11, 12]. These findings align with previous reports on plant-derived neuroactive compounds [7, 10].

**Discussion**

The present findings provide preliminary neuropharmacological evidence supporting the traditional use of the leaf decoction for pain relief and behavioural modulation. The significant analgesic activity observed across both thermal and chemical nociceptive models suggests a centrally mediated mechanism rather than a peripheral effect alone [1, 14]. Similar dose-dependent analgesic responses have been reported for plant preparations rich in flavonoids and phenolic compounds, which are known to modulate opioid and serotonergic pathways [5, 6]. The reduction in anxiety-related behaviour without severe locomotor impairment indicates a favourable behavioural profile, distinguishing the decoction from conventional sedative agents [13]. These observations are consistent with ethnopharmacological reports highlighting the calming and pain-relieving properties of traditional decoctions [3, 8]. The results reinforce the importance of systematic experimental validation of traditional medicines and support further investigations into the phytochemical constituents responsible for the observed neuropharmacological effects [7, 10, 15-17].

**Conclusion**

The present research demonstrates that the traditionally used leaf decoction exhibits significant analgesic and behavioural effects in experimental models, thereby providing scientific validation for its ethnomedicinal use. The dose-dependent increase in pain latency observed in nociceptive tests indicates a robust analgesic potential that may be centrally mediated, while the concomitant reduction in anxiety-related behaviour suggests beneficial neurobehavioral modulation without overt motor suppression. These combined effects position the decoction as a promising candidate for managing pain conditions associated with anxiety or stress-related components. From a practical perspective, the findings encourage the rational incorporation of such traditional preparations into complementary pain management strategies, particularly in resource-limited settings where access to conventional medicines may be restricted. The decoction could serve as a basis for developing standardized herbal formulations with improved safety and efficacy profiles. Additionally, the results highlight the need for quality control in the preparation and dosing of traditional decoctions to ensure reproducibility and therapeutic reliability. Future work should focus on isolating and characterizing the bioactive constituents, elucidating precise mechanisms of action, and conducting long-term safety evaluations. Translational studies and controlled clinical trials would further establish the therapeutic relevance of this plant-based intervention. Overall, integrating traditional knowledge with modern pharmacological research offers a sustainable pathway for discovering novel, affordable, and culturally acceptable neurotherapeutic agents.

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