Research Article
CODEN (USA): IJPLCP

ISSN: 0976-7126
Parmar & Gupta, 16(11):1-4, 2025

International Journal of Pharmacy & Life Sciences
Open Access to Researcher

Neuropharmacological Studies on Anxiety-Reducing Effects *of Sarcostemma acidum* Aerial Parts

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Article info

Received: 16/09/2025

Revised:15/10/2025

Accepted: 30/10/2025

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Abstract

The present investigation was undertaken to comprehensively evaluate the anxiolytic potential of the aqueous extract prepared from the aerial parts of *Sarcostemma acidum* (Roxb.) Voigt, a traditionally utilized medicinal plant. In this study, Swiss albino adult mice were employed as experimental models to assess behavioral changes associated with anxiety-like conditions. The anxiolytic activity of the extract was determined primarily using the Light–Dark Box test, a widely accepted behavioral paradigm that measures the innate aversion of rodents to brightly illuminated areas. Additionally, motor coordination and possible neuromuscular impairment were evaluated through the Rota Rod test, ensuring that any observed anxiolytic response was not accompanied by sedative or muscle relaxant effects.

The aqueous extract was administered orally at dose levels of 200 mg/kg and 400 mg/kg body weight and its efficacy was compared against the standard benzodiazepine anxiolytic drug, diazepam (1 mg/kg, i.p.). Behavioral observations revealed that treatment with the extract resulted in a significant and dose-dependent increase in the duration spent in the brightly illuminated compartment of the Light–Dark Box, along with an increased frequency of transitions between the two chambers. These effects suggest a reduction in anxiety-driven responses and improvements in exploratory behavior. The extract did not induce noticeable deficits in motor coordination, indicating that its anxiolytic action is likely independent of sedative effects. Collectively, the findings demonstrate that the aqueous aerial extract of *Sarcostemma acidum* exhibits promising anxiolytic properties and highlights its potential as a natural therapeutic agent for managing anxiety-related disorders.

Keywords: *Sarcostemma acidum,* Diazepam, Anxiolytic Activity

Introduction

Anxiety represents a distressing emotional condition characterized by persistent feelings of uneasiness, heightened tension, excessive worry, and physiological discomfort. When such symptoms become severe and disproportionate to the triggering situation, they may progress into clinically diagnosable anxiety disorders, significantly impacting daily activities and overall well-being. These disorders encompass a wide spectrum, including Agoraphobia, Specific Phobia, Social Anxiety Disorder, Panic Disorder, Separation Anxiety Disorder, and Selective Mutism. Anxiety has been defined as "a state of intense apprehension, uncertainty, and fear arising from the anticipation of a potential threat," often profound enough to disrupt normal psychological and physical functioning. Although current pharmacotherapies provide relief to nearly two-thirds of affected individuals, clinical outcomes remain suboptimal, with many patients experiencing inadequate improvement.

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Furthermore, prolonged use of existing anxiolytic medications is associated with adverse effects, dependency, tolerance, and withdrawal complications, raising concerns regarding their long-term effectiveness and safety [1–3].

Sarcostemma acidum (Roxb.) Voigt, commonly referred to as Somlata, is a member of the family Asclepiadaceae and is distributed in India as well as parts of Europe and the United States. This underutilized medicinal plant holds significant ethnopharmacological relevance, particularly among rural and tribal populations, who traditionally employ it for the management of ailments such as asthma, inflammatory conditions, fever, dyspepsia, gastric disorders, swelling, and general body rejuvenation. The therapeutic value of this species lies in its reservoir of bioactive phytoconstituents, offering potential leads for the development of novel pharmacologically active agents. Despite its widespread traditional applications, only limited scientific studies have been conducted to validate its use in psychiatric conditions, particularly anxiety disorders [4–6]. Therefore, the present research was undertaken to systematically investigate the anxiolytic potential of *Sarcostemma acidum* and provide evidence-based support for its traditional use.

Material and Methods

Collection and authentication of Plant Material

The aerial parts of *Sarcostemma acidum* W. & A. was collected in the months of July-August 2021 from the Jabalpur, (M.P.) and identified & authenticated by Dr. S. N. Dwivedi, Retd. Prof. and Head, Department of Botany, Janata PG College, A.P.S. University, Rewa, (M.P.) and was deposited in our Laboratory. Voucher specimen No. L/Bot./SAAP-023 was allotted.

Extraction of Plant Material

Sample were shattered and screened with 40 mesh. The shade dried coarsely powdered plant material (250gms) were loaded in Soxhlet apparatus and was extracted with water and ethanol until the extraction was completed. Further After completion of extraction, the solvent was removed by distillation. The extracts were dried using rotator evaporator. [7-8]

Acute toxicity study of extract (LD_{50})

Acute oral toxicity studies have been conducted separately followed by using OECD guideline 423. The method used defined doses of 5, 50, 300, 2000 mg/kg *p.o.* body weight. Results were allowed substance rank and classify according to the Globally Harmonized System (GHS) for classification of chemicals which causes acute toxicity. From LD_{50} determination, $1/10^{th}$ of the dose was focused as the medial for pharmacological screening. Since all the animals were alive; no mortality, no toxicity and no significant changes in the body weight between the control and treated group were observed at a dose of 2000 mg for duration of 72 hours. All experimental protocols were reviewed and accepted by the Institutional Animal Ethical Committee (IAEC) prior to the initiation of the experiment. [9]

Anxiolytic Activity (By Elevated plus maze apparatus)

An elevated plus maze consisting of two open arms (35×6 cm) and two enclosed arms (35 × 6 × 15 cm) has been used. The maze has been elevated to the height of 40 cm. Mice has been placed individually in center of apparatus, facing towards enclosed arm. The time spent by the mouse during the next 05 minutes in open & enclosed arm has been recorded on second and seventh day of dosing schedule. The animals received vehicle (1ml/kg) or plant extracts 60 minutes before and diazepam (1mg/kg, *i.p.*), 30 min. before placement on the apparatus. The increased exploratory activity in the open arm has been taken as an indicator of anxiolytic activity. [10]

Statistical Analysis

Results are expressed as means ± standard error of the mean (SEM). Comparisons between the averages of series of values were performed by ANOVA followed by Dunnett's multiple comparisons test. Data analysis employed Graphpad INSTAT version 2.0 software; statistical significance was set at $P<0.05$.

Results and Discussion

The present study was done with an objective to explore the anxiolytic activity of aqueous extract of aerial part of *S. acidum* in mice and the results are summarized in table 1. The results obtained indicate that the extract found to have significant ($P < 0.05$) anxiolytic activity. The aqueous extract at the test doses 400 mg/kg b.w. showed maximum activity when compared with standard drug.

ISSN: 0976-7126
Parmar & Gupta, 16(11):1-4, 2025

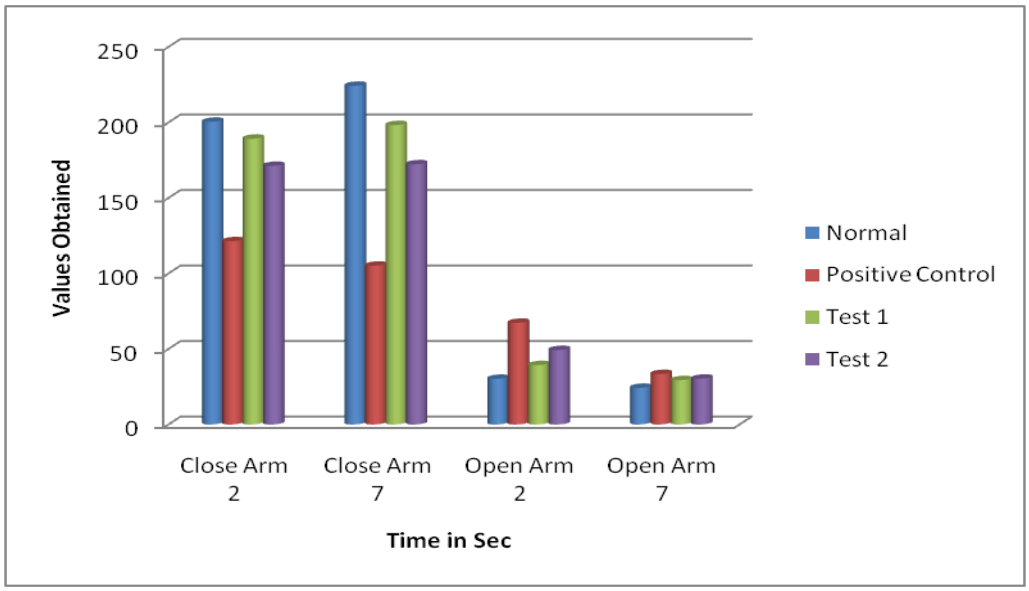
Conclusion

The present investigation showed that *S. acidum* aerial part aqueous extract had marked effects on the anxiety-related behavioural parameters on exposure to the light/dark test in mice. The extract causes"anxiolytic" behaviour comparable with the effects of diazepam.

Table 1: Anxiolytic activity of *S. acidum* by elevated plus maze apparatus in mice

Group	Treatment (mg/kg) , *p.o.*	Time Spent in Closed Arm (Sec.) (2nd Day)	Time Spent in Closed Arm (Sec.) (7th Day)	Time Spent in Open Arm (Sec.) (2nd Day)	Time Spent in Open Arm (Sec.) (7th Day)
Normal Control	Saline	200.39 ± 0.28	224.21	30.21± 0.12	24.24
Positive control	Diazepam (1 mg/kg) *i.p.*	121.33 ± 0.22	105.10	67.30 ± 0.02	33.38
Test 1 200 mg/kg	AESAAP	189.21 ± 0.01	198.20	39.29 ± 0.21	29.33
Test 2 400 mg/kg	AESAAP	171.21 ± 0.02	172.21	49.26 ± 0.02	30.32

* P<0.05, compared to control (ANOVA followed by Dunnett's multiple comparisons test).



Graph 1: Anxiolytic activity of *S. acidum*

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Cite this article as:
Parmar H.K. and Gupta S. K. (2025). Neuropharmacological Studies on Anxiety-Reducing Effects *of Sarcostemma acidum* Aerial Parts. *Int. J. of Pharm. & Life Sci.,* 16(11):1-4.

Source of Support: Nil
Conflict of Interest: Not declared
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