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REVIEWER'S REPORT

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Title: PHYTOCHEMICAL INVESTIGATION, ANTIBACTERIAL AND ANTI-INFLAMMATORY ACTIVITIES OF MUSSAENDA ELEGANS AND SMEATHMANNIA LAEVIGATA: CONTRIBUTION TO THE VALORIZATION OF GUINEAN MEDICINAL PLANTS

Recommendation:
Accept as it is

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality			√	
Clarity			√	
Significance		√		

Reviewer Name: Dr. Manju M

Detailed Reviewer's Report

1. Relevance of medicinal plants in healthcare

Medicinal plants have long served as a cornerstone of human healthcare systems across cultures. In many developing regions, they remain the most accessible and affordable form of primary treatment. Numerous modern pharmaceuticals are directly derived from plant-based bioactive compounds. Traditional medicinal knowledge continues to guide contemporary drug discovery efforts. Scientific validation of these plants bridges traditional wisdom with modern medicine. Hence, systematic phytochemical and biological studies are essential to strengthen their therapeutic credibility.

2. Rationale for selecting the studied plant species

Mussaenda elegans and Smeathmannia laevigata are traditionally valued medicinal plants with limited scientific evaluation. Both species are commonly found in West Africa and are frequently used in folk remedies. Their ethnomedicinal relevance suggested the presence of pharmacologically active constituents. However, the absence of detailed phytochemical and biological data justified their selection. Investigating such underexplored plants contributes to biodiversity-based drug discovery. This approach supports the scientific documentation of indigenous medicinal resources.

3. Overall aim of the investigation

The primary objective of this study was to scientifically assess the medicinal potential of the selected plant leaves. Particular emphasis was placed on phytochemical composition and associated biological activities. Antimicrobial and anti-inflammatory properties were prioritized due to their high clinical relevance. The study aimed to link chemical constituents with observed pharmacological effects. Such an integrated evaluation enhances scientific interpretation. This approach strengthens the reliability of traditional medicinal claims.

4. Study location and botanical origin

Plant materials were collected from the Kankan commune in the Republic of Guinea. This region is known for its rich plant biodiversity and strong tradition of herbal medicine. Favorable environmental conditions supported healthy plant growth. Proper documentation of the collection site enhances reproducibility and transparency. Regional studies also highlight the medicinal potential of local flora. This contributes to the conservation and valorization of indigenous plant resources.

5. Authentication and handling of plant material

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Correct botanical identification was ensured through expert taxonomic verification. Leaves were carefully harvested to avoid physical damage and contamination. Immediate and appropriate handling minimized enzymatic degradation of active compounds. Authentic plant sourcing is critical for reproducible scientific outcomes. This step reduces experimental ambiguity. Accurate authentication strengthens the overall credibility of the study.

6. Processing and preservation of leaf samples

Collected leaves were shade-dried at ambient temperature to preserve thermolabile constituents. Drying under controlled conditions prevented microbial growth and chemical degradation. The dried material was finely powdered to ensure extraction efficiency. Samples were stored in airtight containers to avoid moisture absorption. Standardized processing ensured uniformity across experiments. Proper preservation supports reliable and reproducible results.

7. Extraction strategy and solvent selection

A hydroethanolic solvent system (70% ethanol) was selected for extraction. This solvent efficiently dissolves both polar and semi-polar phytochemicals. Exhaustive maceration improved the recovery of bioactive compounds. Rotary evaporation was used to remove solvent gently. This method minimized thermal degradation of metabolites. The approach ensured biologically active extracts suitable for analysis.

8. Preliminary phytochemical screening significance

Qualitative phytochemical screening provided an initial overview of the chemical constituents present. It helped predict potential biological activities of the extracts. Standardized chemical tests ensured methodological reliability. Early screening guided subsequent quantitative analyses. This step reduced experimental uncertainty. It formed the foundation for interpreting pharmacological results.

9. Detection of major metabolite classes

Both plant extracts contained tannins, flavonoids, mucilage, and reducing compounds. These metabolites are widely associated with therapeutic properties. Their presence supports traditional medicinal use of the plants. Multiple compound classes suggest possible synergistic effects. Chemical diversity often enhances biological efficacy. This richness increases pharmacological relevance.

10. Identification of bioactivity-related compounds

Specific tests confirmed the presence of flavonoids, alkaloids, and anthraquinones. These compounds are known for antimicrobial and anti-inflammatory activities. Established chemical reactions ensured reliable detection. Their coexistence explains the observed biological effects. Such chemical diversity supports multi-target pharmacological action. The findings align with known therapeutic mechanisms.

11. Importance of phenolic compounds

Phenolic compounds play a central role in plant-based therapeutics. They exhibit strong antioxidant, antimicrobial, and anti-inflammatory activities. Their abundance often correlates with biological potency. Quantifying phenolics enhances scientific interpretation of efficacy. These compounds also protect plants from environmental stress. Their presence underscores the medicinal value of the extracts.

12. Quantification of total polyphenols

Total phenolic content was determined using the Folin–Ciocalteu method. Gallic acid was employed as the reference standard. Spectrophotometric analysis ensured precision and reproducibility. Results were expressed as gallic acid equivalents. This standardized approach allows inter-study comparison. Quantitative data strengthened biological correlations.

13. Measurement of flavonoid content

Flavonoid levels were estimated using the aluminum chloride colorimetric assay. Quercetin served as the calibration standard. This method selectively measures flavonoid structures. Quantitative results supported antimicrobial and anti-inflammatory findings. Higher flavonoid content indicated stronger bioactivity. The assay enhanced chemical–biological interpretation.

14. Determination of tannin concentration

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Tannin content was assessed using the vanillin–HCl method. Catechin equivalents ensured standardized expression of results. Tannins are known for antimicrobial and protein-binding properties. Quantification enabled comparative analysis between species. This strengthened structure–activity relationships. The findings supported therapeutic relevance.

15. Comparative phytochemical richness of the plants

Mussaenda elegans exhibited higher levels of phenolics, flavonoids, and tannins. This indicates a chemically richer phytochemical profile. Smeathmannia laevigata showed moderate but meaningful concentrations. Quantitative differences explain variations in biological activity. Such comparisons aid in plant prioritization. They guide future pharmacological exploration.

16. Selection of microbial test organisms

Clinically relevant bacterial and fungal strains were selected for antimicrobial testing. Both Gram-positive and Gram-negative bacteria were included. Candida albicans represented common fungal pathogens. This selection ensured medical relevance of results. Testing diverse organisms strengthened applicability. The approach supports translational significance.

17. Antimicrobial testing methodology

The microdilution method was used to determine minimum inhibitory concentrations. Standardized inoculum sizes ensured experimental consistency. Colorimetric indicators facilitated accurate growth detection. Experiments were conducted in triplicate. This enhanced statistical reliability. The method is internationally accepted in antimicrobial research.

18. Antibacterial efficacy of Mussaenda elegans

The extract exhibited strong antibacterial activity against tested pathogens. Low MIC values indicated notable potency. Activity against resistant strains was particularly significant. These results highlight therapeutic promise. The chemical richness likely contributed to efficacy. This supports its traditional medicinal use.

19. Antimicrobial performance of Smeathmannia laevigata

This extract showed moderate broad-spectrum antimicrobial activity. It inhibited both bacterial and fungal organisms. Although less potent than Mussaenda elegans, effects were meaningful. Such activity validates ethnomedicinal applications. Optimization may enhance efficacy. The plant remains pharmacologically relevant.

20. Importance of antifungal observations

Activity against Candida albicans is clinically significant. Fungal infections are increasingly resistant to conventional drugs. Plant-based antifungal agents offer alternative solutions. These findings expand the therapeutic scope of the study. They support further antifungal investigations. This adds translational value.

21. Anti-inflammatory evaluation model

The formalin-induced paw edema model in rats was employed. This model reliably reflects acute inflammatory responses. Controlled experimental conditions ensured validity. Oral administration mimicked therapeutic exposure. The model is widely accepted in pharmacology. It supports biological relevance.

22. Observed anti-inflammatory effects

Both plant extracts produced moderate reduction in paw edema. Mussaenda elegans demonstrated comparatively higher inhibition. Although less potent than standard drugs, effects were significant. Phytochemicals likely mediated the response. This suggests adjunct therapeutic potential. The results support traditional use.

23. Statistical validation of results

Data were analyzed using appropriate statistical methods. Results were expressed as mean ± SEM. ANOVA followed by post-hoc tests confirmed significance. Statistical rigor enhanced result reliability. This minimized experimental bias. The findings were scientifically robust.

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24. Correlation between chemistry and bioactivity

Higher phenolic content correlated with stronger biological activity. This supports mechanistic interpretation of results. Chemical composition explained activity variations. Such correlations enhance scientific validity. They align with established pharmacological principles. This strengthens study conclusions.

25. Medicinal relevance of leaf-based extracts

Leaves are renewable and easily accessible plant parts. They contain diverse and abundant phytochemicals. Leaf harvesting supports sustainable medicinal practices. This aligns with ethical resource utilization. The findings reinforce their therapeutic value. Leaves are suitable for herbal formulations.

26. Need for compound isolation studies

Crude extracts contain multiple active constituents. Identifying individual bioactive compounds is essential. Isolation enables structure–activity relationship studies. This step is crucial for drug development. It refines therapeutic potential. Further research is warranted.

27. Importance of toxicity assessment

Efficacy must be complemented by safety evaluation. Plant extracts may contain toxic components. Toxicity studies guide safe dosage determination. Safety profiling is essential for clinical translation. This ensures responsible therapeutic application. It protects public health.

28. Significance and future recommendations

This study provides scientific validation of two traditional medicinal plants. Results confirm antimicrobial and anti-inflammatory potential. Further in vivo and toxicity studies are recommended. Isolation and formulation research is necessary. These plants hold promise for phytotherapeutic development. They contribute to evidence-based herbal medicine.