

Chemical investigation and Therapeutic significance of Essential oils of Nigerian *Plumeria acuminata* Ait.

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Abstract

This study was designed to examine chemical profiles and therapeutic properties of essential oils of *Plumeria acuminata*. The oils obtained from the leaf, flower and root by hydrodistillation were analyzed using the gas chromatography-mass spectrometry technique. The toxicity, antimicrobial and antioxidant activities of the oils were evaluated via brine shrimp lethality, agar well-diffusion and DPPH free radical-scavenging assays, respectively. A total of 26, 85 and 12 constituents were identified in the leaf, flower and root oils corresponding to 70.0%, 99.8% and 97.4% of the whole oils, respectively. The major components were β -eudesmol, 43.0% (root), nonanal, 20.0% (flower), palmitic acid, 27.6% (root) and linalool, 16.1% (leaf). The oils exhibited high toxicity with LC_{50} less than 100 ppm, indicating they are biologically active. They also showed potent antimicrobial activities with an inhibition zone range of 1.7 ± 0.2 - 22.1 ± 0.1 mm when compared with the activities of standard drugs: Gentamycin (8.0 ± 0.0 - 12.5 ± 0.1 mm) and Ketoconazole (10.3 ± 0.4 - 21.0 ± 1.4 mm). However, low antioxidant activities were demonstrated by the oils (IC_{50} = 441-695 μ g/ mL) with respect to positive control, α -tocopherol (81.58 μ g/mL) and butylated hydroxyanisole (45.11 μ g/mL). These findings suggest that *P. acuminata* essential oils are biologically active and could be natural sources of antibiotics.

Keywords: *Plumeria acuminata*, chemical profile, Toxicity, Antimicrobial, Antioxidant.

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Introduction

Plumeria acuminata Ait. (Family: Apocynaceae) is a medicinal plant native to South America, Central America, Mexico and the Caribbean. The plant is widely cultivated because of its fragrance and the flowers that beautify the environment. Nevertheless, the plant is also used in folk medicine in the treatment of rheumatism, tooth ache, asthma, heatstroke, constipation, fever, dysentery and diarrhea. Previous reports on this plant include phytochemical constituents and their pharmacological activities¹. The present study is aimed at evaluating the chemical constituents, toxicity, antimicrobial and antioxidant activities of essential oils from the leaf, flower and root of Nigerian *P.acuminata* and also compare the chemical compositions with those results from previous studies from other part of the world. Toxicity, antioxidant and antimicrobial activities of these oil as well as the chemical composition of the root oil are been reported for the first time.

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Materials and Methods

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Results

The summary of the GC/MS analysis of the Eos were given in Table 1. The oils exhibited high toxicity with LC50 less than 100 ppm (Table 2), indicating they are biologically active. The oils also demonstrated good antimicrobial activities (Table 3). However, low antioxidant activities were demonstrated by the oils (IC50= 441-695 µg/ mL) with respect to positive control, α -tocopherol (81.58 µg/mL) and butylated hydroxyanisole (45.11 µg/ml)

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Conclusion

Plumeria acuminata leaf, flower and root essential oils showed commendable antimicrobial activities and toxicity against brine shrimp. The results from this study suggest that essential oils especially the leaf oil, might be an alternative source of antimicrobial and antitumor agents. However, further investigations to determine the minimum inhibitory concentrations and the toxicity of the oils against human cell lines will be carried out..

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Table 1 Classes of Compounds in the EOs

	Percentage composition (%)`		
Classes	Leaf	Flower	Root
Monoterpene hydrocarbons	3.8	2.9	-
Oxygenated monoterpenes	18.7	16.2	-
Sesquiterpene hydrocarbons	8.9	1.1	-
Oxygenated sesquiterpenes	1.1	5.7	47.6
Apocarotenoids	7.2	0.1	-
Diterpenes	6.8	1.3	-
Non terpenes	23.5	72.7	49.8
Percentage identified	70.0	99.8	97.3
Number identified	25	85	12

Table 2 Activities of Eos against the Brine shrimps

EO	LC ₅₀ (ppm)	LCL (ppm)	UCL (ppm)	CL
Leaves	6.9070	1.1274	14.6368	0.2970
Flowers	23.1982	10.5660	41.7706	0.1514
Root	61.2245	33.8675	104.6401	0.1106

LC₅₀- Concentration with 50% mortality LCL- Lower confidence limit UCL- Upper confidence limit CL- Confidence limit ppm- part per million

References

- 1 Shinde, P. R., Patil P. S. and Bairagi V. A. 2014. Phytopharmacological review of *Plumeria* species. *Scholars Academic Journal of Pharmacy*, 3: 217-227.
- 2 Alade,A. T., Aboaba,S. O., Satyal,P. and Setzer,W. N. 2021. Evaluation of chemical profiles and biological properties of *Gliricidia sepium* (Jacq.) Walp. volatile oils from Nigeria. *Natural Volatiles and Essential Oils*, 8(3): 34-43.[Doi.org/10.37929/nveo.862407](https://doi.org/10.37929/nveo.862407)

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