

PHYTOCHEMICAL, ANTIOXIDANT AND ANTIMICROBIAL STUDIES OF THE LEAVES OF *UVARIA CHAMAE* (P. BEAUV)

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Abstract

This study investigates the phytochemical composition, antioxidant, and antimicrobial activities of the methanol leaf extract of Uvaria chamae (P. Beauv). The antimicrobial and antioxidant properties were evaluated using agar disk-diffusion, 2,2-diphenyl-1-picrylhydrazyl (DPPH), and Potassium Ferric Reducing Antioxidant Power (PFRAP) assays. Phytochemical screening revealed the presence of saponins, flavonoids, carbohydrates, tannins, alkaloids, and terpenoids. The extract demonstrated strong antioxidant activity with significant radical scavenging potential comparable to standard ascorbic acid. Antimicrobial results indicated concentration-dependent inhibition against Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa, with the highest activity observed at 250 mg/ml. These findings validate the ethnomedicinal use of Uvaria chamae and suggest its potential as a source of natural antioxidants and antimicrobial agents for managing multidrug-resistant infections.

Keywords: *Uvaria chamae*, phytochemical screening, antioxidant activity, antimicrobial properties, medicinal plants, Nigeria.

1. Introduction

Natural products have long served as vital sources of bioactive compounds, many of which form the foundation of modern pharmaceuticals. Secondary metabolites such as alkaloids, flavonoids, and terpenoids are known for their diverse pharmacological activities, including antimicrobial and antioxidant properties (Newman & Cragg, 2016). The increasing incidence of antibiotic resistance has renewed scientific interest in plant-based therapeutics as viable alternatives to synthetic drugs (Iwu et al., 1999). *Uvaria chamae* (P. Beauv), a member of the Annonaceae family, is native to West and Central Africa and widely used in traditional medicine for treating fever, infections, and inflammatory conditions (Burkill, 1985; Aliyu & Chedi, 2010). Despite its broad ethnomedicinal use, there is limited scientific evidence validating its pharmacological properties. This study therefore aims to assess the phytochemical constituents, antioxidant capacity, and antimicrobial potential of *Uvaria chamae* leaves to provide a scientific basis for its traditional applications and promote the search for novel plant-derived therapeutic compounds.

2. Materials and Methods

2.1 Sample Collection and Preparation

Fresh leaves of *Uvaria chamae* were collected from a forest region in Nigeria, identified and authenticated at the Department of Botany, University of Abuja. The leaves were washed, air-dried at room temperature, and pulverized into fine powder for extraction.

2.2 Extraction Procedure

Approximately 500 g of the powdered leaves was soaked in methanol for 72 hours with intermittent stirring. The filtrate was concentrated using a rotary evaporator at 40 °C to obtain the crude methanol extract.

2.3 Phytochemical Screening

Standard procedures were used to test for the presence of alkaloids, flavonoids, saponins, tannins, terpenoids, and carbohydrates following methods described by Trease and Evans (1996) and Sofowora (1982).

2.4 Antioxidant Assay

Antioxidant activities were determined using DPPH and PFRAP assays. Percentage inhibition was calculated in comparison to ascorbic acid as a standard antioxidant.

2.5 Antimicrobial Activity

The agar disk-diffusion method was used to evaluate antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) were determined using serial dilution techniques.

3. Results and Discussion

Phytochemical screening confirmed the presence of major secondary metabolites such as saponins, tannins, flavonoids, alkaloids, carbohydrates, and terpenoids, which contribute to the biological activity of the plant.

Phytochemical Component	Observation
Alkaloids	✓ Present
Flavonoids	✓ Present
Saponins	✓ Present
Tannins	✓ Present
Terpenoids	✓ Present
Carbohydrates	✓ Present
Glycosides	✗ Not detected
Steroids	✗ Not detected

The DPPH radical scavenging assay revealed that the methanol extract exhibited strong antioxidant potential, comparable to ascorbic acid. Similarly, the PFRAP test confirmed the reducing power of the extract, indicating a high capacity to neutralize free radicals.

Sample (mg/mL)	Concentration % (Extract)	DPPH Inhibition % (Ascorbic Acid)	DPPH Inhibition PFRAP (Fe^{2+}/g)	(μmol
25	42.3	56.4	112.5	
50	58.9	70.8	136.7	
100	73.2	82.1	162.9	
250	86.4	91.7	188.3	

Antimicrobial tests showed concentration-dependent activity with *Staphylococcus aureus* being the most susceptible organism.

Microorganism	Extract (mg/mL)	Concentration Zone of Inhibition (mm)	Ciprofloxacin (10 µg/mL)
<i>Staphylococcus aureus</i>	50	11.2	25.0
	100	16.5	25.0
	250	22.4	25.0
<i>Escherichia coli</i>	50	8.3	24.2
	100	12.1	24.2
	250	18.7	24.2
<i>Pseudomonas aeruginosa</i>	50	6.5	23.6
	100	9.8	23.6
	250	14.3	23.6

These findings support previous reports that *Uvaria chamae* contains bioactive flavonoids and acetogenins responsible for antimicrobial efficacy.

4. Conclusion

This study confirms that *Uvaria chamae* leaves are rich in phytochemicals with notable antioxidant and antimicrobial activities. The extract's ability to scavenge free radicals and inhibit microbial growth supports its ethnopharmacological use in treating infections and inflammation. Further work on isolation and structural elucidation of active compounds is recommended to develop standardized herbal formulations and potential drug candidates.

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