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Comprehensive Phytochemical Profiling of the Ethanolic Extract of *Zephyranthes candida* (Amaryllidaceae)

S. V. Madhale
Department of Botany
Shri. Yashwantrao Patil Science College, Solankur, Maharashtra India.
svmadhale11@gmail.com

Abstract: *Phytochemicals are the non-nutritive, bioactive chemical compounds that occur naturally in plants, acting as a primary defense mechanism against environmental stressors and pathogens. The extraction of these compounds using ethanol is a standard pharmacological practice, as ethanol effectively dissolves a broad spectrum of secondary metabolites including polar phenolics and non-polar terpenoids. This study aims to provide a rigorous qualitative and quantitative assessment of the chemical constituents of a specific test plant.*

Keywords: *Phytochemicals*

I. INTRODUCTION

Phytochemicals are the non-nutritive, bioactive chemical compounds that occur naturally in plants, acting as a primary defense mechanism against environmental stressors and pathogens. The extraction of these compounds using ethanol is a standard pharmacological practice, as ethanol effectively dissolves a broad spectrum of secondary metabolites including polar phenolics and non-polar terpenoids. This study aims to provide a rigorous qualitative and quantitative assessment of the chemical constituents of a specific test plant.

II. MATERIALS AND METHODS

Extraction

The plant material was subjected to ethanolic extraction to isolate the bioactive fractions for further analysis.

Qualitative Methodology

The screening for various secondary metabolites was conducted using globally recognized protocols:

Alkaloids: Detection was performed using Mayer's, Dragendorff's, and Wagner's reagents as described by Evans (2009)

Terpenoids: The Salkowski test was utilized following the procedures of Trease and Evans (2002)

Phenolics: Presence was determined via Ferric chloride and Lead acetate methods outlined by Harborne (1998)

Phytosterols: Screening was conducted through the Libermann-Burchard and Salkowski tests based on Sofowora (1993)

Quantitative Methodology

Quantitative estimations were calculated as percentage composition (g/100g) using modified gravimetric and spectrophotometric procedures.

III. RESULTS AND DETAILED EXPLANATION

Qualitative Screening Results

The qualitative analysis revealed a significant presence of phenolic compounds, indicated by the formation of a greenish-blue color during testing Flavonoids were identified by the transition from yellow to colorless in the alkaline reagent test

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Table 1: Qualitative Phytochemical screening of Ethanol extract

Phytochemical	Test Name	Observation	Result
Phenolics	Ferric chloride	Blue/green/purple	++ (Higher Quantity)
Terpenoids	Salkowski	Reddish-brown interface	+ (Present)
Alkaloids	Mayer's/Wagner's	Cream/Brown ppt	+ (Present)
Flavonoids	Shinoda/Alkaline	Red/orange; Yellow→colorless	+ (Present)
Phytosterols	Libermann-Burchard	No Blue-green color	Absent

Quantitative Composition

The quantitative data highlights **Terpenoids** as the most abundant constituent at 2.35 \pm 0.25 g/100g, followed by **Phenolics** at 1.55 \pm 0.12 g/100g[1414]. Interestingly, while phytosterols were not detected qualitatively, the quantitative analysis measured a trace amount of 0.21 \pm 0.05 g/100g

Table 2: Percentage composition (g/100g) [16]

Phytochemicals	Composition (g/100g)
Terpenoids	2.35 \pm 0.25
Phenolics	1.55 \pm 0.12
Alkaloids	0.29 \pm 0.04
Flavonoids	0.24 \pm 0.06
Phytosterols	0.21 \pm 0.05

IV. DISCUSSION

The high concentration of terpenoids (2.35 g/100g) suggests the plant may possess significant anti-inflammatory or antimicrobial properties. The "higher quantity" of phenolics observed qualitatively aligns with the 1.55 g/100g measured quantitatively, reinforcing the plant's potential as a source of natural antioxidants. The discrepancy in phytosterols—being absent in qualitative tests but present in quantitative results—is often attributed to the quantitative method's higher sensitivity to low concentrations.

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