

THE ACTIVE COMPOUNDS IN POLYSCIAS SCUTELLARIA IDENTIFIED BASED ON THE SOLVENT

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ABSTRACT

Polyscias scutellaria, commonly known as bowl leaf, is a medicinal plant belonging to the Araliaceae family, celebrated for its diverse therapeutic properties, particularly in Southeast Asia. This study aimed to explore the phytochemical composition and antioxidant potential of various extracts of *Polyscias scutellaria*. The active compounds were identified through qualitative and quantitative analyses, employing extraction methods including 96% ethanol, ethyl acetate, and methanol. The phytochemical screening revealed a rich profile of bioactive compounds, including phenolics, flavonoids, saponins, and alkaloids. Notably, the 96% ethanol extract exhibited a phenolic content of 14.67 ± 0.33 mg GAE/g and a flavonoid content of 1.83 ± 0.05 mg QE/g, highlighting its potential as a natural antioxidant source. The ethyl acetate extract displayed the highest total phenolic content of 289.813 ± 11.381 mg GAE/g, indicating its efficiency in extracting valuable compounds. Antioxidant activity assessed via the DPPH method demonstrated significant scavenging effects, with the ethanol extract showing an IC₅₀ value of 46.28 mg/mL, surpassing the n-hexane extract. Additionally, the methanol extract revealed a higher concentration of alkaloids, carbohydrates, and saponins, suggesting its potential for functional health applications. These findings underscore the pharmacological significance of *Polyscias scutellaria* and its bioactive constituents, emphasizing the need for further research to validate its therapeutic efficacy and explore its applications in drug discovery. Overall, this study contributes to the growing body of evidence supporting the medicinal value of *Polyscias scutellaria*, advocating for its integration into traditional and modern health practices.

Keywords : *Polyscias scutellaria* ; The Active Compounds ; The Solvent

INTRODUCTION

Polyscias scutellaria, commonly referred to as bowl leaf, is a member of the Araliaceae family and is recognized for its significant medicinal properties and traditional uses in Southeast Asia (Goh, B. H., Tee, T. T., & Ibrahim, 2014). The plant's leaves are known for their unique bowl shape and are utilized in traditional medicine for their purported health benefits, which include antioxidant, anti-inflammatory, immunomodulatory, and cardiovascular protective effects (Tiwari, P., Kaur, N., & Kaur, 2011). The therapeutic potential of *Polyscias scutellaria* is largely attributed to its rich array of bioactive compounds, including flavonoids, polyphenols, saponins, tannins, and alkaloids (Khan, M. A., Ahmad, A., & Khan, 2015; Nguyen, T. M., Nguyen, H. T., & Le, 2019).

Research into the phytochemical composition of *Polyscias scutellaria* has demonstrated significant antioxidant activity attributed to the presence of phenolic compounds and flavonoids. These compounds are known for their ability to scavenge free radicals and reduce oxidative stress, which is a contributing factor to various chronic diseases, including cancer (Huzaemah et al., 2024). The Folin-Ciocalteu method, commonly used for quantifying total phenolic content,

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has shown that the leaves of *Polyscias scutellaria* have an average phenolic content of 14.67 ± 0.33 mg GAE/g, highlighting its potential as a natural antioxidant source (Muhar et al., 2023). The presence of saponins and tannins further emphasizes the therapeutic potential of *Polyscias scutellaria*. Saponins are recognized for their anti-inflammatory and immunomodulatory properties, while tannins are known for their ability to stabilize membranes and exhibit antimicrobial activity (Nasution et al., 2021). Additionally, the examination of various extraction methods, including the use of ethanol, ethyl acetate, and methanol, has yielded promising results in terms of the extraction efficiency of these bioactive compounds (Muhar et al., 2023).

Given the pharmacological significance of *Polyscias scutellaria*, the present study aims to investigate the active compounds present in various extracts of this plant, including their antioxidant, anti-inflammatory, and potential cytotoxic activities. Through qualitative and quantitative analyses, this research will provide insight into the therapeutic applications of *Polyscias scutellaria* and its extracts in the context of drug discovery.

RESEARCH METHODOLOGY

The literature review aimed to consolidate research on *Polyscias scutellaria*, focusing on its phytochemical properties, antioxidant potential, and therapeutic applications. A systematic search was conducted across databases like PubMed, Google Scholar, and ScienceDirect, using keywords such as “*Polyscias scutellaria*,” “antioxidant activity,” and “bioactive compounds.” Relevant studies from 2000 to 2024 were selected. The review categorized the literature into themes such as phytochemical composition, extraction methods, antioxidant assays, and therapeutic potential, highlighting the plant's rich content of phenolics, flavonoids, saponins, and alkaloids.

RESULT

THE 96% ETHANOL

Active Compounds	Method	Interpretation
Phenolic	Magnesium powder and 2-4 drops of concentrated hydrochloric acid (HCl)	+
	Folin-Ciocalteu	14.67 ± 0.33 mgGAE/g
Flavonoid	2-3 drops of ferric chloride (FeCl ₃)	+
	Colorimetric / Aluminum chloride	1.83 ± 0.05 mgQE/g
Alkaloid	Mayer	-
	Dragendorff	+
Flavonoid	Magnesium strip and HCl	+
Saponin	Shaking ang HCL	+
Tannin	Ferric (III) Chloride	+
Terpenoid	Liebermann-Burchard	+

Tabel 1 : Active compounds in 96% Ethanol Extract of *Polyscias scutellaria*. The 96% ethanol extract of *Polyscias scutellaria* was qualitatively identified to contain phenolic and flavonoid compounds. The presence of phenolic compounds was indicated by a blackish-green color, with the total phenolic content measured using the Folin-Ciocalteu method found to be an average of 14.67 ± 0.33 mg GAE/g (Nur et al., 2020). Additionally, the flavonoid compounds were identified by the appearance of an orange color in qualitative analysis, with the total flavonoid content determined via the aluminum chloride method averaging 1.83 ± 0.05 mg QE/g (Nur et al., 2020). Alkaloids were tested using Mayer and Dragendorff reagents, showing no precipitate with Mayer but a positive reaction (precipitate formation) with Dragendorff. Flavonoids were confirmed by a color change to red when using a magnesium strip and HCl, indicating their

presence. The test for saponins, which involved shaking the solution with HCl, resulted in stable foam formation, confirming the presence of saponins. Tannins were detected by the dark green color that developed when ferric (III) chloride was added. Lastly, terpenoids were identified through the Liebermann-Burchard test, which produced a purple color, indicating their presence in the sample (Huzaemah et al., 2024).

ETHYL ACETATE

Active Compounds	Method	Interpretation
Alkaloids	Bouchardart	+
	Maeyer	-
	Wagner	+
	Dragendorff	+
	Salkowsky	-
Triterpenoids and Steroids	Lieberman-Burchard	-
Saponins	Aquadest + Alkohol 96%	+
	FeCl ₃ 5%	+
Flavonoids	Mg + HCl	-
	H ₂ SO ₄ (dilute)	-
Tannins	FeCl ₃ 1%	+

Table 2 : Phytochemical Screening Results of Mangkokan (*Polyscias scutellaria*) Leaf Extract. The phytochemical screening of Mangkokan leaf ethanol extract (*Polyscias scutellaria*) revealed the presence of several bioactive compounds. Alkaloids were detected using the Bouchardart, Wagner, and Dragendorff methods, but the Maeyer and Salkowsky tests were negative, indicating that not all alkaloid subtypes were present. Triterpenoids and steroids were absent, as indicated by the negative Liebermann-Burchard test. Saponins were present, confirmed by both the Aquadest + alcohol 96% method and the FeCl₃ 5% test. Flavonoids were not detected, as both the Mg + HCl and dilute H₂SO₄ tests were negative. Lastly, tannins were found in the extract, as shown by the positive result in the FeCl₃ 1% test. This screening suggests that *Polyscias scutellaria* contains alkaloids, saponins, and tannins, but lacks triterpenoids, steroids, and flavonoids (Nasution et al., 2021).

N-HEXANE, ETHYL ACETATE, AND ETHANOL

No	Sample	IC ₅₀ (mg/mL)	Total Phenolic Content (mg GAE/g)	Total Flavonoid Content (mg/g)
1.	Ethanol Extract of PS (EEPS)	46.28	250.284 ± 9.381	25.4 ± 2.18
2.	Ethyl Acetate Extract of PS (EAPS)	52.67	289.813 ± 11.381	20.38 ± 1.28
3.	n-Hexane Extract of PS (nhPS)	72.33	20.41 ± 2.34	5.18 ± 0.817
4.	Vitamin C (VC)	12,31	-	-

Table 3 : Antioxidant Activity (IC₅₀), Total Phenolic, and Total Flavonoid Content of *Polyscias scutellaria* Extracts. The antioxidant activity of *Polyscias scutellaria* (PS) extract and its fractions was evaluated using the DPPH method, revealing significant findings. At a concentration of 15.625 µg/mL, the extract demonstrated a 20.95% scavenging activity for DPPH, with activity increasing as the concentration rose, indicating a positive correlation between extract concentration and antioxidant effect. Notably, the scavenging effect of PS was found to be higher than that of Vitamin C (VC) at equivalent doses. The antioxidant capacities

of the different samples were ranked in the following order: Vitamin C (VC) > Ethanol Extract of PS (EEPS) > Ethyl Acetate Extract of PS (EAPS) > n-Hexane Extract of PS (nhPS). The IC50 values, which indicate the concentration required to inhibit 50% of DPPH radicals, were determined as follows: VC at 12.31 mg/mL, EEPS at 46.28 mg/mL, EAPS at 52.67 mg/mL, and nhPS at 72.33 mg/mL. Additionally, the total phenolic content was highest in the EAPS fraction, measuring 289.813 ± 11.381 mg GAE/g dried extract, followed by EEPS with 250.284 ± 9.381 mg GAE/g, and the lowest was found in nhPS at 20.41 ± 2.34 mg GAE/g. The total flavonoid content mirrored these trends, with EEPS exhibiting the highest level at 25.4 ± 2.18 mg/g, followed by EAPS at 20.38 ± 1.28 mg/g, and nhPS at 5.18 ± 0.817 mg/g (Muhar et al., 2023).

METHANOL

No	Active Compounds	Interpretation
1.	Alkaloid	++
2.	Carbohydrate	++
3.	Saponin	++
4.	Glycoside	+
5.	Reducing Sugar	+
6.	Flavonoid	+
7.	Tannin	-
8.	Steroid	-

Note:

- (++) indicates a higher amount.
- (+) indicates a moderate amount.
- (-) indicates absence.

Table 4 : This table provides the qualitative analysis of various phytochemical constituents present in MEPSL (Methanol Extract of Polyscias scutellaria Leaves). The table indicates the presence of various phytochemical constituents in the extract, showing a higher concentration of alkaloids, carbohydrates, and saponins (++), and moderate amounts of glycosides, reducing sugars, and flavonoids (+). Tannins and steroids were absent (-). The extract of Polyscias scutellaria leaves was obtained through the cold maceration method, where 80 g of powdered leaves were soaked in 600 mL of methanol for 10 days in a sealed round-bottom flask. The mixture was then filtered and air-dried for an additional 7 days, yielding 16.15 g of leaf extract.

DISCUSSION

The present study highlights the therapeutic potential of Polyscias scutellaria, confirming its rich phytochemical composition and significant antioxidant activity while emphasizing the role of extraction methods in optimizing bioactive compound yields. The ethyl acetate extract exhibited the highest phenolic content, aligning with previous findings on the efficacy of mid-polar solvents, while the ethanol extract demonstrated a balanced profile of phenolics and flavonoids with strong antioxidant activity, corroborating earlier research. Notably, the methanol extract revealed higher concentrations of alkaloids, carbohydrates, and saponins, broadening the scope of potential therapeutic applications beyond antioxidants, particularly in anti-inflammatory and immunomodulatory contexts. These findings validate the hypothesis that Polyscias scutellaria contains bioactive compounds with therapeutic potential, but the absence of steroids and triterpenoids and variations in antioxidant efficacy across extracts underscore the need for further investigation into compound-specific mechanisms, synergistic effects, and bioavailability. While consistent with existing literature, the study adds new

insights into the influence of solvent polarity and extraction methods, offering a solid foundation for exploring the plant's role in drug discovery and functional health applications.

CONCLUSION

The study comprehensively analyzed the active compounds present in *Polyscias scutellaria* using various extraction methods, highlighting the plant's potential as a source of bioactive compounds with significant therapeutic applications. The qualitative and quantitative assessments demonstrated the presence of essential phytochemicals, including phenolics, flavonoids, saponins, and alkaloids, across different solvent extracts. Notably, the 96% ethanol extract revealed substantial phenolic and flavonoid content, while the ethyl acetate extract showed the highest total phenolic content, indicating its efficiency in extracting valuable compounds. Furthermore, the antioxidant activity analysis illustrated that the ethanol extract exhibited potent scavenging activity against DPPH radicals, outperforming the n-hexane extract. The methanol extract showed a higher concentration of alkaloids, carbohydrates, and saponins, suggesting its potential as a functional ingredient in health applications. Overall, *Polyscias scutellaria* demonstrates promising pharmacological properties, warranting further investigation into its efficacy for therapeutic purposes and potential applications in drug discovery.

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