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STUDY OF COMPARATIVE PHYTOCHEMICAL ANALYSIS OF *CHLOROPHYTUM BORIVILIANUM* EXTRACT

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ABSTRACT

This study investigates the comparative phytochemical analysis of *Chlorophytum borivilianum* (Safed Musli) extracts obtained through hydroalcoholic and aqueous methods. The extractive values indicate a higher yield in the aqueous extract (8.6%) compared to the hydroalcoholic extract (5.2%). Preliminary phytochemical screening revealed the presence of alkaloids, carbohydrates, proteins, phenols, flavonoids, diterpenes, and saponins in both extracts, with differences in the concentrations of these compounds. The hydroalcoholic extract exhibited higher levels of phenols and flavonoids, which are known for their antioxidant and anti-inflammatory properties. In contrast, the aqueous extract showed a higher concentration of saponins, which are associated with immune-boosting and cholesterol-lowering effects. The total phenolic content was significantly greater in the hydroalcoholic extract (0.541 GAE mg/100mg) compared to the aqueous extract (0.162 GAE mg/100mg), and the flavonoid content was also higher in the hydroalcoholic extract (0.614 Quercetin equivalent mg/100mg) than in the aqueous extract (0.347 Quercetin equivalent mg/100mg). These findings highlight the variations in the chemical composition of *Chlorophytum borivilianum* extracts and suggest that different extraction methods may yield extracts with distinct pharmacological properties.

Keywords: *Chlorophytum borivilianum,* Safed Musli, phytochemical analysis, hydroalcoholic extract, aqueous extract, alkaloids, flavonoids, phenols, saponins, total phenolic content, total flavonoid content, antioxidant, anti-inflammatory, medicinal plants

INTRODUCTION

Chlorophytum borivilianum, commonly known as Safed Musli, is a traditional medicinal plant native to India, primarily used for its therapeutic properties. It has gained significant attention due to its high medicinal value, especially in Ayurvedic medicine. The plant is known for its tuberous roots, which are rich in bioactive compounds, including alkaloids, saponins, flavonoids, and glycosides, which contribute to its numerous pharmacological activities. These activities include aphrodisiac, adaptogenic, anti-inflammatory, anti-diabetic, antioxidant, and anticancer effects (Lata *et al.,* 2011; Verma *et al.,* 2014).

The growing interest in *Chlorophytum borivilianum's* health benefits has spurred numerous studies focusing on the chemical composition and potential therapeutic uses of its extracts. Phytochemical analysis plays a critical role in identifying and quantifying the active components in medicinal plants. The extracts of *Chlorophytum borivilianum* are typically evaluated for their phytochemical content, which varies depending on factors

such as geographical location, growth conditions, and the method of extraction (Patil *et al.,* 2015).

Comparative phytochemical analysis is a valuable approach to understanding the differences in the chemical profiles of *Chlorophytum borivilianum* from various sources or extraction methods. This analysis aids in the identification of bioactive compounds that might contribute to its therapeutic potential. In addition, it helps assess the plant's quality, ensuring the consistency and reliability of its medicinal properties for industrial or clinical use.

Recent studies have employed advanced techniques like High-Performance Liquid Chromatography (HPLC), Gas Chromatography-Mass Spectrometry (GC-MS), and Thin-Layer Chromatography (TLC) to identify and quantify the chemical constituents of *Chlorophytum borivilianum* (Rai *et al.,* 2017; Sharma *et al.,* 2019). These methods enable the comprehensive evaluation of the plant's phytochemicals, providing valuable data for its standardization and formulation into medicinal products.

In this study, we aim to conduct a comparative phytochemical analysis of *Chlorophytum borivilianum* extracts obtained through different solvents and extraction methods, to identify and compare the variations in their chemical profiles. This research will contribute to the understanding of the medicinal potential and therapeutic efficacy of *Chlorophytum borivilianum* in modern pharmacology.

MATERIALS AND METHODS

Collection of plant materials

The roots of *Chlorophytum borivilianum* were collected from Shubham nursery, Bhopal.

Extraction of *Chlorophytum borivilianum* using microwave assisted extraction technique

The extract was prepared by microwave assisted extraction technique. Fresh *Chlorophytum borivilianum* collected, shade-dried, and made into powder. 50 gram powdered were microwave with Hydroalcoholic; ethanol: water (30:70) and aqueous solvent and packed in extraction bottle for 24 hours. The extract was filtered first using muslin cloth and then with Whatman filter paper No. 1. Excess of solvent was evaporated by rotary evaporator at 40°C to get semisolid texture of extract. The extract obtained with solvent was weighed on a constant weight and calculated on the basis of percentage w/w. Finally powdered extracts was weighed and transferred in clean and dried vial, then stored in refrigerator at 4°C until use.

Phytochemical Analysis

Preliminary phytochemical screening means to investigate the plant material in terms of its active constituents. In order to detect the various constituents present in the Hydroalcoholic and aqueous extracts of *Chlorophytum Borivilianum*, were subjected to the phytochemical tests as per standard methods. Phytochemical screening was revealed for the presence of alkaloids, glycosides, carbohydrates, tannins, resins, flavonoids, proteins and amino acids [48].

Quantitative Estimation of Phenols and Flavonoids

Total phenolic content of both the extracts was evaluated with folin-ciocalteu method. Samples containing polyphenols are reduced by the folin-ciocalteu reagent there by producing blue colored complex. The

phenolic concentration of extracts was evaluated from a gallic acid calibration curve. To prepare a calibration curve, aliquots of 5, 10, 15, 20 and 25µg/mL gallic acid methanolic solutions were mixed with 2.5 mL folin– ciocalteu reagent (diluted ten-fold) and 2.5 mL (7.5 g/l) sodium carbonate. After incubation at 25°C for 30 min, the quantative phenolic estimation was performed at 765 nm against reagent blank by UV Spectrophotometer. The calibration curve was constructed by putting the value of absorbance vs. concentration. A similar procedure was adopted for the extracts as above described in the preparation of calibration curve. All determinations were performed in triplicate. Total phenolic content was expressed as milligrams of gallic acid equivalent (GAE) per g of extract (Amic *et al.,* 2003).

Estimation of total flavonoids content

The aluminum chloride colorimetric method was modified from the procedure[51]. Quercetin was used to make the calibration curve. Ten milligrams of quercetin was dissolved in methanol and then diluted to 5-25 µg/mL. The diluted standard solutions (0.5 mL) were separately mixed with 1.5 mL of 95% ethanol, 0.1 mL of 10% aluminum chloride, 0.1 mL of 1M potassium acetate and 2.8 mL of distilled water. After incubation at room temperature for 30 min, the absorbance of the reaction mixture was measured at 415 nm with a Shimadzu spectrophotometer. The amount of 10% aluminum chloride was substituted by the same amount of distilled water in blank. Similarly, 0.5 mL of Hydroalcoholic and aqueous extracts and Flavonoid standard solutions were reacted with aluminum chloride for determination of Flavonoid content as described (Olufunmiso and Afolayan; 2011).

RESULTS AND DISCUSSION

The comparative phytochemical analysis of *Chlorophytum borivilianum* extracts provides important insights into the plant's chemical composition and its potential therapeutic applications. From the extractive values, it is clear that the aqueous extract yields a higher percentage (8.6%) compared to the hydroalcoholic extract (5.2%). This indicates that water is more efficient at extracting certain compounds, particularly polar ones like carbohydrates and phenols, while the hydroalcoholic extract may be better at capturing a broader range of compounds due to the solvent's mixed polarity.

In the preliminary phytochemical screening, both the hydroalcoholic and aqueous extracts contain alkaloids, carbohydrates, proteins, amino acids, and phenols, which are known for their wide range of pharmacological activities, such as antioxidant, anti-inflammatory, and antimicrobial effects. Both extracts also show the presence of flavonoids, though the hydroalcoholic extract has a stronger presence, as indicated by positive results in multiple tests. This suggests that hydroalcoholic extraction is more effective for isolating flavonoids, which are important due to their potent antioxidant and anti-inflammatory properties. Additionally, both extracts contain diterpenes, which are known for their anticancer effects, but only the hydroalcoholic extract shows the presence of these compounds.

Saponins are detected in the aqueous extract but are absent in the hydroalcoholic extract. Saponins have various health benefits, including cholesterol-lowering effects and

immune-boosting properties, indicating that the aqueous extract may have a different set of therapeutic potentials. On the other hand, the absence of saponins in the hydroalcoholic extract could suggest that this solvent is less efficient for extracting these compounds.

The total phenolic content is significantly higher in the hydroalcoholic extract (0.541 GAE mg/100mg) compared to the aqueous extract (0.162 GAE mg/100mg), suggesting that hydroalcoholic extraction is more efficient in isolating phenolic compounds. Phenols are known for their antioxidant properties, which help in reducing oxidative stress and inflammation, making the hydroalcoholic extract potentially more effective for antioxidant-based therapies.

Similarly, the total flavonoid content is higher in the hydroalcoholic extract (0.614 Quercetin equivalent mg/100mg) compared to the aqueous extract (0.347 Quercetin equivalent mg/100mg). This further supports the notion that hydroalcoholic extraction is more efficient at extracting flavonoids, which could be beneficial for medicinal formulations focused on antioxidant and anti-inflammatory activities.

Table 1: Extractive values obtained from *Chlorophytum borivilianum*

S. No.	Extract	% Yield w/w
1.	Hydroalcoholic	5.2%
2.	Aqueous	8.6%

Table 2: Preliminary phytochemical screening of hydroalcoholic extract of *C. borivilianum*

S. No.	Phytoconstituents	Test Name	Hydroalcoholic Extract
1	Alkaloids	Wagner's Test	**+(ve)**
2	Carbohydrates	Fehling's Test	**+(ve)**
3	Flavonoids	Lead acetate	**+(ve)**
		Alkaline reagent test	**+(ve)**
4	Proteins & Amino acids	Precipitation test	**+(ve)**
5	Phenols	Ferric chloride test	**+(ve)**
6	Diterpenes	Copper acetate test	**+(ve)**
7	Saponins	Foam test	**-(ve)**

Table 3: Preliminary phytochemical screening of aqueous extract of *C. borivilianum*

S. No.	Phytoconstituents	Test Name	Aqueous Extract
1	Alkaloids	Wagner's Test	**+(ve)**
2	Carbohydrates	Fehling's Test	**+(ve)**
3	Flavonoids	Lead acetate	**-(ve)**
		Alkaline reagent test	**+(ve)**
4	Proteins & Amino acids	Precipitation test	**+(ve)**
5	Phenols	Ferric chloride test	**+(ve)**
6	Diterpenes	Copper acetate test	**-(ve)**
7	Saponins	Foam test	**+(ve)**

Table 4: Total phenolic content of hydroalcoholic extract of *Chlorophytum borivilianum*

Extract	Total phenolic content GAE mg/100mg
Hydroalcoholic extract 1000µg/ml	0.541

Table 5: Total phenol content of aqueous extract *Chlorophytum borivilianum*

Extract	Total phenolic content GAE mg/100mg
Aqueous extract (1000µg/ml)	0.162

Table 6: Total flavonoid content of hydroalcoholic extract of *Chlorophytum borivilianum*

Extract	Flavonoid content Quercetin equivalent mg/100mg
Hydroalcoholic extract 1000µg/ml	0.614

Table 7: Total flavonoid content of Aqueous extract *Chlorophytum borivilianum*

S. No.	Extract	Flavonoid content Quercetin equivalent mg/100mg
1	Aqueous extract (1000µg/ml)	0.347

CONCLUSION

In conclusion, the comparative analysis of *Chlorophytum borivilianum* extracts reveals significant differences in their chemical profiles, with the hydroalcoholic extract showing a higher concentration of phenolic and flavonoid compounds. These differences in extract composition suggest that the hydroalcoholic extract may offer stronger antioxidant and anti-inflammatory benefits, while the aqueous extract may be better suited for other therapeutic purposes due to its higher content of saponins and other water-soluble compounds.

DECLARATION OF INTEREST

The authors declare no conflicts of interests. The authors alone are responsible for the content and writing of this article.

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