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PHARMACOGNOSTIC CHARACTERIZATION, PHYTOCHEMICAL SCREENING, AND MICROBIOLOGICAL QUALITY EVALUATION OF BEAN LEAF (*Phaseolus vulgaris* L.) SIMPLICIA

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ABSTRACT

Background: Common bean leaves *(Phaseolus vulgaris L.)* are horticultural plant materials with potential use as traditional herbal medicine due to their diverse secondary metabolites that exhibit various health-promoting properties. Pharmacognostic characterization and quality evaluation are essential to ensure the quality and safety of herbal raw materials. ***Objective:*** This study aimed to determine the microscopic characteristics, moisture content, loss on drying, phytochemical profile, and microbiological quality of common bean leaves. ***Methods:*** This study was conducted using a descriptive approach. Common bean leaf simplicia was extracted by maceration using 70% ethanol. Microscopic observations were performed on fresh leaves and powdered simplicia. Quality evaluation included the determination of moisture content, loss on drying, phytochemical screening, and microbial contamination through Total Plate Count and Yeast and Mold Count analyses. ***Results:*** The extraction process yielded an extract recovery of 11.78%. Microscopic analysis revealed the presence of epidermal tissues, stomata, trichomes, and sclerenchyma. The moisture content and loss on drying were 3.0% and 2.1%, respectively. Phytochemical screening indicated the presence of alkaloids, flavonoids, saponins, tannins, triterpenoids, and steroids. The Total Plate Count and Yeast and Mold Count were 1.6×10^5 CFU/g and 3.1×10^3 CFU/g, respectively. ***Conclusion:*** Common bean leaves possess distinctive pharmacognostic characteristics, contain various potentially bioactive secondary metabolites, and meet microbiological quality requirements for use as herbal raw materials.

ABSTRAK

Latar belakang: Daun buncis (*Phaseolus vulgaris* L.) merupakan tanaman hortikultura yang berpotensi dimanfaatkan sebagai bahan baku obat tradisional karena mengandung berbagai metabolit

sekunder yang berkhasiat bagi kesehatan. Karakterisasi farmakognostik dan evaluasi mutu diperlukan untuk menjamin kualitas dan keamanan bahan baku herbal. **Tujuan:** Penelitian ini bertujuan untuk mengetahui karakteristik mikroskopis, kadar air, susut pengeringan, profil fitokimia, dan mutu mikrobiologi daun buncis. **Metode:** Penelitian dilakukan secara deskriptif. Simplisia daun buncis diekstraksi menggunakan metode maserasi dengan etanol 70%. Pengamatan mikroskopis dilakukan pada daun segar dan serbuk simplisia. Evaluasi mutu meliputi pengujian kadar air, susut pengeringan, skrining fitokimia, serta cemaran mikroba melalui penentuan Angka Lempeng Total (ALT) dan Angka Kapang Khamir (AKK). **Hasil:** Rendemen ekstrak yang diperoleh sebesar 11,78%. Analisis mikroskopis menunjukkan adanya epidermis, stomata, trikoma, dan sklerenkim. Kadar air dan susut pengeringan masing-masing sebesar 3,0% dan 2,1%. Skrining fitokimia menunjukkan adanya alkaloid, flavonoid, saponin, tanin, triterpenoid, dan steroid. Nilai Angka Lempeng Total dan Angka Kapang Khamir berturut-turut sebesar $1,6 \times 10^5$ CFU/g dan $3,1 \times 10^3$ CFU/g. **Simpulan:** Daun buncis memiliki karakteristik farmakognostik yang khas, mengandung berbagai metabolit sekunder yang berpotensi bioaktif, serta memenuhi persyaratan mutu mikrobiologi sebagai bahan baku herbal.

INTRODUCTION

The common bean (*Phaseolus vulgaris* L.) is a widely consumed horticultural crop that provides essential nutrients such as protein, vitamins, minerals, and dietary fiber. Beyond its nutritional benefits, this plant also exhibits several pharmacological effects that may enhance human health. Studies have shown that common bean has diuretic, antihyperglycemic, anti-inflammatory, antifungal, immunomodulatory, antidiabetic, and antitumor properties. These effects are linked to its secondary metabolites, which act as bioactive compounds (Padmavathi et al., 2021).

Common bean contains diverse secondary metabolites including alkaloids, flavonoids, saponins, tannins, polyphenols, steroids, triterpenoids, β-sitosterol, and stigmasterol. These compounds are present in various parts of the plant such as pods, stems, and leaves. Research has mainly concentrated on the pods, known for their antihyperglycemic activity due to β-sitosterol, stigmasterol, and triterpenoids. However, the leaves also hold significant potential for use in traditional medicine and cosmetics, given their antioxidant, anti-inflammatory, antimicrobial, and antidiabetic properties (Chávez-Mendoza & Sánchez, 2017; Ebrahim et al., 2022; Padmavathi et al., 2021; Rodríguez et al., 2022).

Further supporting the value of common bean leaves, studies report that leaf extracts may be used as moisturizing agents in cosmetics and have antihyperglycemic effects beneficial for diabetes management. The presence of phytosterols and other bioactive compounds enhances their antioxidant and anticancer potential, making the leaves a promising source of raw materials for herbal health products (Gallo, 2022).

To safely use natural products in traditional medicine and cosmetics, quality, safety, and consistency must be assured. Standardization of simplicia and extracts is a critical step involving the assessment of physical, chemical, biological, and sensory parameters. Microbial contamination is a key biological concern, as it can compromise product safety and quality. Indonesian Food and Drug Authority regulations set maximum microbial limits to ensure herbal product safety (BPOM, 2006; Alvarez-Leite, 2025).

Pharmacognostic characterization is vital for natural product standardization. Microscopic analysis identifies diagnostic plant features by examining tissues and fragments in simplicia. Common bean leaves exhibit identifiable traits such as epidermal tissues, cuticles, chloroplasts, and stomata. Phytochemical screening further reveals the classes of secondary metabolites present, supporting their use as health product raw materials (M Devi et al., 2020).

Although many studies highlight the biological effects of common bean, data on the microscopic characteristics, phytochemical content, and microbiological quality of leaves from Manggarai, East Nusa Tenggara, remain scarce. This study aims to evaluate these pharmacognostic, phytochemical, and microbiological parameters to provide foundational data for standardizing common bean leaf simplicia and extracts, facilitating their development for traditional medicine and health-related products.

METHOD

Plant Identification

Plant identification was conducted to confirm the taxonomic identity of common bean leaves (*Phaseolus vulgaris* L.) used in this study. The identification process was carried out at UPT Materia Medica Batu, East Java, Indonesia.

Sample Preparation

Bean leaves were collected from Manggarai, East Nusa Tenggara, Indonesia. The leaves were separated from other plant parts, thoroughly washed, and dried under sunlight covered with a black cloth. The dried simplicia were then ground into powder.

Extraction and Concentration of Extract

A total of 100 grams of powdered simplicia was extracted by maceration using distilled water as the solvent at a 1:10 weight-to-volume ratio. The maceration process lasted for 3 days at room temperature, with occasional stirring. Afterward, the macerate was filtered through flannel cloth, and the filtrate was concentrated in a water bath at 50°C until a thick, viscous extract was formed. The extraction yield was then calculated using the following formula:

$$\text{Yield \%} = \frac{\text{Weigh of extract}}{\text{Weight of simplisia}} \; x\; 100\%$$

Specific Parameter Analysis

Macroscopic Examination

The macroscopic assessment was conducted organoleptically by observing the simplicia's shape, color, smell, and taste.

Microscopic Examination

A small sample of simplicia powder was placed on a microscope slide, treated with chloral hydrate solution, covered with a cover slip, and examined under a microscope to identify distinctive plant tissue fragments.

Phytochemical Screening

Qualitative phytochemical tests were performed to detect secondary metabolites present in the bean leaf extract as follows:

1. Flavonoids: Identified using the Mg-HCl (Shinoda) test, with a positive result indicated by red, yellow, or orange coloration.
2. Alkaloids: Detected using Mayer's and Dragendorff's reagents, where white or orange-red precipitates confirmed their presence.
3. Saponins: Identified by the foam formation method; a stable froth after HCl addition indicated saponins.
4. Tannins: Detected with 1% $FeCl_3$ solution, where a greenish-black color indicated a positive result.
5. Triterpenoids and Steroids: Identified by the Liebermann–Burchard reaction; a brownish or violet ring indicated triterpenoids, while a green color signified steroids.

Non-Specific Parameter Analysis

Moisture Content

Two grams of simplicia powder were dried in an oven at 105°C until a consistent weight was reached. The moisture content was then calculated using a specific formula:

$$\text{Moisture contenct (\%)} = \frac{W1 - W2}{W1 - W0}\ x\ 100\%$$

Where:

- W_0 = weight of the empty porcelain crucible
- W_1 = weight of the crucible plus sample before drying
- W_2 = weight of the crucible plus sample after drying

Loss on Drying

Two grams of the sample were dried at 105°C until their weight remained constant. The loss on drying was then calculated using the formula below:

$$\text{Loss on Drying (\%)} = \frac{W2 - W0}{W1}\ x\ 100\%$$

Where:

- W_0 = weight of the empty porcelain crucible (without lid)
- W_1 = weight of the porcelain crucible containing the extract before drying
- W_2 = weight of the porcelain crucible containing the extract after oven drying (without lid)

Total Plate Count (TPC)

One milliliter of the sample was serially diluted using 0.85% physiological NaCl solution up to a dilution factor of 10^{-6}. Each dilution was then inoculated onto Nutrient Agar (NA) plates using the pour plate method and incubated at 35–37°C for 24 hours. After incubation, colonies were counted and expressed as colony-forming units per gram (CFU/g) calculated by the following formula:

$$\text{TPC } (CFU/g) = \text{Numberof colonies x } \frac{1}{\text{Dilution Factor}}$$

Yeast and Mold Count (YMC)

A total of 2.5 grams of the sample was homogenized in 22.5 mL of sterile distilled water and then serially diluted up to 10^{-5} using 0.85% physiological NaCl solution. One milliliter from each dilution was inoculated in duplicate onto Potato Dextrose Agar (PDA) plates using the pour plate method. The plates were incubated at 25–37°C for 3 to 5 days. After incubation, yeast and mold colonies were counted and expressed as colony-forming units per gram (CFU/g) using the following formula:

$$\text{YMC } (CFU/g) = \text{Numberof colonies x } \frac{1}{\text{Dilution Factor}}$$

Data Analysis

The data collected from plant identification, simplicia characterization, phytochemical screening, moisture content, loss on drying, and microbial contamination tests were analyzed using descriptive methods. The findings were presented in tables and descriptive narratives to detail the sample characteristics, without drawing inferences or generalizing to a larger population.

RESULT

Plant Identification of The Common Bean Leaves (*Phaseolus vulgaris* L.)

Plant identification was undertaken to confirm the botanical identity of the plant material used in this study. The Herbal Laboratory of Materia Medica Batu, East Java, Indonesia, verified the sample as *Phaseolus vulgaris* L. (common bean), documented under no. 000.9.3/3529/102.20/2023. This species is classified within Kingdom Plantae,

Division Magnoliophyta, Class Magnoliopsida, Order Fabales, Family Fabaceae (Papilionaceae), and Genus *Phaseolus*.

Species identification relied on morphological traits and taxonomic keys from Backer and Bakhuizen van den Brink's (1963) Flora of Java (Spermatophytes Only), Vol. I, following a detailed key sequence for the family Papilionaceae, genus *Phaseolus*, and species *Phaseolus vulgaris* L.

Morphological observations described the plant as an annual herb, 3.5 to 4.5 meters tall, with a cylindrical, segmented, greenish-brown stem. It has trifoliate compound leaves with oblong leaflets, papilionaceous flowers ranging from white to purplish, and elongated pods containing 4–6 seeds. The study used the leaves as the plant material.

Accurate plant identification is essential for standardizing herbal raw materials, ensuring species authenticity, and preventing adulteration or substitution. Confirming *Phaseolus vulgaris* L.'s identity provides a dependable foundation for further pharmacognostic characterization, phytochemical screening, and microbiological quality evaluation (Delgado-Salinas et al., 1999; Ntuli, 2018a).

Organoleptic Evaluation of The Common Bean Leaf Simplicia

Figure 1. Simplicia of Leaf *Phaseolus vulgaris* L.

Organoleptic evaluation is one of the specific quality parameters used to characterize herbal raw materials through sensory observation, including appearance, color, odor, and taste (Ministry of Health of the Republic of Indonesia, 2000). The organoleptic examination of the leaf simplisia of *Phaseolus vulgaris* L. revealed that the material was in powder form, green in color, possessed a characteristic odor, and exhibited a bland or tasteless flavor (Herman H et al., 2022).

The results showed that the simplicia was in powder form, green in color, possessed a characteristic odor, and exhibited a bland or tasteless flavor (**Figure 1**). The powdered appearance indicates that the dried leaves were successfully processed into a homogeneous material suitable for extraction and quality evaluation. Powdered simplicia generally provides a larger surface area, which may facilitate solvent penetration during the extraction process (Naziella et al., 2022).

The green coloration of the simplicia suggests the presence of chlorophyll pigments that were relatively preserved during drying and processing. Leaf color is often used as an indicator of raw material quality, as excessive browning may indicate

pigment degradation resulting from inappropriate drying conditions. Therefore, the retention of the green color reflects good handling and processing of the plant material (Arnida et al., 2021).

The characteristic odor observed in the simplicia can be used as one of this describes the distinguishing organoleptic features of the leaf simplicia of *Phaseolus vulgaris* L. In addition, the bland or tasteless characteristic is consistent with the sensory properties observed during the examination. Organoleptic attributes such as odor and taste are important preliminary parameters in the identification and quality assessment of herbal raw materials, as they provide basic information regarding the authenticity and uniformity of the simplicial (Herman H et al., 2022; Nugrahani et al., 2016).

Microscopic Characteristics of the Common Bean Leaf (*Phaseolus vulgaris* L.) Simplicia

Microscopic examination of the *Phaseolus vulgaris* L. of leaf simplicia identified several diagnostic fragments useful for authentication and quality control of the herbal raw material (Figure 2). Key fragments included lower epidermal parts with paracytic stomata, vascular tissue with scalariform thickening, unicellular trichomes, upper epidermal fragments, palisade and spongy mesophyll tissues, cortical tissue, and collateral vascular bundles (Purwanti & Fauzi, 2019; Rania M. A. Nassar et al., 2016).

The lower epidermal fragments (Figures 2A and 2E) displayed paracytic stomata, marked by guard cells surrounded by epidermal cells that closely resemble neighboring cells without distinct subsidiary cells. Stomata presence and type are critical diagnostic features widely used in pharmacognostic leaf identification (Rania M. A. Nassar et al., 2016).

Vascular tissue fragments (Figure 2B) showed scalariform thickening ladder like secondary wall thickenings typical of xylem elements serving as key microscopic markers for plant identification. A unicellular trichome fragment (Figure 2C) was also noted, representing a specialized epidermal structure helpful in distinguishing the simplicia (Park et al., 1994; Rania M. A. Nassar et al., 2016).

The upper epidermal fragment (Figure 2D) contained polygonal epidermal cells with clear cell walls. Palisade and spongy mesophyll tissue fragments (Figure 2F) revealed chlorenchymatous tissues typical of leaves. The midrib region (Figure 2G) comprised irregularly shaped parenchymatous cortical cells, while the vascular bundle (Figure 2H) showed a collateral arrangement with adjacent xylem and phloem tissues (Rania M. A. Nassar et al., 2016).

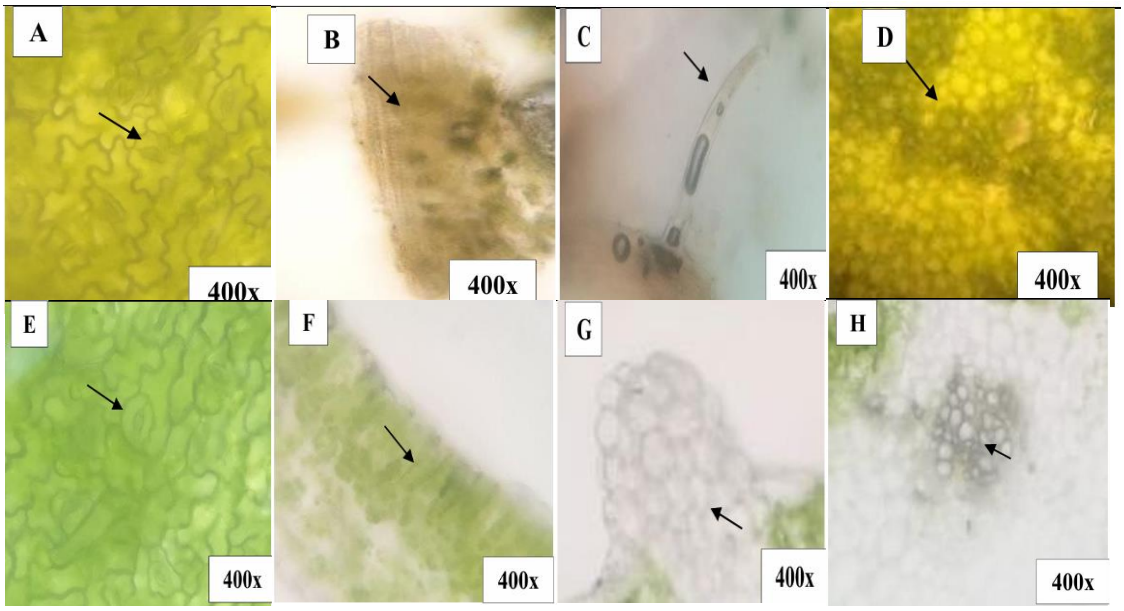

Figure 2. A–D: Microscopic analysis of specific fragments of the leaf and simplicia of *Phaseolus vulgaris* L. **E**: View of the lower epidermal surface. **F–H**: Transverse sections of the leaf. **A** and **E**: Lower epidermal fragments showing paracytic stomata. B: Vascular tissue exhibiting scalariform thickening. **C**: Fragment with unicellular trichomes. **D**: Fragment of upper epidermal cells. **F**: Palisade and spongy mesophyll tissues. **G**: Midrib region tissue composed of irregular pentagonal cells. **H**: Collateral vaskular bundle.

The combination of these microscopic fragments constitutes a diagnostic set of characteristics for *Phaseolus vulgaris* L. leaf simplicia.The presence of anomocytic stomata, unicellular trichomes, scalariform xylem vessels, mesophyll tissues, and collateral vascular bundles provides reliable pharmacognostic parameters for confirming the identity and authenticity of the raw material. These microscopic characteristics are particularly valuable for detecting adulteration, substitution, or contamination of herbal materials and therefore contribute to the standardization of bean leaf simplicia.

Phytochemical Screening of The Common Bean Leaf (*Phaseolus vulgaris* L.) Ethanol Extract

Phytochemical screening was performed to identify the secondary metabolites present in the ethanol extract of common bean leaves (*Phaseolus vulgaris* L.). The results showed that the extract contained flavonoids, alkaloids, saponins, tannins, and triterpenoids/steroids (Table 1).

Table 1. Phytochemical Screening Results of the Ethanol Extract of Common Bean Leaf (*Phaseolus vulgaris* L.)

Phytochemical Group	Result
Flavonoids	+
Alkaloids	+
Saponins	+
Tannins	+
Triterpenoids/Steroids	+

Note: (+) Presence of phytochemical compounds; (−) Absence of phytochemical compounds.

The identification of these phytochemical components demonstrates that bean leaves are abundant in secondary metabolites with promising biological effects. Flavonoids are well-known for their antioxidant capabilities and their role in neutralizing free radicals. Alkaloids have been documented to exhibit a range of pharmacological effects, such as antimicrobial, anti-inflammatory, and pain-relieving properties. Saponins and tannins are typically linked to antimicrobial activity and are crucial in plant defense against pathogens and environmental challenges. Furthermore, triterpenoids and steroids aid in plant protection and physiological processes and have been shown to possess various biological functions (Nugrahani et al., 2016). The presence of these phytochemical groups indicates that Phaseolus vulgaris leaves hold considerable promise as a natural reservoir of bioactive substances. These results reinforce the traditional medicinal use of bean leaves and provide a scientific foundation for their advancement as herbal remedies and functional ingredients (Petropoulos et al., 2019).

Moisture Content and Loss on Drying of Common Bean Leaf (*Phaseolus vulgaris* L.) Simplicia

The moisture content and loss on drying analyses were performed to evaluate the quality and stability of common bean leaf (*Phaseolus vulgaris* L.) simplicia powder. Moisture content is an important parameter for assessing the amount of water present in herbal materials, whereas loss on drying indicates the amount of moisture and volatile substances removed during the drying process (Herman H et al., 2022).

The moisture content of the simplicia powder was found to be 3.0%, with an average final weight of 75.740 g and a standard deviation of 0.00058 (Table 2). The loss on drying value was 2.1%, with an average final weight of 61.004 g and a standard deviation of 0.002. The low standard deviation values indicate good precision and reproducibility of the measurements (Arnida et al., 2021).

Table 2. Moisture Content and Loss on Drying of Common Bean Leaf (*Phaseolus vulgaris* L.) Simplicia

Parameter	Initial Weight (g)	Final Weight (g)	Result (%)	Mean (g)	Standard Deviation
Moisture Content	82.15	75.74	3.0	75.740	0.00058
Loss on Drying	84.13	61.00	2.1	61.004	0.002

The moisture content obtained in this study was relatively low, indicating that the drying process effectively reduced the water content of the simplicia. Low moisture levels are desirable because they minimize the risk of microbial growth, enzymatic activity, and deterioration during storage. Similarly, the low loss on drying value suggests that only a small amount of moisture and volatile compounds remained in the simplicia. These findings indicate that the bean leaf simplicia possesses good physicochemical quality and is suitable for further pharmacognostic, phytochemical, and microbiological evaluations (Arnida et al., 2021; Naziella et al., 2022).

Total Plate Count (TPC) and Yeast and Mold Count (YMC) of Common Bean Leaf (*Phaseolus vulgaris* L.) Simplicia

Microbiological quality evaluation was conducted through Total Plate Count (TPC) and Yeast and Mold Count (YMC) analyses to determine the level of microbial contamination in common bean leaf (*Phaseolus vulgaris* L.) simplicia (see Tables 3 and 4). These parameters are important indicators of the safety, quality, and storage stability of herbal raw materials (Tandi et al., 2026).

Table 3. Mean Total Plate Count (TPC) of Common Bean Leaf (*Phaseolus vulgaris* L.) Simplicia

Sample	TPC (CFU/g)	SD	CV (%)
Bean leaf simplicia	1.6×10^5	1437	88

The TPC analysis revealed a microbial load of 1.6×10^5 CFU/g in the common bean leaf simplicia. The presence of microorganisms in the simplicia may be attributed to environmental exposure during harvesting, processing, drying, handling, and storage. These findings indicate that microbial contamination was present in the plant material, highlighting the importance of proper post-harvest handling and storage conditions to maintain microbiological quality (Ningsih et al., 2025).

Table 4. Mean Yeast and Mold Count (YMC) of Common Bean Leaf (*Phaseolus vulgaris* L.) Simplicia

Sample	YMC (CFU/g)	SD	CV (%)
Bean leaf simplicia	3.1×10^3	3039	97

The YMC analysis showed a fungal contamination level of 3.1×10^3 CFU/g. The occurrence of yeasts and molds in herbal materials is commonly associated with environmental humidity and storage conditions. The detected fungal load suggests that the simplicia was exposed to environmental microorganisms during processing or storage, although drying treatment may have reduced fungal proliferation (Ilham et al., 2025).

Overall, the microbiological analyses confirmed the presence of both bacterial and fungal contaminants in bean leaf simplicia. These results provide important baseline information for the microbiological characterization of *Phaseolus vulgaris* L. leaf simplicia and emphasize the need for appropriate processing, packaging, and storage practices to preserve the quality and safety of herbal raw materials.

DISCUSSION

The present study provides a comprehensive pharmacognostic, phytochemical, physicochemical, and microbiological evaluation of common bean leaf (*Phaseolus vulgaris* L.) simplicia. Authentication of the plant material confirmed the identity of the species as *Phaseolus vulgaris* L., ensuring the reliability of subsequent analyses. Accurate botanical identification is an essential prerequisite in the standardization of herbal raw materials because it prevents adulteration and guarantees the authenticity of medicinal plant products (Arnida et al., 2021; Purwanti & Fauzi, 2019; Rania M. A.Nassar et al., 2016).

Organoleptic examination revealed that the simplicia was a green powder with a characteristic odor and a bland taste. These characteristics can serve as preliminary quality indicators and are useful for routine authentication of the raw material. The retention of the green color suggests that the drying process preserved the natural pigments of the leaves, indicating appropriate post-harvest handling (Naziella et al., 2022).

Microscopic examination identified several key diagnostic features, such as anomocytic stomata, unicellular trichomes, scalariform xylem vessels, upper epidermal cells, palisade and spongy mesophyll tissues, cortical cells, and collateral vascular bundles. These microscopic traits serve as crucial pharmacognostic markers for plant identification and quality assurance. Their presence confirms the authenticity of the simplicia and helps detect any adulteration or substitution with other plant materials (Gil & Ron, 1992; Park et al., 1994; Rania M. A. Nassar et al., 2016).

Phytochemical analysis of the ethanol extract from bean leaves revealed the presence of flavonoids, alkaloids, saponins, tannins, and triterpenoids/steroids. These

secondary metabolites are well-known for their diverse biological activities, including antioxidant, antimicrobial, anti-inflammatory, and protective properties. The variety of phytochemicals found in this study indicates that bean leaves are a valuable source of bioactive compounds for the development of herbal medicines and functional ingredients (Xuan et al., 2024; Nugrahani et al., 2016).

The physicochemical evaluation showed a moisture content of 3.0% and a loss on drying value of 2.1%. These relatively low values indicate effective drying and suggest good storage stability of the simplicia. Low moisture levels are advantageous because they reduce the likelihood of microbial growth, enzymatic degradation, and deterioration during storage. Therefore, the obtained physicochemical parameters indicate that the simplicia possesses acceptable quality for further utilization (Ningsih et al., 2025; Tandi et al., 2026).

Microbiological analyses revealed a total plate count of 1.6×10^5 CFU/g and a yeast and mold count of 3.1×10^3 CFU/g. The presence of microbial contaminants is expected in plant-derived materials due to exposure during cultivation, harvesting, processing, and storage. Although bacterial and fungal contamination was detected, the relatively low moisture content may have contributed to limiting microbial proliferation. These findings emphasize the importance of maintaining proper handling, drying, packaging, and storage conditions to preserve the microbiological quality and safety of herbal raw materials (Ilham et al., 2025; Ningsih et al., 2025; Tandi et al., 2026).

Overall, the results demonstrate that *Phaseolus vulgaris* L. leaf simplicia possesses distinctive pharmacognostic characteristics, contains several biologically relevant phytochemical groups, exhibits favorable physicochemical properties, and presents measurable microbiological parameters. These findings provide valuable baseline data for the standardization, quality control, and future utilization of bean leaf simplicia as a potential herbal raw material.

CONCLUSION

Common Bean leaf (*Phaseolus vulgaris* L.) simplicia exhibited characteristic pharmacognostic features, including specific organoleptic and microscopic characteristics, which support its authenticity and quality. Phytochemical screening revealed the presence of flavonoids, alkaloids, saponins, tannins, and triterpenoids/steroids. In addition, the simplicia showed low moisture content and loss on drying values, indicating good physicochemical quality. Microbiological evaluation provided baseline data on bacterial and fungal contamination levels. These findings support the potential use of *Phaseolus vulgaris* L. leaf simplicia as a standardized herbal raw material for further pharmaceutical and nutraceutical applications.

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