

ANALYSIS OF SPECIFIC AND NON SPECIFIC PARAMETERS OF GOROHO BANANAS (*MUSA ACUMINATA* L.)

Wiwit Zuriati Uno^{*1}, Rionaldo Arginggang², Lya Yulyani Sulasdi³, Makhfudia A. Masulili⁴, Sri Safitri Nasib⁵, Hudan Wijaya⁶

^{1,2,3,4,5,6} Gorontalo State of University, Gorontalo, Indonesia

*Corresponding Author: wiwit@ung.ac.id

<p>Info Article</p> <p>Received : 01 Oktober 2025</p> <p>Revised : 02 November 2025</p> <p>Accepted : 02 Desember 2025</p> <p>Publication : 30 Desember 2025</p>	<p>Abstract: <i>Goroho banana (<i>Musa acuminata</i> subsp. <i>goroho</i>) is a local Indonesian plant with potential as a traditional medicine due to its secondary metabolite content. This study aimed to standardize goroho banana extract through testing specific and nonspecific parameters to ensure the quality, safety, and quality of the extract. The method used was maceration extraction with 96% ethanol. Specific parameters tested included organoleptic testing, water-soluble extract content, ethanol-soluble extract content, and phytochemical screening. Nonspecific parameters included water content and microbial contamination testing. The results showed that goroho banana extract was thick, light yellow, and had a distinctive banana odor. The water-soluble extract and ethanol content were each 16.6%, meeting quality requirements. Phytochemical screening revealed the presence of flavonoids and saponins, while alkaloids yielded negative results in the Mayer test. Nonspecific testing indicated that the water content and microbial contamination were within safe limits according to standards. Based on these results, goroho banana extract meets the quality criteria for herbal extracts and has the potential to be developed as a raw material for traditional medicine</i></p>
<p>Keywords: Goroho Banana, Pharmacognosy, Phytochemical Screening, Extract Standardizati On.</p> <p>Kata Kunci : Pisang Goroho, Farmakognosi, Skrining Fitokimia, Standarisasi Ekstrak.</p>	<p>Abstrak: Pisang goroho (<i>Musa acuminata</i> subsp. <i>goroho</i>) merupakan tanaman lokal Indonesia yang berpotensi dikembangkan sebagai bahan obat tradisional karena kandungan metabolit sekundernya. Penelitian ini bertujuan untuk melakukan standarisasi ekstrak pisang goroho melalui pengujian parameter spesifik dan nonspesifik guna menjamin mutu, keamanan, dan kualitas ekstrak. Ekstraksi dilakukan dengan metode maserasi menggunakan pelarut etanol 96%. Parameter spesifik yang diuji meliputi uji organoleptik, kadar sari larut air, kadar sari larut etanol, serta skrining fitokimia. Parameter nonspesifik meliputi pengujian kadar air dan cemaran mikroba. Hasil penelitian menunjukkan bahwa ekstrak berbentuk kental, berwarna kuning muda, dan memiliki bau khas pisang. Kadar sari larut air dan etanol sebesar 16,6% dan memenuhi persyaratan mutu. Skrining fitokimia menunjukkan adanya senyawa flavonoid dan saponin, sementara alkaloid negatif pada uji Mayer. Pengujian nonspesifik menunjukkan kadar air dan cemaran mikroba masih dalam batas aman. Dengan demikian, ekstrak pisang goroho memenuhi kriteria mutu ekstrak herbal dan berpotensi sebagai bahan baku obat tradisional.</p>
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INTRODUCTION

The use of medicinal plants as therapeutic agents has long been recognized and has become an integral part of traditional healthcare systems in many countries, including Indonesia. Along with advances in science and technology, the utilization of natural products is no longer based solely on empirical experience but requires systematic scientific validation to ensure the safety, efficacy, and quality of the materials used. Medicinal plants are known to contain various secondary metabolites, such as flavonoids, alkaloids, tannins, saponins, terpenoids, and steroids, which play important roles in providing biological activities, including antioxidant, antimicrobial, anti-inflammatory, and antidiabetic effects. The presence of these compounds makes medicinal plants a potential source for the development of traditional medicines and phytopharmaceuticals (Andayani et al., 2018).

The increasing public interest in herbal medicines necessitates strict quality control of herbal raw materials. Variability in the chemical composition of medicinal plants can be influenced by several factors, such as environmental growing conditions, harvesting time, plant parts used, processing methods, and storage conditions. In the absence of clear quality standards, natural materials are prone to quality degradation, contamination, and inconsistency in active compound content, which may ultimately reduce their effectiveness and safety. Therefore, the standardization of crude drugs (*simplisia*) and plant extracts is a crucial step in ensuring the quality and reproducibility of herbal raw materials used in the pharmaceutical field (Ministry of Health of the Republic of Indonesia, 2020).

One of Indonesia's local plants with great potential for development is goroho banana (*Musa acuminata* sp.), a banana variety native to North Sulawesi that has long been utilized by local communities as food and traditional medicine. Goroho banana is characterized by its less sweet taste, dense flesh texture, and relatively high resistant starch content. In addition to its nutritional value, several studies have reported that goroho banana contains bioactive compounds, particularly polyphenols and flavonoids, which function as natural antioxidants. These antioxidant activities are important in scavenging free radicals involved in various degenerative diseases, such as diabetes mellitus, cardiovascular diseases, and chronic inflammation (Rumondor et al., 2017).

Not only the fruit pulp, but other parts of the goroho banana plant, such as the peel, banana blossom, and sap, have also been reported to possess pharmacological potential. The secondary metabolites contained in these parts exhibit antimicrobial and

anti-inflammatory activities, thereby opening opportunities for the utilization of goroho banana as a raw material in the development of traditional medicines. However, the broader application of this plant in the pharmaceutical field still requires comprehensive scientific data regarding its quality, identity, and chemical characteristics to ensure its scientifically accountable use (Hidayat, 2023). In the process of natural product standardization, the evaluation of specific and non-specific parameters is an essential step. Specific parameters aim to describe the identity and distinctive characteristics of a plant or crude drug, including organoleptic evaluation, identification of chemical constituents, and chromatographic profiling. These parameters play an important role in ensuring authenticity and preventing adulteration or substitution. Meanwhile, non-specific parameters include general quality assessments, such as moisture content, ash content, loss on drying, and microbial contamination, which are closely related to the stability, purity, and safety of natural materials (Andayani et al., 2018).

In addition to quality parameter evaluation, phytochemical screening is also an important component of pharmacognostic studies. Phytochemical screening is conducted to qualitatively identify groups of secondary metabolites present in a plant through simple chemical reactions, such as color changes or precipitate formation. The information obtained from phytochemical screening provides an initial overview of the plant's potential biological activities and serves as a foundation for further studies, including the determination of active compound levels, chromatographic profile analysis, and pharmacological activity testing (Samsu et al., 2020).

Based on the above considerations, the analysis of specific parameters, non-specific parameters, and phytochemical screening of goroho banana represents an important step in the standardization and development of local plants as herbal raw materials. This study is expected to provide comprehensive scientific information regarding the quality, identity, and potential chemical constituents of goroho banana, thereby supporting its rational and safe utilization. Furthermore, the results of this study are expected to serve as a basis for further research and to encourage the development of goroho banana as one of Indonesia's leading natural resources in phytopharmaceutical development (Ministry of Health of the Republic of Indonesia, 2020).

METHOD

This study was an experimental laboratory-based research conducted using a descriptive and analytical approach. The study aimed to evaluate the quality of goroho

banana (*Musa acuminata* sp.) simplicia and extract through the analysis of specific parameters, non-specific parameters, and phytochemical screening as part of the standardization of natural raw materials. The research object was goroho banana, a local Indonesian banana variety selected based on good physical condition, free from mechanical damage and contamination. The samples were processed into simplicia prior to extraction. All experimental procedures were carried out in a controlled laboratory setting in accordance with the guidelines of the Indonesian Pharmacopoeia, the standards issued by the Indonesian National Agency of Drug and Food Control (BPOM), and relevant scientific literature. Data collection was performed through direct laboratory observation during each experimental stage, accompanied by quantitative measurements of the tested parameters, including weighing, extractive value determination, and microbial colony counting. The collected data consisted of qualitative and quantitative data, which were recorded systematically throughout the study.





RESULTS AND DISCUSSION

Results


Standardization plays a crucial role in the development of medicines derived from natural materials that are widely used in Indonesia. It is necessary to ensure the quality, safety, and consistency of herbal medicines so that they can be further developed into products that provide real benefits to the community. One natural material with significant medicinal potential is goroho banana. Goroho banana (*Musa acuminata* Colla L.) is a local banana variety originating from North Sulawesi and Gorontalo, which has long been used by local communities for various traditional medicinal purposes. Several scientific studies have reported that goroho banana contains secondary metabolites with pharmacological activities, including antioxidant, antidiabetic, and antibacterial effects. In this project-based learning activity, an analysis of specific and non-specific parameters of goroho banana (*Musa acuminata* Colla L.) was conducted to support its standardization as a herbal raw material. The extraction process was carried out using the maceration method. According to Fakhruzy (2020), maceration is a compound separation technique that involves soaking plant material in an organic solvent at a specific temperature. This method is advantageous because it is simple, cost-effective, and suitable for isolating natural compounds. During the soaking process, differences in pressure between the inside and outside of plant cells cause the

breakdown of cell walls and membranes, allowing secondary metabolites in the cytoplasm to dissolve into the solvent.


Organoleptic Test

Sample	Form	Light	odor
 <i>(musa acuminata)</i>	 Thick extract	 Light yellow	 Banana-like odor with a smooth texture


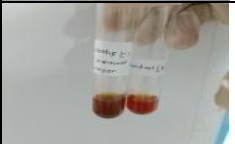

Water-Soluble Extractive Content

Sample	Water-Soluble Extractive Content (%)	Result
<i>(musa acuminata)</i>	16,6% (Meets the requirement)	


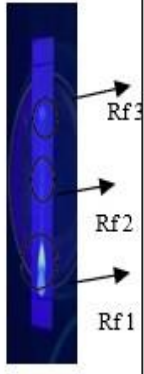

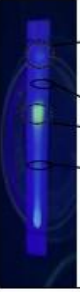


Ethanol-Soluble Extractive Content

Sample	Ethanol-Soluble Extractive Content (%)	Result
Pisang Goroh (<i>musa acuminata</i>)	16,6% (Meets the requirement)	

Phytochemical Screening

Sample	Compound Test	Observation Results	Reagent	Remarks
Pisang Goroho (<i>musa acuminata</i>)	Flavonoids		Magnesium powder + HCl	(+) Positive
	Alkaloids (Mayer test)		Mayer's reagent	(-) Negative
	Saponins		FeCl ₃ + hot water	(+) Positive

Thin Layer Chromatography (TLC) Analysis

No	Sampel	Mobile Phase	Observation Results		Rf
			245nm	366nm	
1.	Pisang Goroho (<i>musa acuminata</i>)	n-Hexane: Ethyl acetate (4:1)			Rf ₁ =0,2 (Green) Rf ₂ =0,62 (Blue) Rf ₃ =0,875 (Blue)
2.	Pisang Goroho (<i>musa acuminata</i>)	n-Hexane: Ethyl acetate (3:2)			Rf ₁ =0,375 (Blue) Rf ₂ =0,675 (Green) Rf ₃ =0,875 (Blue) Rf ₄ =1
3.	Pisang Goroho (<i>musa acuminata</i>)	n-Hexane: Ethyl acetate (3.5:1.5)			Rf ₁ =0,3 (Green) Rf ₂ =1 (Blue)

Rasio 3,5:1,5

No	Distance Traveled (N)	Calculation	Rf Value
N1	0,8	0,8/4	0,2
N2	2,6	2,6/4	0,62
N3	3,5	3,5/4	0,875






Rasio 3:2

No	Distance Traveled (N)	Calculation	Rf Value
N1	1,2	1,2/4	0,3
N2	4	4/4	1

Rasio 4:3

No	Distance Traveled (N)	Calculation	Rf Value
N1	1,5	1,5/4	0,375
N2	2,7	2,7/4	0,675
N3	3,5	3,5/4	0,875
N4	4	4/4	1

Yeast and Mold Count (YMC)

Dilution Factor	Dilution Factor
10 ⁻¹	 (Meets the requirement)
10 ⁻²	 (Meets the requirement)
10 ⁻⁴	 (Meets the requirement)
10 ⁻⁵	 (Meets the requirement)
10 ⁻⁶	 (Meets the requirement)

Total Plate Count (TPC) Calculation

Dilution Factor	Number of Colonies
10-1	5
10-2	34
10-3	11
10-4	9
10-5	15
10-6	23

Calculation Formula: Number of colonies × dilution factor⁻¹

Example Calculation: 10⁻² = 34 × 10² = 3.4 × 10³ CFU/mL

Yeast and Mold Count (YMC) Calculation

Dilution Factor	Number of Colonies
10-1	16
10-2	9
10-3	19
10-4	82
10-5	11
10-6	7

Calculation Formula: Number of colonies \times dilution factor⁻¹

Example Calculation: $10^{-4} = 82 \times 10^4 = 8.2 \times 10^5$ CFU/mL

Calculation Formula: Number of colonies \times dilution factor⁻¹

Calculation Results:

1. $10^{-1} = 16 \times 10^1 = 1.6 \times 10^2$ CFU/mL
2. $10^{-3} = 19 \times 10^3 = 1.9 \times 10^4$ CFU/mL
3. $10^{-4} = 82 \times 10^4 = 8.2 \times 10^5$ CFU/mL
4. $10^{-5} = 11 \times 10^5 = 1.1 \times 10^6$ CFU/MI

Discussion

Standardization plays a crucial role in the development of medicines derived from natural materials that are widely used in Indonesia. It is essential to ensure the quality, safety, and consistency of herbal medicines so that they can be further developed into products that provide tangible benefits to the community. One natural material with significant medicinal potential is the goroho banana. Goroho banana (*Musa acuminata* Colla L.) is a local banana variety originating from North Sulawesi and Gorontalo that has long been used by local communities for various traditional medicinal purposes. Previous studies have reported that goroho banana contains secondary metabolites with diverse pharmacological activities, including antioxidant, antidiabetic, and antibacterial effects. In this project-based learning activity, analyses of specific and non-specific parameters of goroho banana (*Musa acuminata* Colla L.) were conducted to support its standardization as a herbal raw material. The extraction process was performed using the maceration method. According to Fakhruzy (2020), maceration is a compound separation technique that involves soaking plant material in an organic solvent at a specific temperature. This method is advantageous due to its simplicity, cost-effectiveness, and suitability for isolating natural compounds. During the soaking process, differences in pressure between the interior and exterior of plant cells lead to the disruption of cell walls and membranes, allowing secondary metabolites in the

cytoplasm to diffuse into the solvent.

Organoleptic Properties

The organoleptic evaluation (Table 1) showed that the goroho banana extract was obtained in the form of a thick extract with a light yellow color. The extract exhibited a characteristic banana-like odor and a smooth texture. These characteristics indicate good physical quality and are consistent with typical properties of banana-derived extracts, suggesting that the extraction process was carried out properly without causing significant degradation of sensory attributes.

Extractive Values

The water-soluble extractive content (Table 2) of the goroho banana extract was 16.6%, which met the established requirements. This result indicates the presence of polar compounds such as sugars, glycosides, and certain phenolic compounds that are readily soluble in water. Similarly, the ethanol-soluble extractive content (Table 3) was also 16.6% and met the required standards. Ethanol-soluble extractives generally represent semi-polar to non-polar constituents, including flavonoids and other bioactive compounds. Comparable values for water- and ethanol-soluble extractives suggest that the extract contains a balanced composition of polar and semi-polar constituents, supporting its potential use as a standardized herbal raw material.

Phytochemical Screening

Phytochemical screening results (Table 4) revealed the presence of flavonoids and saponins in the goroho banana extract, as indicated by positive test reactions. In contrast, alkaloids tested using Mayer's reagent showed negative results. The presence of flavonoids is of particular interest, as these compounds are widely known for their antioxidant, anti-inflammatory, and antimicrobial activities. Saponins also contribute to biological activities such as immunomodulatory and antimicrobial effects. The absence of alkaloids may be advantageous from a safety perspective, as certain alkaloids can exhibit toxic effects.

Thin Layer Chromatography (TLC) Analysis

Thin layer chromatography analysis was conducted using different ratios of n-hexane and ethyl acetate as mobile phases (Table 5). Multiple spots were observed under UV light at 245 nm and 366 nm, indicating the presence of several phytochemical constituents with varying polarity. The calculated R_f values (Table 6)

ranged from 0.20 to 1.00, depending on the mobile phase composition. Variations in Rf values across different solvent ratios demonstrate the effectiveness of solvent polarity adjustment in separating the components of the extract. The appearance of blue and green fluorescent spots under UV light further supports the presence of phenolic and flavonoid compounds in the extract.

Microbiological Quality

Microbiological evaluation included Total Plate Count (TPC) and Yeast and Mold Count (YMC) analyses to assess the safety and quality of the extract. The YMC results (Table 7 and Table 9) indicated that the yeast and mold counts at all tested dilution factors met the established requirements. This suggests that the extract was adequately processed and handled under hygienic conditions, minimizing fungal contamination. The TPC results (Table 8) showed variation in colony numbers across dilution factors, with a representative calculation at the 10^{-2} dilution yielding a value of 3.4×10^3 CFU/mL. These values are within acceptable limits for herbal raw materials. The relatively low microbial load may be attributed to the extraction process, which involves solvent exposure that can reduce microbial contamination, as well as the presence of bioactive compounds such as flavonoids and saponins that may exhibit antimicrobial activity. Overall, the results of organoleptic evaluation, extractive value determination, phytochemical screening, TLC profiling, and microbiological analysis indicate that goroho banana (*Musa acuminata* Colla L.) extract meets the required quality and safety parameters. These findings support its potential development as a standardized herbal raw material for further pharmaceutical or functional food applications.

CONCLUSION

Identification and organoleptic evaluation showed that the extract exhibited characteristics consistent with Dayak onion bulbs, as indicated by its reddish-brown color, distinctive aroma, and thick, homogeneous texture, suggesting that the extraction process was optimal and free from contamination. Phytochemical screening revealed that the extract is rich in bioactive secondary metabolites such as alkaloids, flavonoids, tannins, and saponins, which are known to play important roles in the pharmacological activities of Dayak onion, while steroid and terpenoid groups were not detected or were present in non-dominant amounts. Thin Layer Chromatography (TLC) analysis

produced a clear and well-defined separation pattern across various Rf values, reflecting the diversity of polar, semi-polar, and non-polar compounds and indicating flavonoids and phenolic compounds as major components. Overall, the results of physical, chemical, and chromatographic analyses demonstrate that the Dayak onion bulb extract has good quality, a complex metabolite composition, and is suitable for further research and the development of herbal formulations

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