

Simplicia quality analysis and phytochemical screening of red bracts of Kepok banana flower (*Musa paradisiaca* L.)

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Abstract

Background: The Kepok banana plant (*Musa paradisiaca* L.) has been processed into food preparations, empirically used as medicine, and as a cosmetic for hair and skin care. Kepok banana flowers have bracts and male flowers contain nutritional content, namely carbohydrates, protein, low fat, high fiber and also minerals such as phosphorus, iron and calcium) as well as vitamins A, B1 and vitamin C. To determine the potential of the red bracts of Kepok banana flowers as an efficacious ingredient in medical and cosmetic preparations, simplicia characteristics testing was carried out to determine the quality of simplicial and phytochemical screening to determine secondary metabolite compounds in plant.

Objective: The aim of this research was to identify the characteristics of simplicia and screen phytochemicals in the red bracts of Kepok banana flowers (*Musa paradisiaca* L.).

Method: This research was carried out experimentally in the Pharmaceutical and Chemical Technology laboratory, Faculty of Pharmacy, Lincoln University College Malaysia. The red bracts of the Kepok banana flower (*Musa paradisiaca* L.) were dried by drying, protected from direct sunlight. Extract of the red bracts of the Kepok banana flower (*Musa paradisiaca* L.) was obtained using the Ultrasonic Assisted Extraction (UAE) method with 70% ethanol solvent.

Results: Microscopic results of powder and fresh simplicia of red bracts of Kepok banana flowers (*Musa paradisiaca* L.) were obtained, epidermis fragments, xylem fibers, sclerenchyma fibers, anomocytic type stomata, endocarp and essential oil. The results of the simplicia quality inspection showed that the water soluble essence content was 37.15%, the ethanol soluble essence content was 16.57%, the water content was 5.31%, the total ash content was 9.04%. and the acid insoluble ash content was 2.42%. Phytochemical screening of the red bractea extract of Kepok banana flowers (*Musa paradisiaca* L.) obtained alkaloids, phenolics, flavonoids, tannins and triterpenoids/steroids.

Conclusion: The results of the quality analysis of the simplicia red bracts of the Kepok banana flower (*Musa paradisiaca* L.) met the simplicia quality standards and the results of the phytochemical screening examination of the red bractea extract of the Kepok banana flower (*Musa paradisiaca* L.) contained alkaloids, phenolics, flavonoids, tannins and triterpenoids/steroids compounds.

Keywords: Potential; Red Bracts of Kepok Banana Flowers; Simplicity Quality; Phytochemical Screening

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1. Introduction

Various types of banana plants grow abundantly in Indonesia, one of which is the Kepok banana (*Musa paradisiaca* L.) which can be found in various regions of the archipelago. Many people have processed parts of the Kepok banana plant (*Musa paradisiaca* L.) into food preparations, medicines and cosmetics for hair and skin care [1]. The potential in banana plants starts from the tuber, midrib, stem, leaves, banana flower, fruit peel and banana fruit.

Banana heart or also called banana flower is part of the banana plant, consisting of red outer bracts and yellowish white inner bracts and yellowish white male flowers [2]. The bracts in the banana flower are often processed as an alternative food ingredient, while the outer part of the red bracts of the Kepok banana flower is rarely used.

Kepok banana flower bracts contain nutritional content, namely carbohydrates, protein, low fat, high fiber and also minerals such as phosphorus, iron and calcium) as well as vitamins A, B1, and vitamin C [3]. Kepok banana flower bracts contain high levels of antioxidant compounds [4]. Based on the results of research conducted by Ferdinan and Ade, 2018, Kepok banana flower bract extract can ward off free radicals in the skin so that it can be formulated in cosmetic preparations as anti-aging [5,6]. Banana flowers have benefits for preventing heart disease, stroke, improving blood circulation because as an anticoagulant it prevents blood clots [4].

The characteristics of *simplicia* are one of the parameters to determine the quality of *simplicia* to meet the standards of *simplicia* and extracts [7]. To determine the class of compounds in *simplicia* and extracts, this can be done by identifying secondary metabolite compounds.

To determine the quality of *simplicia* and the content of secondary metabolite compounds and components in the red bracts of the Kepok banana flower (*Musa paradisiaca* L.), it is necessary to test the characteristics of *simplicia*, phytochemical screening.

2. Material and methods

2.1. Place and time of research

This research was conducted in the Pharmaceutical Technology and Chemistry laboratory, Faculty of Pharmacy, Lincoln University College Malaysia, from January to April 2024.

2.2. Tools and materials

2.2.1. Tools

The tools used are: digital scales (Panda Scale), electronic balance (Napco JA-500), smoothing machine (Philips HR-2116), drying cabinet, sonicator (Hielscher Ultrasonic UIP1000hdT), rotary evaporator (MTST), water bath, mesh sieve no. 60, glassware, hot plate, microscope (Olympus CX23), filter paper, aluminum foil, chamber, and Gf254 silica gel plate.

2.2.2. Materials

The materials used in this research were 70% ethanol, n-hexane p.a, methanol p.a, ethyl acetate p.a, hydrochloric acid p.a, 2N hydrochloric acid, wagner's reagent, Bouchard's reagent, gelatin, zinc, magnesium, chloroform, amyl alcohol, sodium chloride, and distilled water

2.3. Research procedure

2.3.1. Making *simplicia* of red bracts of Kepok banana flowers (*Musa paradisiaca* L.)

The bracts of Kepok banana flowers (*Musa paradisiaca* L.) were separated from the base and the red bracts were taken. The red bracts of Kepok banana flowers are washed with running water and drained then chopped and then dried in a drying cupboard at a temperature of \pm °C [8]. The dried red bracts of Kepok banana flowers were weighed for drying loss and continued with grinding. The red bracts of the Kepok banana flower powder obtained were sieved using a mesh 60 sieve and stored in a closed airtight container.

2.3.2. Preparation of red bractea extract from Kepok banana flowers (*Musa paradisiaca* L.)

Red bracts of Kepok banana flowers (*Musa paradisiaca* L.) were extracted with 70% ethanol solvent in a ratio of 1:10 using the ultrasonic assisted extraction method, a tool used by Hielscher Ultrasonic UIP1000hdT, sonicator amplitude 60 for 15 minutes. The filtrate obtained is concentrated using a rotary evaporator until a thick extract is obtained, then the extract is stored in an airtight container [9].

2.3.3. Identification of the red bractae simplicia of the Kepok banana flower (*Musa paradisiaca* L.)

Identification of the red bractae simplicia of the Kepok banana flower (*Musa paradisiaca* L.) includes organoleptic examination (color, aroma, taste and texture), macroscopic and microscopic examination [10].

2.3.4. Characteristics of the red bractae simplicia of the Kepok banana flower (*Musa paradisiaca* L.)

Water soluble essence content

A total of 5 grams of red bractae powder from Kepok banana flowers (*Musa paradisiaca* L.) was put into a stoppered flask, 100 mL of saturated chloroform distilled water was added and stirred occasionally for 6 hours then left 18 hours, then filtered and 20 mL of the filtrate was taken, put into a evaporating cup that had been set aside. Heat the filtrate in an oven at a temperature of 105 °C until a constant weight is obtained [10].

Ethanol soluble essence content

A total of 5 grams of red bractae powder from Kepok banana flowers (*Musa paradisiaca* L.) was put into a stoppered flask, 100 mL of ethanol was added and stirred occasionally for 6 hours, then left for 18 hours, then filtered and 20 mL of the filtrate was taken, put into a evaporating cup that had been set aside. Heat the filtrate in an oven at a temperature of 105 °C until a constant weight is obtained [10].

Water content

The water content of the red bracts of the Kepok banana flower (*Musa paradisiaca* L.) was analyzed using the Azeotropy method. A total of 200 mL of toluene and 2 mL of distilled water were put into a 500 mL round bottom flask then distilled for 2 hours, then cool the toluene for 30 minutes and read the volume of water in the tube. Put 5 grams of red bracts of Kepok banana flowers (*Musa paradisiaca* L.) into a round bottom flask, then heat for 15 minutes after the toluene boils, set the drip speed every second starting at 2 drops per second and continuing to 4 drops per second. After distillation, all the water in the inside of the cooler was rinsed with toluene and distillation continued for 5 minutes, and the holding tube was cooled to room temperature. After the toluene and water are separated, the water content is obtained with an accuracy of 0.05 mL and the water content is calculated in percent [11].

Total ash content

A total of 5 grams of red bractae powder from Kepok banana flowers (*Musa paradisiaca* L.) was put into a porcelain crucible that had been ignited and set aside. The porcelain crucible is put into the furnace and fired until the charcoal run out, then cooled and the fixed weight is weighed [11,12].

Acid insoluble ash content

The ash of red bractae powder from Kepok banana (*Musa paradisiaca* L.) obtained from determining the total ash content (2.3.4.4) was added to 25 mL of dilute hydrochloric acid, then boiled for 5 minutes and filtered. The residue obtained is rinsed with hot water then dried again and cooled. Weight the ash obtained until the weight is constant [10].

2.3.5. Phytochemical screening of red bracts of Kepok banana flowers (*Musa paradisiaca* L.)

Alkaloid testing

A total of 0.5 g of red bractae extract of Kepok banana flowers (*Musa paradisiaca* L.) was put into a glass beaker, added 1 mL of 2N hydrochlorid acid and 9 mL of distilled water, heated over a water bath for 2 minutes and cooled and filtered [11]. A total of 2 mL of the filtrate was dripped with 2 drops of Mayer's reagent. If a white precipitate forms then the identification indicates the presence of alkaloids. A total of 2 mL of the filtrate was dripped with 2 drops of Wagner's reagent, if a white precipitate is formed then the identification indicates the presence of alkaloids [12]. A total of 2 mL

of the filtrate was dripped with 2 drops of Bouchadart's reagent, if a blackish brown precipitate is formed then the identification indicates the presence of alkaloids [11].

Phenolic testing

A total of 0.5 g of red bractea extract of Kepok banana flowers (*Musa paradisiaca* L.) was put into a glass beaker, add 5 ml of distilled water, stir and filter, then add 1 % ferric chloride solution to the filtrate and stir. If green, purple, blue, blackish colors are formed then the identification indicates the presence of phenolic compounds [10].

Flavonoid testing

A total of 0.5 g of red bractea extract of Kepok banana flowers (*Musa paradisiaca* L.) was put into a glass beaker, add 5 mL of distilled water, stir and filter, then add magnesium powder and 2N hydrochloric acid to the filtrate, stir and heat. Once cool, add amyl alcohol and shake vigorously then leave until a layer forms. If an orange or red color is formed which is attracted to amyl alcohol then the identification indicates the presence of flavonoid compounds [10].

Tannin testing

A total of 5 mL of the flavonoid test result solution (2.3.5.3) was put into a test tube, then add 1% gelatin solution and stir. If a white precipitate forms, identification indicates the presence of tannin compounds [10].

Quinone testing

A total of 5 mL of the filtrate from the tannin test (2.3.5.4) is put into a test tube, then add 3 drops of potassium hydroxide and stir. If a red, brown or orange precipitate is formed then the identification indicates the presence of a quinone compound [10].

Saponin testing

A total of 0.5 g of red bractae extract from Kepok banana flowers (*Musa paradisiaca* L.) was put into a glass beaker, added with 5 mL of distilled water, stirred and filtered. Put the filtrate into a test tube and add 10 mL of distilled water, shake vertically for 10 seconds. If foam is formed as high as 1-10 cm which is persistent for 10 seconds then the identification shows the presence of saponin compounds [10].

Triterpenoid/steroid testing

A total of 0.5 g of red bracts extract from Kepok banana flowers (*Musa paradisiaca* L.) was put into a glass beaker, added with 5 mL of distilled water, stirred, heated and filtered. Put the filtrate into a test tube and add chloroform, 2N hydrochloric acid and libermant-bouchardart. If a red solution is formed then identification indicates the presence of triterpenoid/steroid compounds [13].

3. Results and discussion

3.1. Making simplicial of red bracts of Kepok banana flowers (*Musa paradisiaca* L.)

The results of research on making Kepok banana flower bracts (*Musa paradisiaca* L.) after drying at a temperature of ± 40 °C for 5 days were brittle, easily crushed, blackish red in color, and a drying shrinkage of 9.3% was obtained. The red bracts of the Kepok banana flower (*Musa paradisiaca* L.) can be seen in figure 1. The chopped red bracts of Kepok banana flowers (*Musa paradisiaca* L.) can be seen in figure 2. And the dried red bracts of Kepok banana flowers (*Musa paradisiaca* L.) can be seen in figure 3.



Figure 1 Red bracts of the Kepok banana flower (*Musa paradisiaca* L.)



Figure 2 Red bracts of Kepok banana flower (*Musa paradisiaca* L.) chopped



Figure 3 Dry red bracts of the Kepok banana flower (*Musa paradisiaca* L.)

Drying plants aims to reduce the water content in plants so that they have a long shelf life and are not easily overgrown by bacteria and fungi. The water content lost during the drying process is marked by a decrease in simplicial. Based on the requirements, the maximum drying shrinkage limit is not less than 10% [14].

3.2. Preparation of red bractea extract from Kepok banana flowers (*Musa paradisiaca* L.)

The results of making extracts from Kepok banana flower bracts (*Musa paradisiaca* L.) using the UAE method using 70% ethanol solvent produced a thick, sticky, blackish red brown extract with a yield of 21.7%.

The extract yield is a comparison between the thick extract obtained and the simplicia used. Extraction using the UAE method produces more active substances and a more concentrated extract because the assistance of ultrasonic waves can increase the breakdown of cell walls in simplicia powder that has been soaked in solvent [15].

3.3. Identification of the red bractae simplicial of the Kepok banana flower (*Musa paradisiaca* L.)

Macroscopic identification of the bractea simplicial of the Kepok banana flower (*Musa paradisiaca* L.) showed that the outside and inside of the bracts were red, had a distinctive aromatic aroma and a slightly chelated taste, the texture was thick and soft and watery, the inside of the bracts had spongy fibers. After drying the red simplicial bracts of the Kepok banana flower (*Musa paradisiaca* L.) it is mashed to obtain a yellowish red brown color, has a typical plant aroma, a rough taste and a fine, fibrous texture.











Microscopic identification of the red bractea simplicia of the Kepok banana flower (*Musa paradisiaca* L.) resulted in fragments of the outer epidermis layer being white, the inner epidermis layer being red, anomocytic stomata, endocarp and essential oils in the epidermis layer. Meanwhile, microscopic results of the red bractae of Kepok banana flowers (*Musa paradisiaca* L.) showed fragments of the outer epidermis, xylem fibers, sclerenchyma fibers, endocarp and brownish yellow essential oil.

The results of identification of simplicia and red bractae powder of Kepok banana flowers (*Musa paradisiaca* L.) macroscopically can be seen in Table 1 and the results of identification of simplicia and red bractae powder of Kepok banana flowers (*Musa paradisiaca* L.) microscopically can be seen in Table 2.

Table 1 Results of macroscopic identification of red bracts of Kepok banana flowers (*Musa paradisiaca* L.)

SN.	Test	Results	
		Simplicia	Powder
1	Color	Purplish red	Yellowish red brown
2	Aroma	Specially aromatic	Typical plant smell
3	Flavor	A little flat	Rough
4	Texture	Oval tip, blunt base, wide middle, soft, spongy, watery, rough outer surface, smooth inner surface	Smooth and has fibers

Table 2 Results of microscopic identification of red bracts of Kepok banana flowers (*Musa paradisiaca* L.)

SN.	Results of microscopic observations of simplicia	Fragment	Powder microscopic observation results	Fragment
1		Outer epidermis		Outer epidermis
2		Deep epidermis		Xylem fibers
3		Anomocytic stomata		Sclerenchyma fibers
4		Endocarp		Endocarp
5		Essential oil		Essential oil

Based on the function of plant cell walls, there are epidermal cells, xylem cells and phloem cells. Epidermal cells are thick primary cell walls covering the surface of the plant. Xylem is plant tissue resulting from the division of thin-walled cambium cells [16]. The epidermal cells of the bracts always contain essential oils which indicate the fragrant nature of the flower.

3.4. Characteristics of the red bractae simplicia of the Kepok banana flower (*Musa paradisiaca* L.)

The results of the examination of simplicia characteristics consist of water soluble essence content, ethanol soluble essence content, water content, total ash content and insoluble ash content of the red bracts of Kepok banana flowers (*Musa paradisiaca* L.) can be seen in **Table 3**

Table 3 Results of examination of the characteristics of the red bractae simplicial of the Kepok banana flower (*Musa paradisiaca* L.)

SN.	Test	Results
1	Water soluble essence content	37.15%
2	Ethanol soluble essence content	16.57%
3	Water content	5.31%
4	Total ash content	9.04%
5	Acid insoluble ash content	2.42%

Examination of the essence content in the red bractae simplicia of the Kepok banana flower (*Musa paradisiaca* L.) using water and ethanol solvents resulted in greater water soluble essence levels being extracted compared to the ethanol solvent, this shows that more compounds dissolve in water compared to ethanol. Determination of total ash content and acid insoluble ash content aims to determine that simplicia does not contain certain heavy metals. Examination of the characteristics of the red bractae simplicia of the Kepok banana flower (*Musa paradisiaca* L.) meets the requirements based on the Indonesia Herbal Pharmacopoeia II edition.

3.5. Phtochemical screening of red bractea extract of Kepok banana flowers (*Musa paradisiaca* L.)

The results of the phytochemical screening examination of the red bractea extract of Kepok banana flowers (*Musa paradisiaca* L.) consisting of alkaloids, phenolics, flavonoids, tannins, quinones, saponins and triterpenoids/steroids can be seen in Table 4.

Table 4 Result of phytochemical screening examination of red bractea extract of Kepok banana flowers (*Musa paradisiaca* L.)

SN.	Test	Results
1	Alkaloids	+
2	Phenolics	+
3	Flavonoids	+
4	Tannins	+
5	Quinones	-
6	Saponins	-
7	Triterpenoids/Steroids	+

Phytochemical screening examination of the red bractea extract of Kepok banana flowers (*Musa paradisiaca* L.) obtained positive results for alkaloids, phenolics, flavonoids, tannins, and triterpenoids/steroids, while negative for saponins dan quinones. The extract filtrate with the addition of Mayer dan Wagner reagents forms a white precipitate which is positive for containing alkaloids [12]. The extract filtrate with the addition of 1% ferric chloride gives a blue-black color so it is positive for phenolic content. The extract filtrate with flavonoid testing forms a red-orange color, then it is positive for containing flavonoids, and followed by the addition of 1% gelatin, a white precipitate forms, then it is positive for containing tannin [10]. The extract filtrate with the addition of chloroform, 2N hydrochloric acid and Liberman-Bouchardat reagent forms a red color so it is positive for containing triterpenoid/steroid compounds [13]. Meanwhile, the extract filtrate with saponin testing did not form foam and the extract filtrate with the addition of potassium hydroxide did not form a red precipitate, so the results were negative for saponin and quinone compounds.

Potential secondary metabolite compounds in the ethanol extract of red bracts of Kepok banana flowers (*Musa paradisiaca* L.) can be used as a source of raw materials for medicines and cosmetic. Pharmacologically, alkaloid compounds function as antibacterial, antiviral, anti-inflammatory and anesthetic. Flavonoids, including phenolic compounds, function as antioxidants, antibacterial, anticancer, antidiabetic and have bioactivity as medicines [13].

4. Conclusion

The results of the quality analysis of the simplicia red bracts of the Kepok banana flower (*Musa paradisiaca* L.) met the simplicia quality standards and the results of the phytochemical screening examination of the red bractea extract of the Kepok banana flower (*Musa paradisiaca* L.) contained alkaloid, phenolic, flavonoid, tannin and triterpenoids/steroids compounds.

Compliance with ethical standards

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Disclosure of conflict of interest.

No conflict of interest to be disclosed.

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