Jurnal Akademika Kimia, 12(4): 2**26**-2**29**, November 2023
ISSN (online) 2477-5185 | ISSN (print) 2302-6030
http://jurnal.fkip.untad.ac.id/index.php/jak/

OPEN ACCESS

Analysis Of Flavonoid Levels on Skin Langsat Fruit (Lansium Domesticum) Using Uv-Vis Spectrophotometer

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Received 07 January 2021, Revised 08 November 2022, Accepted 18 October 2023
doi: 10.22487/j24775185.2023.v12.i4.pp226-229

Abstract

Langsat fruit (lansium domesticum) is a plant included in the family meliaceace. Several compounds were reported to have been isolated from multiple constituents in langsat plants that contain lansic acid, triterpene amino sugar glycoside, and dukunolides A- C, tetranortripenoid was dukunolides D- F. With the development of sciense a lot of research on ingredients and benefits langsat fruit both the pulp of the fruit and the skin. Empirically, the skin of the langsat fruit has been used as an anti-oxidant and anti-cancer treatment. Langsat fruit skin is an essential source of bioactive components such as phenols, flavonoids, tannins, saponins, triterpenoids, and alkaloids. This study used a UV-Vis spectrophotometer to determine the levels of flavonoids in the ethanol extract of langsat fruit peel (Lansium domesticum). This study aims to determine the levels of flavonoids in the skin of langsat fruit (lancium domesticum) by comparing the wet and dry fruit skin. Extraction of the chemical content of langsat fruit skin (Lansium domesticum) was carried out by the meseration method using ethanol 70.0/0. The determination of flavonoid levels in langsat fruit peel extract was measured at 520 nm and 700 nm from the result of the study. The total flavonoid levels of each sample were 2.856 mg /100 grams of alkaline fruit skin and 4.209mg /100 grams of dried langsat fruit peel. This shows that dried langsat fruit peel samples have high anti-oxidant power and alkaline fruit peel extracts.

Keywords: Langsat fruit, flavonoids, langsat fruit skin, UV-Vis spectrophotometer

Introduction

Langsat fruit (lansium domesticum) belongs to the family Meliaceae, also known as duku or kokosan (Indonesia). Hanum et al. (2013) stated that several compounds have been isolated from different parts of the langsat plant, namely lansioside A, triterpene amino sugar glycoside, dukunolides A- C, tetranortriterpenoids, namely dukunolides D- F, and lansic acid. Based on the bioactive compounds of Lansium domesticum, several studies have reported pharmacological activities such as antidiarrheal (Sepdahlia, 2013), antibacterial (Marfori et al., 2015; Mohamed et al., 1994), antimalarial (Saewan et al., 2006), anticancer (Manosroi et al., 2012), and antioxidant that can prevent damage to cell membranes or DNA due to free radical attack (Klungsupya et al., 2015).

With the development of science, many studies have been conducted on the contents and benefits of the langsat fruit, including the skin, pulp, and peel. The nutritional content of langsat fruit includes calories, vitamin A, vitamin C, vitamin B1, fat, carbohydrates, phosphorus, calcium, iron, and protein, which are needed by the body. In addition, it contains flavonoids, phenolics, and several bioactive compounds that are antioxidant compounds.

Empirically, langsat peel has been used as an antioxidant and anticancer agent. It is an important source of bioactive components such as phenols, flavonoids, tannins, saponins, triterpenoids, and alkaloids, which have antioxidant properties and have inhibited the growth of S. typhi and S. aureus. (Korompis et al., 2010)

Flavonoids are a major group of polyphenols. These compounds are common in plants and are pigments in higher plants (Singh, 2002). These compounds are found in all plant parts, including fruits, pollen, and roots (Sirait, 2007). Flavonoids are involved in all biological activities. According to cancer researchers at UCLA, smokers who consume foods containing flavonoids may reduce their risk of lung cancer. According to Miller (1996), several medicinal plants containing flavonoids have antioxidant,

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antibacterial, antiviral, anti-inflammatory, and anti-allergic activities.

Based on the above description, researchers are interested in conducting research on the analysis of the flavonoid content in langsat fruit peel. This research was conducted because previous researchers have done a lot of research on antioxidant and antibacterial langsat fruit peel, so it is necessary to research the flavonoid content in langsat fruit peel, which functions as an antioxidant.

Methods

Tools and materials

The tools used in this research are dropping pipette, 250 mL measuring cup, 10 mL measuring cup, 1000 mL beaker, 250 mL Erlenmeyer, test tube, stirring rod, funnel, digital balance, cuvette, test tube rack, shaker, rotary evaporator, centrifuge, microtube, spatula, cutting board, knife, and UV-VIS spectrophotometry.

The materials used in this study were langsat fruit peel, tissue, aluminum foil, filter paper, distilled water, 70 % ethanol, 37 % HCl solution, magnesium solids, and pH 1 and pH 5 buffer solutions.

Research procedure

Sample preparation

Dry sample preparation

The langsat fruit is separated from the flesh and skin. Then, the langsat fruit skin is washed with running water until clean. Then, the langsat fruit skin is chopped. After that, it is dried for several days without direct sunlight. Then, the sample is ready for further use.

Wet sample preparation

Langsat fruit is separated from pulp and skin. Then, the skin is washed with running water until it is clean. The skin is chopped. After that, it is dried for a few minutes without direct sunlight. Then, the sample is ready for further use.

Sample extraction

Sample extraction in this study was done by the researchers using modifications from Gustandy (2016), namely: 20-gram samples of langsat fruit peel were weighed using a digital balance. The sample was placed in an Erlenmeyer flask, and 200 mL of 70 % ethanol solution was added. To dissolve the flavonoid compounds in the sample. The conical flask containing the sample solution was sealed with aluminum foil, shaken on a shaker at 240 rpm for 60 minutes, and left for 24 hours. This process was repeated 3 times. Each filtrate obtained was concentrated using a rotary evaporator until no liquid dripped, resulting in a concentrated Langsat fruit peel extract. The Langsat fruit peel extract obtained can be used for further analysis.

Flavonoid analysis

Qualitative analysis of flavonoid

Researchers carried out qualitative flavonoid analysis in this study using a modification of Manik et al. (2014): 3 grams each of langsat fruit peel extract was placed in a test tube. The Langsat fruit peel extract was mixed with 2 mL of 37 % HCl solution and 0.05 g of Mg powder. The solution's discoloration into a yellow to purple-red color indicates the presence of flavonoids.

Quantitative analysis of flavonoid

Quantitative analysis of flavonoid in this study was carried out by researchers using a modification of Rezki et al., (2017), namely: 3 grams of ethanol extract of langsat fruit peel in each of 2 test tubes. In tube 1, a pH 1 buffer solution was added, and in tube 2, a pH 5 buffer solution was added. Then the absorbance was measured using a UV-Vis spectrophotometer at 520 nm and 700 nm. Measurements were performed with two replicates.

Calculate the flavonoid content of ethanol extracts of raw, semi-ripe, and ripe tin fruit using the differential pH method with absorbance values. The sample in this study was calculated by the researcher using the formula from Lee et al. (2005).

$$Absorbansi_{Total} = \{(A_{520} - A_{700})_{pH\,1} - \{A_{520} - A_{700})_{pH\,4,5}\} \quad (1)$$

The flavonoid content in the sample was calculated using the formula:

$$Flovanoid\ Total = \frac{A \times Mr \times 100}{\varepsilon \times b} \quad (2)$$

where, A is the total absorbance, E is the molar absorptivity of cyanidin-3-glucoside (26.900 L / mol / cm-1), B is the width of the cuvette (1 cm), Mr is the molecular weight of cyanidin-3-glucoside (449.2 g / mol), and 1000 is the conversion factor from grams to milligrams.

Results and Discussion

Based on the research carried out on the analysis of flavonoid levels in the peel of Lansium Domesticum fruit, which included qualitative and quantitative tests, the study's results are presented in **Table 1**.

Table 1. Average flavonoid content of Langsat fruit peels

No	Langsat fruit Peel Extract	Flovanoid Content
1	Dry	1403 mg / L
2	Wet	952 mg / L

Qualitative tests are carried out to determine the types of compounds contained in wet and dry langsat fruit peel extracts. The types of compounds to be identified are flavonoid compounds using 37 % HCl solution and 0.05 grams of magnesium solids (Manik et al., 2018).

The identification of flavonoid compounds using a 37 % HCl solution and 0.05 gram

magnesium solids aims to determine the presence of flavonoid compounds in the sample. Qualitative tests showed that dry and wet langsat fruit peel extracts were positive for flavonoids, as indicated by a change in color from orange to reddish yellow and from faded orange to faded yellow (Korompis et al., 2010).

Based on the results of qualitative tests, each sample has a different level of color density, and each extract has various chemical compounds (Stankovic et al., 2011).

Flavonoid compounds in langsat fruit peel were tested using a UV-Vis spectrophotometer; then, the levels were determined using the differential pH method. The differential pH method is used to test the total presence of anthocyanins in a sample, so the anthocyanin content obtained through this method is assumed to be the total flavonoid content in the sample. This is done because the basic structure of anthocyanin compounds, namely C6-C3-C6, is the basic structure of flavonoid compounds (Rahmasita et al., 2021).

The differential pH method was used in this study to determine the flavonoid content in the langsat fruit peel. Langsat fruit peel extract was reacted with pH 1 and pH 5 buffer solutions in a 3- 3 ratio. The added buffer solution acts as a reagent. Langsat fruit peel extract in this study was measured for absorbance using a UV-Vis spectrophotometer at 520 nm and 700 nm. $\lambda = 520$ nm is the maximum λ for cyanidin-3-glucoside, and measuring the sample at $\lambda = 700$ nm aims to correct or check for turbidity in the analyzed solution (Lee et al., 2005). Flavonoid levels are determined in an acidic atmosphere because acids can denature plant cell membranes and dissolve anthocyanin pigments, allowing them to escape from the cells and preventing flavonoid oxidation. Anthocyanins are a class of flavonoid compounds that act as natural antioxidants. Anthocyanins are more stable in an acidic atmosphere than in a humid or neutral atmosphere. Anthocyanins themselves are affected by several factors, including pH (Aminah et al., 2016).

The results obtained from calculating the flavonoid concentration in the sample solution (mg / L) are then converted to the dry weight concentration in the sample (mg / 100 g). Flavonoid levels in Langsat fruit peel samples with wet and dry variations are 2.856 mg / 100 g and 4.209 mg / 100 g, respectively. The results show that the highest flavonoid levels are in dry langsat peel extract compared to wet langsat peel extract. The water content is one of the factors responsible for the lack of flavonoids in wet fruit peel extracts, as water is involved in the weighing process during the extraction process. On the other hand, in dry fruit peel extracts, the water content is lower, and the flavonoids are not damaged by temperature. This shows that sample preparation can affect the sample's total flavonoid content, and the dried langsat peel sample has high antioxidant power compared to the wet langsat peel extract.

Conclusions

Based on the research and discussion that has been done regarding the analysis of flavonoid levels in langsat (Lansium domesticum) fruit peel, it can be concluded that: Dry langsat (Lansium domesticum) fruit peel contains flavonoid compounds of 1403 mg / L equivalent to 4.209 mg / 100 g, wet langsat (Lansium domesticum) fruit peel contains flavonoid compounds of 952 mg / L equivalent to 2.856 mg / 100 g, and sample preparation may affect the total flavonoid levels in the sample.

Acknowledgment

The author would like to thank the laboratory assistants of the Faculty of Teacher Education for their guidance and input in completing this research.

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