STUDY APPLICATION OF ANTHOCYANIN EXTRACT OF BLACK GLUTINOUS RICE (ORYZA SATIVA VAR GLUTINOSA) AS ANTIOXIDANT IN LIQUID SOAP: LITERATURE REVIEW ARTICLE

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REVIEW ARTICLE

STUDY APPLICATION OF ANTHOCYANIN EXTRACT OF BLACK GLUTINOUS RICE (*ORYZA SATIVA VAR GLUTINOSA*) AS ANTIOXIDANT IN LIQUID SOAP: LITERATURE REVIEW ARTICLE

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ABSTRACT

Antioxidants have many different benefits in the body, including inhibiting the oxidation process. Antioxidants are found in several plants, including black sticky rice (Oryza sativa var glutinosa). Color pigment in black sticky rice contains a mixture of anthocyanin compounds that function as antioxidants and free radical scavengers. This study aims to describe the antioxidant activity of black glutinous rice extract with extraction for different hours and solvents. Research design is a literature study or a review of scientific articles. The antioxidant activity was tested using the DPPH method so that it could be applied as an innovative liquid soap with organic ingredients. The results obtained were that the stability of anthocyanins was influenced by pH, temperature, and extraction time, acetone solvent had a greater amount of anthocyanin extract than ethanol. Anthocyanins can be applied because they contain phenolic compounds in anthocyanins which can inhibit bacterial growth, marked by an inhibition zone.

KEYWORDS

antioxidants, black glutinous rice, soap, anthocyanin.

1. INTRODUCTION

Free radicals can cause premature aging of the skin. Aging of the skin results in a decrease in the elasticity of the skin and can increase the damage to skin melanin. The body has natural antioxidants called enzymatic antioxidants which can catalyze the reduction of free radicals. However, when the skin is exposed to a large number of free radicals that come from the environment, endogenous antioxidants alone are not enough to ward off these free radicals. Therefore, exogenous-derived antioxidants are needed to keep skin healthy (Sriarumtias, 2017). Natural ingredients are often used in the manufacture of cosmetics such as black sticky rice extract which contains anthocyanins. Anthocyanin is a bioactive component and is a basic coloring agent in red, blue, purple, and black in food. Anthocyanins can provide antioxidant, anti-inflammatory, and anti-cancer protective effects (Giusti, 2001).

Black sticky rice is a food source that is rich in anthocyanins and has not been widely developed as a functional food. Black glutinous rice has different properties from black rice due to its higher antioxidant activity than black rice (Wrostald, 1974). Several studies have shown that the anthocyanin content of black sticky rice plays an important role in antioxidant, anti-inflammatory, as well as natural coloring in foods. Anthocyanins are substances that are usually found in higher plants and form color pigments. Anthocyanins belong to a group of compounds known as flavonoids. Anthocyanin pigments are the main components believed to play a role in the antioxidant activity of black sticky rice (Suhartatik, 2019). The antioxidant activity of black sticky rice can potentially be formulated into liquid soap to protect the skin from being exposed to free radicals and bacteria. The use of liquid soap is very common and always exists in every home. The purpose of this study was to make liquid soap preparations from black sticky rice extract which have antioxidant activity.

2. LITERATURE REVIEW

Liquid soap is a pharmaceutical preparation used to clean the skin from dirt and bacteria. According to Hernani's research, in 2010 soap was produced from a reaction between fatty acids and strong bases which function to wash and clean dirt. Liquid soap was chosen because it has the effect of cleaning the surface of the skin from both water-soluble and fat-soluble impurities. Liquid soap itself is easy to place in a closed container so that it can be carried anywhere and hygienic (Wijana, 2009). Liquid soap is also a medium that is commonly used to prevent or minimize the occurrence of diseases and infections caused by bacteria, viruses, fungi and other minor groups (Aryani, 2015).

Some of the common microorganisms that can stick to and infect the skin are *Escherichia coli* and *Staphylococcus aureus. E. Coli* causes a primary infection of the intestine which causes diarrhea and other tissues besides the intestine. *E. coli* has habitats such as aquatic, soil, food, urine and feces. The spread of *E. coli* can also be through physical contact such as touching and shaking hands later (Melliawati, 2015). While *S. aureus* is a microorganism that is often found on the skin and can cause several diseases such as boils, acne, pneumonia, meningitis, and arthritits (Madigan, 2008). In the soap literature study, a correlation relationship between the soap literature and the antioxidant potential of black sticky rice can be made.

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In making soap with water henna raw material with a composition of 15% with a raw material of 7.5 grams, it gets the test requirements that are in accordance with the Indonesian National Standard. Soaps with black sticky rice as raw material have great advantages over water henna flowers because the anthocyanin content of black sticky rice is greater and the antioxidant activity in black sticky rice reaches 59.2%, while the antioxidant activity in purple sweet potatoes according to Husna's research, 2013 amounted to 31.14% and according to research Kang, 2013 the antioxidant activity of water henna flowers was 54.05% (Suhartatik, 2013).

Research studies on the extraction of black sticky glutinous anthocyanins using the maceration method, where anthocyanins are a group of flavonoid compounds associated with pigment content such as red, purple and black. Flavonoid compounds have benefits as antioxidants, such as being able to repair cells damaged by free radicals. The most common types of anthocyanins are cyanidin-3-o-glucoside and peonidin-3-o-glucoside (Lee, 2010).

3. Research Methodology

The research design is a literature study or a review of scientific articles (international journals). Literature review study is one of the methods used to collect data or related sources on a particular topic of writing a final project (thesis) or study. Literature review is a comprehensive overview of research that has been done on a specific topic to show readers what the topic is and what is not known, to find rationale for research that has been done or for future research ideas (Denney and Tewksbury, 2013).

Literature studies can be obtained from various sources including journals, books, documentation, internet and literature. The literature study method is a series of activities related to the methods of collecting library data, reading and taking notes, and managing writing materials (Zed, 2008 in Nursalam, 2016). The type of writing used is a literature review study that focuses on the results of writing related to the topic or variable of writing. In this study, using international journals as a literature study to obtain data that supports the results of the discussion. International journal topics include the extraction of black sticky rice with various solvents as antioxidants in soap.

4. Finding and Discussion

In this research study, an analysis of the literature study on anthocyanin extract of black glutinous rice was carried out using various types of solvents. In addition, this study could determine the application of the anthocyanin extract of black glutinous rice which is used as an antioxidant in soap. The purpose of this research study was to determine the optimal results related to anthocyanin pigment extract with a simple method in comparison of black sticky rice extraction data. In this research study, a journal review was carried out with the topic of black glutinous rice anthocyanin extraction as an antioxidant in soap. In each journal topic used, objective analysis, theoretical analysis, data analysis and analysis of the influence of the parameters used in each journal are carried out. In the analysis carried out, a conclusion was obtained about the optimal results related to the anthocyanin pigment extract of black glutinous rice using a simple method. These results will be compared on each parameter used in the black sticky rice extraction research in each journal literature.

The same thing was also reported by that the HPLC profile showed that the anthocyanins extracted in black rice were cyanidin-3-O-bglucoside as the first peak (85%) and peonidin 3-ObD-glucoside the second (15%) (Yawadio et al. 2007). In antioxidants there are various types of compounds, including anthocyanins. According to a study, most natural sources of antioxidants are plants that contain phenolic compounds that are scattered throughout the plant, whether on wood, seeds, leaves, fruit, roots, flowers or pollen (Sarastani, 2002). The existence of anthocyanins in nature and their distribution in various different types of plants and in other natural materials, make anthocyanins have different characters. This makes anthocyanins an organic chemical with great potential in exerting physiological functions in various living organisms, both for humans, animals, and in plants themselves.

Table 1: Data Comparison of Total Anthocyanin (Rabalski, 2006; Sompong, 2010; Velioglu, 1998; Shivakumara, 2014; Yunilawati, 2018)

Types	TAC (µg/g)
White rice	27.2
Brown rice	93.5
Black rice	2566.1
Black glutinous rice	3276
Purple corn	1277
Blueberry	796.3
Water henna flowers (*Impatiens balsamina L.)*	320
Purple sweet potato	1700

4.1. Types of Solvents for Anthocyanin Extraction of Black Sticky Rice

One of the factors that affect the stability of anthocyanins is the solvent used, as for the selection of the type of solvent used in the maceration extraction process of black sticky rice anthocyanins. Anthocyanins are dyes that are polar and will dissolve well in polar solvents (Hanum, 2000). Widarta and Nocianitri's research in 2011 reported that ethanol solvent was able to produce higher total phenolics and anthocyanins in brown rice and black rice than methanol and aquades solvents. The table of extraction results and total anthocyanin content from black glutinous rice extract with various types of solvents.

Table 2: Results of Total Anthocyanin Content

Raw Material	Solvent Type	Total of anthocyanin (%w/w)
Black glutinous rice	Methanol	0.166
	Ethanol	0.126
	Acetone	0.077

Based on the extraction and total anthocyanin results in Table 2, black glutinous rice extraction, the greatest yield for% extraction yield is found in acetone solvent. Kanitha Tananuwong's research study in 2009 showed that acetone was superior to ethanol solvent when used to make crude extracts from black glutinous rice, at the same solvent pH and extraction time, the acetone solvent gave a larger extract, but produced a small total anthocyanin content. This is because the boiling point of acetone is about 22 °C lower than ethanol solvent (Lide, 2008). Lower temperatures can reduce solvent evaporation and can save energy and reduce heat degradation of antioxidants during the evaporation process.

However, the evaporation process will cause loss of anthocyanins carried by evaporation that is too young, this causes the total anthocyanin to decrease. In terms of regulatory status, acetone is permitted to be used as an extraction solvent for food additives according to the FAO JECFA Monograph and Directive 2009/32 / EC (JECFA, 2006; EC, 2009). Acetone containing 70 ml acetone / 100 ml solvent was then selected as a model system to consider the optimal. In terms of anthocyanin extraction, most use ethanol and methanol solvents, because in anthocyanins there are phenolic levels that are easily soluble in alcohol solvents (Widarta, 2011).

4.2 Effect of pH and time on Anthocyanin Extraction of Black Sticky Rice

The pH factor also affects the anthocyanin extraction process, the extraction of anthocyanin compounds is carried out acidic ally because anthocyanins are more stable in acid than neutral or alkaline. acid causes more and more vacuole cell walls to break so that more anthocyanin pigments are extracted. At pH 2, anthocyanins are more stable and not easily degraded due to the higher stability of anthocyanins in acids. The table of types of anthocyanins produced from the extraction of glutinous rice with various pHs. Based on Table 3, total anthocyanins obtained in increasingly acidic conditions have a high anthocyanin content, but low antioxidant levels. At the extraction time of 8 hours, the total anthocyanins decreased, this was due to the fact that the length of the extraction time

showed that the color of the anthocyanins was fading because the colored flavylium cations were hydrated into colorless carbinols. Under strong acid conditions, this compound is rapidly hydrolyzed into fully ionized chalcone. This is what causes anthocyanins to be easily damaged in long immersion conditions.

In addition, anthocyanins can also be degraded by the presence of oxygen and enzymatic oxidation, for example, polyphenol oxidase, which results in significant color changes. However, the decrease in absorbance did not change the pigment in the extraction result. This is consistent with Hanum's research in 2000, that the condition of the black glutinous rice concentrates at pH 5.5 showed a decrease in pigment levels that was greater or at least stable compared to conditions of pH 3.5 and 4.5. In Table 3, pH 2 anthocyanins are more stable and not easily degraded due to the higher stability of anthocyanins in acids, however, acidic solvents produce crude extracts with lower antioxidant activity for antioxidant activity. high stable at a susceptible pH 4-6.8 (Kanitha Tananuwong, et al., 2009). Immersion at pH 2 with extraction time for 2 hours has increased anthocyanin yield, after 4 hours the extraction has decreased. This shows that the color of anthocyanins is fading because the colored flavilium cations are hydrated into colorless carbinols. At a strong acidic pH, this compound quickly hydrolyzes to form fully ionized chalcone. This is what causes anthocyanins to be easily damaged in long immersion conditions (Hanum, 2000).

Table 3: Total monomer anthocyanin content of black glutinous rice crude extract obtained from different extraction times and solvent pH (acetone-water mixture, 70:30 v / v) in Kanitha Tananuwong Research, 2009

pH	Time (h)	Total of anthocyanin (mg/g of powder)	IC50 (g powder/g DPPH)
2.0	2	342 ± 6a	77.6 ±0.5 a
2.0	4	352 ±35 a	59.3 ±0.5 b
2.0	8	313 ±30 a	51.9 ±0.5 b
6.8	2	275 ±26 a	46.9 ±2.0 a
6.8	4	288 ±22	42.9 ±2.7 a
6.8	8	298 ±11 a	46.0 ±1.8 a

a = ± standard deviation for triplicate experiments

b = followed by the same letter in the column are not significantly different (p> 0.05).

Table 4: Anthocyanin levels of black glutinous rice at several temperatures and heating time (initial anthocyanin levels 25 mg cyanidin-3-glucoside / 100 mL)

Heating temperatur e (°C)	Anthocyanin levels (mg / 100 mL) during heating (minutes)			
	15	30	45	60
30	14,06 + 0,03^{c}	11,61 + 0,08^{gh}	12,19 + 0,03^{fg}	11,08 + 0,03^{i}
40	16,34 + 0,02 ^{a}	12,26 + 0,04^{f}	11,25 + 0,01^{h}	10,82 + 0,02^{i}
50	15,21 + 0,03^{b}	13,74 + 0,01^{d}	7,44 + 0,01^{n}	7,10 + 0,01^{no}
60	13,22 + 0,02^{e}	8,13 + 0,03^{kl}	7,74 + 0,03l^{m}	7,40 + 0,01^{mn}
70	10,10 + 0,02^{j}	8,68 + 0,01^{k}	6,15 + 0,08^{q}	5,44 + 0,01^{r}
80	7,83 + 0,04^{kl}	7,54 + 0,03^{lm}	6,92 + 0,02^{op}	6,66 + 0,01^{p}

In the anthocyanin extraction treatment, care must be taken in making the variable composition for the study. Anthocyanins are stable at strong acid pH but will be easily degraded at long immersion time. For soaking in acidic pH with a fast extraction time, anthocyanin yields are not high. It is necessary to pay attention to the variable composition treatment in anthocyanin extraction research in order to obtain maximum anthocyanin results.

4.3 The Effect of Temperature on Anthocyanin Extraction of Black Sticky Rice

Based on Table 4, a decrease in anthocyanin levels is also experienced when heating at temperatures above 30 °C. A decrease in anthocyanin levels> 50% was experienced in anthocyanins heated at temperatures > 70 °C. Heating for more than 30 minutes will reduce anthocyanin levels by more than 50%. The higher the heating temperature, the more damaged anthocyanins will be. Likewise, the length of heating time, the longer the heating time, the more anthocyanins are degraded. Sadilova et al's research in 2006 stated that the damage of as much as 50% of the anthocyanin of elderberry fruit would occur when heated at 95 °C for 3 hours. Meanwhile, in the research of Garcia- Viguera and Zafrilla in 2001, stated that anthocyanin losses of between 10% and 80% will occur in jam if heated with a range of between 10 -15 minutes.

Some researchers have also mentioned that temperature during storage has a logarithmic effect on anthocyanin damage (Drdak and Daucik, 1990; Havlikova and Mikova, 1985; Rhim, 2002). In general, anthocyanin degradation can occur due to the presence of polyphenol oxidase enzymes. This enzyme can be inactivated by moderate heating (<50 °C). This is what explains why heating at temperatures <50 °C in Table 4, especially at a heating time of 15 minutes, shows that anthocyanin levels are higher than temperatures of 30 °C. Similar results were also reported in a previous study and a study by when conducting experiments with blueberry juice that was blanched (heating treatment) and the results did not experience enzymatic degradation during the storage process (Skrede et al., 2000; Rossi et al., In 2003).

5. Conclusion

The results obtained from this study are:

1) Factors that affect the anthocyan stability of black glutinous rice extract include solvent, pH, temperature, extraction time.
2) The method of application of black glutinous rice extract is carried out in the final stage after all the ingredients are homogeneous because the anthocyanin of black glutinous rice extract is an active substance to increase antiseptic and free anti-radical properties.
3) The liquid soap test is carried out by the soap testing test, the free alkali test, the water content test, the organoleptic test and the inhibition zone test.The way to make/design a figure

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