



Comparison of Phytochemical Content in Clitoria Ternate Flowers and Roselle Flowers as Functional Drink Ingredients in Kediri, Indonesia

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ABSTRACT

Clitoria ternatea, or butterfly pea flower, is a tropical plant with high historical and cultural value, especially in traditional medicine in Indonesia and Asia. This plant is rich in bioactive compounds such as phenols, terpenoids, and alkaloids, which support its various pharmacological activities, including as an antioxidant, antidiabetic. Roselle petals contain bioactive compounds with high anthocyanin content. The research problem is that the flowers used as functional beverage ingredients do not yet have information on their phytochemical compounds. The study aims to examine the comparison of phytochemical compound content in butterfly pea flowers and roselle flowers as coloring ingredients for functional beverages. Anthocyanins, which are a group of flavonoids, act as natural antioxidants. The research method uses quantitative tests on both types of flowers. The parameters measured are DPPH, polyphenols, anthocyanins, fiber, and vitamin C. The research results explain that butterfly pea flowers contain an IC₅₀ value of 25.1559-29.9034 µg/mL, protein around 10-15%, fiber 20-30%, Vitamin C 100-200 mg/100g, minerals including potassium, calcium, and magnesium, phenol 13.8%, and anthocyanin 0.1-0.5%. The roselle flower has an IC₅₀ of around 33.79 µg/mL, total phenolics of 2086.32 µg/mL, Vitamin C around 244-260 mg/100g, and anthocyanin around 0.1-0.5%. Its minerals include calcium, magnesium, and potassium

INTRODUCTION

Roselle flower petals contain bioactive compounds with high levels of anthocyanins. Anthocyanins are a group of flavonoids that act as natural antioxidants. Red roselle grows scattered throughout Indonesia, including in the Sukabumi area, which has a soil structure at an altitude of 584 meters above sea level, sufficient to meet the requirements for roselle to grow well. Research results show that the IC₅₀ of red roselle flower petal extract is 581.5 ppm, while the comparator solution, vitamin C, yields an IC₅₀ value of 11.23 ppm (Shafirany, et al., 2021). Roselle plants are well-known plants because the petals of the roselle flower are commonly used as a health drink that can cure various diseases (Patel, 2014). Instant granules combining roselle flower petal extract have also been proven to have activity in treating diseases, including hypertension tested on male white rats (Shafirany, et al., 2018). Roselle petals (*Hibiscus sabdariffa* L.) are so popular because almost all parts of this plant can be used for alternative medicine; in addition, roselle contains chemical compounds that can provide many benefits.

The purpose of the study is to examine the comparison of bioactive compound and phytochemical content in 2 types of flowers, namely butterfly pea and roselle, as functional food ingredients. The potential of both types of flowers is highly favored by consumers because they are proven to be beneficial as health drinks and natural food colorants with an appealing aroma.

LITERATURE RIVIEW

This is related to several compounds found in roselle, such as anthocyanins (delphinidin and cyanidin-3-O-sambubioside), phenolic acids (especially protocatechuic acid), and organic acids (hydroxycitric acid and hibiscus acid) (Rocha et al., 2014). Butterfly pea (*Clitoria ternatea*) is one of the plants whose all parts have functional benefits for the human body. The flower petals are reported to be beneficial as antioxidants, antidiabetic, anti-obesity, anticancer, anti-inflammatory, antibiotic, and protective of liver tissue (Marpaung, 2020). One version specifically mentions Southeast Asia as the origin of this plant (Manjula et al., 2013). Meanwhile, according to another version, butterfly pea is said to originate from the Caribbean, Central America, and Mexico (Mukherjee et al., 2008) or Africa (Poth et al., 2011).

METHODOLOGY

Research Time

The research was conducted from October to December 2025 at the Biochemistry Laboratory, Faculty of Agricultural Technology, Brawijaya University, Malang. The equipment used included an oven, grinder, volumetric flask, volumetric pipette, analytical balance, measuring cup, spectrophotometer, refrigerator, incubator, mixer, and burette. The research materials included extracts of roselle flowers and butterfly pea flowers obtained from Blitar, East Java. Supporting materials for chemical analysis included distilled water. The method for phytochemical compound analysis was a quantitative test, which included:

DPPH Analysis

Antioxidant activity is measured using a UV-Vis spectrophotometer, and the obtained data is presented in tabular form. The comparator used as a positive control is vitamin C, used as a comparator because it functions as a secondary antioxidant, namely capturing free radicals, preventing chain reactions, its antioxidant activity is very high, it is easily obtainable, and vitamin C is more polar than other vitamins (Isnindar, 2011).

Vitamin C Analysis

Vitamin C testing uses the Spectrophotometry method to measure the absorbance of vitamin C at a certain wavelength.

Anthocyanin Analysis

Determination of anthocyanin content in roselle flowers and butterfly pea flowers using spectrophotometry to measure anthocyanin absorbance at a wavelength of 510-550 nm.

Fiber Analysis

Fiber measurement using the HPLC method, which uses liquid chromatography to separate and determine the fiber content in the sample.

Protein Analysis

Protein content can be measured using the Kjeldahl method.

Mineral Analysis

Mineral content in the sample can be measured using the AAS method.

Phenolic Analysis

Phenol content measurement can be done using the HPLC method. Hasil dan Pembahasan

RESULT AND DISCUSSION

Clitoria ternatea flowers have quite high antioxidant levels. Research shows that extracts of Clitoria ternatea flowers have an IC₅₀ value of 25.1559-29.9034 µg/mL, indicating strong antioxidant activity. By comparison, ascorbic acid has an IC₅₀ value of 2.7777 µg/mL. The phenolic compound content in Clitoria ternatea flowers also acts as an antioxidant. Other research shows that the ethyl acetate fraction has the highest total phenol content of 13.68% and very strong antioxidant activity with an IC₅₀ value of 26.81 ppm. Thus, Clitoria ternatea flowers can be a good source of natural antioxidants for health. Hibiscus flowers have quite high antioxidant levels. Research shows that Hibiscus flower extracts have an IC₅₀ value of 33.79 µg/mL, indicating strong antioxidant activity. In addition, roselle flowers also contain a total phenolic compound of 2086.32 µg/mL. The antioxidant content in roselle flowers is also influenced by the extraction method used. Roselle flower ethanol extract has better antioxidant activity compared to decoction, with IC₅₀ values of 8.416 µg/ml and 19.74 µg/ml, respectively.

Roselle flowers also contain antioxidant compounds such as gossypetin, anthocyanins, and glucosides, which can help fight free radicals and reduce oxidative stress. Butterfly pea flowers have fairly high nutrient levels. Here are some examples of nutrient content in butterfly pea flowers: they contain around 10-15% protein, about 20-30% fiber, around 100-200 mg/100g of vitamin C, and minerals such as potassium, calcium, and magnesium. The anthocyanin compounds that give the flowers their blue color are present at about 0.1-0.5%. Butterfly pea flowers contain total phenolic compounds of around 13.68%. Nutrient levels in butterfly pea flowers can vary depending on factors such as variety, soil conditions, and processing methods. However, in general, butterfly pea flowers can be a good source of nutrients for health. Roselle flowers have a fairly high nutrient content. Here are some examples of nutrient levels in roselle flowers, which are rich in vitamin C, with levels around 244-260 mg/100g. Phenolic Compounds: Roselle flowers contain a total phenolic compound of 2086.32 µg/mL. Roselle flowers contain anthocyanins that give the flowers their red color, with levels around 0.1-0.5%. Roselle flowers contain minerals such as potassium, calcium, and magnesium, and also contain fiber that can help improve digestive health. The nutrient content in roselle flowers can vary depending on factors such as variety, soil conditions, and processing methods. However, in general, roselle flowers can be a good source of nutrients for health. According to the opinion (Athallah, et al., 2024) the bioactive compounds in butterfly pea flowers work through mechanisms such as enzyme inhibition, regulation of glucose levels, modulation of inflammatory responses, and protection of tissues from oxidative stress, with potential to be developed as innovative therapies with broad benefits in treating various diseases. The research results of Helilusiatiningsih (2025), sequentially Mineral content of the flowers: Potassium (K): 1456 mg/100g; Magnesium (Mg): 58 mg/100g; Calcium (Ca): 337 mg/100g; Phosphorus (P): 115 mg/100g; Iron (Fe): 2.3 mg/100g; Zinc (Zn): 1.4 mg/100g.

CONCLUSIONS AND RECOMMENDATIONS

The results of the chemical compound analysis of butterfly pea flowers and roselle flowers showed different levels of their contents; however, both types of flowers have the same potential as functional food ingredients. They benefit the body as antioxidants that function to boost immunity, inhibit the development of degenerative diseases such as cancer, inflammation, bacteria, diabetes, allergies, and others.

FURTHER STUDY

This research still has limitations so that further research is needed on the topic of Comparison of Phytochemical Content in Clitoria Ternate Flowers and Roselle Flowers as Functional Drink Ingredients to perfect this research and increase insight for readers and writers.

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