Journal Techno, Vol. 8, No.1, 2022, pp. 075 - 082
ISSN. 2461-1484

EXTRACTION OF NATURAL COLOR OF BUTTERFLY PEA (*CLITORIA TERNATEA L*) WITH VARIABLES pH-TEMPERATURE AND CONCENTRATION FOR FOOD COLORING

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Abstract

Anthocyanins are chemical compounds contained in a plants. Anthocyanin pigments are water soluble and have pink, red, purple, blue, and yellow colors. Anthocyanins act as a natural food coloring in the form of dry powder or concentrated liquid. The production of anthocyanins from butterfly pea as a natural dye is currently not maximized yet. The anthocyanin extraction process in this study was carried out by heating the butterfly pea using aquadest as a solvent. The purpose of this study is to find the optimum conditions for extracting anthocyanins from butterfly pea, to learn the effect of temperature and pH on the absorbance and color values of the butterfly pea extract with distilled water, as well as its application as a natural dye in food. In this study, it was found out that the optimum concentration was obtained at a ratio of 15 grams:500 ml (weight of butterfly pea:solvent volume) at pH 4. This proves that the concentration will increase along with the increase in the absorbance value. The optimum concentration value occurs at a temperature of 60°C. While the lowest transmittance value was obtained in the sample with a ratio of 15 grams: 500 ml (weight of telang flower: volume of solvent) at pH 4 and a temperature of 60°C. This proves that the transmittance value is inversely proportional to the concentration value. The butterfly pea extract that obtained at pH 4 produced a bluish purple color, pH 5 produced a purplish blue color, pH 6 produced a light blue color, pH 7 produces a blue color, pH 8 produces a bluish green color, and pH 9 produces a green color.

Keyword: *Anthocyanin, Extraction, Butterfly Pea*

PRELIMINARY

Indonesian people have a tendency to abuse the use of dyes for various foodstuffs, for example, dyes for textiles and leather are used to color foodstuffs (Darmawati, 2019). Almost all foods use coloring agents to give them a bright effect. Not all dyes are safe for our bodies to consume, such as synthetic dyes or textile dyes used as food coloring. In the regulation of the minister of health (Regulation of the Minister of Health of the Republic of Indonesia Number: 722/Menkes/Per/IX/88) it has been explained that the use of food coloring as a food additive and dye is prohibited in the

food industry (Mastuti, 2013). Synthetic or textile dyes are very dangerous for health because of the heavy metal residues in these dyes. Synthetic dyes are made by a gradual chemical process that makes them more stable. At this time, people are used to common food coloring, such as suji leaves, pandan, kesumba, Rosella flowers, and other plural dyes (Darmawati, 2019). Indonesia has various types of biodiversity, which is around 40,000 plant species (Istiqomah and Fakhrinanda, 2019). These plants have various benefits of each, one of which can

used as a natural dye. found in various parts of plants, such as roots, leaves, stems, and even flowers. One of the natural pigments that can be used as natural dyes is anthocyanin. Anthocyanins are chemical compounds that are widely distributed in nature as dyes in plants. Anthocyanin pigments are soluble in water and have pink, red, purple, blue, and yellow colors (Adam, 2015). Anthocyanins have an aromatic ring structure that has a polar component and a glycosyl residue, therefore they can produce polar molecules. The polar nature of anthocyanins makes it more soluble in water than in non-polar solvents (Angriani, 2019).

The presence of anthocyanins in nature is the most abundant. Based on several research results, it shows that the source of anthocyanins is mainly found in natural materials, especially in plants. Anthocyanins found in flowers, especially in the flower crown, were mostly found in flowers with varying concentrations of anthocyanins: rose (0.925% / 10g), hibiscus (0.739% / 10g), roselle (0.795% / 10g by weight of fresh flowers, 44.856% / 100g dry weight), four o'clock (0.977% / 10g), and others (Priska et al., 2018). The level of anthocyanin contained in the pea flower is 5.4 mmol/mg of interest (Priska et al., 2018). In the food industry, anthocyanins are used as natural food and beverage colorants in the form of dry powder or concentrated concentrations. The color produced by anthocyanins can attract attention to food and beverages. Several food and beverage industries that use anthocyanins include the jam, ice cream, gelatin, carbonara, yogurt and muffin industries. Several countries that have used butterfly pea in various food and beverage products include Thailand, Malaysia, and Singapore.

The production of anthocyanins from butterfly pea as a natural dye for the food industry is currently not maximized. This is indicated by the continued use of synthetic dyes in the food industry. The use of synthetic dyes can have a negative impact, especially for consumers. Synthetic dyes have more negative impacts on health. If consumed continuously and in the long term, it will affect the performance of organs in the body. The use of synthetic dyes that are prohibited can cause health problems. Prohibited dyes can poison the kidneys and cause liver function disorders and cancer because generally the dyes used are textile dyes (Handayani and Henilisa, 2018).

The anthocyanin extraction process in this study was carried out by heating the butterfly pea using aquadest as a solvent. With this research, it is hoped that

optimum conditions can be found for extracting anthocyanins from butterfly pea, studying the effect of heating temperature and pH on absorbance value and natural color produced from butterfly pea extract with distilled water as a solvent, as well as its application as a natural dye in food.

RESEARCH MATERIALS AND METHODS

Tools and materials

The equipment used in this research is a set of extraction tools. The materials used were dried butterfly pea obtained from farmers in the Yogyakarta area, aquadest, lime juice, and Kangen Water pH 8 and 9.

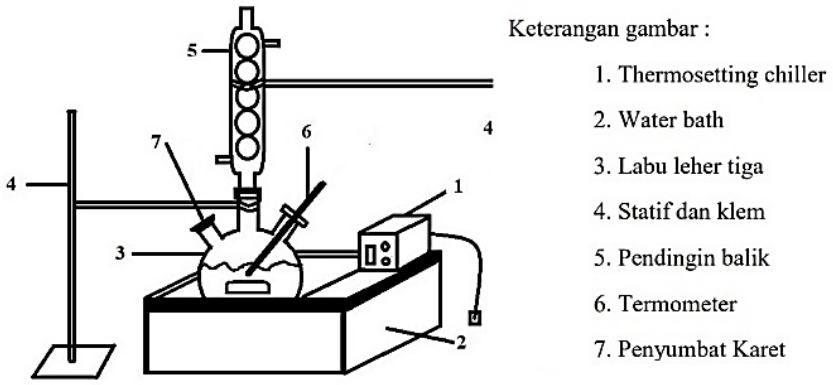

Figure 1. Extraction Tool Series

Method

1. Plant Material

Dried butterfly pea were obtained from butterfly pea farmers in the Yogyakarta area, aquadest, lime juice, and Kangen Water pH 8 and 9.

2. Extraction

The butterfly pea (*Clitoria ternatea L*) used in this study is a flower that has been dry and has been separated from the impurities. For the purposes of standardization, the telang flower was dried again using an oven at 60°C for 20 minutes. The dried butterfly pea is then chopped into small pieces before the extraction process is carried out.

The extraction process in this study was carried out using distilled water for 1 hour with variations in the ratio of the weight of the butterfly pea to the solvent (5:500; 7:500; 9:500; 11:500; 13:500; 15:500) gram/ml; extraction temperature 30 °C; 40 °C; 50 °C; 60 °C and 70 °C, and with a pH variation of 4; 5; 6; 7; 8; 9. The extract obtained was then filtered to obtain the filtrate.

3. Implementation of Pomegranate Flower Extract as Food Color

Each sample obtained was applied as a food coloring by mixing the extract into the food or drink that would be given a natural dye.

4. Results Analysis

The obtained filtrate was analyzed using a UV-Vis spectrophotometer to determine the anthocyanin concentration seen from the resulting absorbance value. The anthocyanin concentration can be calculated using the equation obtained from the anthocyanin standard curve. After obtaining the anthocyanin concentration, the transmittance value was analyzed.

RESEARCH RESULTS AND DISCUSSION

The standard curve is obtained at a wavelength of 536 nm, where at this wavelength is the maximum absorption wavelength.

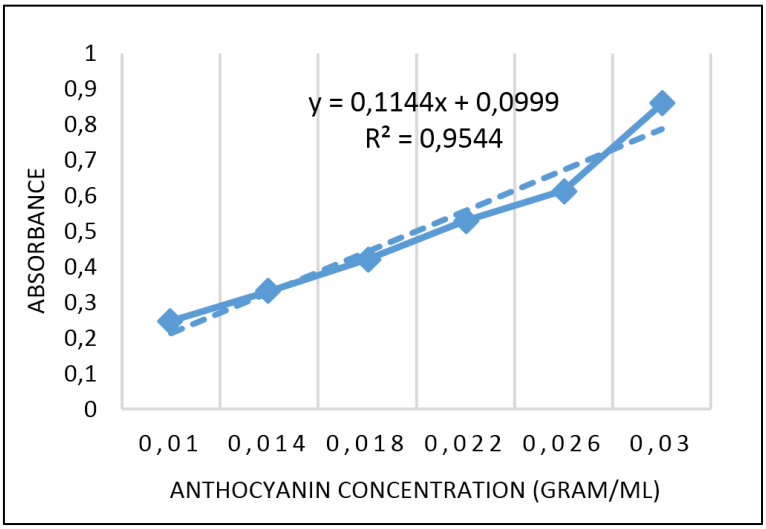

Figure 2. The Anthocyanin Standard Curve of butterfly pea

The filtrate from the extraction of telang flower was analyzed for its absorbance value using UV-VIS Spectrometry. Furthermore, the absorbance value is entered in the equation that has been obtained from the anthocyanin standard curve.

The anthocyanin concentration in the butterfly pea extract is influenced by the absorbance value, the higher the absorbance value, the higher the anthocyanin concentration or the anthocyanin content of the butterfly pea extract obtained. This is in accordance with the Lambert-Beer law which states that the relationship between absorbance and the concentration of the analyte solution is linear and inversely proportional to the transmittance.

Based on the results obtained, the optimum concentration value occurs in the sample with a ratio of 15 grams: 500 ml (weight of butterfly pea: volume of solvent) at pH 4 at a temperature of 60°C.

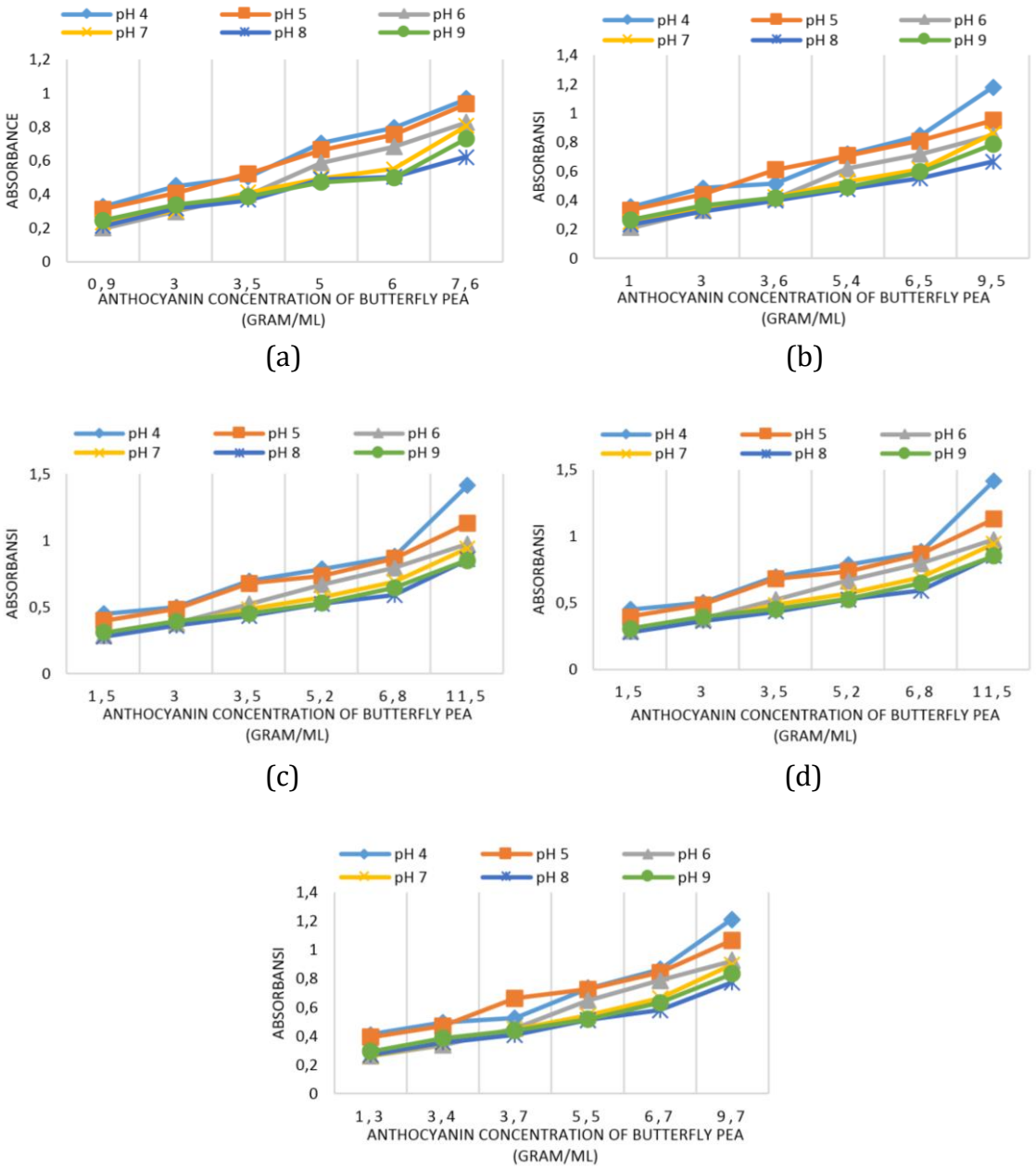

Figure 3. Graph of Relationship between Absorbance and Anthocyanin Concentration (a) Temperature 30°C (b) Temperature 40°C (c) Temperature 50°C (d) Temperature 60°C (e) Temperature 70°C

IMPLEMENTATION OF PEA FLOWER EXTRACT IN FOOD

Variations in pH caused variations in the natural color of the anthocyanin extract of the butterfly pea obtained. The types of anthocyanins obtained were peonidin at pH 4-5, delphinidin at pH 6, and petunidin at pH 7. Meanwhile, at pH 8-9, the greenish color was changed from peonidin with the addition of alkaline substances..

The results obtained from the butterfly pea extract show that at pH 4 it produces a bluish purple color, pH 5 produces a purplish blue color, pH 6 produces a light blue color, pH 7 produces a blue color, pH 8 produces a bluish green color, and pH 9 produces a green color. butterfly pea extract obtained is then applied as a food coloring, which is used as a pudding colorant. The color of the pudding produces the same color as the extract obtained. The aroma of the butterfly pea pudding is not smelt, in other words, the butterfly pea extract does not have a distinctive aroma that can affect the aroma of the food itself. Likewise, the taste of the pudding was not affected by the addition of butterfly pea extract.

CONCLUSION

Butterfly pea concentration, temperature, and pH are variables that affect the concentration and color of the butterfly pea anthocyanin extract obtained, in this study the results obtained that the optimum butterfly pea anthocyanin concentration was obtained at a ratio of 15 grams: 500 ml (weight of butterfly pea: volume of solvent) at pH 4. This proves that the anthocyanin concentration of butterfly pea will increase along with the increase in absorbance value. The optimum value of butterfly pea anthocyanin concentration occurred at a temperature of 60°C. While the lowest transmittance value was obtained at a ratio of 15 grams: 500 ml (weight of butterfly pea: volume of solvent) at pH 4 and a temperature of 60°C.

Based on the effect of pH, several color variations were obtained from each of these pHs. The types of anthocyanins obtained were peonidin at pH 4-5, delphinidin at pH 6, and petunidin at pH 7. Meanwhile, at pH 8-9, the greenish color was changed from peonidin with the addition of alkaline substances. Butterfly pea extract obtained is then applied as food coloring, which is used as a pudding colorant. The color of the pudding produces the same color as the extract obtained. This butterfly pea extract does not affect the aroma and taste of the pudding.

THANK-YOU NOTE

We would like to thank the Yogyakarta Veteran National Development University who has provided facilities for the implementation of our research and to all parties who have helped us to complete this research, so that it is carried out well, smoothly and successfully.

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