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Study of addition sweet potato extract on sensory test and antioxidant activity in yoghurt

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Abstract

Sweet potato is a local food ingredient that needs to be preserved and its benefits are because it contains a high source of starch with anthocyanins. The utilization of local ingredients is still rarely used due to limited knowledge of sweet potato processing techniques. The purpose of this study is to create innovations by developing purple sweet potato food cultivation as a natural dye in the formulation of yogurt products through hedonic testing. The research was conducted using a Randomized Block Design (RAK) method with 4 treatments consisting of 4 levels, namely A = 0 mg, B = 5 mg, C = 10 mg dan D = 15 mg, repeated 3 times. The most preferred yogurt by the panelists was yogurt with 15 mg of purple sweet potato extract added, with a value of 3.78 for taste, 3.01 for flavor and 3.53 for color. With a protein content of 4.76 gr, fat 12.60 gr, 13.2 gr, anthocyanins 14.42 mg (in 100 mL), and antioxidant activity of 3851.13 ppm.

Keywords: sweet potato extract; antioxidant; yogurt; organoleptic.

Practical Application: Concentration of natural dyes used in the manufacture of yogurt.

1 Introduction

The Ministry of Agriculture places food diversification as the second successful program after food self-sufficiency and sustainable self-sufficiency reducing the high level of dependence on rice and flour whose consumption has reached 139 kg/capita/year and 17 kg/capita/year (Astono, 2013).

Utilization of local ingredients is still rarely used due to limited knowledge about the processing techniques of sweet potatoes which are only boiled, steamed, and fried and are used as snacks. Meanwhile, the use of sweet potato as an alternative food is very large, especially in efforts to improve human nutrition.

Consumption of sweet potato has only reached 40 g/capita/day or about 6% of the ideal consumption set at 100 g/capita/day in the Expected Food Pattern (PPH). The high anthocyanin content in sweet potatoes sweet potato has high stability compared to anthocyanins from other sources. That's why this plant is the best choice healthier and as an alternative to coloring naturally (Samber et al., 2013). Sweet potato has benefits for the health of the body, namely as an antioxidant, anti-cancer, anti-bacterial and protection against liver damage, heart disease, and stroke that inhibits blood cell clumping. So that this plant becomes a healthier choice and an alternative to natural coloring (Samber et al., 2013).

Milk is a food ingredient that is composed of various nutritional values with balanced proportions (Maitimu et al., 2012). Cow's milk as the basic ingredient for making yogurt has a nutritional composition (for every 100 mL), including Vitamin A 158 I.U, Vitamin D 2.0 I.U, Vitamin B6 0.036 mcg, Calories 69 kcal, Protein 3.3 grams, Fat 3.7 grams, Lactose 4.8 grams, Calcium 125 mg, Casein 2.8 grams, Iron 0.10 mg, Minerals 0.72 grams (Prasetyo, 2010). Although milk has so many nutrients, the shelf life of milk is very short, and cannot stand in the open air at room temperature.

A yogurt is a form of fermented milk which is also a solution so that milk has a longer shelf life (Maitimu et al., 2012). Yogurt is a fermented product that involves the services of microorganisms, namely bacteria. Yogurts are widely consumed across the globe and are produced by fermenting different types of milks with bacteria such as *Streptococcus thermophilus*, *Lactobacillus bulgaricus*, and *Lactobacillus acidophilus*. Some yogurts are also enriched with other probiotic strains, such as Bifidobacterium spp., to confer additional health benefits (Coskun & Dirican, 2019; Costa et al., 2020; Pei et al., 2017; Shah, 2007; Tamime & Robinson, 1999).

The addition of purple sweet potato extract aims to increase the effectiveness of the use of Lactobacillus acidophilus and Bifidobacterium sp. as a starter for fermentation. Both types of bacteria are included in the class of lactic acid bacteria (LAB) which are probiotics. Lactobacillus acidophilus and Bifidobacterium sp. can grow well on tubers rich in oligosaccharides. Oligosaccharides contained in sweet potatoes are carbohydrates that are beneficial for the growth of probiotic bacteria. In addition, the addition of purple sweet potato in yogurt will produce a more attractive

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color of yogurt appearance so that it can increase the level of consumer preference for yogurt (Utami et al., 2010). To find out whether or not a food product is accepted, an organoleptic test can be carried out.

2 Material and methods

2.1 Experimental location and statistical analysis

This research was conducted at the FTIP Laboratory of Padjadjaran University and STIKES Immanuel. The research was conducted using a Randomized Block Design (RAK) method with 4 treatments consisting of 4 levels, namely; A = 0 mg, B = 5 mg, C = 10 mg and D = 15 mg, repeated 3 times.

2.2 Sensory test

Sensory evaluation of sweet potato yogurt formulations was carried out by panelists conducting blind tests, with samples of yogurt formulations F1 to F4. For each sample, 10 mL of purple sweet potato yogurt was served in a plastic cup encoded with a random number. Water is served as a flavor neutralizer among the samples. Panelists receive an admissions test assessment sheet for each formulation. The acceptance of the formulation in relation to sensory attributes was assessed using a 5-point hedonic scale, which ranged from very dislike (1) to very like (5) (Larmand, 2000; Lawless, 2013). Fat content using the Soxhlet method (Association of Official Analytical Chemists, 1990), calcium levels using the AAS method (Basset et al., 1994), protein content using the Kjeldahl method, anthocyanin levels using the pH-Differential-Lambert Beer method (Giusti & Wrolstad, 2001).

3 Yoghurt processing

The ingredients used in making yogurt are purple sweet potato extract which was extracted using ultrasound for 120 minutes, then dried using a spray dryer (Hariadi et al., 2018), pure milk (2 liters), sugar, yogurt starter, and aqua dest.

The first step in making yogurt is that pure milk is heated to a temperature of approximately 75 °C so that the milk protein is not destroyed, this heating aims to kill toxic microorganisms so that the homogenization process can be achieved. After going through the heating process, the milk is cooled to 45 °C, this cooling aims to provide an optimal environment for lactic acid bacteria so that they can breed properly. After the temperature is 45 °C, add the yogurt starter and purple sweet potato extract (F1 = 0 mg, F2 = 5 mg, F3 = 10 mg and F4 = 15 mg) and mix well. After the addition of the starter, the milk must be incubated for approximately 48 hours at room temperature.

4 Results and discussion

4.1 Taste organoleptic test

The results of organoleptic tests for the sensory of yogurt purple sweet potato extract powder can be seen in Figure 1.

Based on Figure 1. It can be known that panelists prefer the taste of yogurt F4 (15 mg sweet potato extract) because the addition of extract enhances the distinctive taste of sweet potato which adds to the attractiveness of panelists, for the aroma panelists

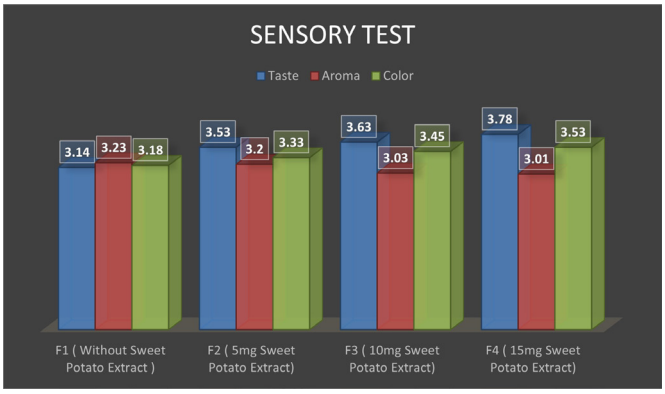

Figure 1. Sensory test result yogurt sweet potato.

prefer yogurt F1 (without the addition of sweet potato extract) it is caused because the more extract added will give langu aroma derived from sweet potato, for color panelists prefer yogurt F4 (15 mg sweet potato extract) because the addition of sweet potato supplementing extract makes the color of yogurt more colorful and more striking, people tend to be more interested in colored foods compared to colorless foods.

According to Duncan's test at a level of 5% the addition of purple sweet potato extract gave a significantly different effect on sensory test, the resulting taste, panelists tended to like the taste of yogurt with the addition of purple sweet potato extract, the result of duncan's test can be seen in Table 1. Based on Table 1 the highest average rating of 3.78 (like) and the lowest rating of 3.14 (like) with the taste of yogurt with the addition of purple sweet potato extract.

The taste of yogurt produced in this study before being added to the purple sweet potato powder extract treatment was typical of yogurt which was dominated by a sour taste. After being given purple sweet potato extract, the yogurt taste becomes sourer, the more purple sweet potato powder extract is added, the more sour the taste will be. Making yogurt with purple sweet potato extract is one of the basic ingredients of yogurt, especially fresh milk, and the starter plan and the results of purple sweet potato extract powder get the best pH stability from the extraction process, pH 3 is acidic.

Panelists tended to like the flavor of yogurt with the addition of purple sweet potato extract with the highest average rating of 3.23 (like) and the lowest rating of 3.01 (like) with the taste of yogurt with the addition of purple sweet potato extract.

The flavor of yogurt is obtained from the production of acids formed during fermentation. The flavor produced is generally caused by chemical changes and the form of compounds with other ingredients, for example between amino acids resulting from changes in protein and reducing sugars that form food flavor and aroma compounds (Sinaga, 2007).

The value of preference for yogurt without the addition of purple sweet potato extract has a higher value than the addition of purple sweet potato extract. This is because yogurt that is added with purple sweet potato extract will produce yogurt with a strong sweet and sweet aroma. The higher the concentration

Table 1. Sensory test result of addition in yogurt sweet potato extract.

Treatment	Taste	Aroma	Color
F1 (Without Sweet Potato Extract)	3.14 ± 0.13^{a}	3.23 ± 0.01^{a}	3.18 ± 0.05^{a}
F2 (5 mg Sweet Potato Extract)	3.53 ± 0.08^{b}	3.20 ± 0.09^{a}	3.33 ± 0.13^{b}
F3 (10 mg Sweet Potato Extract)	3.63 ± 0.05^{c}	3.03 ± 0.05^{ab}	3.45 ± 0.06^{bc}
F4 (15 mg Sweet Potato Extract)	3.78 ± 0.05^{d}	3.01 ± 0.06^{b}	3.53 ± 0.15^{c}

Description: Mean treatment marked with the same letter is not significantly different according to Duncan Test at 5% level. F1: Without Sweet Potato Extract; F2: 5 mg Sweet Potato Extract; F3: 10 mg Sweet Potato Extract; F4: 15 mg Sweet Potato Extract.

of purple sweet potato extract added, the lower the panelists' preference for yogurt. The strong aroma of sweet potato can dominate and overpower the fresh sour smell that characterizes yogurt. The addition of sweet potato extract to yogurt will cause an unpleasant aroma, namely the aroma of sweet potatoes carried from sweet potato raw materials (Andriani & Khasanah, 2010).

Panelists tended to like the color of yogurt with the addition of sweet potato extract with the highest rating average of 3.53 (like) and the lowest rating of 3.18 (like) with the taste of yogurt with the addition of purple sweet potato extract.

The color of the yogurt produced in this study before adding the sweet potato extract powder formula was white, after being given the addition of 5 mg purple potato extract powder the color of the yogurt changed to light orange, and given the addition of 10 mg sweet potato extract powder it changed to orange carrot color, and given Additional 15 mg, sweet potato powder extract formula turns into orange syrup color. Effect of adding sweet potato extract powder. The addition of sweet potato as a food ingredient is not something new. sweet potato has purple skin and flesh so it is rich in anthocyanin pigments which are higher than other varieties so that it can be used as a colorant for both drinks and food.

4.2 The results of the analysis of the nutritional content of yogurt with the best treatment based on organoleptic tests

Based on the organoleptic test, the panelists preferred yogurt with the addition of 15 mg of sweet potato extract, the yogurt with the best treatment was then analyzed for nutritional content to determine the nutritional content of yogurt with the addition of sweet potato.

4.3 Protein

Protein is one of the macronutrients whose role is very important in the growth and maintenance of the body, the formation of essential body bonds, regulating water balance, antibody formation, and transporting nutrients (Khairani et al., 2020). This protein content analysis aims to determine the protein content contained in yogurt. The protein content obtained from the laboratory test results of 100 mL of yogurt is 4.76 g.

4.4 Fat

Fat is an energy source that has an important role in the process of fat metabolism, as a means of transportation and solvent for fat-soluble vitamins, providing a sense of satiety and delicacy, healthy body temperature, and protecting body organs (Tavakoli et al., 2019). The fat produced from the 100 mL yogurt laboratory test is 12.60 g.

4.5 Calcium

Calcium functions for the formation of bones and teeth regulate muscle contractions including heart rate, plays a role in the blood clotting process, and is a catalyst for biological reactions (Craig & Brothers, 2021). Therefore, its function is very important for the body, it is necessary to analyze the calcium levels contained in cow's milk which is processed into yogurt products. After laboratory tests, the calcium content in yogurt is 132 g.

4.6 Anthocyanins

The anthocyanin content contained in the sweet potato powder extract obtained from the results of laboratory tests on yogurt was 14.42 mg per 100 mL.

Results of Antioxidant Activity Analysis of Sweet Potato Yoghurt. Powder Extract. Antioxidant activity was measured using the DPPH method. The DPPH method is a simple, fast, and easy method to screen the radical scavenging activity of several compounds. This caused the extract tested with DPPH to directly measure its absorbance with a spectrophotometer at a wavelength of 517 nm to determine the percent of total antioxidant activity. The antioxidant activity found in yogurt with the addition of 15 mg purple sweet potato extract was 3851.13 ppm.

5 Conclusion

Based on the organoleptic test results, the most preferred yogurt by the panelists was yogurt with the addition of 15 mg purple sweet potato extract, with a value of 3.78 for taste, 3.01 for flavor and 3.53 for color. With a protein content of 4.76 gr, fat 12.60 gr, 13.2 gr, anthocyanins 14.42 mg (in 100 mL), and antioxidant activity of 3851.13 ppm.

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