ACCEPTABILITY OF CHOCOLATE BISCUIT FROM PURPLE SWEET POTATO AS AN ALTERNATIVE SNACK FOR TODDLER AGE 12 – 36 MONTHS

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Abstract. Background: Toddlers are one of the life cycles with an age range of 12 - 59 months, where stepping on the critical period of growth or also called the golden period. Toddlers are one of the nutritionally vulnerable groups. Chocolate biscuits made with purple sweet potato flour substitution are one of the alternative snack to prevent nutritional problems in toddlers. Objective: To determine the acceptability of chocolate biscuits made from purple sweet potato flour as an alternative snack for toddlers aged 12-36 months. Method: This type of research is True Experimental, There is a control group and an experimental group, with 3 treatments (proportion of wheat flour: purple sweet potato flour) namely, BU1 (control), BU2 (1:1), and BU3 (1:3). Organoleptic test assessment using hedonic test which was then processed with Kruskal Wallis test and then continued with Mann Whitney test. Results The results of the organoleptic test based on the overall indicator that was most preferred was the BU3 (1:3) formulation. The Kruskal Wallis test results indicated that there was a significant difference ($p<0.05$) in the three formulations. Conclusion: The most preferred formulation is BU3 formulation with an average score of 4.32 which means like. The most significant difference in the formula was in the aroma and flavor of BU1 and BU3 formulations.

Keywords: Biscuits, purple sweet potato, toddler snacks, acceptance

1 BACKGROUND

Toddlers are children who have an age range of 12-59 months, one of the life cycles that are in an important period of growth and development phase or golden period. Toddlerhood is a time that requires special attention in the field of nutrition because it is included in one of the nutritionally vulnerable groups (Black et al, 2020) (Laili et al, 2022) (Ramlah, 2021). Toddlers are a golden period that only occurs once where the child's growth process is in a very important phase and requires more attention because at this time it becomes a determining factor for growth and development to run well until the next period (Saleh et al, 2021) (Sutomo and Anggraini, 2010).

The World Health Organization (WHO) states that the prevalence of underweight among children under five in the world in 2020 is 12.6% (World Health Organization, 2012). According to the results of the Riskesdas, the percentage of malnutrition and undernutrition in children aged 0 - 59 months in Indonesia was 3.9% and 13.8% (Kemenkes RI, 2018).. At the provincial level, the prevalence of malnutrition among

children aged 0 - 59 months in East Java was 16.7% (Kemenkes RI, 2018). UNICEF (1998) has developed the idea of direct and indirect causes of malnutrition. Lack of food consumption is considered to be the direct cause of malnutrition, supported by infectious diseases.

Nutritional fulfillment is needed to support growth and development, brain intelligence and the quality of human resources during the toddler years and in the future because long-term nutritional deficiencies will reduce nutritional status as a consequence of which children become undernourished and malnourished which can affect it (Cohen Kadosh et al, 2021) (Wulandari et al, 2018) (Susetyowati, 2014). One of the strategies that have been carried out in order to improve nutrition is PMT for toddlers (Kemenkes RI,2019). When toddlers have begun to be taught to eat foods with high nutritional value, between main meals toddlers can be given snacks in the form of cakes, biscuits, ice cream, etc (Susetyowati, 2014). These snacks are an alternative to prevent a decrease in nutritional status in toddlers

Biscuits are a snack in the form of pastries that are popular and often consumed by various economic groups and age groups, one of which is toddlers (Pries et al, 2019) (Asta, 2021) (Sirkka et al, 2022). The nutritional content of biscuits includes all macronutrients obtained from the ingredients used to make the biscuits (Bakare et al, 2020).

Purple sweet potato, also known as Ipomoea batatas L., is a type of cassava that is often found in Indonesia with a dark purple flesh color (Widyastuti dan Limantarac, 2019) (Elsi et al, 2019). Purple sweet potato is one of the local food ingredients with its function as a source of energy and complex carbohydrates as well as minerals and vitamins as a value-added or functional food (Dereje et al, 2020) (Ginting et al, 2014) (Jiang et al, 2022). Energy and carbohydrates play a role in supporting the growth and development of children, performing activities and maintaining health. Sufficient energy needs with the activities carried out can maintain body weight so as to prevent malnutrition and maintain nutritional status (Wijayanti, 2017). The anthocyanin content of purple sweet potatoes is higher than that of orange and white sweet potatoes (Setyawati and Daryanti, 2020). The role of anthocyanins for health is contributed by their antioxidant activity to prevent or reduce the risk of disease, support brain development and vision (Khoo et al, 2017). When purple sweet potatoes are processed, the anthocyanin content can be reduced but the resulting product still contains anthocyanins as antioxidants (Husna et al, 2013).

The utilization of purple sweet potatoes in the community is still very simple, boiled/steamed, baked and product innovation is limited, mostly in the form of chips, buns, ice cream (Tari et al, 2021). Therefore, purple sweet potatoes are processed into semi-finished products, such as flour. Purple sweet potato flour is a semi-finished product with a long shelf life that can be used as an ingredient in food processing (Nurdjanah and Yuliana, 2019). Sweet potato can be consumed and produced in an attractive way while maintaining its high nutritional content, especially if it is done with simple processing methods that can be adopted and then further developed on a

household scale as one of the strategies to promote sweet potato consumption (Truong et al, 2018) (Cartabiano-Leite et al, 2020) (Ginting et al, 2011). This is a process of diversification as well as to increase the selling value of purple sweet potato. These are action with the aim of limiting dependence on wheat flour and exploring other food potentials (Syarfaini et al, 2017).

Based on the description and problems above, the authors are interested in making alternative toddler snacks in the form of chocolate biscuits with purple sweet potato flour substitution as a functional local food ingredient and utilization of local commodities that are easily obtained and well consumed by toddlers.

2 RESEARCH METHOD

The type of research is True Experimental, there are 2 groups, namely the control group and the experimental group which are then observed for differences. The de-sign applied in this study is RAL (Completely Randomized Design), considered sufficient if the repetition fulfills the equation with the result that the number of replicates for ready treatment is 9 replicates. Due to time and cost constraints, the repetition was done twice.

The data collection method were carried out through the form filling of the or-ganoleptic test. The test used a Hedonic Scale Test to assess the panelists' level of liking for the color, aroma, taste, and texture of the biscuits. Hedonic test results were then analyzed using the Kruskal Wallis test to identify product differences between treatments conducted in the study and will be followed by the Mann Whit-ney test. Tests were conducted by 25 panelists with a moderately trained category.

2.1 Research Sample

The samples used were three formulations with 1 formula as a control. The difference is in the ratio of wheat flour to sweet potato flour. The three formulations produced 25 pieces of biscuits. The weight of the ingredients is shown in the following table

Table 1. Puprle Sweet Potato Chocolate Biscuit Formulation

Ingridients	**Formulation**		
	BU 1 (1:0)	BU 2 (1:1)	BU 3 (1:3)
Wheat Flour	100 gram	50 gram	25 gram
Purple Sweet Potato Flour	0 gram	50 gram	75 gram
Chicken Egg	15 gram	15 gram	15 gram

Margarine	45 gram	45 gram	45 gram
Refined Sugar	45 gram	45 gram	45 gram
Skim Milk Powder	30 gram	30 gram	30 gram
Choco Chips	10 gram	10 gram	10 gram

3 RESULT

3.1 Characteristics of Purple Sweet Potato Chocolate Biscuit Formulation

The substitution of purple sweet potato flour in the formulation resulted in differences in the characteristics of the chocolate biscuits according to the specified amount of purple sweet potato flour. The differences of each purple sweet potato chocolate biscuit formulation are presented in Table 2 below.

Table 2. Characteristics of Purple Sweet Potato Chocolate Biscuit Formulation

Parameter	**Formulation**		
	BU 1 (1:0)	**BU 2 (1:1)**	**BU 3 (1:3)**
Colour	Brownish Yellow	Chocolate	Dark Purple
Texture	Crunchy	Crunchy	Crunchy
Aroma	Typical Biscuit, sweet chocolate smell	Typical biscuit, sweet chocolate smell, slight purple sweet potato smell	Typical biscuit, sweet chocolate odor slight purple sweet potato smell
Taste	Sweet	Sweet, slight purple sweet potato smell	Sweet, slightly typical of purple sweet potato

Source: Primary Data, 2023

Based on Table 2, it can be observed that there are differences characteristic between each formulation

3.2 Organoleptic Test

Organoleptic test results on 3 chocolate biscuit formulations with 25 moderately trained panelists are presented in table 3 below.

Table 3. Organoleptic Test Assessment of Purple Sweet Potato Chocolate Biscuits

Parameter	Formulation		
	BU 1 (1:0)	BU 2 (1:1)	BU 3 (1:3)
Warna	3,52	3,8	4,04
Tekstur	3,76	3,88	4,24
Aroma	3,6	4,32	4,36
Rasa	3,68	4,16	4,64
Total	14,56	16,16	17,28
Average	3,64	4,04	4,32

Source: Primary Data, 2023

Based on table 3 above, of the three sweet potato biscuit products, it can be seen that the most preferred by panelists in general based on color, texture, aroma and taste is the BU3 code (1:3) with an average score of 4.32 which is included in the like category.

3.3 Kruskal Wallis Test

The Kruskal-Wallis test was used to evaluate whether there were differences in color, texture, aroma, and taste between the 3 formulations of purple sweet potato chocolate biscuits. Test results are presented in table 4 below

Table 4. Kruskal Wallis Test

Indicators	Score
Color	0,017
Texture	0,007
Aroma	0,000
Taste	0,000

Source: Primary Data, 2023

Based on table 4 above, the indicators of color, texture, aroma, and taste have a p value <0.05, which means there are differences in color, texture, aroma and taste in the three formulations of Purple Sweet Potato Chocolate Biscuits.

3.4 Mann Whitney Test

Mann-Whitney test was used to identify further whether there is a significant difference between the color, texture, aroma, and taste of the three formulations. The results of the Man Whitney test are presented in Table 5 below.

Table 5. Mann Whitney Test

Indicators	**Formulation**		
	BU1:BU2	BU1:BU3	BU2:BU3
Color	0,201	0,002	0,176
Texture	0,424	0,003	0,029
Aroma	0,002	0,000	0,898
Taste	0,005	0,000	0,006

Source: Primary Data, 2023

Based on table 5 above, there are significant differences in color, texture, aroma and taste between formulas BU1 and BU3 as well as aroma and taste between formulas BU1 and BU2 with a significance value of 0.000, which is p<0.01. There was no significant difference in color and texture between formulas BU1 and BU2 and in color and aroma between formulas BU2 and BU3. However, there were differences in texture and flavor between formulas BU2 and BU3.

4 DISCUSSION

Based on the research findings, Overall, of the three formulations, the best organoleptic test was the BU3 formulation with an average score of 4.32, which means that it likes the ratio between wheat flour and purple sweet potato flour 1: 3, in line with the research of Syarfaini (2017), that the best hedonic test in the 1: 3 formulation with the highest score with the criteria like. Panelist acceptance of purple sweet potato chocolate biscuits BU3 formulation is due to a more attractive color, producing a sweeter aroma with a distinctive purple sweet potato aroma and a sweeter taste also due to more purple sweet potato flour and producing a crunchy texture.

4.1 Colour

Based on the organoleptic test, the three types of purple sweet potato chocolate biscuit formulations have different colors, BU1 formulation which is the control has a brownish yellow color, BU2 formulation produces a brown color, BU3 formulation produces a slightly brown dark purple color. From the results of the organoleptic test, it was found that the preferred color was the BU3 formulation with a value of 4.04 which entered the category of like, while the formulation with the lowest score was BU1, which was 3.52 which entered the category of somewhat like. This is because the color of the BU1 formulation is brownish yellow so it is less attractive to panelists. Baking biscuits causes a browning reaction that involves interactions between carbohydrates, especially amine groups and reducing sugars that produce a brown color in biscuits (Lamusu, 2007). These biscuits are aimed specifically at the needs of children under five who have different food preferences from adults. Children in general like colorful food so that they are interested in consuming it. It can be concluded that the color of the purple sweet potato flour chocolate biscuit formulation is liked. This is certainly a support for children interested in eating chocolate biscuits from purple sweet potato flour.

4.2 Aroma

Based on the organoleptic test results, the aroma produced by the three purple sweet potato chocolate biscuit formulations is different due to differences in sweet potato flour substitution. The aroma of biscuits with purple sweet potato flour substitution most favored by panelists was formulation BU3 with 75 grams of purple sweet potato flour substitution. The BU3 formulation has a more distinctive aroma of purple sweet potato than the BU2 formulation which adds to the sweet smell of the biscuits. Sweet and fragrant aromas like in biscuits are also very well liked by children so that they can raise the attraction to eat them. Assessment of aroma can lead to differences of opinion. Differences of opinion can occur because each individual has a sense of smell that is not similar even though they are able to typical aromas, but their preferences for aromas can vary (Ara, 2018). Other ingredients in the dough such as sugar, margarine, butter, egg yolks, milk powder, and developers that function as aroma regulators can affect the aroma produced (Subandoro, 2013).

4.3 Texture

Based on the organoleptic test, the texture most favored by panelists is in BU3 biscuits with a score of 4.24, which means it is liked. BU3 formulation has larger pores and the texture produced by BU3 formulation is crunchier due to the substitution of purple sweet potato flour. Biscuits can be finger food for toddlers in honing fine motoric skills by pinching food with their fingers. The more purple sweet potato flour substitution, the crunchier the texture will be. This is in line with Putri's research (2022) that the texture

of biscuits with purple sweet potato flour substitution is crunchier and not mushy due to the low water content in the biscuits (Putri et al, 2022). Other ingredients may gave affects crunchiness such as margarine and egg. Margarine serves to increase the volume of biscuits so that the texture becomes better and more stable (Lestari et al, 2018).

4.4 Taste

Based on the organoleptic test, the most preferred taste by panelists was formula BU3 with a score of 4.64. Of the three purple sweet potato chocolate biscuit formulations, all have the same sweet taste, the difference is in the biscuits with purple sweet potato flour substitution. BU3 has more typical purple sweet potato flavor than. The flavor of biscuits is influenced by the composition of the ingredients, including sugar, milk, margarine, and flour as raw materials. In this study, the more substitution of purple sweet potato flour, the sweeter the biscuits tasted and the more typical the flavor of purple sweet potato. This may influence children's interest in eating the biscuits because in general, children prefer sweet and dairy products and fat-rich foods characterized by high energy density. In later periods, taste impressions are also determined by specific food product offerings (eating habits, culture) and experiences (Sobek, 2020). According to Sobek et al in 2020, when compared to the group of children who do not really like sweet flavors, the number of obesity in the group of children who like high sweet flavors is twice as large. So that sweet foods in toddlers should need to be considered by parents because if too much can have an impact not good for toddlers.

4.5 Nutrients of Purple Sweet Potato

The content of energy and nutrients in the most preferred formulation, that is BU3 formula in 1 recipe, is 1024.505 kcal of energy, 16.89 grams of protein, 42.48 grams of fat and 147.275 grams of carbohydrates. The need for energy and macronutrients in toddlers 1 - 3 years is 1350 kcal of energy, 20 grams of protein, 45 grams of fat and 215 grams of carbohydrates (Kemenkes RI, 2018). The need for snacks requires 10% of the total daily needs, so the fulfillment of energy and nutrients from snacks is 135 kcal of energy, 2 grams of protein, 4.5 grams of fat and 21.5 grams of carbohydrates. The energy and nutrient content of 1 piece of biscuit is 40.9 kcal of energy, 0.67 grams of protein, 1.69 grams of fat and 5.89 grams of carbohydrates. One piece of biscuit weighs 9 grams. So toodlers can consume 7 pieces of biscuits to meet the needs of snacks in one day.

5 CONCLUSION

The conclusion based on the research that has been done is that the most preffered is the BU3 formulation with 75 grams of purple sweet potato flour substitution which has a slightly brown dark purple color, a typical sweet and purple sweet potato aroma, a

crunchy texture, and a sweet taste and there is a hint of a typical purple sweet potato flavor. The energy and nutrient content of the most preferred formulation, BU3 formulation (1:3) in 1 chip, is 40.9 kcal of energy, 0.67 grams of protein, 1.69 grams of fat and 5.89 grams of carbohydrates.

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