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The Acceptability Test and Analysis of The Nutritional Content of Cookies that Substitute Breadfruit Flour (Artocarpus altilis) and Anchovy Flour (Stolephorus sp.) as Snacks for Stunted Toodlers

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ABSTRACT

Background: Breadfruit (*Artocarpus altilis*) is rich in carbohydrates and fiber, while anchovies (*Stolephorus* sp.) are rich in protein, calcium, and iron. Both of these foods can be processed into cookies as a snack that has the potential to support the growth and development of stunted children. **Objective:** This study aims to determine the acceptability test and analyze the nutritional content of cookies that substitute breadfruit flour (*Artocarpus altilis*) and anchovy flour (*Stolephorus* sp.) as snacks for stunted toddlers. **Method:** This study used an experimental design with three treatments: F1 (85 gr breadfruit flour: 15 gr anchovy flour), F2 (75 gr breadfruit flour: 15 gr anchovy flour), and F3 (65 gr breadfruit flour: 35 gr anchovy flour). This test went through 2 stages: the organoleptic test for acceptability and the nutrient content test for protein, carbohydrates, calcium, and iron. **Results:** The study reveals that the most favored cookies have color, aroma, texture, and taste, specifically the F1 formulation (85 grams of breadfruit flour and 15 grams of anchovy flour). The Pontianak State Polytechnic Laboratory conducted a nutritional content test of the preferred formulation, revealing protein (6.67%), carbohydrates (50.10%), calcium (6.20%), and iron (0.18 mg). **Conclusion:** Cookies with breadfruit flour and anchovy flour substitution affect the acceptability of color and aroma, but there is no effect on the acceptability of texture and taste.

Keywords: stunting, cookies, breadfruit flour, anchovy flour, protein, carbohydrates, calcium, iron

INTRODUCTION

Each region has a variety of natural resources that have great potential to be managed to increase nutrient availability and provide quality local food sources (Kurniawati & Sutoyo, 2021). West Kalimantan has a diversity of local foods that can be used, such as breadfruit and anchovies. These two local foods can be used as interlude foods to support stunted children's growth and development. One of the nutrients needed is carbohydrates found in breadfruit.

Breadfruit (*Artocarpus altilis)* has many benefits, can be used as a source of carbohydrates, and is high in fiber so it can be used as an alternative to staple foods (Muchlizah et al., 2022). Carbohydrates play a role in the body as an energy source for carrying out activities (Azmy & Mundiastuti, 2018). Fiber content plays a role in balancing microbial populations to increase immunity to inflammation and infection (Asmawati, 2023).

Breadfruit, which is generally consumed by frying and boiling, can also be processed into flour. Based on the Indonesian Food Composition Table (Ministry of Health of the Republic of Indonesia, 2020), one hundred grams of breadfruit flour has an energy content of 353 kcal, protein 2.9 grams, fat 0.5 grams, carbohydrates 84.4 grams, fiber 3.7 grams, calcium 100 mg, phosphorus 85 mg, and iron 4.6 grams. In addition to carbohydrates, animal protein, iron, and calcium are also needed to meet children's growth and development needs, one of which is anchovies.

Anchovies *(Stolephorus* sp.*)* belong to the small pelagic fish group and are one of the most abundant fish in Indonesian waters (Ratnasari & Wahyani, 2022). Anchovies contain essential nutrients such as protein, calcium, and iron (Tohata et al., 2021). Protein plays a role in maintaining body cells and repairing damaged body tissue, calcium helps in bone growth and carrying out muscle and nerve functions in toddlers, and iron plays a role in keeping children's immunity (Asmawati, 2023).

One form of interlude food that can be processed to help the growth and development of stunted children from these two ingredients is cookies. Cookies are a type of biscuit made from soft dough, have a crispy texture, are somewhat thick, flat, and generally have a flat shape. The crunchy texture of cookies makes them one of the snacks toddlers love (Rahmiati et al., 2023). Wheat flour is the basic ingredient used to make cookies. However, due to the large importation of wheat to Indonesia, it is necessary to use local foodstuffs. Breadfruit can be processed into breadfruit flour, which is rich in carbohydrates, and added with anchovies processed into anchovy flour, which has a high protein, calcium, and iron content (Sulistiyati & Mawaddah, 2021).

These two local foods can be used to become a product, namely *cookies,* which are expected to support the growth and development of children and help in efforts to prevent stunting. This is important considering that the prevalence of stunting in West Kalimantan reaches 27.7%, higher than the stunting rate in Indonesia, which is 21.1% (Ministry of Health of the Republic of Indonesia, 2022). Thus, the development of cookies as a product made from local food can be one of the strategies in overcoming nutritional problems, especially in areas with high stunting rates, such as West Kalimantan.

METHOD

1. Research Design

The research design used is an experimental design using three different treatments, namely:

F1: Breadfruit flour: Anchovy flour (85 gr: 15 gr)

F2: Breadfruit flour: Anchovy flour (75 gr: 25 gr)

F3: Breadfruit flour: Anchovy flour (65 gr: 35 gr)

2. Tools

The tools used in making *cookies* are scales, knives, cutting boards, containers, spoons, baking sheets, blenders, stirrers, 60 & 100 mesh sieves, ovens, and gas stoves.

3. Materials

The ingredients used in making *cookies* are breadfruit flour, anchovy flour, wheat flour, margarine, eggs, refined sugar, vanilla, baking powder.

4. RESEARCH PROCEDURES

a. Breadfruit Flour Production

The process of making breadfruit flour goes through several stages, namely sorting to select good quality breadfruit such as not too ripe, not rotten and not black; separation of unused parts of breadfruit; washing; thin cutting to accelerate drying; soaking using salt for 30-60 minutes to reduce browning; draining to reduce water in breadfruit; drying breadfruit using an oven for 9 hours at 60 ˚ C; pulverizing; and sieving using a 60 mesh sieve.

b. Preparation of Anchovy Flour

The process of making anchovy flour is carried out through modified stages, namely washing, drying using an oven for 8 hours at 100 ˚C; pulverizing; and sieving using a 100 mesh sieve.

c. Making Cookies

The process of making cookies goes through several stages, namely mixing the first ingredients including chicken eggs, margarine, sugar and vanilla which are stirred using a whisk until fluffy. After that, wheat flour, breadfruit flour, and anchovy flour are gradually mixed into the first ingredient. Next, the dough is kneaded until even and smooth, then molded according to the desired shape. Then, the dough is placed onto a baking sheet and baked using an oven at 150 ˚C for 30 minutes.

RESULTS AND DISCUSSION

Results

1. Description Product

Cookies are a type of biscuit made from soft dough, with a crunchy, thick texture. Each cookie weighs 10 grams. One recipe yields 34 cookies. These cookies can be served as a midday and afternoon snack for toddlers, with 10 grams (one cookie) given at each meal.

The F1 formulation cookies produced a brighter color, a sharper, more pungent aroma of breadfruit flour, a firmer texture, a dominant breadfruit flour flavor, and a slightly bitter taste. Formulation F2

produces a color that is not too dark and not too light, the resulting aroma is not too strong smell of breadfruit flour and anchovy flour, the texture is hard and slightly sandy, and the resulting taste is not too bitter. Cookies Formulation F3 produced a darker color, a more dominant fishy aroma from anchovy flour, the texture is not too hard and slightly sandy and the resulting taste is dominant anchovy flour. The results of cookie products with flour and anchovy flour substitution can be seen in Table 1.

Table 1. Cookies With Substitution Flour Breadfruit And Flour Fish Anchovies

Cookies 1	Cookies 2	Cookies 3
		

2. Level Color Preferences

The results of the organoleptic color test of cookies with breadfruit flour and anchovy flour substitutions can be seen in Figure 1.

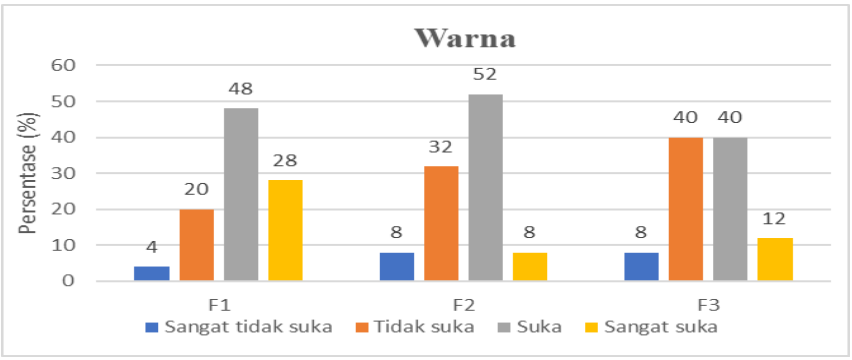
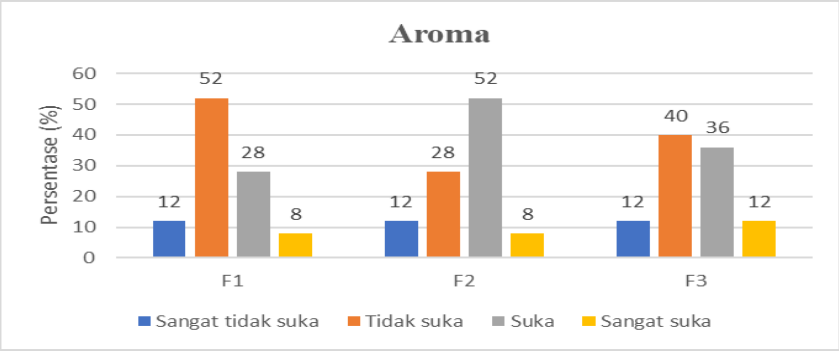


Figure 1. Chart Test Organoleptic Power Accept Color On Cookies

In Figure 1, the organoleptic test of color acceptance shows the formulation that received the highest score in the "like" category, namely Formulation F1 was 48% and the highest “very dislike” category was in formulations F2 and F3 at 8%. Based on the Friedman test with a 95% confidence level, that T count < F table, namely 0.82 < 3.19, indicates that the substitution of breadfruit flour and anchovy flour did not significantly affect the taste acceptance of cookies.

3. Aroma

The results of the organoleptic aroma test on cookies with breadfruit flour and anchovy flour substitutions can be seen in Figure 2.

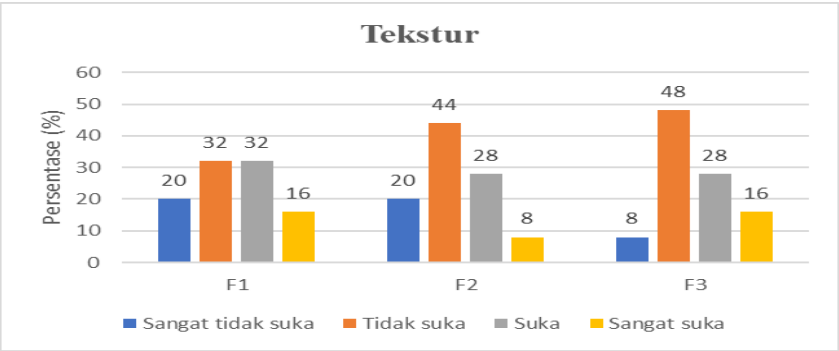


Picture 2. Chart Test Organoleptic Power Accept Aroma On Cookies

Based on Figure 2, the organoleptic test of aroma acceptability in cookies shows that the formulation received the highest score in the "like" category. F2 formulation was 52% and the highest category of "very dislike" was in all formulations, namely F1, F2 and F3. by 12%. The Friedman test with a 95% confidence level showed that there was an effect of breadfruit flour and fish flour substitution on the acceptability of cookie aroma.

4. Texture

The results of the organoleptic texture test on cookies with breadfruit flour and anchovy flour substitutions can be seen in Figure 3.



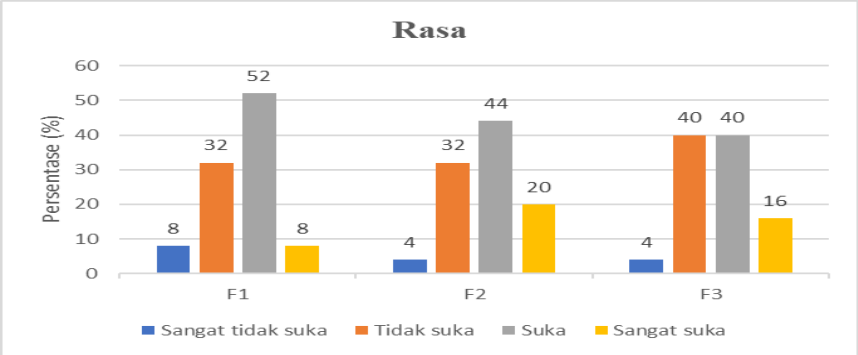
Picture 3. Chart Test Organoleptic Based on Texture On Cookies

Based on Figure 3, the organoleptic test of texture acceptability of cookies shows that the formulation received a score in the "like" category. formulation F1, which is 32% and the lowest “very

dislike" category in formulation F3 is 8%. Friedman test with a 95% confidence level shows that there is no effect of breadfruit flour and fish flour substitution on the acceptability of cookie texture.

5. Flavor

The results of the organoleptic texture test on cookies with breadfruit flour and anchovy flour substitutions can be seen in Figure 4.



Picture 4. Chart Test Organoleptic Power Accept Flavor On Cookies

Based on Figure 4, the organoleptic test of taste acceptability of cookies shows that the formula received a score in the category "Like" highest on formulation F1 by 52% And category "very No Like" lowest on formulation F2 And F3 as big as 8 %. Based on test Friedman, the absence of influence breadfruit flour substitute and fish meal on the acceptability of the taste of cookies.

6. Power Accept the Whole

Panelists' preference for cookies with breadfruit flour and fish meal substitutes was assessed using organoleptic tests for color, aroma, and texture. The cookies tested used different formulations, namely F1 (85 g breadfruit flour). breadfruit: 15 gr flour anchovies), F2 (75 gr flour breadfruit: 25 gr flour fish anchovies And F3 (65 grams of breadfruit flour: 35 gr flour fish anchovies). Following table under This is results Power accept the whole calculated using the Friedman Test.

Table 2. Results Test Organoleptic Based on Power Accept In a way Overall

Formula	Color	Aroma	Texture	Flavor	Amount
F1	153.25	89.25	111.25	100.5	454.25
F2	95.5	123.5	92	125.5	436.5
F3	87.75	110.25	124.5	103	425.5

Based on Table 2, the panelists gave the highest scores for organoleptic tests of color, aroma, texture and taste to cookies with formulation F1 (85 gr breadfruit flour: 15 gr anchovy flour) with a total value of 454.25.

7. Analysis Nutrients

Analysis on nutritional content in cookies products with substitution Breadfruit flour and anchovy flour contain the nutrients protein, carbohydrates, calcium, and iron (Fe). from analysis For identify mark nutrients from each component so that The product meets the nutritional standards for stunted children as stipulated. The formulation analyzed for nutritional content was F1 (85 g breadfruit flour: 15 g anchovy flour), based on organoleptic testing. The results of the nutritional analysis of the cookie product with the substitution of breadfruit flour and anchovy flour as follows.

Table 3. Results Analysis Substance Nutrition

Sample F1	Results Lab Test	SNI Cookies	Information
Protein	6.96 gr	6.67 gr	Significant
Carbohydrate	50.10 gr	30 gr	Significant
Calcium	615 mg	200 mg	Significant
Substance Iron (Fe)	0.18 mg	5 mg	Not significant

Based on Table 3, the results obtained nutritional content analysis to Cookies containing breadfruit flour and anchovy flour substitutes contain 6.96 grams of protein, 50.10 grams of carbohydrates, 615 mg of calcium, and 0.18 mg of iron. These significant results indicate that the ingredients used contribute significantly and comply with SNI 01-7111.2-2005. These are protein, carbohydrates, and calcium. Meanwhile, insignificant results indicate that the ingredients used are less than optimally contributing to iron. Although the results based on SNI 01-7111.2-2005 show some significant and some insignificant results, the recommended Nutritional Adequacy Intake for children aged 1-3 years is 20 g/day of protein, 215 g/day of carbohydrates, 650 mg/day of calcium, and 7 mg/day of iron.

Discussion

1. Color

Based on the analysis of the organoleptic test results on cookies with breadfruit flour and anchovy flour substitutions, there is an effect of substitution. flour breadfruit and fish meal anchovies on the color acceptability of cookies. This shows that the most preferred panelist acceptance of the three formulations is F1 (85g breadfruit flour: 15g anchovy flour), which has an overall acceptance value of 454.25. Research conducted by (Fahmi et al., 2023) stated that the addition of anchovy

flour causes the color of cookies to darken. This is due to the natural color of anchovy flour which is grayish brown. Therefore, using too much anchovy flour can cause the product to become dark and less preferred by panelists. This is in line with research conducted by researchers, namely the higher the use of anchovy flour in cookies. making cookies, the resulting color will be darker.

2. Aroma

The results of the organoleptic test on the aroma of cookies with breadfruit flour and anchovy flour substitutions show that existence substitution effect flour breadfruit and fish meal anchovies on the taste acceptability of cookies. Panelists showed the highest acceptance of formulation F1 (85 gr breadfruit flour: 15 gr anchovy flour) which has mark calculation Power accept as a whole as much 454.25. Third formulation They have varying degrees of aroma. Therefore, the higher the anchovy and breadfruit flour used, the sharper and more intense the resulting aroma.

Research conducted by (Ramadhan et al., 2019) showed that the more anchovy flour used in the cookie formulation, the lower the panelists' preference for the cookie aroma. This assessment is thought to be due to the panelists' lack of experience with the cookie. get used to the smell of fish that is there in cookies so that it appears aroma Fishy. This is inconsistent with the researchers' research, as the greater the use of anchovy flour, the higher the panelists' preference for the cookies. However, the F1 formulation, which used less anchovy flour, had the lowest preference. This is because the high use of breadfruit flour results in a more bitter and intense aroma.

3. Texture

Based on the results of organoleptic tests on the texture of cookies with breadfruit flour and fish flour substitution, there was no effect of breadfruit flour and fish flour substitution. anchovies to Power accept Cookie texture. The formulation with the highest acceptability score was formula F1 (85 g breadfruit flour: 15 g anchovy flour) which had an overall acceptability calculation value of 454.25.

Research conducted by (Ginting et al., 2020) stated that the addition of breadfruit flour in biscuit products produces a soft texture so that it can be consumed by toddlers. This is not in line with research conducted by researchers, where the texture of the three formulations of cookies with breadfruit flour and anchovy flour substitutes tends to be less preferred because the resulting texture is quite hard.

4. Flavor

Based on the results of organoleptic tests on the taste of cookies with breadfruit flour and anchovy flour substitutions, there was no effect of breadfruit flour and anchovy flour substitutions on the taste acceptability of the cookies. Panelists gave the highest score to formulation F1 (85 grams of breadfruit flour: 15 grams of fish meal anchovies).

The resulting taste of cookies with breadfruit flour and anchovy flour substitutes was widely appreciated by panelists, even though they used less anchovy flour. The F1 formulation used only a small amount of anchovy flour, at 15 grams per recipe. This aligns with research by (Ramadhan et al., 2019) that found that the greater the use of anchovy flour, the lower the panelists' preference for the taste.

5. Power Accept the Whole

The results of the organoleptic test covering the color, aroma, texture, and taste of each treatment were analyzed using the Friedman test. Based on the R value, the most preferred treatment was F1 with a value of 454.25 with a ratio of breadfruit flour and anchovy flour of. Formulation F1 produced a color that was not too dark and a less fishy aroma with a stronger aroma of breadfruit flour. The texture of this formulation was still considered hard for toddlers. The resulting anchovy flavor was not too strong so it was still widely liked by the panelists. However, the formulation that researchers expected was F3 with a ratio of breadfruit flour and anchovy flour, namely 65: 35 because of the anchovy flour used more so much that the content higher protein content than the F1 and F2 formulations. This is expected to help optimally prevent stunting.

6. Protein

Protein content testing of cookies with breadfruit flour and anchovy flour substitutes was conducted on May 28, 2024, at the Pontianak State Polytechnic Laboratory. The F1 cookie formulation was tested using the Kjeldahl method. In this study, content protein on cookies with substitution flour breadfruit And flour fish anchovies that is as much as 6.96 grams according to the SNI 01-7111.2-2005 standard, which is a minimum of 6 grams. This is because the addition of anchovy flour, one of the animal proteins that has a fairly high protein value.

Protein plays a crucial role in the repair and growth of tissue cells during child development. However, the results shown were not very significant in preventing stunting because the chosen formulation only used anchovy flour. 15 grams per recipe. The use of this small amount of anchovy flour indicates that, although the content meets the standard, the protein contribution from the anchovy flour is significant. is not yet optimal.

In this study, cookies as a snack were served at 10 grams per meal for toddlers, thus fulfilling their protein requirement of 0.7 grams. According to the Recommended Dietary Allowance (RDA), toddlers aged 1-3 years require a protein intake of 20 grams per day, and using the RDA standard for providing cookies as a snack can fulfill toddlers' daily needs by 3.5%.

7. Carbohydrate

A carbohydrate content test for cookies substituting breadfruit flour and anchovy flour was conducted at the Pontianak State Polytechnic Laboratory. The selected cookie formulation was

Formula F1, using the by-difference method. The study found that the carbohydrate content of cookies substituting breadfruit flour and anchovy flour was 50.10 grams, meeting the minimum requirement set by the Indonesian National Standard (SNI). 01-7111.2-2005.

This is due to the addition of breadfruit flour as a carbohydrate source. The carbohydrate content in breadfruit flour acts as the primary energy source for toddlers. The nutritional analysis results showed significant values due to the use of breadfruit flour in the chosen formulation, which is 85 grams per recipe. so that the carbohydrate contribution from breadfruit flour to cookies is quite maximum.

In this study, cookies were used as a snack for toddlers, served at 10 grams per meal to meet their carbohydrate needs. According to the Recommended Dietary Allowance (RDA), toddlers aged 1-3 years require 215 grams of carbohydrate per day. Using the RDA standard, cookies as a snack can meet 2.38% of the daily intake.

8. Calcium

Calcium content testing in cookies with breadfruit flour and anchovy flour substitutes was conducted at the Pontianak State Polytechnic Laboratory. The F3 cookie formulation was tested using the Complexometry method. In this study, the calcium content in cookies with breadfruit flour and anchovy flour substitutes was 615 mg, in accordance with the SNI 01-7111.2-2005 standard of at least 200 mg.

This is due to the addition of anchovy flour, which is one of the ingredients. A high source of calcium, which can help prevent stunting. The calcium content in anchovy meal plays a crucial role in the growth and development of toddlers, particularly in bone and tooth formation. The results are quite significant, as the use of anchovy meal in cookies contributes significantly.

In this study, cookies can meet 61.5 mg of calcium requirements. According to the Recommended Dietary Allowance (RDA), toddlers aged 1-3 years require 650 mg of calcium per day. Using the RDA standard, cookies as a snack can meet 9.47% of the daily intake.

9. Substance Iron

Iron content testing in cookies with breadfruit flour and anchovy flour substitutes was conducted at the Pontianak State Polytechnic Laboratory. The F1 cookie formulation was tested using the AAS method. In this study, the iron content in cookies with breadfruit flour and anchovy flour substitutes was 0.18 mg, which does not meet the SNI 01-7111.2-2005 standard of 5 mg.

This is due to the addition of anchovy flour, which has a high iron content, but its contribution to this cookie product is not optimal. Iron plays a role in distributing oxygen throughout the body's tissues in toddlers. When oxygen flow to bone tissue is reduced, growth will be hampered. Toddlers with iron deficiency can experience cognitive and physical impairments and an increased risk of

death. Therefore, the use of anchovy flour in cookies is recommended. this even though not yet maximum but no too influential because stunting is more influenced by high protein.

In this study, cookies can meet 0.18 mg of iron requirements. According to the Recommended Dietary Allowance (RDA), toddlers aged 1-3 years require an iron intake of 0.18 mg. 7mg/hr and if using the AKG standard for giving cookies as a snack, it can meet the toddler's intake needs by 0.25% per day.

CONCLUSION

Based on the research results, it can be concluded that there is an effect of substitution of breadfruit flour and anchovy flour in cookies on the acceptability of color and aroma. There is no effect of substitution of breadfruit flour and anchovy flour in cookies on the acceptability. The texture and aroma, texture, and flavor of cookies using breadfruit flour and anchovy flour substitutes are unacceptable, and further research is needed regarding the aroma, texture, and flavor of cookies. The resulting aroma tends to be fishy, the texture is harsh, and the flavor is dominated by anchovy flour, making it less appealing to toddlers.

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