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The Effect of Substitution of Catfish Flour and Yellow Sweet Potato Flour in Making Pmt Biscuits for Increasing Children's Weight in Malnourished Toddlers in Aek Parombunan Village in 2022

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ABSTRACT

PEM and vitamin A deficiency have a close relationship. Providing high protein and vitamin A supplementary food needs to be given to toddlers to prevent PEM and vitamin A deficiency. Catfish is a high protein food, while yellow sweet potato is high in β-carotene content. Biscuits substituted with catfish meat flour and yellow sweet potato flour are expected to be an alternative supplementary food high in protein and β-carotene. Analyzing the effect of substitution of catfish meat flour and yellow sweet potato flour on the nutritional content and acceptance of toddler biscuits. Method: This is an experimental study with a completely randomized design of one factor with 5 levels of treatment of substitution of catfish meat flour and yellow sweet potato flour, namely 0%: 0%, 15%: 8%, 15%: 10%, 20%: 8%, and 20%: 10%. The nutritional content analyzed includes protein, energy and β-carotene levels. Statistical analysis of nutritional content using the One Way ANOVA test followed by the Tukey posthoc test. Acceptance analysis using Friedman and Wilcoxon tests. The highest protein content was found in biscuits substituted with 20% catfish flour (19.81% and 20.8%) and the highest β-carotene content was found in biscuits substituted with 10% yellow sweet potato flour (463.38 µg and 479.12 µg/100g). Variations in the percentage of substitution of catfish flour and yellow sweet potato flour affected the levels of protein, energy, β-carotene as well as the color, aroma, texture, and taste of biscuits. Substitution of catfish flour increased the protein content and yellow sweet potato flour increased the β-carotene content in biscuits. Substitution of catfish flour and yellow sweet potato flour could reduce the acceptance of the color, aroma and taste of biscuits. Meanwhile, the texture of 100% wheat biscuits and substitute biscuits was considered liked by the panelists.

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1. Introduction

Nutritional status is an important indicator for children's health. This is because nutritional status is one of the risk factors for morbidity and mortality.(Pratiwi, Masrul, & Yerizel, 2016),(Septica, 2018). Good nutritional status in children will contribute to their health and also their ability to recover from an

illness. Malnutrition is a condition where the body weight for age (BB/U) is not in accordance with the age that it should be.(CRISMON, 2019),(Mulyani, IP, & RP, 2022).

Malnutrition is prone to occur in toddlers aged 2-5 years because toddlers have adopted eating patterns such as family meals and have started with high levels of physical activity.(AINI, 2021),(Fadhilah et al., 2019). Malnutrition in toddlers is related to brain development so that it can affect children's intelligence and have an impact on the formation of human resource quality in the future. The results of RISKESDAS data on the prevalence of malnutrition in Indonesia in 2018 reached 13.8%. This percentage decreased from 2013 which was 13.9%(Hairunis, Salimo, & Dewi, 2018),(Kurniati, 2021).

Nutritional problems occur due to several interrelated factors. According to the United Nations Emergency Children's Fund (UNICEF), there are two factors that cause malnutrition, namely direct causes which include inadequate food intake and infection, while indirect causes include food security in the family, child care patterns and child health services and the environment.(Nurkhasanah, 2020),(Setyawan, n.d.).

Food intake is one of the direct factors in the occurrence of malnutrition in toddlers. The nutritional needs of toddlers aged 1-3 years are 1112 kcal of energy, 26 grams of protein, 155 grams of carbohydrates, 44 grams of fat, and 650 mg of calcium.(Aulia, Hardiansyah, & Widiastuti, 2022),(Dewi, 2018). Meanwhile, toddlers aged 4-6 years need 1600 kcal of energy, 35 grams of protein, 220 grams of carbohydrates, 62 grams of fat, and 1000 mg of calcium.(Noflidaputri & Lestari, 2022),(Juliana, Nataliningsih, & Aisyah, 2022).

One of the efforts to overcome the problem of malnutrition in toddlers is by Providing Additional Food. The requirement for Providing Additional Food for toddlers with malnutrition is to provide additional food containing 300-400 calories and 15-20 grams of protein per 100 grams of material given for 90 days for toddlers with malnutrition.(Waroh, 2019),(Verawati & Yanto, 2019). The additional food provided is in the form of biscuits made from wheat flour with the addition of sweet potato flour and catfish flour. The selection of cookies as an alternative additional food is because there have been many studies that use biscuit formulations with the addition of food ingredients that are in line with the food diversification program in order to realize Indonesian food security.(Rohmah, 2020),(Verawati & Yanto, 2019).

According to SNI 01-2973-1992, biscuits are a type of biscuit made from soft dough, high in fat content, relatively crispier when broken, and the cross-section of the pieces has a less dense texture. Biscuits that will be made as additional food are substituted with sweet potato flour and dumbo catfish flour.(Ariantya, 2016),(Zahro, Latifa, Alam, & Rosania, 2020). Sweet potatoes contain many nutrients needed for the growth and development of children, including vitamin A, protein and calcium. In 100 grams of fresh sweet potatoes contain 440 mg of calcium, 6.7 grams of protein, 70 mg of phosphorus. While in 100 grams of sweet potato flour contains 2003 mg of calcium, 27.1 grams of protein, 204 mg of phosphorus. Sweet potato powder has a positive effect on overcoming malnutrition in toddlers(Rulina, 2010),(Anggraeny & Ariestiningsih, 2017). The content of protein, calcium, vitamin A and beta-carotene in sweet potatoes has been proven to increase the weight and height of toddlers. Dumbo catfish (Clarias gariepinus) is one of the most popular animal foods and is most easily accepted by the public because of its various advantages. In 100 grams of Dumbo catfish contains 90 grams of calories, 18.7 grams of protein, 1.1 grams of fat, 15 grams of calcium, 260 grams of phosphorus, 2 grams of Fe, 150 grams of Sodium. So it can be said that this catfish contains high protein and high calcium as a bone strengthener during growth.

According to Zakariah's research, adding 3 grams of sweet potato flour a day to the food of undernourished toddlers for 30 days will increase the weight of undernourished toddlers because sweet potato powder can increase the toddler's appetite.(Kurniawan, Suhartiningsih, Pangesthi, & Bahar, nd)(Kurniawan et al., nd). According to Septiani's research, consuming catfish biscuits for 88 days can have an effect on the nutritional status of toddlers where consuming 3.2 biscuits per day or equivalent to 40.6 grams per day can provide additional nutrients to toddlers of around 146 calories for energy and 5.8 grams for protein.

Prevention efforts can be done by providing food fortification or increasing consumption of high-protein and vitamin A foods for toddlers. The form of food is in the form of providing additional food (PMT) (Aisiyah, 2012). One alternative additional food (PMT) for toddlers that can be used is biscuits. The level of biscuit consumption has increased every year.

Malnutrition is a condition where the body weight for age (BB/U) is not in accordance with the age that it should be. Malnutrition is prone to occur in toddlers aged 2-5 years because toddlers have implemented eating patterns such as family food and start with high levels of physical activity. Malnutrition in toddlers is related to brain development so that it can affect children's intelligence and have an impact on the formation of the quality of human resources in the future. The results of RISKESDAS data on the prevalence of malnutrition in Indonesia in 2018 reached 13.8%. This percentage decreased from 2013 which was 13.9%.

From the description above, it is necessary to have additional food that is modified by adding local food that is rich in nutrients, especially for toddlers, especially those who are malnourished in order to improve their condition. It is hoped that this additional food can make a good contribution to improving the condition of toddlers who are malnourished.

2. Methods

2.1 Research design

This research is an experimental research. Experimental or trial research (experimental research). The design used is a completely randomized design (CRD) which aims to assess a treatment or action. In this study, the treatment carried out was to determine the organoleptic test of sweet potato flour biscuits and catfish flour based on organoleptic color, aroma, taste, texture. The experimental unit used is homogeneous or there are no other factors that affect the response outside the factors being tried or studied. In this study, the treatment carried out was the addition of sweet potato flour and catfish flour in making biscuits.

2.2 Formulation Design

This study uses an Experimental Design or Formulation using two factors, namely the comparison between Sweet Potato flour and catfish flour.

Table 1.
Formulation Design

No.	Material	Unit	F1	F2	F3
1.	Sweet Potato Flour	G	80	75	70
2.	Catfish Flour	G	50	55	60
3.	Flour	G	25	25	25
4.	Fine granulated sugar	G	100	100	100
5.	Egg	G	60	60	60
6.	Margarine	G	20	20	20
7.	Skim Milk	G	50	50	50
8.	Choco Chips	G	5	5	5

2.3 Location and Time of Research

This research was conducted in the STIKes Naulii Husada laboratory, the research time was April-July 2022.

a. Making Sweet Potato Flour

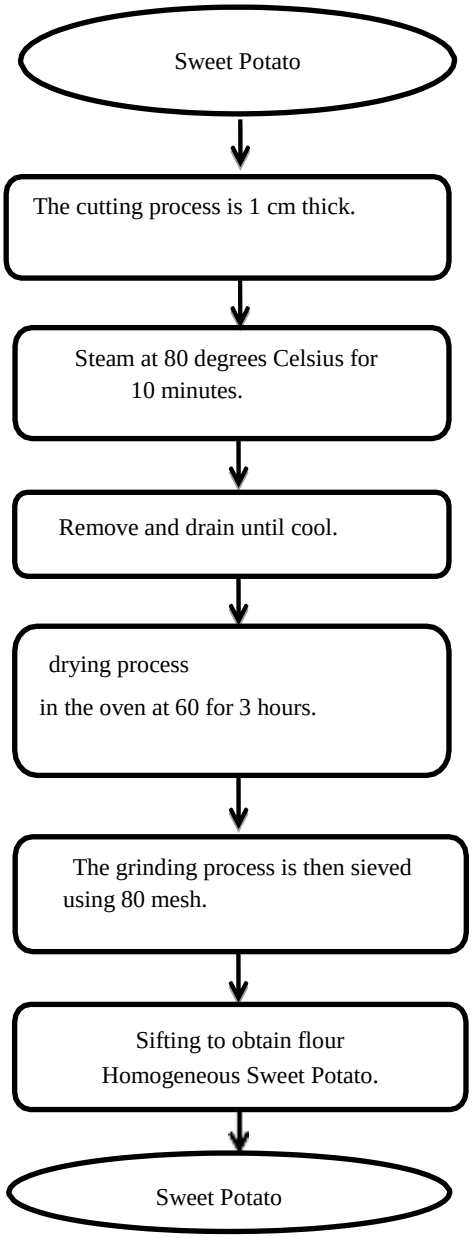


Diagram 1. Making Cassava Flour

b. Making Catfish Flour

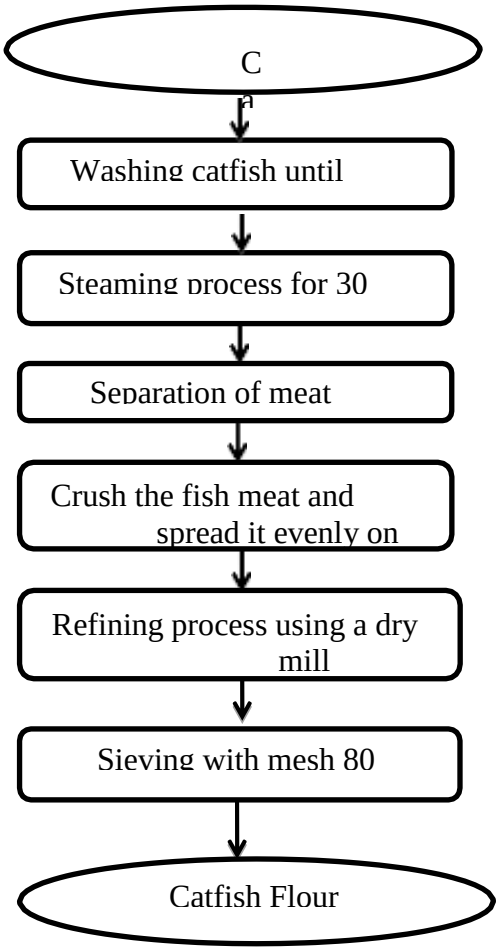


Diagram 2. Making Catfish Flour

c. Biscuit Making

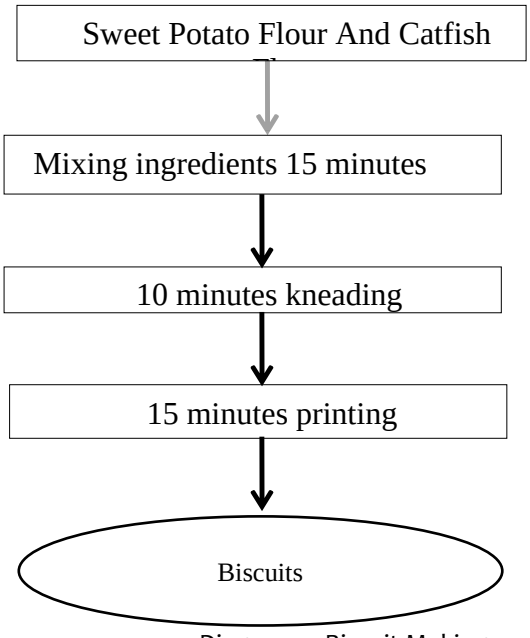


Diagram 3. Biscuit Making

2.4 Organoleptic Test Assessment

Organoleptic test or hedonic test is a test in sensory analysis used to determine the magnitude of the difference in quality between several similar products by giving an assessment or score to certain properties of a product and to determine the level of liking of a product. This level of liking is called a hedonic scale, for example very much like, like, somewhat like, dislike, very much dislike.

2.5 Data Collection and Processing

Data collection used in this study using an organoleptic test form that has been filled out by the panelists. Then processed using Microsoft Excel and SPSS.

2.6 Data analysis

The data obtained from the organoleptic test were analyzed statistically with the Kruskal Wallis test, if the significance is p <0.05 then continue with the Man Whitney test. The data obtained from the organoleptic test were analyzed by comparing the average value of each assessment by the panelists, then tested using an experimental test, namely to determine the results of the treatment of the panelists who had filled out the form, after which it was continued with the Kruskall-Wallis test to determine whether the organoleptic test of Sweet Potato flour biscuits and catfish flour on the quality of color, aroma, texture and taste is there a difference or not.

This study used an experimental design with a quantitative approach. The aim was to evaluate the effect of substitution of catfish flour and yellow sweet potato on the nutritional quality and acceptance of PMT biscuits by toddlers.

3. Results and Discussion

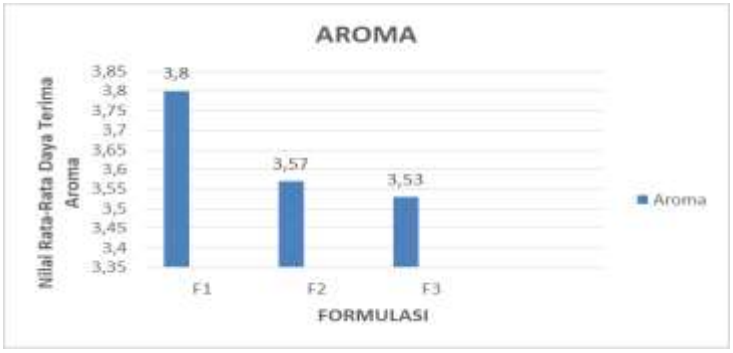
3.1 Analysis of Research Results

a. Organoleptic Acceptability of Color Quality in Sweet Potato Flour and Catfish Flour Biscuit Formulations

Graph 1. Average Value of Organoleptic Test on Color Quality In Biscuit Formulation

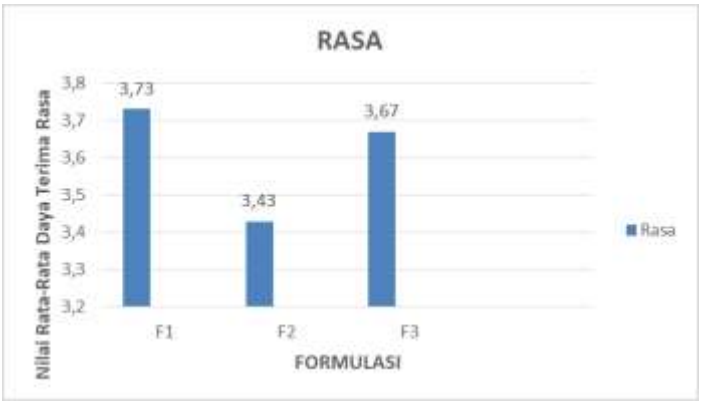
Based on Graph 1. the most preferred color quality results are F1 with a value of 3.7. While the least preferred color formula is F3 with a value of 3.5.

b. Organoleptic Acceptability of Aroma Quality in Sweet Potato Flour and Catfish Flour Biscuit Formulations



Graph 2. Average Value of Organoleptic Test on Aroma Quality in Biscuit Formulation

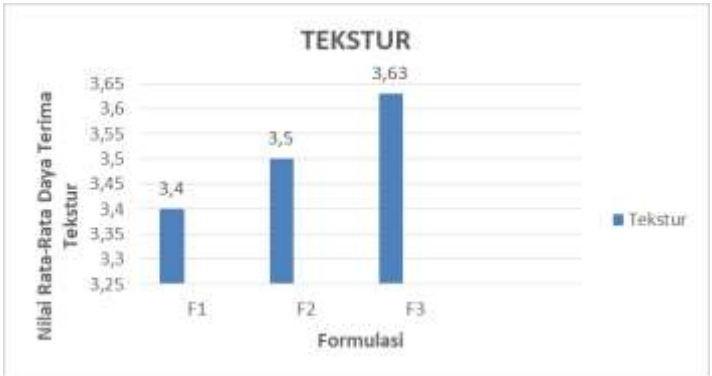
Based on Graph 2. the most preferred aroma quality results were obtained, namely F1 with a value of 3.8. While the least preferred aroma formula was F3 with a value of 3.53.



Graph 3. Average Value of Organoleptic Test on Taste Quality in Biscuit Formulation

Based on Graph 3. the results obtained the most preferred taste quality is F1 with a value of 3.73. While the least preferred taste formula is F2 with a value of 3.43.

c. Organoleptic Acceptability of Texture Quality in Tempe Flour and Catfish Flour Biscuit Formulations.



Graph 4. Average Value of Organoleptic Test on Texture Quality in Biscuit Formulation

Based on Graph 4. the most preferred texture quality results are F3 with a value of 3.63. While the least preferred texture formula is F1 with a value of 3.4.

Table 2.
Univariate Analysis Results of Organoleptic Test Using Kruskall Wallis Test

	Mode Value	Mean Value
Color	3	3.60
Aroma	4	3.63
Flavor	4	3.61
Texture	4	3.51

Based on Table 2. from the highest frequency for all formulations on the most frequently occurring value for color quality is 3 (rather like), the most frequently occurring value for aroma quality is 4 (like), the most frequently occurring value for taste quality is 4 (like) and the most frequently occurring value for texture quality is 4 (like). While the average value for color quality is 3.60, the average value for aroma quality is 3.63, the average value for taste quality is 3.61 and the average value for texture quality is 3.51.

Table 3.
Results of Bivariate Analysis of Organoleptic Tests Using Kruskal Wallis Test.

Organoleptic Test	**Asymp. Sig Value**
Color	0.527
Aroma	0.300
Flavor	0.287
Texture	0.390

Based on Table 3, it can be seen that the results of the analysis of color, aroma, taste and texture using Kruskal Wallis showed p>0.05, there was no difference in the variation of biscuit formulations on the organoleptic test results because the average values of biscuits F1, F2 and F3 were not much different.

3.1. Discussion

a. Color

Event The results of the organoleptic test of tempeh flour and catfish flour biscuits on the color quality of the biscuits can be seen that the most preferred formulation is F1 with 80 grams of tempeh flour and 50 grams of catfish flour with a scale of 3.7 (rather like). Treatment F2 with a ratio of 75 grams of tempeh flour and 55 grams of catfish flour with a scale of 3.6 (rather like). Treatment F3 with a ratio of 70 grams of tempeh flour and 60 grams of catfish flour with a scale of 3.5 (rather like).

From the highest frequency for all formulations, the most frequently occurring value for color quality is 3 (rather like). While the average value for color quality is 3.60.

The results of this study are supported by research by Syamsiah, (2018) who stated that the results of organoleptic tests on the color of biscuits made from flourtempeh on the six products showed that the more tempeh flour and catfish were added in the making, the brighter the brown. The addition of tempeh flour resulted in brighter brown biscuits. The results of the color quality on the seven formulations with a 95% confidence level showed that all the formulas made were very different (p<0.01), the addition of tempeh flour makes the biscuits produced increasingly light brown.

Based on the results of the Kruskal Wallis statistical analysis, it is known that the P value>0,05, namely 0.527, there was no real difference in the treatments (F1, F2 and F3) on the color quality of tempeh flour and catfish flour biscuits.

In this study, flour biscuitstempeh and catfish flour on the organoleptic quality of the color panelists prefer F1 compared to F2 and F3 because the addition of more tempeh flour in the F1 formula causes the color to be brighter than F2 and F3. From the research that has been carried out, the color of F1 biscuits is widely preferred by somewhat trained panelists with an average value of 3.7 (somewhat like) because the color is bright and brownish.

b. Aroma

Based on the results of the study of tempeh flour biscuits and catfish flour, it showed that the F1 formula had the highest average value of respondents, namely 3.8 (rather like) for the aroma quality of tempeh flour biscuits and catfish flour. Statistical analysis of the influence of F1, F2 and F3 showed that there was no significant difference between the organoleptic test of tempeh flour biscuits and catfish flour on the organoleptic quality of aroma. From the results of the bivariate analysis of the organoleptic test on aroma, the asymp.sig value P> 0.05 was obtained, namely 0.300.

From the highest frequency for all formulations, the most frequently occurring value for aroma quality is 4 (like). While the average value for aroma quality is 3.63. The highest average value of panelists' preference for biscuit aroma is produced by the biscuit formulation with 5% addition of anchovy flour with a value of 3.30 and the lowest average value is produced by the biscuit formulation with 35% addition of anchovy flour with an average value of 2.50.

Meanwhile, in the study of tempeh flour biscuits and catfish flour on the organoleptic quality of the aroma of formula F1 is stronger because the addition of tempeh flour and catfish flour is more than formulas F2 and F3. During the biscuit kneading process, the typical aroma of biscuits is not so noticeable, but when the biscuits are baked, they begin to be smelled by the sense of smell. The resulting aroma comes from margarine, egg yolks, skim milk, tempeh flour and catfish flour itself. From the research that has been carried out, the aroma of F1 biscuits is widely preferred by trained panelists because the aroma is not too smelly in tempeh flour and catfish flour.

c. Flavor

The results of the study of tempeh flour biscuits and catfish flour showed that the F1 formula showed an average value of respondents of 3.73 (rather liked) for the taste quality of biscuits enriched with tempeh flour and catfish flour. Statistical analysis of the F1, F2 and F3 formulas showed that there was no significant difference between the acceptability of tempeh flour biscuits and catfish flour for the organoleptic quality of taste. From the results of the bivariate analysis of the organoleptic test on taste, the asymp.sig value P> 0.05 0.287 was obtained.

From the highest frequency for all formulations, the most frequently occurring value for taste quality was 4 (like), while the average value for taste quality was 3.61.

The formula of tempeh flour and catfish flour biscuits in F1, F2 and F3 has a taste that is not much different, this is due to the use of tempeh flour and catfish flour which are more dominant than each treatment which gives a distinctive taste to the biscuits. From the research that has been carried out, the taste of F1 biscuits is widely preferred by fairly trained panelists because the taste is not too sweet and delicious.

d. Texture

The results of the study of tempeh flour and catfish flour biscuits showed that the F3 formula showed the highest average value of respondents, namely 3.63 (rather like) for the texture quality of biscuits enriched with tempeh flour and catfish flour. Statistical analysis of the F1, F2 and F3 formulas showed that there was no significant difference in the organoleptic quality of the texture. From the results of the bivariate analysis of the organoleptic test on taste, the asymp.sig value P> 0.05 0.390 was obtained.

The results of this study explain that the addition of tempeh flour and catfish flour affects the acceptability of the texture quality of tempeh flour and catfish flour biscuits. From the highest frequency for all formulations, the most frequently appearing value for texture quality is 4 (like). While the average value for texture quality is 3.51.

Texture is something that can be observed with the sense of touch, both surface texture, elasticity and so on. Another definition of texture is a sensation of pressure that can be enjoyed with the mouth (when bitten, chewed and swallowed) or touched with the fingers.

Of the three products studied based on organoleptic tests of three different formulations, it was found that the F1 formulation was preferred by panelists in terms of color, aroma and taste quality compared to formulations F2 and F3, while the F3 formulation was preferred by panelists in terms of texture quality compared to F1 and F2.Based on the Kruskall Wallis test, it was found that there were significant differences. From the research that has been carried out, the texture of F3 biscuits is preferred by somewhat trained panelists because the addition of more flour than other formulas makes the biscuit texture crispy.

4. Conclusion

Based on the results of the research and discussion of the organoleptic test of biscuits with tempeh flour and catfish flour substitution, the following conclusions can be drawn: The results of the most preferred product color quality were obtained, namely F1, The results of the most preferred product aroma quality were obtained, namely F1, The results of the most preferred product taste quality were obtained, namely F1, The results of the most preferred product texture quality were obtained, namely F3,

Suggestions Based on the results of the research that has been done, the researcher gives suggestions to the Community, For the community, tempeh flour and catfish flour biscuits can be used as a home business because the ingredients are easy to get, besides that they can utilize healthy and cheap local food. For Toddlers with Energy Protein Deficiency, For children with energy protein deficiency, they can consume biscuits that are rich in nutrients, especially high protein to overcome nutritional status problems and as an alternative light snack between meals, namely morning or afternoon snacks.

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