

Kindergarten Students' Acceptance of Biscuits Made from Soybean Flour and Tempe Flour as Substitute Ingredients

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ABSTRACT—*This study aims to investigate the consumers acceptance of biscuits made from soybean flour and tempe flour. The consumers in this case are students of kindergarten in TK Hikmah of Lamasi District, Luwu Regency. This study is experimenting the use of soybean flour and tempe flour as substitutes ingredients for wheat flour. This study was conducted at the laboratory of Home Economics Department and TK Hikmah in Lamasi District of Luwu Regency from April to August 2020. The data is collected on the quality of biscuits in terms of color, aroma, texture, taste, overall, and preferences. The data then analyzed Data were analyzed using the formula for a vera ge score, frequency, and t-test. The results showed that biscuits with soybean flour and tempe flour were accepted by kindergarten students with acceptance rate of 73%. It is higher than the standard of acceptance rate (70%). The composition of every 100 grams, there is 24% of flour, 0,6% of soybeans, 5,4% of tempe, 16.7% of cornstarch, 12% of margarine, 29% of egg yolks, 12% of refined sugar, 6.2% of baking powder, and 0.2% of vanilla.*

Keywords— Biscuits, formulation, soybean, tempe

1. INTRODUCTION

The coronavirus (COVID-19) becomes a significant threat to global health and the economy. There is no treatment for this virus yet, so it is urgent to find alternative methods to control the spread of diseases that disrupt health, especially people who are less educated, poor, and groups that are susceptible to disease [1] [2]. Based on the results of the study conducted by Atri, et.al and Victora, et.al, the group that is susceptible to infection is age and low immunity [2] [3].

Most people with malnutrition in Indonesia live in rural areas (15.3%), work as farmers / fishermen / laborers / (15.8%), and do not go to school/ do not complete elementary school (32.3%) [4]. Diet and eating habits shape food consumption patterns. If people consume food that is high in nutrients, it will support their growth, immunity and health, which can avoid nutritional problems [5], [6].

In optimizing the handling of nutrition and health problems through diversification of supplementary foods considering the benefits of nutrition, health, acceptability, durability and the advantages of local food soybean and tempe. This is in accordance with the demands of industrial priority technology in the national research master plan 2020-2045 in the form of formulation technology and production of special/functional food [7]. Soybeans and tempe are food ingredients that people like because they are affordable, easy to get, and contain very high protein and calcium. Tempe and soybeans which contain antioxidants that can prevent coronary heart disease, cancer, diabetes, hypertension, lowering blood cholesterol, lowering atherosclerotic plaques, improving the intestinal microflora environment, and maintaining the body's cyclophosphamide immunosuppressive function [8], [9], [10], [11].

Based on these facts, formulation of supplementary food is necessary by using sardines, soybeans and tempe in the form of biscuits. The advantage of biscuits is that they are easy to consume and are well accepted by children. However, the biscuits produced today are not enriched with local food ingredients [12].

Therefore, it is urgent to conduct an in-depth study by examining biscuits made from soybean flour, and tempe flour to increase immunity and to inhibit the spread of Covid-19. The research objective is to determine the consumer acceptance of biscuits with substitution of sardines, soybean flour and tempe flour.

2. MATERIALS AND METHODS

2.1. Research Design

This experimental research was carried out in several stages. The first stage is making soybean flour and tempe flour, the second stage is the process of formulating the biscuit with substitution of soybean flour and tempe flour until you get the best formula. The third stage is testing the kindergarten children's acceptance of biscuits made from soybean flour and tempe flour .

2.2. Ingredients

Ingredients in making biscuits from soybean flour and tempe flour are margarine, sugar, egg yolk, vanilla, baking powder, cornstarch, and wheat flour, while soybean flour and tempe flour are the main ingredients in this study.

2.3. Place and Time

This research was conducted in the laboratory of Home Economics Department for the process of formulation and quality testing of biscuits and at TK Hikmah in Lamasi District of Luwu Regency. This research starts from April to August 2020

2.4. Data/M Measurement Source

The data collected in this study were data on the quality and acceptance of biscuits by observing and measuring the biscuit organoleptic from the 36 trained panelists. The organoleptic measurement is using 7 scales in terms of color (very dark brown to very light brown), aroma (very unpleasant fragrant to very nice fragrant of soy/tempe), texture (very soggy to very crispy), taste (very bad to very good), overall (horrible to excellent) and hedonic with 11 scales (very very dislike to very very like). The data collected from the kindergarten students are in 2 scales, like and dislike [13], [14], [15]

2.5. Data Analysis

The obtained organoleptic data were analyzed using Mean formula, the average t-test, while the acceptance was analyzed using frequency

3. RESULT AND DISCUSSION

3.1. Process of Making Biscuit

The process of making biscuits starts with weighing the ingredients used the predetermined size, then stirring margarine and sugar until it expands and then adding egg yolks and stirring again until it becomes a soft dough, the next step is adding vanilla, baking powder, wheat flour, soybean flour and tempe flour. After that, the well-mixed ingredient is molded into small chips with 6 grams each and when cooked they become 5 grams. When all dough has been molded in chips, then bake in the oven for 40 minutes at a temperature of 140°C..

Choosing the right biscuit ingredients will affect the ease of manufacture process, as well as the results. The meaning of the right ingredients according to the purpose of the biscuits, for example the suitable flour for the manufacture of biscuits is a type of flour that contains low protein. Low protein will give a crispy texture, on the other hand if you use medium and high protein flour it will make the texture hard. This is in line with study conducted by Manley (2001) who stated that the right flour for making biscuits or cookies is low protein flour [16]. The baking process also has a very significant effect on the color of the biscuits. The use of the right oven heat and the timing is also very decisive, only at 140°C for 25 minutes. This is also in accordance with the results study conducted by Widodo in 2017 [13].

3.2. The Quality of Biscuits Made from Soybean Flour and Tempe Flour

The quality of biscuits is determined by the quality and acceptance. The biscuit quality is determined by its color, aroma, texture, taste and overall, while the acceptance is determined by the panelists' preference [13]. The following data in Table 1 is obtained from the quality and acceptance of the biscuits.

Table 1. The Average Score Organoleptic Test of Biscuits Made from Soybean Flour and Tempe Flour

Indicator	Color	Aroma	Textur	Taste	Over All	Hedonic	Acceptance
F0	(4,31±1,167) ^d	(5,69±1,191) ^d	(5,22±0,989) ^e	(4,31±1,451) ^{cdefg}	(6,25±1,873) ^g	(6,25±1,873) ^{de}	61,1%
FTK1	(5,50±0,707) ^f	(4,28±1,274) ^{ab}	(2,44±1,504) ^a	(4,33±1,138) ^{defg}	(4,00±1,085) ^{ab}	(6,22±1,309) ^{de}	41,7%
FTK21	(6,08±0,967) ^g	(5,67±0,862) ^d	(3,25±1,461) ^b	(5,08±1,273) ^{hi}	(4,89±0,575) ^{ef}	(6,97±1,183) ^e	86,1%
FTK25	(6,14±1,018) ^g	(4,75±1,402) ^{ab}	(3,28±1,734) ^b	(4,89±1,090) ^{ghi}	(4,50±1,082) ^{abcdef}	(6,61±1,573) ^{de}	77,8%
FTK29	(5,58±0,967) ^f	(5,47±0,941) ^{cd}	(4,06±1,330) ^c	(5,19±1,091) ⁱ	(4,94±0,826) ^f	(6,94±1,308) ^e	86,1%
FTK31	(5,03±1,158) ^e	(3,97±1,464) ^a	(4,86±1,291) ^{de}	(4,58±1,052) ^{ghij}	(4,64±0,899) ^{cdef}	(5,78±1,623) ^{cd}	58,3%
FTK35	(5,61±0,934) ^f	(3,97±1,276) ^a	(4,44±1,132) ^{cd}	(3,92±1,228) ^{bcdef}	(4,36±0,723) ^{abcde}	(5,31±1,411) ^{abc}	55,6%
FTK39	(5,53±0,774) ^f	(4,67±1,219) ^{ab}	(4,64±1,334) ^{cde}	(3,58±1,052) ^{abc}	(4,33±0,828) ^{abcde}	(5,11±1,489) ^{abc}	44,4%
FTK41	(4,64±1,199) ^{de}	(4,28±1,323) ^{ab}	(4,42±1,251) ^{cd}	(4,11±0,919) ^{bcdef}	(4,31±0,889) ^{abcd}	(5,33±1,219) ^{abc}	44,4%
FTK45	(4,72±1,003) ^{de}	(4,92±1,105) ^{bc}	(4,47±1,183) ^{cd}	(4,50±1,276) ^{efgh}	(4,69±0,822) ^{def}	(5,75±1,556) ^{bcd}	61,1%
FTK49	(4,56±0,909) ^{de}	(4,03±1,558) ^a	(4,64±1,291) ^{cde}	(3,06±1,241) ^a	(3,94±0,826) ^a	(4,50±1,483) ^a	16,7%
FTK51	(2,39±1,128) ^a	(4,50±1,949) ^{ab}	(4,89±1,450) ^{de}	(3,92±1,628) ^{bcdef}	(4,28±1,162) ^{abcd}	(4,94±1,820) ^{abc}	41,7%
FTK55	(2,67±0,793) ^{ab}	(4,56±1,780) ^{ab}	(4,92±1,317) ^{de}	(3,78±1,376) ^{bde}	(4,19±1,305) ^{abcd}	(5,11±2,122) ^{abc}	38,9%
FTK59	(2,44±0,909) ^a	(4,31±1,721) ^{ab}	(5,97±1,134) ^f	(3,86±1,397) ^{bcdef}	(4,56±1,054) ^{bcdef}	(4,86±1,915) ^{ab}	36,1%
FTK61	(2,33±0,862) ^a	(4,61±1,479) ^{ab}	(5,08±1,052) ^{de}	(3,89±1,410) ^{bcdef}	(4,22±0,898) ^{abcd}	(4,64±1,839) ^a	38,9%
FTK65	(3,25±1,052) ^c	(4,44±1,463) ^{ab}	(4,89±1,304) ^{de}	(3,44±1,443) ^{ab}	(4,06±1,068) ^{abc}	(4,47±1,612) ^a	27,8%
FTK69	(2,94±0,754) ^{bc}	(4,33±1,454) ^{ab}	(4,72±1,542) ^{cde}	(3,67±1,604) ^{abcd}	(4,06±1,094) ^{abc}	(4,67±1,971) ^a	33,3%
p. Value	0.000	0.000	0.000	0.000	0.000	0.000	
Trend	-0,2209x	-0,049x	0,1013x	-0,0787x	-0,0624x	-0,1433x	

Based on the data above, the best formula for ingredients substitution of biscuit made from sardine flour, soybean flour and tempe flour is the FTK 29 formula and the selected biscuits were continued to be tested to kindergarten students' acceptance

3.2.1. The Quality of Biscuits Color

The resulting color quality is golden brown however, the biscuits made from sardines, soybean flour and tempe flour show a darker brown trend. This darker color indicates that the color of the flour added is darker than wheat flour as the main ingredient so that it has a darker effect on the results compared to those without sardines, soybean flour and tempe flour. The darker color is also affected by the baking process, resulting in browning all ingredients and due to caramelization of the sugar. This is in accordance with the results study by Kartika [17], Widodo [13], and Manley [18] which found that the baking process on biscuits will result in a browner color caused by caramelization..

3.2.2. The Quality of Biscuits Aroma

The expected biscuits aroma has the nice aroma of soy and tempe, however the biscuits made from sardines flour, soybean flour and tempe flour have unpleasant aroma. The distinctive aroma of soybeans and tempe greatly affects the final result if it were added more. This was also conveyed by Manley [18], and Widodo [13] that adding ingredients that have aromatic properties will impact the aroma on the product and will decrease the acceptance rates if added more of such ingredients.

3.2.3. The Quality of Biscuits Texture

The texture of biscuits made from sardine flour, soybean flour and tempe flour is crunchy. It is because of the protein denaturation process and the caramelization of sugar in the biscuits. Besides, the properties of sardines flour, soybean flour and tempe flour are low in carbohydrate and gluten content so that the level of crispiness is increased. Therefore, the biscuit is crunchier when substituted ingredients are added. This is in line with research from Katika [6] and Manley [18] who found that the crispy texture of biscuits and crackers is influenced by the gluten content in the constituent ingredients.

3.2.4. The Quality of Biscuits Taste

The taste of food or beverage is influenced by the protein and fat content that collaborates on the biscuits produced. The balance and the combination of protein and fat improves the taste. A person's feelings are also influenced by age, because the older a person experiences a decrease in taste. This is in line with the results of research by Baiq [19] and Paliling [20] which found that the use of vegetable ingredients (not excessive) will give a good taste effect, especially on the savory effect.

3.2.5. The Biscuits Hedonic Test Result

In this study, biscuits that contained sardines flour, soybean flour and tempe flour are preferred when more substitutes were added. This level of preference is strongly influenced by the quality and shape of the biscuits. The delicious tastes, the unique shape and easy to consume, make the biscuits more preferred. This concurs with the opinion of Kartika [17], Widodo [13], and Manley [18]. The biscuits with the highest score on the level of preference were the FTK29 formula with a ratio of ingredients per 100 grams consists of 24% of flour, 0,6% of soybeans, 5,4% of tempe, 16,7% of cornstarch, 12% of margarine, 29% of egg yolks, 12% of refined sugar, 6,2% of baking powder, and 0,2% of vanilla.

3.3. The Kindergarten Students Acceptance of Biscuits Made from Soybean Flour and Tempe Flour

The acceptance of biscuits is indicated by the preference of the product. The tested biscuits are the selected and the most preferred biscuits by the panelists in terms of the biscuit quality and preferences level. Then, 132 students of TK Hikmah are given 1 biscuit without substitutes and 1 biscuit made from soybean flour and tempe flour with the weight of each biscuit is 5 grams. For more details, it can be seen in Figure 3. Based on the figure, the frequency shows that the biscuits tested exceed the minimum biscuit acceptance limit, which is more than 70% [21]



Figure 2. The Students' of TK Hikmah Acceptance of the Biscuits

The level of students' preference is based on various things such as shape, taste, their environment, and habits. The good taste influences the preferences of children. The unique shape and one bite size of the product will increase the acceptance. This is in accordance with the results study by Widodo [14], Naseem [22], and Mohammed [23] which found that the respondent's acceptance or preferences level is due to its good taste, interesting shape, and easy to eat

4. CONCLUSION

As the conclusion, the more substituted ingredients soybean flour and tempe flour added in the biscuits dough, the tastier the biscuits and preferred by the panelists and kindergarten students. However, the crunchier the biscuit, the darker its color. The biscuits with the highest score on the level of preference were the FTK29 formula with a ratio of ingredients per 100 grams consists of 24% of flour, 0,6% of soybeans, 5,4% of tempe, 16,7% of cornstarch, 12% of margarine, 29% of egg yolks, 12% of refined sugar, 6,2% of baking powder, and 0,2% of vanilla.

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6. REFERENCES

- [1] L. Zhang and Y. Liu, “Potential interventions for novel coronavirus in China : A systematic review,” *Med. Virol.*, no. February, pp. 479–490, 2020.
- [2] D. Atri, H. K. Siddiqi, J. Lang, and V. Nauffal, “Covid-19 for the Cardiologist: A Current Review of the Virology, Clinical Epidemiology, Cardiac and Other Clinical Manifestations and Potential Therapeutic Strategies,” *JACC Basic to Transl. Sci.*, 2020.
- [3] C. Victora *et al.*, *The Lancet series: maternal and child undernutrition 2: consequences for adult health and human capital*, vol. 6736, no. 7. 2008.
- [4] Kemenkes RI, “Angka Kecukupan Gizi 2018 bagi Orang Indonesia.” 2018.
- [5] J. L. Cannon, B. A. Lopman, D. C. Payne, and J. Vinjé, “Birth Cohort Studies Assessing Norovirus Infection and Immunity in Young Children : A Review,” *Infect. Dis. Soc. Am.*, vol. 69, pp. 357–365, 2019.
- [6] D. Kartika, S. A. Marliyati, L. Kustiyah, and A. Khomsan, “Role of Biscuits Enriched with Albumin Protein from Snakehead Fish, Zinc and Iron on Immune Response of under Five Children,” *Pakistan J. Nutr.*, vol. 13, no. 1, pp. 28–32, 2014.
- [7] KemenRis TekDikTi, *Rencana Induk Riset Nasional Tahun 2017-2045*. Jakarta, 2017.
- [8] C. Hu, W. Wong, R. Wu, and W. Lai, “Biochemistry and use of soybean isoflavones in functional food development,” *Crit. Rev. Food Sci. Nutr.*, vol. 0, no. 0, pp. 1–15, 2019.
- [9] Y. Ma, X. Peng, J. Yang, V. Giovanni, and C. Wang, “Impacts of functional oligosaccharide on intestinal immune modulation in immunosuppressive mice,” *Saudi J. Biol. Sci.*, 2019.
- [10] F. Zhao, W. Liu, Y. Yu, X. Liu, and H. Yin, “derived peptide supplementation on attenuating burn injury-induced inflammation and accelerating,” *R. Soc. Community Adv.*, vol. 9, pp. 1247–1259, 2019.
- [11] L. Dewi, L. A. Lestari, A. N. Astiningrum, V. Fadhilah, and N. Amala, “The Alleviation Effect of Combination of Tempeh and Red Ginger Flour towards Insulin Sensitivity in High-Fat Diet Rats,” *J. Food Nutr. Res.*, vol. 8, no. 1, pp. 21–25, 2020.
- [12] S. Widodo, “Peningkatan Immunitas dan Penurunan Morbiditas Anak Gizi Kurang Usia 3 –5 Tahun dengan Pemberian Biskuit Berbasis Blondo, Ikan Gabus dan Beras Merah,” in *Prosiding Seminar Nasional (APTEKINDO) XIX*, 2016, pp. 1397–1405.
- [13] S. Widodo and S. Sirajuddin, “Biscuit Formulation with Addition of Mozambique Tilapia Fish, Round Sardinella Fish and Brown Rice,” *Int. J. Sci. Res.*, vol. 6, no. 8, pp. 1699–1704, 2017.
- [14] S. Widodo and S. Sirajuddin, “Nutrition Improvement of Elementary Students with Intervention of Tilapia Fish Flour and Sardine Fish Flour Based Biscuits,” *Asian J. Appl. Sci.*, vol. 6, no. 6, pp. 415–422, 2018.
- [15] S. Widodo and S. Siradjudin, “Improving Macro Nutrition Content on Nutritional Biscuits with Substitution of Tilapia Fish Flour, Sardine Fish Flour, and Red Rice Flour,” *Asian J. Appl. Sci.*, vol. 5, no. 5, 2017.
- [16] D. Manley, *Biscuit, Cracker and Cookie Recipes for the Food Industry*. Washington: Woodhead Publishing Ltd and CRC Press LLC, 2001.
- [17] D. Kartika, S. A. Marliyati, L. Kustiyah, A. Khomsan, and T. M. Gantohe, “The Organoleptic Functional Biscuit Formulation Based on Snakehead Fish (*Ophiocephalus striata*) Flour,” *Agritech*, vol. 34, no. 2, pp. 120–125, 2014.
- [18] D. Manley, *Manley’s Technology of Biscuits, Crackers and Cookies*. Padstow Cornwall UK: Woodhead Publishing Series in Food Science, Technology and Nutrition: Number 217, 2017.
- [19] Baiq Setiana Hidayati, C. M. Kusharto, and D. Martianto, “Corelation Compliance Toward Consumption Of African Catfish (*Clarias Gariepinus*) Enriched Biscuits With Nutritional Status And Morbidity Among Children Under Five In Sub Distric Of Warungkiara And Bantargadung, Sukabumi,” in *Tesis IPB*, bogor: IPB Press, 2011, pp. 1–78.
- [20] I. P. H. Paliling, Metusalach, and N. Amir, “The Quality and preference of Tilapia (*Oreochromis niloticus*) Meatballs Supplemented with Carotenoid Extract from White Shrimp Shell (*Litopenaeus vannamei*),” *J. IPTEKS PSP*, vol. 5, no. 10, pp. 132–148, 2018.
- [21] S. Widodo, H. Riyadi, I. Tanzaha, and M. Astawan, “Acceptance Test of Blondo, Snakehead Fish Flour and Brown Rice Flour based Biscuit Formulation,” *Int. J. Sciences Basic Appl. Res.*, vol. 4531, no. 2, pp. 264–276, 2015.
- [22] K. Naseem, N. Bibi, S. Raza, and A. Mumtaz, “Pakistan J. Agric. Res. Vol. 26 No. 3, 2013,” vol. 26, no. 3, pp. 230–236, 2013.
- [23] G. F. Mohamed, A. M. Sulieman, N. G. Soliman, and S. S. Bassiuny, “Fortification of Biscuits with Fish Protein Concentrate,” *World J. Dairy Food Sci*, vol. 9, no. 2, pp. 242–249, 2014.