

THE EFFECT OF SUBSTITUTION OF SNAKEHEAD FISH AND PURPLE EGGPLANT FLOUR ON THE ACCEPTABILITY OF BISCUITS FOR STUNTING PREVENTION

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ABSTRACT

The development of supplementary food formulas for toddlers made from local foods can be an alternative in handling child nutritional problems. Purpose of study was to observe the acceptability of biscuits substitution of snakehead fish meal and purple eggplant flour. Design of study was an quasi experimental using *posttest only control group design* with four treatments namely substitution of snakehead fish meal and purple eggplant flour. The ratio of wheat flour, fish meal and purple eggplant flour is 100% : 0 : 0,85% : 10% : 5%, 70% : 20% : 10%, and 55% : 30% : 15%. The results of the study based in the color characteristic the highest score after control was F1 (score = 2.47), the taste aspect F1 (score = 2.7), the aroma aspect F1 (score = 2.41), the texture/crunch F1 (score = 2.65). There was an effect of substitution of snakehead fish meal and purple eggplant flour on color acceptability ($p = 0.000$) and taste ($p = 0.003$), there is no effect of substitution of snakehead fish meal and purple eggplant flour on aroma receptivity ($p = 0.306$) and crispness ($p = 0.155$). In conclusion, there are significant differences in the color and taste characteristics of cookies substitution of snakehead fish flour and purple eggplant flour between F0, F1, F2 and F3.

Keywords: biscuits, snakehead fish, eggplant purple, color, taste

ABSTRAK

Pengembangan formula makanan tambahan untuk balita berbahan pangan lokal dapat menjadi alternatif dalam penanganan masalah gizi balita. Tujuan penelitian untuk mengetahui daya terima biscuit substitusi tepung ikan gabus dan tepung terong ungu. Desain penelitian adalah eksperimental semu (quasi experiment) menggunakan rancangan posttest only control group design dengan empat perlakuan yaitu substitusi tepung ikan gabus dan tepung terong ungu. Perbandingan tepung terigu, tepung ikan dan tepung terong ungu adalah 100% : 0 : 0,85% : 10% : 5%, 70% : 20% : 10%, dan 55% : 30% : 15%. Hasil penelitian menunjukkan pada karakteristik warna skor paling tinggi setelah kontrol adalah F1 (skor = 2,41), aspek rasa F1 (skor = 2,47), aspek aroma F1 (skor = 2,41), aspek kerenyahan F1 (skor = 2,65). Ada pengaruh substitusi tepung ikan gabus dan tepung terong ungu terhadap daya terima warna ($p = 0,000$) dan rasa ($p = 0,003$), tidak ada pengaruh substitusi tepung ikan gabus dan tepung terong ungu terhadap daya terima aroma ($p = 0,306$) dan kerenyahan ($p = 0,155$). Kesimpulan menunjukkan terdapat perbedaan signifikan karakteristik warna dan rasa cookies substitusi tepung gabus dan tepung terong ungu pada F0, F1, F2, F3.

Kata kunci: biscuit, ikan gabus, terong ungu, warna, rasa

INTRODUCTION

Toddlerhood is a golden period of growth and development. Failure in this period is irreparable in the next phase of life and will affect health outcomes in childhood and adulthood. Malnutrition that occurs at the beginning of life can result in growth faltering which affects cognitive development, morbidity, and mortality. Optimal growth and development requires proper and

adequate nutritional intake, parenting, and stimulus (Marlina, Maulianti, and Fernandez 2018).

Based on National Health Survey in 2018, nationally, the prevalence of malnutrition in children under five is 17.7 percent which is still a serious health problem. Stunting toddlers is also still a serious problem in Indonesia with a prevalence of 29.9% (Ministry of Health 2018). Base on data from Nutritional Status Indonesia Survey (SSGI) shows that prevalence of stunting in

toddler 29.0% in Gorontalo and 24.4% in national level (Ministry of Health 2021).

Nutritional problems that occur in toddlers occur due to unbalanced intake of food consumed. Total Diet Survey in 2014 found that the average level of macro and micronutrient adequacy in toddlers was still lacking in some parts of Indonesia (Ministry of Health, 2016). To overcome this problems, developing an additional food formula for toddlers made from local food that can meet the nutritional needs of both macro and micronutrients in the form of making biscuits substituted with snakehead fish meal and purple eggplant .

Biscuits are a type of pastry that is widely consumed by people from all walks of life. Biscuit is a dry bakery product made by baking dough made from wheat flour with or without its substitution, oil/fat, with or without the addition of other foodstuffs and permitted food additives (BSN 2011). Biscuits can be used as an alternative to practical and healthy interlude foods. The raw material for making biscuits is wheat flour derived from wheat where itself cannot be grown in Indonesia, so one solution to the problem is by importing. For this reason, the use of alternative flour is an option, including snakehead fish meal and purple eggplant flour.

Fish is a fishery product that contains the main nutrients in the form of protein, fat, vitamins and minerals. Fish as an animal food has several advantages over other protein sources, including a fairly high protein content in the fish body composed of amino acids that are patterned close to the needs of amino acids in the human body, fish meat contains unsaturated fatty acids needed by the human body. One of the fish with the best nutritional content is snakehead fish, which is freshwater fish that contains the best protein that is very beneficial for health such as increasing endurance, healing wounds, maintaining cell fluid balance, and healing and preventing diseases (Dahlia et al. 2019). Snakehead extract contains abundant of albumin (2.17 ± 0.14 g/100mL) which is the largest fraction (64.61%) of protein. This is sufficient to provide albumin for highly demanded such as hypoalbuminemia and post-surgicalpatients, and growing children. Snakehead extract is a potential source of albumin as per 100 mL it contains 3.36 ± 0.29 g protein, $2.17 \pm$

0.14 g albumin, 0.77 ± 0.66 g total fat ; Total Glucose 0.07 ± 0.02 g, Zinc 3.34 ± 0.8 mg; Cu 2.34 ± 0.98 mg and 0.20 ± 0.09 mg Fe (Mustafa, Widodo, and Kristianto 2012). Purple eggplant (*Solanum melongena* L) as an ingredient in eating purple eggplant can also be a food coloring and has health benefits, because in purple eggplant there is an anthocyanin pigment that acts as an antioxidant(Lestari, Sumarni, and Mappiratu 2019). The purpose of this study is to determine the acceptability of biscuit products substituted with snakehead fish meal and purple eggplant flour.

METHODS

The type of research used is *quasi-experimental* research using the *posttest only control group design* with four treatments, namely the substitution of snakehead fish meal and purple eggplant flour. The ratio of wheat flour, fish meal and purple eggplant flour is F0 (100% : 0 : 0), F1 (85% : 10% : 5%), F2 (70% : 20% : 10%) and F3 (55% : 30% : 15%).

The research design scheme was in the form of X PX in the control group and the treat group with a percentage ratio of snakehead fishmeal and purple eggplant flour that varied. The research was conducted from August to October 2021 at the Food Implementation Laboratory of the Department of Nutrition, Polytechnic, Ministry of Health, Gorontalo.

Tools used in making biscuits include electric ovens, digital scales, food processors, mixers, blenders, spoons, plates, basins, knives, cutting boards, molded baking sheets, washcloths, dough grinders, biscuit carvings, sieves. While the ingredients used in biscuits making are wheat flour, snakehead fish meal, purple eggplant flour with varying ratios in the three groups, while other ingredients with the same amount in all three formulas include refined sugar, eggs, full cream milk, *baking powder*, vanilla, margarine, butter, cornstarch.

The favorability level test was carried out on semi-trained panelists, namely 30 students of the Polytechnic Nutrition Department of the Ministry of Health, Gorontalo. A semi-trained panelist is a person who is used as a subject to assess the

organoleptic test of selected biscuits in advance. The criteria for panelists in the study included panelist not having allergies to the ingredients used in making biscuits, having a good taste buds device, healthy / not sick, willing to be a panelist without coercion and panelist knowing the whole about biscuits.

The procedure for making snakehead fish meal includes snakehead fish cleaned and greased with lime, then steamed for 30 minutes, then separated the meat from the unusable parts (bones, thorns and skin), then dried in the oven for 2 hours at a temperature of 60°C, then ground and sifted at 80 mesh. While the procedure for making eggplant flour includes purple eggplants washed and cut into pieces, then dried for 120 minutes at a temperature of 60°C, then ground and sifted on 80 mesh.

Meanwhile, the procedure for biscuits making includes mixing wheat flour dough, granulated sugar, eggs, margarine and fish meal and purple eggplant mixed until it becomes smooth, then adding full cream milk is done printing and roasting. Each biscuit approximately 10 - 15 gram per piece.

The way data collection is carried out for the level of favorability will be obtained from semi-trained panelists to determine the most preferred formula using the *hedonic scale test form* as a tool. Data processing of research results using *a computer*. The data that has been analyzed will be presented in the form of tables and *bar charts* as well as narratives to discuss the results of the study. Analysis of panelists' acceptability to biscuits using *friedmann test* while analysis of substitution effect on the proximate value of biscuits using statistical test *s pearman's rank*.

RESULTS AND DISCUSSION

Figure 1 shows that based on the acceptability to biscuit colors, the highest in formula 0 as a

control sample, followed by formula 1 with an average value of 2.47 and the lowest in formula 3 with an average value of 1.19. The highest acceptability of biscuit flavors after control was formula 1 with an average value of 2.7 and the lowest in formula 2 with an average value of 2.12. The acceptability biscuit aroma after control (formula 0) was formula 1 with an average value of 2.42 and the lowest in formula 3 with an average value of 2.38. The acceptability biscuit crunch after control (formula 0) was formula 1 with average value of 2.65 and lowest in formula 3 with an average value of 2.23.

Table 2 shows that based on the highest color acceptability of biscuits is the acceptability of biscuits with substitution snakehead flour and purple eggplant flour of 0% (63.3%), while the lowest which was most dislike compared to all formulas was formulas 3. Results of statistical tests using the *Friedmann test* obtained *p value* = 0.000 ($\alpha < 0.05$), this means that there is a significant influence substitution snakehead fish and purple eggplant flour on the acceptability of biscuit color.

The taste of food includes 2 main aspects, namely the appearance of food when served and the taste of food when eaten and the color of food plays a major role in the appearance of food because it is the first stimulus in the sense of the eye (Solichah et al., 2021). Attractive and natural-looking food colors can enhance the taste. Similar to appearance, color is not too much of a priority, because color is only seen from the outside, if the color is good but the taste is not good, then the product is unacceptable. Research on the development of snakehead fish cookies shows that the average value of all organoleptic cookies ranges from 3.41 – 3.91 on a scale of 5. There is no significant difference in organoleptic parameters between the 50% and 60% formulas. Snakehead

Table 1. Preference test results

Component	Formulas		
	F1	F2	F3
Flavor*	3.80 ± 0.8a	3.93 ± 0.98 b	3.00 ± 1.23 c
Color *	3.97 ± 0.77 a	3.93 ± 0.87 b	3.30 ± 1.08 c
Texture *	3.67 ± 0.75 a	4.03 ± 0.61 b	3.43 ± 1.13 c
Aroma	3.23 ± 1.19	3.60 ± 1.19	3.33 ± 1.18

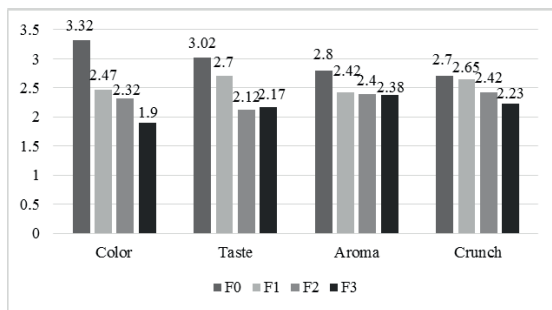


Figure 1. Characteristics of the acceptability of fishmeal substitution biscuits and purple eggplant flour

fish cookies have a nutritional content per 100 g of cookies including energy 565.9 kcal, protein 14.09 g, fat 24.33 g, carbohydrates 72.62 g, and water content 2.68% (Ganap et al. 2020). The addition of fishmeal has a noticeable effect on color is also found in the manufacture of fish nugget products (Solichah et al. 2021). Likewise, the manufacture of cookie products with the substitution of the addition of snakehead fish meal and surimi flour shows a noticeable color difference based on the concentration of the composition of the flour

used (Misshella, 2019). Biscuits substitution with snakehead fish and purple eggplant in high percentage have low acceptability compared to the lowest percentage substitute material, it was because high composition of sneakehead fish give impact in texture and strong fish taste.

The highest acceptance of biscuit taste is the acceptance of very liking biscuits with the substitution of snakehead fish and purple eggplant flour 0% (56.7%), while the most receptive is the very dislike acceptance of biscuits with the substitution of snakehead fish and purple eggplant flour 10% and 20% (0%) and the acceptability of likes with the substitution of snakehead fish and purple eggplant flour 0% (0%). Many panelists were prefer formula 0 more because it was basic formula to make biscuit, there not additional substitution material from snekehead fish and purple eggplant flour.

Results of statistical tests using the *Friedmann test* obtained p value = 0.003 ($\alpha > 0.05$), this means that there is no effect of snakehead fish substitution and purple eggplant flour on the taste

Table 2. Analysis of the relationship of acceptability based on aspects of color, taste, aroma and crispness of biscuits substitution of snakehead fish and purple eggplant

Variable	Acceptability										p value
	SD		D		AL		L		VL		
	n	%	n	%	n	%	n	%	n	%	
Color											0,000
F0	0	0,0	0	0,0	1	3,3	19	63,3	10	33,3	
F1	0	0,0	2	6,7	9	30,0	14	46,7	5	16,7	
F2	0	0,0	2	6,7	11	36,7	11	36,7	6	20,0	
F3	0	0,0	5	16,7	12	40,0	9	30,0	4	13,3	
Taste											0,003
F0	1	3,3	0	0,0	4	13,3	8	26,7	17	56,7	
F1	0	0,0	2	6,7	6	20,0	11	36,7	11	36,7	
F2	0	0,0	4	13,3	9	30,0	9	26,7	9	30,0	
F3	1	3,3	2	6,7	6	20,0	6	50,0	6	20,0	
Aroma											0,306
F0	1	3,3	0	0,0	3	10,0	13	43,3	13	43,3	
F1	1	3,3	2	6,7	7	23,3	7	23,3	13	43,3	
F2	1	3,3	1	3,3	4	13,3	14	46,7	10	33,3	
F3	0	0,0	2	6,7	8	26,7	8	26,7	12	40,0	
Crunch											0,155
F0	0	0,0	0	0,0	4	13,3	8	26,7	18	60,0	
F1	0	0,0	0	0,0	4	13,3	10	33,3	16	53,3	
F2	0	0,0	0	0,0	6	20,0	9	30,0	15	50,0	
F3	0	0,00	1	33,3	4	13,3	12	40,0	13	43,3	

Abbreviations; SD = strongly dislike; D = dislike; AL = almost like; L = like; VL = very like

acceptability of biscuits. The taste of food is the second factor that determines the taste of food after the appearance of the food itself. If the appearance of the food served stimulates the nerves through the sense of sight so that it is able to arouse the appetite to taste the food, then in the next stage the taste of the food will be determined by stimulation of the sense of smell and sense of taste.

The taste plays an important role in the selection of products by consumers, because even though the nutritional content is good, if taste is not acceptable to consumers, people will not willing to consume thus target of increasing people's nutritional intake cannot be achieved. The results of research on the nutritional value and acceptability of snakehead fish cookies as a complementary food for pregnant women in Sleman Regency, Yogyakarta showed that the average value of all organoleptic parameters of cookies ranged from 3.41 to 3.91 on a scale of 5. There was no significant difference on the parameters organoleptic between the formulas 50% and 60% ($p < 0.05$) (Ganap et al. 2020).

There is an effect of snakehead fish substitution and purple eggplant flour on the receptivity of biscuit aromas where panelists tend to like the taste of biscuits with formula 0. Panelists who tend to like formulas without snakehead fish substitution and purple eggplant flour are caused because biscuits still have an original, distinctive and fragrant taste.

Based on the highest aroma acceptability of biscuits is the acceptability of likes on biscuits with the substitution of snakehead fish and purple eggplant flour 20% as many as 14 people (46.7%), while the most receptive is the very dislike receptivity of biscuits with the substitution of snakehead fish and purple eggplant flour 30% as much as 0 people (0%) and the acceptability of likes with snakehead fish substitution and purple eggplant flour 0% as much as 0 people (0%). Results Statistical tests using the *Friedmann test* obtained $p \text{ value} = 0.306 > \alpha = 0.05$, this means that there is no effect of snakehead fish substitution and purple eggplant flour on the receptivity of biscuit aroma.

The aroma that is spread by food is a very strong attraction and is able to stimulate the sense of smell so as to arouse appetite. The emergence of

food aroma is caused by the formation of volatile compounds as a result or reaction due to the work of enzymes or can also be formed without the help of enzyme reactions (Solichah et al., 2021).

Similarly, the aroma is an important factor in food products by consumer, where the taste of a food is largely determined by the aroma factor. In many ways the aroma becomes its own attraction in determining the good taste of the food product itself (Solichah et al., 2021). The results of the snakehead fish cookies development study showed that the average of all organoleptic parameters of tick cookies ranged from 3.41 – 3.91 on a scale of 5. There was no significant difference in the organoleptic parameters of tic between the formulas 50% and 60% ($p < 0.05$) (Ganap et al. 2020).

There was no effect of snakehead fish and purple eggplant flour substitution on the acceptance of biscuit aroma. Panelist likes and dislikes tend to be balanced. This is because the biscuits without snakehead fish and purple eggplant flour still have a dominant flavor was fish and vegetable flavor, which some panelists like. On the other hand, the panelists who tended to dislike biscuits with snakehead fish and purple eggplant flour substitutions were more due to the fact that the biscuits were not too flavorful because the biscuit aroma began to be covered with other dough.

Based on the highest acceptability of biscuit crispness is the acceptance of very liking biscuits with the substitution of snakehead fish and purple eggplant flour 0% (60%), while the most receptive is the very dislike acceptability of biscuits with all formulas and the acceptability of likes with the substitution of snakehead fish and purple eggplant flour 0%, 10%, 20% (0%). Results Statistical tests using the *Friedman test* obtained $p \text{ value} = 0.155$ ($\alpha > 0.05$), this means that there is no effect of snakehead fish substitution and purple eggplant flour on the crispness acceptability of biscuits.

The consistency or texture of food is also a component that also determines the taste of food because the sensitivity of the taste buds is influenced by the consistency of the food. Foods with a thick consistency will stimulate the sense of taste more slowly. Crispness is a supporting factor in the selection of food products by

consumers because the product is considered to have a certain level of crispness so that the texture also determines the acceptance of the biscuit. There was no effect of snakehead fish and purple eggplant flour substitution on the acceptability of the crispness of the biscuits where the panelists tended to be balanced between those who disliked and those who liked all biscuit formulas. This is because the crispness of the biscuits for all formulas is almost the same, which is a bit hard. Panelists who didn't like it because the biscuits weren't crunchy made chewing difficult, while those who liked them were more because they felt the biscuits were a bit crunchy. The addition of snakehead fish has an impact on the level of crispness of fish nuggets (Solichah et al. 2021). Likewise, in the manufacture of cookie products by substituting the addition of snakehead fish flour and surimi flour, there is a significant difference in texture based on the concentration of the flour composition ratio used (Mishella, 2019).

CONCLUSION

There is an effect of substitution of snakehead fish and purple eggplant flour on color acceptability ($p = 0.000$) and taste ($p = 0.003$) between F0-F3, there is no effect of substitution of snakehead fish meal and purple eggplant flour on aroma receptivity ($p = 0.306$) and crispness ($p = 0.155$). We suggested to develop biscuits product for prevention of malnutrition based on local food, such as snakehead fish and purple eggplant.

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