Sys Rev Pharm 2020;11(8):400-405
A multifaceted review journal in the field of pharmacy

NUTRITIONAL EDUCATION INTERVENTION BY GIVING SNAKEHEAD FISH MEATBALL TO INCREASING NUTRITIONAL STATUS OF CHILDHOOD STUNTING AND IMPROVEMENT OF MOTHER'S CARE PATTERNS IN LAMONGAN DISTRICT

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ABSTRACT

Introduction: Based on data from WHO, it is known that globally, approximately 151 million (22%) children under 5 years are stunted. One of the factors that often occur stunting in toddlers is low nutritional intake. One of the efforts that can be made to increase fish consumption in children under five is by diversifying products which is fish meatballs substitute with different pumpkin flour concentration.
Aims: The aim of this study was to improve nutritional status to children under five years old with stunting by increasing the protein intake through the snakehead fish meatballs intervention.
Methods: This research was an experimental design with a completely randomized design consisting of 3 substitution treatments of pumpkin flour. The formula of snakehead fish meatballs was tested using organoleptic test and proximate test. Data was analyzed using Kruskal Wallis test with significant value of alpha=0.05.
Results: The results of the organoleptic test on the 4 attributes and proximate test showed that the best assessment was found in the snakehead fish meatball formulation with 5% pumpkin flour substitution. The meatball of this formula contains 17.86% protein, 50.33% water, 0.77% fat, 0.95% ash, and 29.99% carbohydrates contents. The organoleptic test showed the score for appearance was 5.62, flavor was 6.92, taste was 6.50, and texture was 7.58. The result from Kruskall Wallis analysis revealed that only texture attribute showed significant difference of the three snakehead fish meatball formulations ($p<0.001$).
Conclusions: The best formulation of snakehead fish meatball is the substitution treatment of pumpkin flour 5%.

Keywords: Snakehead fish, meatballs, pumpkin flour, stunting

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INTRODUCTION

Nutrition in children have an important role in the growth and development body. According to Kandowangko et al., explained that in toddlers, the most common growth disorders for toddlers are malnutrition and also short toddlers or what is commonly known as stunting (1). Stunting is a chronic nutritional problem in children under five whose nutritional status is measured based on height by age and then compared with WHO-MGRS if the z-score is less than -2 SD. Based on data from WHO, it is known that globally, approximately 151 million (22%) children under 5 years are stunted (2). More than half of children with stunting are from Asia (3) and based on data from the Riskesdas 2018, it is known that the prevalence rate of stunting in children under five in Indonesia reaches 30.8% (4). Based on information obtained from TNP2K 2017, the stunting rate in Lamongan district has reached 44031 people (5).

Based on the WHO Child Stunting Framework, there are determinant factors that can cause stunting in children under five, including proximate factors such as maternal nutritional status, breastfeeding practices, complementary feeding practices, and exposure to infections as well as related distal determinants such as education , food systems, health care, and water and sanitation infrastructure and services (6). One of the factors that often occur stunting in toddlers is low nutritional intake. According to Widyaningsih et al., this can happen because toddlers are not getting breast milk but the additional food given to toddlers does not meet the nutritional adequacy of toddlers (7). One of the nutrients that play a role in the growth of toddlers is protein. In the toddler's body, if there is a lack of protein intake, it can damage the mineral mass which can affect the bone growth of the toddler's body (8). Therefore, for toddlers who are stunted, adequate protein intake is required, one of the foods that can increase protein intake in the body, namely snakehead fish. Snakehead fish is known have a fairly high protein content of 25.2% (9).

One of the efforts that can be made to increase fish consumption in children under five is by diversifying products, one of which is fish meatballs. Fish meatball is a processed product that uses fish meat as the main raw material for the product. In general, fish meat used to produce meatballs is minced fish meat that has been processed and emulsified with other additives, printed in a round shape and then cooked in hot water. There are 4 things that need to be considered in order to produce fish meatball products with good quality, including the type of meat, the quality of the meat, the type of flour, and the ratio between the meat and the flour that we used (10). However, snakehead fish is a type of fish that does not

contain elastin, then the connective tissue found in the meat is also small (11). So the protein in snakehead fish becomes easy to digest. However, the water content found in snakehead fish is also quite high, approximately 69% (9). So, if we want to use fish meat as a raw material in the manufacture of processed products such as fish meatballs, other additional materials are needed that can increase the water holding capacity so as to produce a better texture. Additional ingredients that can use pumpkin flour. Pumpkin is known as a vegetable that contains high β-carotene which has antioxidant compounds (12). In addition, pumpkin flour is also known have a higher amylose content when compared to tapioca flour (13). Therefore, in this study pumpkin flour was used as a substitute for tapioca flour. The purpose of this study was to determine the best formulation of snakehead fish meatballs with pumpkin flour substitution.

MATERIALS AND METHODS

This research was an experimental design with a completely randomized design consisting of 3 substitution treatments of pumpkin flour (5%, 7.5%, 10%) on snakehead fish meatball. This study consisted of 2 variables, namely the independent variable which was the concentration of pumpkin flour and the control variable in the form of the organoleptic test and also the proximate test.

The formula of snakehead fish meatballs was tested using organoleptic test and proximate test. Organoleptic test was done by limited panelist lecturers from Nutrition Department, Faculty of Public Health Universitas Airlangga and Universitas Nahdlatul Ulama Surabaya. This test was to determine the level of preference and acceptance of snakehead fish meatballs and catfish nugget in terms of taste, texture, scent, and color using a scoring test with 9-scale (14).

Study Procedure

The first step of this study was the preparation of raw materials such as snakehead fish meat that was washed thoroughly and weighed as much as 300 g. After that, ground together with ice cube as much as 75 g using food processor. Next, add seasonings such as salt, sugar, pepper, coriander, and garlic, then ground again until it mixed. Next, add tapioca and pumpkin flour for snakehead fish meatballs and mixed. Next step was formed snakehead fish roundly, then boiled for 10-15 minutes until the meatballs. Drained the snakehead fish meatballs and immediately proximate and organoleptic tested. Organoleptic tested conducted by limited panelist.

Data Analysis

The data that has been collected will be processed through the data entry stage. After the panelist evaluating the acceptability of snakehead fish meatballs and catfish nugget formula, the results of organoleptic data will be analyzed by description analysis and using Kruskal Wallis tested on SPSS software for different test with sig 0,05. Proximate test was carried out on all snakehead fish meatball formulations. After proximate analysis was done, the data will be tabulated and averaged using Microsoft Excel.

RESULTS AND DISCUSSION

Organoleptic test was carried out by sensory test on 13 limited panelists which included 4 assessment attributes, there are appearance, flavor, taste and texture. Organoleptic testing was carried out to determine the level of assessment (scoring) given by the panelists to samples that had differences in their formulations. The range of scoring test assessments given is from 1 to 9 where point 1 is the lowest point. Panelist characteristics can be seen in table 1 and the results of the organoleptic test can be seen in table 2.

Table 1. Limited Panelist Characteristics

Characteristics	Percentage
Gender	
Male	7.7%
Female	92.3%
Age	
20-30 years old	23.1%
30-40 years old	53.8%
> 40 years old	23.1%
Job	
Lecturer	92.3%
Government Employees	7.7%

Table 2. Organoleptic Test Results on 3 Formulations of Snakehead Fish Meatballs with Pumpkin Flour Substitution

Atribute/Formulation	Mean	St. Deviation	Ranks	Test Statistics	
				Chi Square	Sig.
Appearance					
5% pumpkin flour	5.10	1.68	18.65	1.816	0.403
7.5% pumpkin flour			23.31		
10% pumpkin flour			18.04		
Flavor					
5% pumpkin flour	6.64	1.63	21.12	0.791	0.673
7.5% pumpkin flour			21.12		
10% pumpkin flour			17.77		
Taste					
5% pumpkin flour	6.28	1.45	20.81	1.939	0.379
7.5% pumpkin flour			22.50		
10% pumpkin flour			16.69		
Texture					
5% pumpkin flour	6.95	1.25	23.00	16.027	<0.001*
7.5% pumpkin flour			26.50		
10% pumpkin flour			10.50		

Appearance

Appearance is the first sensory that can be assessed or seen directly by the panelists. Based on the results of data analysis, it can be seen that the appearance of snakehead fish meatballs with pumpkin flour substitution is not in accordance with fish meatballs in general. The average value of each snakehead fish ball formulation ranged from 4.62 - 5.62. The highest assessment regarding the appearance of snakehead fish meatballs is the 5% pumpkin flour formulation with a score of 5.62. However, this score is still not good because if it is adjusted to the description of the scoring test, it can be said that the snakehead fish meatball formulation with 5% pumpkin flour has the appearance of an irregular round shape, unequal size, slightly hollow, and the color is creamy white. Pumpkin flour contains beta-carotene which is an orange pigment in fruits and vegetables so that it can affect the final color of a food product when additions or substitutions are made (15). Then, based on table 2, the results of Kruskall Wallis' analysis showed that there was no difference in three formulations of snakehead fish meatballs tested (p > 0.05). This probably happened because the concentration range used in this study was too close (5%; 7.5%; 10%) so that the appearance of snakehead fish meatballs was not significantly different.

Flavor

Flavor is an odor caused by chemical stimulation that is smelled by olfactory nerves in the nasal cavity. Based on the results of the organoleptic test in Figure 1, it can be seen that the scoring results obtained from the flavor attribute ranged from 6.31 to 6.92 with the highest score found in the snakehead fish meatball formulation with pumpkin flour substitution 5%. If it is equivalent to the description contained in the scoring test questionnaire, it can be said that the flavor produced by snakehead fish meatballs with the 5% pumpkin flour formulation is not fishy, the specific fish meatball is slightly reduced. Pumpkin flour has a strong enough flavor, so when added to a food formulation it has a strong enough effect (16). Therefore, in Figure 1, we can see that the higher the concentration of pumpkin flour that is substituted, the lower the assessment of the flavor attributes of snakehead fish meatballs. Then, based on table 2, the results of Kruskall Wallis' analysis showed that there was no significant difference in the flavor of the three snakehead fish meatball formulations tested (p > 0.05). However, in the Kruskall Wallis test results, it can be seen that the highest ranks are found in the 5% pumpkin flour formulation.

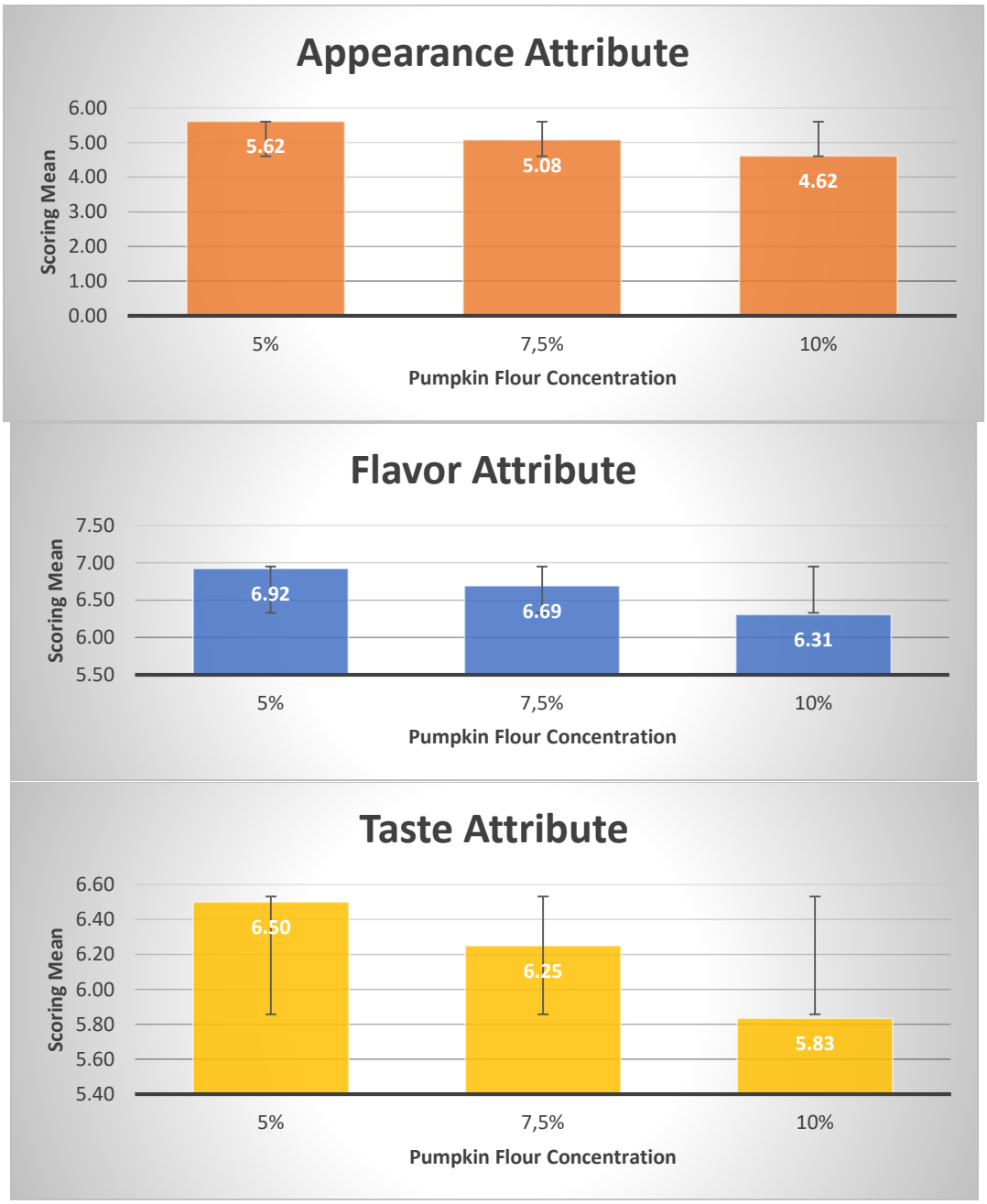
Taste

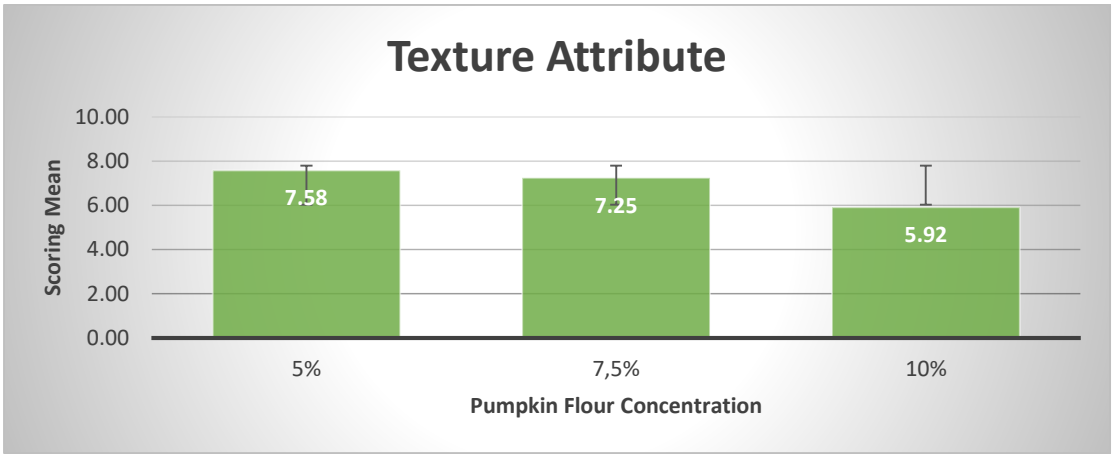
Taste is the level of liking observed by the sense of taste. Based on the results of the organoleptic test in Figure 1, it can be seen that the scoring results obtained from the taste attributes range from 5.83 to 6.50 or can be said to be quite low, with the highest score found in the snakehead fish meatball formulation with pumpkin flour substitution 5%. If it is equivalent to the description contained in the scoring test questionnaire, it can be said that it is rather delicious, but the taste of the fish is still lacking. Basically, pumpkin has a sweet taste (17) so it is possible that when it is mixed in a food product composition, it can affect the final result of the product. In this snakehead fish meatball product, the possibility of adding pumpkin flour can cause the fish to taste less. Because when seen in Figure 1, the higher the concentration of pumpkin flour substitution, the lower the taste attribute assessment given by the panelists. Then, based on table 2, the results of Kruskall Wallis' analysis showed that there was no significant difference regarding the taste of the three snakehead fish meatball formulations tested (p > 0.05). However, in the Kruskall Wallis test results, it can be seen that the highest ranks are found in the 5% pumpkin flour formulation.

Texture

Texture is something that is observed with the human sense of touch. Based on the results of the organoleptic test in Figure 1, it can be seen that the scoring results obtained from the texture attributes ranged from 5.92 to 7.58 with the highest score found in the snakehead fish meatball formulation with pumpkin flour substitution of 5%. If it is equivalent to the description contained in the scoring test questionnaire, it can be said that the texture of the snakehead fish balls produced is solid, compact and rather chewy. One of the ingredients in flour that affects the texture of a product is the amylose and amylopectin

content in starch. Amylose has a linear and slightly branched structure (18) so that it has a higher viscosity property. In addition, amylose also contains many hydroxyl groups so that it is a dissolved fraction. So that usually this amylose content causes the product to become hard and stiff. Meanwhile, amylopectin has a branched structure (19). This causes the granule structure to be more compact, the air space between the granules and the size of the granules is larger. So that amylopectin has soft gel properties and high adhesiveness. Then, based on table 2, the results of Kruskall Wallis' analysis showed that there was a significant difference in the texture attributes of the three snakehead fish meatball formulations ($p<0.001$). This difference is probably due to the amylose content in pumpkin flour. The substitution of pumpkin flour for tapioca flour greatly affects the texture of snakehead fish meatballs because the amylose content in pumpkin starch is 18.65 - 21.29% (13) while tapioca flour is only 17% (20). And the highest ranks in the Kruskall Wallis test were found in the snakehead fish meatball formulation with 5% pumpkin flour substitution.





Picture 1 : Graphs of Snakehead Fish Meatball Scoring Test

Overall Organoleptic Evaluation

Overall, the results of the organoleptic test on the 4 attributes assessed showed that the best assessment was found in the snakehead fish meatball formulation with 5% pumpkin flour substitution which can be seen in Figure Graph 1. Organoleptic acceptance of snakehead fish meatballs by panelists decreased along with the increase the percentage of substituted pumpkin flour. This is probably due to the very strong characteristics of pumpkin flour, both in terms of color, flavor and taste, so that if too much is mixed into the fish ball formulation, it can reduce or decrease the characteristics of the fish balls themselves.

Chemical Quality of Fish Meatball

Tabel 3. Proximate Composition of 3 Snakehead Fish Meatball Formulations

Parameters	Snakehead Fish Meatballs Formulation			SNI Standard*
	Pumpkin Flour 5%	Pumpkin Flour 7.5%	Pumpkin Flour 10%	
Carbohydrates	29.99	30.56	31.05	-
Protein	17.86	16.55	16.24	Min 7
Lipids	0.77	0.77	0.37	-
Water	50.33	52.09	51.23	Max 65
Ash	0.95	1.03	1.11	Max 2.0

*SNI 7266:2014 for Fish Meatball

The results of proximate test on 3 kinds of snakehead fish meatball formulations can be seen in Table 3. Based on this table, the results show that the three snakehead fish meatball formulations meet the SNI requirements which have been determined where the protein content is more than 7%, water content is less than 65% and ash content is less than 2% (21). Basically, the differences in the nutritional content of the three formulations are not too different, because the difference in the percentage of pumpkin flour used as the independent variable in this study is too close, the difference is about 2.5% between 1 formulation and the next. The results obtained are not much different. However, when viewed from the protein content, the one with the highest protein content was found in snakehead fish meatballs with 5% pumpkin flour substitution, which is 17.86%. Apart from that, the water and ash content in this formulation also has the lowest value compared to the other 2 formulations. This can be a supporter of the organoleptic test results which also show that the best formulation according to the panelists is the snakehead fish meatball formulation with the substitution of pumpkin flour 5%.

CONCLUSION

This study has shown that the best formulation of snakehead fish meatball is the substitution treatment of pumpkin flour 5% with the results of analysis of physicochemical characteristics, 17.86% protein content, 50.33% water content, 0.77% fat content, 0.95% ash content, and carbohydrates 29.99%, while the organoleptic test results were appearance 5.62 flavor 6.92 taste 6.50 and texture 7.58. Suggestions can be given are, it is necessary to do a test for acceptance test to the public or toddlers to find out whether this snakehead fish meatball product is acceptable.

ACKNOWLEDGEMENTS

We thank all the panelists involved in this study. The researchers also extend the gratitude to Direktorat Riset dan Pengabdian Masyarakat, Deputi Bidang Penguatan Riset dan Pengembangan Kementerian Riset dan Teknologi/ Badan Riset dan Inovasi Nasional for funding this study.

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