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Characteristics of Organoleptic Functional Biscuit Formula Rich in Protein and *Betacaroten*

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ABSTRACT

One of the fishery products that have great potential for solutions in the effort to handling nutrition cases is snakehead fish as a source of protein and pumpkin as a source of beta-carotene. This study aimed to determine the effect of variations in biscuit formula by supplementation snakehead fish meal and pumpkin flour to the characteristics of organoleptic functional biscuits and obtaining functional biscuit formulas with organoleptic characteristics can be received by the panelist. The main ingredients of this study were snakehead fish meal and pumpkin flour. Fish meal maker tools include oven and flour blender, biscuit making tools, baking pan, mold, mixer, and oven. The results of this study indicate that variations in biscuit formulas with supplementation of snakehead fish and pumpkin fish meal significantly affected the characteristics of organoleptic functional biscuits. Functional biscuit formula with a ratio of 75% wheat flour, 12.5% snakehead fish meal, 12.5% pumpkin flour (comparison of 3 parts wheat flour with 2 parts mixture of fish flour and pumpkin/ 3:1) selected as the best formula. The conclusion showed that functional biscuits rich in protein and beta-carotene with supplementation of snakehead fish meal and pumpkin flour (ratio 3:1) can be an option to overcome nutritional problems and be able to improve immunity

Keywords: *betacaroten,* functional biscuit, organoleptic, and protein,

1. Introduction

The normal immune system is very important for human health, the condition of lack of energy and protein affects the weakeness of the body's immune response. External factors that can affect the immune system are food, so improving nutritional can increase the body's immune system. The most ideal way to overcome the problem of nutrition is through the consumption of balanced foods so that the body gets adequate nutrition, both in terms of quality and quantity.

Foodstuffs are functional because they provide flavour, aroma, and nutrients. It also provides physiological benefits, which can reduce the risk of developing chronic diseases or at the very least be able to optimize body health (Muchtadi, 2012). Biscuits are high protein and beta-carotene as functional foods that can be an option for overcoming future nutritional problems, including foods that can increase body immunity. One of the fishery products that have great potential for solutions in the handling of nutritional cases is snakehead fish as a source of protein and pumpkin as a source of beta-carotene.

According to Muchtadi (2012), functional food must have three basic functions: (1) sensory (2) nutritional, and physiological. The physiological functions of a functional food include: (a) prevention of the onset of a disease related to food consumption, (b) increasing body resistance, (c) rhythm

regulation of the physical condition of the body, (d) slowing down the process aging, (e) recovery of the body after suffering from a particular disease, (f) and others.

According to Nurimala et al. (2009), snakehead fish protein content 25.5% and it was higher compared to sardines (21.1%), milkfish (20.0%), snapper (20.0%), catfish (17.71%), and goldfish (16.0) %). It was very destructive nature of fish requires handling and processing which aims to prevent damage or decay so it can extend the shelf life of fish. Fish meal processing is an effort to overcome the fish's perishable nature. Fish meal has high nutritional value, especially its protein content which is rich in essential amino acids, especially lysine and methionine. Besides that fish meal is also rich in B vitamins, minerals, and has low fiber content.

Yellow pumpkin (*Cucurbita moschata*) is one of the local foodstuffs containing beta-carotene which is quite high at 1,569 µg / 100 g (Mien et al., 2009). The nature of the pumpkin is soft and easy to digest and contains carotene (provitamin A) is quite high if added to the processed product will get a more attractive colour processed, but so far the use of pumpkin is not optimal. Pumpkin can be processed into the flour so that the utilization becomes more widespread, among others it can be supplemented in biscuit processing.

Functional biscuits with snakehead fish meal and pumpkin flour supplementation are appropriate given to children because the nutritional content of the biscuits is better quality, compared to biscuits in general which tend to be high in carbohydrates and fat and less balanced in other nutritional content. The purpose of this study was to determine the effect of biscuit formula variation with cork fish meal and pumpkin supplementation on organoleptic characteristics (hedonic and hedonic quality) of functional biscuits and obtain functional biscuit formula with organoleptic characteristics acceptable to panelists.

2. Materials and Methods

Materials

The main ingredients of this research are snakehead fish and pumpkin, using fish flour making equipment such as oven and flour blender and biscuit making using a baking pan, molds, mixers, and ovens. Organoleptic testing uses as many as 20 untrained panelists, a score sheet for hedonic organoleptic test and hedonic quality.

Methods

Manufacture of snakehead *Fish Flour and Yellow Pumpkin*

Good quality fish flour should have the following properties, the details of which were fairly uniform, free of bone residues, fish eyes, and other foreign matter. Fish flour made from offal material will have lower protein content than higher mineral content than fish flour made from the whole fish fillet. Traditional and modern processing methods have different effects on the protein content of fish flour.

According to Sari (2014), the procedure for making fish flour starts from the stage of fish cleaning and removal of the head, tail, stomach contents, scales, and fins. Furthermore, the fish was split in the back and washed using clean water 3 times. Finished the process of steaming the fish followed by the separation of fish meat from bones and skin. Fish meat obtained was dried using an oven at 50°C for 12 hours. Furthermore, dried fish meat has been mashed using a dry mill and carried out sifting to obtain uniform fish meal granules (± 60 mesh size).

Pumpkin flour is made by thinly slicing the pumpkin and then dried using sunlight/oven at a temperature of 40-50°C for ± 12 hours, after drying the pumpkin pieces are mashed and sieved to obtain pumpkin flour with a size of 60 mesh.

Functional Biscuit Formulation

Biscuits are a kind of food made from wheat flour with a process of heating and printing, as a dry food made from roasting, with the ingredients of flour and other additives that form a dough formula, which in turn forms products with certain properties and structures and has Shelf life is relatively long and easy to carry because of its relatively small volume and weight as a result of the drying process. Biscuits are processed by roasting until the water content is not more than 5%. The quality of the biscuits is determined by its nutritional value and is determined by its color, aroma, taste, and crispness. One of the crispness is determined by the protein content in the form of gluten flour used. The functional biscuit formula is presented in Table 1.

Table 1. Functional Biscuit Formulation

No.	Materials (gram)	Formula			
		A	B	C	D
1.	Wheat flour (TT)	250.00	187.50	125.00	62.50
2.	Fish flour (TI)	-	31.25	62.50	93.75
3.	Pumpkin flour (TL)	-	31.25	62.50	93.75
4.	Fine granulated sugar	100.00	100.00	100.00	100.00
5.	Cornstarch	25.00	25.00	25.00	25.00
6.	Cheese	25.00	25.00	25.00	25.00
7.	Mentega	100.00	100.00	100.00	100.00
8.	Butter	50.00	50.00	50.00	50.00
9.	Egg	50.00	50.00	50.00	50.00
10.	Milk powder	50.00	50.00	50.00	50.00
	Total	625.00	625.00	625.00	625.00

Description:
A = TT 100% (without supplementation)
B = TT 75% : mixture TI and TL 25% (3:1)
C = TT 50% : mixture TI and TL 50% (1:1)
D = TT 25% : mixture TI and TL 75% (1:3)

Analysis Procedure

Characterization of the quality of functional biscuits rich in protein and beta-carotene by snakehead fish meal and pumpkin supplementation observed included yield parameters, organoleptic test, namely hedonic (color, taste, aroma, texture, and overall product characteristics) and hedonic quality (color, taste, color, aroma, and texture specifications).

Data analysis

Organoleptic test data is non-parametric analyzed using the Sign Test to test the comparative hypothesis of two correlated samples, which is the data has ordinal measurement scale and data is not normally distributed

3. Results and Discussion

Recovery

Fresh snakehead fish as much as 5 kg (5,000 g) are separated from the fish meat and then dried using an oven (temperature of 50°C for 12 hours) and mashed with flour blender. Fish meal was obtained as much as 562 g, based on the weight of starting material (fresh snakehead fish), the yield of snakehead fish flour was 11.24%.

Pumpkin as much as 15 kg (15,000 g) is dried naturally using sunlight with indirect irradiation or pumpkin dried in the shade so that the content of beta-carotene in the pumpkin is not damaged. Pumpkin flour was obtained as much as 975 g, based on the weight of the fresh pumpkin, the yield of pumpkin flour was 6.50%.

Functional biscuit yields were calculated based on the weight of all biscuit ingredients for each treatment of 625 g after becoming biscuits obtained by the treatment of formula A as much as 479 g (76.64%), B as much as 478 g (76.48%), C as much as 491 (78.56%) , and D 556 g (88.96%).

Organoleptic Test

The hedonic organoleptic test and the functional quality of hedonic biscuits use descriptive methods to get an idea of the characteristics of a product. According to Setyaningsih et al. (2010), the purpose of the sensory analysis is to find out the response or impression obtained by the human senses on a stimulus caused by a product. The average organoleptic functional biscuit test table is presented in Table 2.

Table 2. Average Functional Biscuit Organoleptic Test

No.	Organoleptic Test	Functional Biscuit Formulation			
		A	B	C	D
1.	Hedonic test				
	Colour	4.60±0.82a	6.60±1.23b	6.80±0.89bc	6.60±1.23bcd
	Taste	4.90±1.02a	6.40±1.14b	4.90±0.45ac	3.30±0.73d
	Aroma	4.60±0.82a	6.20±1.20b	5.20±1.11c	3.50±1.10d
	Texture	5.00±0.92a	6.20±1.01b	5.10±0.79ac	4.30±0.98d
	All	4.80±0.62a	6.60±0.82b	5.20±0.62c	3.60±0.94d
2.	Hedonic quality				
	Colour	5.40±0.82a	6.40±0.94b	5.00±0.92ac	2.80±0.62d
	Taste	5.90±1.21a	7.10±1.37b	5.30±0.98ac	3.10±0.79d
	Aroma	6.40±1.47a	5.70±0.98ab	4.70±0.98c	2.50±0.89d
	Texture	5.20±1.44a	7.10±0.79b	7.00±0.00bc	7.00±0.65bcd

Description:
A = TT 100% (without supplementation)
B = TT 75% : mixture TI and TL 25% (3:1)
C = TT 50% : mixture TI and TL 50% (1:1)
D = TT 25% : mixture TI and TL 75% (1:3)

Colour

The highest hedonic colour functional biscuit test for treatment B (3:1) with like criteria and the lowest for treatment A (without supplementation) with normal criteria. The sign test results showed that the hedonic test of biscuit colour with snakehead flour and yellow pumpkin supplementation was significantly different from biscuits without supplementation but the increase in supplementatio formula was not significantly different from the colour of biscuits. Fellows (2000), states that colour is the fastest and easiest response to give a good impression. According to Winarno (2004), visually, colour determines whether food is accepted or not by the community or consumers. Foods that have good taste, nutritious and well-textured will not necessarily be liked by consumers if the food has an unsightly colour or deviates from the colour that should be.

The highest hedonic quality test score for functional biscuits was in treatment B (3:1) with ordinary criteria, and the lowest was in treatment D (1:3) with dark criteria. The hedonic quality of functional biscuits with the highest average is bright yellow, the increase in formula supplementation makes the biscuit the colour dark yellow or brownish-yellow in colour. According to Mervina (2009), the material used in making products affects the colour of the biscuits. Sari et al. (2017) state that the variation of MP-ASI formula (complimentary food for breast milk) instant porridge with fish meal and yellow pumpkin flour substitution shows bright yellow which is derived from the substitution of pumpkin flour and the addition of powdered milk and palm oil.

Biscuits produced from various variations of pumpkin flour and snakehead flour have a golden yellow colour, which is favored by panelists. Addition to the substitution of pumpkin flour produces a golden colour that tends to be dark becaus the colour of pumpkin flour is very yellow and the effect of proteins that combine with sugar/starch in a hot atmosphere will cause the colour to darken. This is caused by the Maillard reaction, which is a reaction between sugar/starch which causes the colour to darken (Winarno, 2004).

Taste

The highest hedonic test and hedonic quality of functional biscuit taste were highest in treatment B (3:1) with normal and tasty criteria, the lowest was in treatment D (1:3) with criteria of dislike and discomfort. The sign test results showed that the variation of biscuit formula with snakehead fish meal and pumpkin supplementation significantly affected the taste of functional biscuits. According to Permitasari (2013), several components that play a role in determining food taste are food aroma, food seasoning, and food ingredients, tenderness or suppleness of food, the crispness of food, maturity level, and food temperature.

Variation of formula MP-ASI instant porridge with the substitution of fish flour and pumpkin flour that tastes sweet and savory. The sweet taste comes from the use of powdered sugar and pumpkin flour. While skim milk and snakehead fish flour gives a savory taste (Sari et al., 2017). The hedonic quality of functional biscuits with the highest average has a sweet and savory taste. Increased formula supplementation makes the biscuit taste uneasy with a rather bitter/bitter after taste. The existence of a bitter after taste can be caused by hydrolysis of amino acids that occur in the Maillard reaction when making pumpkin flour.

Flavour

The hedonic test average aroma of functional biscuits was highest in treatment B (3:1) with ordinary criteria and lowest in treatment D (1:3) with disliked criteria. The sign test results showed that the variation of biscuit formula with snakehead fish meal and pumpkin supplementation significantly affected the aroma of functional biscuits.

The average hedonic quality test of functional biscuit aroma was highest in treatment A (without supplementation) with ordinary criteria and lowest in treatment D (1:3) with fishy / pumpkin-smelling criteria. The sign test results showed that the aroma between the A-B treatments was not significantly different or the biscuits without supplementation with formula comparison 3 (1:1) biscuits had the same aroma. Supplementation of pumpkin flour in biscuits can mask the fishy odor of fish meal and an increase in supplementation formula makes biscuits smell fishy/smelly. According to Winarno (2004), the aroma or odor that evaporates is an attribute of a product received by olfactory cells contained in the nose and passed on to the brain in the form of electrical impulses. The aroma also determines the acceptance of a product.

The smell of biscuits is influenced by its constituent ingredients. According to Hendrasty (2003), pumpkin flour has specific properties with a distinctive aroma. In general, the flour has the potential as a companion to the flour and rice flour in various processed food products. Wahyu et al. (2017) stated that the increased substitution of African catfish flour and pumpkin flour caused a decrease in the level of panelists' preference for the aroma of crackers biscuits.

Texture

The mean hedonic test texture of functional biscuits was highest in treatment B (3:1) with ordinary criteria and lowest in treatment D (1:3) with disliked criteria. The sign test results showed that the variation of biscuit formula with snakehead fish meal and pumpkin supplementation significantly affected the texture of functional biscuits. Mervina (2009) states that texture is one of the assessment attributes that affects panelists' acceptance of biscuit products.

The average hedonic quality test was the highest functional biscuit texture in treatment B (3:1) with the crispy and the lowest in treatment A (without supplementation) with the usual criteria. Sign test results showed that the hedonic quality test of biscuit texture with supplementation of snakehead and pumpkin flour was significantly different from biscuits without supplementation but the increase in supplementation formula was not significantly different from the texture of the biscuits. The texture of the biscuit product is related to the composition and type of raw material used. According to Wahyu et al. (2017), the increased substitution of African catfish flour and pumpkin flour led to a decrease in the level of panelists' preference for the texture of crackers biscuits.

Overall Hedonic Test of Biscuit Properties

The overall average hedonic test highest functional biscuit properties in treatment B (3:1) with like criteria and the lowest in treatment D (1:3) with dislike criteria. Sign test results showed that variations in biscuit formulas with supplementation of snakehead and pumpkin fish meal significantly affected the overall nature of functional biscuits. According to Winarno (2004), the texture and consistency of ingredients will affect the flavour caused by these ingredients. Changes in texture or viscosity of the material can be caused by these materials which can change the smell and taste because it can affect the speed of stimulation of olfactory receptor cells from the salivary glands.

According to Sari et.al. (2014), the use of snakehead fish into biscuits with a substitution of 15% fish flour gave the panelists the taste and texture they liked the most. Sari et.al. (2014b) states that in each serving size (60 g) biscuits can provide 302 kcal, 8 g protein, 54.64 Zn and 74.44 Fe. The bioavailability of Zn and Feat fortification of 50% AKG / serving size were 41.80% and 76.32% and the digestibility of biscuit protein was 78.45%. Furthermore, according to Sari et.al. (2014c), the efficacy of feeding supplemental snakehead fish biscuits fortified with Zn and Fe can increase hemoglobin, ferritin, zinc, albumin, and immunoglobulin G levels in children.

4. Conclusions

1. The variations in biscuit formula with snakehead fish meal and pumpkin supplementation have a significant effect on the organoleptic characteristics of functional biscuits
2. Functional biscuit formula with a ratio of 75% wheat flour, snakehead fish flour 12.5%, pumpkin flour 12.5% (comparison of 3 parts wheat flour to 2 parts fish meal mixture and pumpkin / 3: 1) selected as the best formula for organoleptic properties hedonic test and hedonic biscuit quality.

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