P-ISSN: 2355-729X
Jurnal IPTEKS PSP. Vol. 9 (2) October 2022: 76 – 86 E-ISSN: 2614-5014

THE PREFERENCY AND CHEMICAL CHARACTERISTICS OF STICK PRODUCTS FORTIFICATION OF SUCKERMOUTH CATFISH FLOUR (*Pterygoplichthys pardalis*)

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Manuscript received: 31 October 2022
Revision accepted: 19 Januari 2023
DOI: 10.20956/jipsp.v9i2.23773

ABSTRACT

Suckermouth catfish (*Pterygoplichthys pardalis*) are found in Lake Tempe, Wajo Regency, but their existence has not been utilized so far and is even considered the cause of the loss of several endemic fish species in the lake. This study aims to determine the chemical characteristics and the preference level of sticks fortified with Suckermouth catfish (*Pterygoplichthys pardalis*) meal as an effort to utilize these fish. The research method used was experimental with treatment of SK (control without adding Suckermouth catfish flour), S1 (addition of 10 g of Suckermouth catfish flour), S2 (addition of 20 g of Suckermouth catfish flour), and S3 (addition of 30 g of Suckermouth catfish flour). The parameters observed were moisture, protein, fat, carbohydrate and ash content and the level of preference (hedonic test). The results showed that the panelists tended to say they really like the appearance and flavour of the stick S1 product, and very much like the taste and texture of the stick S3 product. The highest protein and water content was in S3 treatment, the highest ash and carbohydrate content was in SK treatment, and the highest fat content was in S1 treatment

Keywords: Fish Meal, Fortification, Sticks, Suckermouth Catfish

INTRODUCTION

The broomfish (*Pterygoplichthys pardalis*) originates from the Amazon River in South America. Its existence is now spread in several countries in the world, including Indonesia (Wahyudewantoro, 2018). In Indonesia, brooms are found scattered in several public waters, including the Ciliwung River and the Cilutung River. This fish is also found in Tempe Lake, South Sulawesi (Dina, et al., 2019). Based on recent research, the development of broomstick fish has caused the loss of some fish species in Lake Tempe. According to Amir et al. (2020), the presence of broom fish in Tempe Lake, Wajo Regency, has not yet been exploited and is even thought to be the reason why several fish species have declined in the lake. This is due to the fact that broomfish have an effect on the structure of the aquatic

environment, the food chain, competition for resources like food and dwelling space with endemic species, changes in aquatic plant communities, and damage to fishing gear. These fish are just tossed away or killed when they are captured. Most people think that the broomstick fish is not for consumption, seeing the morphology and the place of life of the fish. However, according to Munandar and Eurika (2016), Jember residents use broom fish as a component in dumplings, batagor, and otak-otak.

The research results of Amir's, et al (2020), showed that broomfish in three sub-districts in Lake Tempe did not contain Pb but contained Hg and as which did not exceed the metal contamination limit requirements based on SNI 2729:2013 regarding the quality and safety requirements of fresh fish. From the results of this study, it is possible to utilize broom fish as an alternative in fortification of fishery products.

Sticks is one of the snacks in the form of thin slices in the form of long flats made from wheat flour, tapioca flour, eggs and water which is fried and has a savory taste and crunchy texture. The addition of fish ingredients in stick products is intended to add nutritional value to stick snacks. Sticks is one of the products in the extrudate snack category. These extruded snacks are snacks made through the extrusion process from flour and starch raw materials for food with the addition of other food ingredients and other permitted food additives with or without going through the frying process (Fera, et al. 2019).

Several research results on fish sticks and product fortification using fish meal that have been carried out include the use of scad meat meal for fish sticks (Pratiwi, 2013), the use of mackerel meat and bones (Rastrelliger kanagurta) in making snack sticks (Siswanti, et al., 2017), chemical and organoleptic characteristics of sticks with snakehead fish meat substitution (Channa striata) (Fera, et al., 2019), cheese stick acceptability with the addition of anchovy flour (*Stolephorus sp*.) in stunting toddlers (Ramah, et al., 2019), chemical and sensory characteristics of stick products fortified with yellowfin tuna (Lekahena, 2019), quality of Starry Triggerfish sticks (*Abalistes stellaris*) and Red Lolosi fish (*Caesio chrysozona*) as an alternative to diversification of processed fish (Apriliani and Syahputra, 2019) . Information on the use of broom fish in diversified products is still lacking, and the presence of this fish, especially in Lake Tempe, has not been utilized until now. This study aims to determine the chemical characteristics and the level of consumer acceptance of the stick product fortified with broomstick fish meal (*Pterygoplichthys pardalis*).

P-ISSN: 2355-729X
E-ISSN: 2614-5014

MATERIAL AND METHOD

Time and place

The research was conducted in August 2020 at the Fishery Products Technology Laboratory, Faculty of Marine and Fishery Sciences and the Nutrition Laboratory, Faculty of Animal Husbandry, Hasanuddin University. The raw material for broom fish is taken from Tempe Lake, Wajo Regency

Materials

The ingredients used are fish meat flour, wheat flour, glutinous rice flour, eggs, margarine, sugar, salt, pepper, celery, garlic, water and cooking oil, aquades, 3% boric acid, sulfuric acid 0, 0171 N, concentrated sulfuric acid, bromine cresol indicator, methyl red indicator, label paper, filter paper, chloroform, 40% sodium hydroxide, rubber stopper, plastic bag and selenium mixture.

The tools used in this study were washbasins, stick printing machines, scales, frying pans, porcelain dishes, blenders, burettes, spray bottles, porcelain dishes, funnels, desiccators, 100 ml erlenmeyer (pyrex), iron gegep, 100 ml measuring cup (pyrex), distilled flask, 100 ml volumetric flask, fume hood, clamps, drip pipettes, 5 ml and 10 ml volume pipettes, oven, tube rack, a set of distillation apparatus, a set of destruction tools, statives, destruction tubes, test tubes (pyrex), soxhlet extractor, 250 ml round bottom flask, fat sleeve (extraction thimbles).

Research method

The research method used was experimental laboratories, using a completely randomized design with four treatments with three replications. The stick formulation consisted of 125 g of wheat flour, 125 g of glutinous rice flour, 50 g of eggs, 15 g of liquid margarine, 5 g of sugar, 10 g of salt, 1 g of pepper, 2.5 g of celery, 5 g of garlic, 100 ml of water. The treatment given was the addition of broom fish meat flour to a predetermined stick formulation. The treatments consisted of SK (without the addition of broom fish meal), S1 (addition of 10 g of fish meal), S2 (addition of 20 g of fish meal), and S3 (addition of 30 g of fish meal). brooms).

Sampling method

In this study, a hedonic test was conducted to determine the panelists' preference for appearance, aroma, taste, and texture using a scoresheet. The range of values on the scoresheet 1-9 with specifications very much dislike (1), dislike very much (2), dislike (3), slightly dislike (4), neutral (5), somewhat like (6), like (7), like very much (8), like very much (9). The number of panelists used is 25 people. The chemical characteristic parameters observed were:

P-ISSN: 2355-729X
E-ISSN: 2614-5014

Water content

Determination of water content based on AOAC (1995) and Alinti, et al. (2018) by cleaning and drying a porcelain dish for one hour in an oven at a temperature of 105-110ºC, cooling for 30 minutes in a desiccator and weighing (A g), weighing a sample of 2 g and placing it in a porcelain dish of known weight (B g), dried the sample in porcelain for 24 hours in an oven at a temperature of 105–110ºC, cooled in a desiccator for 30 minutes and weighed (C g). This weighing is repeated until a constant weight is obtained. The percentage of water content is calculated using the formula:

$$\boldsymbol{Water\ Content}\ (\%) = \frac{(B-C)}{(B-A)} \text{ x } 100\%$$

Ash Level

Determination of fat content followed the procedure of Nurhidayah, et al., (2019), which was to dry porcelain ash dishes in an oven at 105oC for 2 hours. Weigh the cup that has been cooled in a desiccator for 30 minutes (A). Put 0.347 g of the sample into a porcelain ash dish (B). Put the ash cup containing the sample into an electric ashing furnace at a temperature of 600oC and let it sit for 3 hours until it becomes ashes. Cool the ash cup containing the ashing sample in a desiccator for 30 minutes and then weigh it (C). The percentage of ash content is calculated using the formula:

$$\boldsymbol{Ash\ content}\ (\%) = \frac{(B-A)}{(C)} \text{ x } 100\%$$

Fat level

Determination of total nitrogen using the Kjeldahl method (Sudarmadji, 2010). Pratama, et al. (2014) was carried out by weighing 1 g of the sample, adding 2 g of a mixture of selenium and 20 ml of concentrated H2SO4 into a Kjeldahl flask. Disintegrate in a fume hood until the solution changes color to clear. Cool the results of digestion then put into a 100 ml volumetric flask and dilute using distilled water to the mark and then shaken. Pipette the solution as much as 5 ml and put it into a distilled flask then add 100 ml of distilled water using a measuring cup. Add 15 ml of 40% NaOH then distilled. Prepare a 100 ml Erlenmeyer which is given a mix indicator of 3 drops and 2% boric acid to accommodate the distillate results. Perform distillation to obtain a distillate volume of about 50 ml. Titrate the distillate with 0.0171 N sulfuric acid until the solution changes from green to red. The percentage of protein content is calculated by first determining the percentage of N content.

$$\%\ \boldsymbol{N} = \frac{14\ x\ P}{Sample\ Weight\ (g)} \text{ x } 100\%$$

$$\boldsymbol{Protein\ Content}\ (\%) = \%\ N \text{ x Fk}$$

Information:

P = Dilution

N = Normality of sulfuric acid solution

14 = Weight of Nitrogen equivalent

Fk = 6.25 (The magnitude of the multiplication factor of N in food)

Carbohydrate Level

Determination of carbohydrate levels using the Jayadi and Rahman (2018) method, which is based on calculations (in %):

$$\boldsymbol{Carbohydrates}\ (\%) = 100\% - \%\,(protein + fat + ash + water)$$

Data analysis

Data on the level of preference for sticks fortified with fish meat meal are presented in tabular form and described. The chemical characteristics data were tested using analysis of variance with a 95% confidence degree, the test results which gave a significant effect were continued with Duncan's test.

RESULTS AND DISCUSSION

The Preference

The results of the hedonic test to determine the panelists' preference for sticks fortified with broomfish meat meal can be seen in Table 1.

Table 1. Test Results of the Preference score Level of Sticks Fortified with Broom Fish Meal

Treatment of Addition of Broom Fish Meat Flour	Favorite Parameters			
	Appearance	Scent	Flavor	Texture
SC (0 g)	7	7	7	7
S1 (10 g)	8	8	7	7
S2 (20 g)	7	7	7	7
S3 (30 g)	7	6	9	9

Based on Table 1, it is known that the panelists stated that they really liked (score 8) to the appearance and aroma of the sticks fortified with 10 g of broomstick fish meal, and very much liked (score 9) to the taste and texture of the sticks fortified with 30 g of flour. broom fish meat. The results of the research by Siswanti, et al (2017) showed that fish meat sticks were favored in terms of texture and bone sticks were favored in terms of aroma. Sari, et al (2019) wrote that the addition of a mixture of meat and fish bones had a significant effect on the characteristics of the organoleptic properties, namely the aroma and taste of the sticks. The results of Yanuar's (2020) research, which used several types of fish, showed a level of preference from somewhat like to like on the sensory parameters of fish sticks.

The level of preference for the appearance and aroma of the sticks fortified with 10 g of fish meal was preferred by the panelists compared to the addition of 20 g and 30 g, probably because of the appearance of the color of the golden brown yellow sticks and the aroma is not sharp. Siswanti, et al (2017) wrote that the higher the addition of meat, the less desirable the appearance of the color of

the sticks because it would produce sticks with a dull brown color. This is presumably due to the Maillard reaction, namely reactions between carbohydrates, especially reducing sugars with the primary amine groups contained in the material, resulting in a brown material. Pratiwi (2013) adds that the more use of fishmeal flour makes the fish aroma on fish sticks more noticeable.

The taste and texture of the sticks fortified with 30 g of fish meat meal were preferred by the panelists compared to the addition of 10 g and 20 g. This is probably due to the savory taste due to the addition of broom fish meat flour and the crispy and not hard texture of the sticks. Sari, et al. (2019) wrote that increasing the concentration of fish meat causes a savory taste on the sticks. Siswanti, et al (2017) wrote that the savory taste can be caused by the protein content which is hydrolyzed into amino acids, namely glutamic acid which causes a strong distinctive taste. Sari, et al (2019) added that protein is related to the components that form the taste of food, the more protein the product tastes more savory. Fitri, et al (2016) writes that taste is a determining factor for consumer acceptance of food products. Taste is assessed using the sense of taste or tongue. The taste factor plays an important role in product selection by consumers, because even though the nutritional content is good but the taste is not acceptable to consumers, the target of improving community nutrition cannot be achieved and the product does not sell.

The fortification of the sticks using fish meat flour has a crunchy texture. This is also in line with the results of research by Sari, et al. (2019) that the texture of the crispy sticks is with 40% concentration of substitution of Siamese sepat fish. Siswanti, et al (2017) added that the use of mackerel meat in processing sticks produces a crunchy texture

Chemical Characteristics

The results of the chemical characteristics test to determine the nutritional components of the sticks fortified with broomfish meat meal can be seen in Table 2.

Table 2. Chemical Characteristics of Sticks Fortified with Broom Fish Meal

Treatment addition of Broom Fish Meat Flour	Water (%)	Ash (%)	Fat (%)	Proteins (%)	Carbohydrates (%)
SC (0 g)	0.77a	3.40a	13.46a	8.93a	54.55d
S1 (10 g)	0.74a	3.15a	25.25b	11.74b	51.40b
S2 (20 g)	1.71c	3.15a	18.52ab	13.18b	45.37a
S3 (30 g)	1.05b	3.14a	20.97a	14.93c	52.09c

Description: Numbers with letters and on the same line, do not differ at = 0.05

Based on Table 2, it is known that the treatment has an effect on the chemical characteristics of the sticks fortified with broomfish meat meal. Overall, the value of water content, fat content and carbohydrates did not show an increasing or decreasing trend along with the increase in the addition of broomfish meat meal. Protein content increased with an increase in the amount of fortified broom fish meal on the sticks. On the other hand, the ash content decreased with the addition of broom fish meal. The highest protein content and the lowest ash content were added to the addition of 30 g of broom fish meal.

The amount of water content in food in food is expressed as water content. An increase in water content in processed food is an indication of a decrease in quality. Thus, water content is one of the important factors to be analyzed in food ingredients, especially in maintaining the quality of food products (Fitri, et al., 2016). The average value of the water content of the sticks fortified with broom fish meal was in accordance with the quality requirements of extruded snacks based on SNI 01-2886-2015, which was a maximum of 4%. The treatment without fortification and fortification with 10 g of broomfish meat meal did not show any difference in influencing the water content, but the fortification treatment with 20 g and 30 g of broomfish meat meal showed a difference in influencing the water content. The average value of the water content on the sticks did not show an increasing or decreasing trend, this was different from the results of the research of Lekahena (2019) which showed that the greater the percentage of fish meal fortified in the stick product, the lower the water content of the sticks. Sari, et al (2019) wrote that the lower the water content in the material indicates the better the quality of the food because it can reduce the microbial growth medium so that the product becomes more durable. The water content in the material affects the quality and shelf life of the material.

Ash content is an inorganic substance left over from the combustion of an organic material. Determination of ash content is closely related to the mineral content contained in a material, the purity and cleanliness of the resulting material (Fitri, et al., 2016). All treatments did not show any difference in giving effect to the ash content of the sticks fortified with broomfish meat meal. The average value of the ash content of the sticks fortified with broomfish meat meal showed a decrease along with the increase in the amount of broomfish meat meal used. This is different from the results of Lekahena's research (2019) which shows a trend of increasing ash content of stick products along with the greater percentage of fortified fish

meal. The results of the research by Siswanti, et al (2017)

Fat is an important food substance to maintain the health of the human body, besides that oil and fat are a more effective source of energy compared to carbohydrates and protein (Fitri, et al., 2016). The average value of the fat content of fish sticks fortified with broom fish meal is 13.46-25.25% in accordance with the quality requirements of extruded snacks with the frying process based on SNI 01-2886-2015, which is a maximum of 38%. The treatment without fortification, fortification with 20 g and 30 g of broomfish meat meal, did not show any difference in giving effect to fat content, but the difference was shown by fortification with 20g of broomfish meat meal. The average value of fat content on the sticks did not show an increasing or decreasing trend. This is different from the results of the Lekahena (2019) which showed an increase in the fat content of the sticks along with the increase in the percentage of fortified fish meal. According to Zulfahmi, et al (2014), the addition of fish meat into the processing of fish products can add fat to the product. Muchtadi, et al. (2010) added that the water content is inversely proportional to the fat content. From this study, it can be seen that in the treatment with fortification of 10 g of fish meal, the water content was inversely proportional to the fat content of the sticks.

Protein is a food substance that is very important for the body, because this substance in addition to functioning as fuel in the body also functions as a building block and regulator. Protein also replaces body tissues that are damaged and that need to be overhauled. The main function of protein for the body is to form new tissue and maintain existing tissue (Winarno, 2004). Treatments without fortification, fortification and fortification with 10 g, 20 g, and 30 g showed a difference in influencing the protein content of sticks, but the treatment between fortification 10 g and 20 g did not show any difference. The mean value of protein content of fortified with broomstick fish meal increased along with the increase in the amount of fortified broom fish meat meal.

Carbohydrates are a cheap source of calories. Carbohydrates have an important role in determining the characteristics of food ingredients, such as taste, color, texture and others (Fitri, et al., 2016). All treatments showed differences in giving effect to the carbohydrate content of the sticks fortified with broomfish meat meal. The average value of carbohydrate content on the sticks did not show an increasing or decreasing trend, this was different from the results of the Lekahena (2019) research, namely the carbohydrate content of yellowfin sticks decreased when the percentage of fortified fish meal was greater

CONCLUSION

The conclusion of this research is that the panelists really like the appearance and aroma of the S1 stick product, and really like the taste and texture of the S2 stick product. The highest protein and water content in the S3 treatment, the highest ash and carbohydrate content in the SK treatment, and the highest fat content in the S1 treatment.

ACKNOWLEDGEMENT

We would like to thank the Hasanuddin University Research and Community Service Institute for funding the research.

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