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THE ADDITION OF NILEM PROTEIN CONCENTRATES ON BISCUITS PREFFERED LEVEL

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ABSTRACT

Nilem (*Osteochilus hasselti*) is an endemic fish (native) of Indonesia that lives in fresh waters, such as rivers and swamps. Biscuits with the addition of nilem protein concentrate can be high protein foods, but the addition of nilem fish protein concentrate to biscuits can affect organoleptic quality such as color, aroma, texture, and taste. This research aims to determine the appropriate level of addition of fish protein concentrate to the preferred level of biscuits. The design used is a non-factorial Completely Randomized Design (CRD), with four levels of treatment namely without the addition of nilem protein concentrate, addition of nilem protein concentrate 7,5%, addition of nilem protein concentrate 10%, and addition of nilem protein concentrate 12,5%. The parameters tested were organoleptic namely color, aroma, taste and texture carried out by 20 rather trained panelists. The results showed that biscuits with the addition of 10% nilem fish protein concentrate were the most preferred by consumers with organoleptic values (Color 7.5, aroma 7.3, texture 6.9, taste 6.5).

Keywords : Biscuits, Nilem Protein Concentrates, Level of Preference.

1. INTRODUCTION

Nilem (*Osteochilus hasselti*) is an endemic fish (native) of Indonesia that lives in fresh waters, such as rivers and swamps. Nilem has the advantage that nilem fish eggs can be used in the field of fisheries processing and this fish is quite popular because of its delicious, chewy and savory meat [5]. However, nilem has decreased in population due to lack of utilization of nilem and the result of changes in the aquatic environment. Nilem are also rarely sought after by the public because there are many thorns in the meat.

Fish protein concentrate as a form of food for human consumption is made from whole fish or its parts, by removing most of the fat and water so that the protein content of the product is higher than the fresh material [4]. The high protein content contained in FPC makes FPC very suitable for use as a supplement of low protein foods.

Biscuits are one type of pastry made from flour and processed by roasting process until the water content of the product is not more than 5% [2]. Biscuits have the characteristics of a layer of golden brown skin without brown spots, the shape of the biscuits are symmetrical, crisp and soft texture. Biscuits were chosen as an alternative to the product added to the nilem fish protein concentrate because commercial biscuits had relatively low protein content.

This study aims to determine the appropriate level of addition of fish protein concentrate to the preferred level of biscuits.

2. MATERIALS AND METHODS

2.1 Time and Place

The research was conducted in March-August 2019 at the Laboratory Fisheries Product Processing, Faculty of Fisheries and Marine Science, Padjadjaran University.

2.2 Materials and Tools

The tools used in the process of making nilem protein concentrates are : Digital Scales, Knives, Meat Grinder for smoothing fish meat, food processor, spoon, measuring cup capacity of 50 ml, cutting board, glass jars, calico cloth, mixer, oven, sifter (100 mesh), grinder, baking pan. Ingredients used in the process of making protein concentrate for nilem are: fresh nilem fish obtained from Majalaya, hexane, $NaHCO_3$, NaCl, wheat flour, butter, sugar, vanilla, water, eggs, full cream milk, baking powder.

2.3 Research Methods

The level of preference for biscuits was analyzed by Friedman's non-parametric statistical method consisting of 4 treatments and 20 semi-trained panelists as a test. The treatment of adding nilem protein concentrate to biscuits is as follows:

Treatment A (control) : Without the addition of nilem protein concentrate (0%).
Treatment B : 7.5% addition of nilem protein concentrate.
Treatment C : 10% addition of nilem protein concentrate.
Treatment D : 12,5% addition of nilem protein concentrate.

The formulation for making biscuit can be found in Table 1.

Table 1.Formulation of making Biscuits by Adding Nilem protein concentrate

Material for	Biscuit FPC			
	A	B	C	D
Flour (g)	100	100	100	100
FPC (g)	-	7.5	10	12.5
Butter (g)	35	35	35	35
Sugar (g)	20	20	20	20
Egg Yolk (g)	10	10	10	10
Milk (g)	2.5	2.5	2.5	2.5
Baking Powder (g)	0.2	0.2	0.2	0.2
Vanilla (g)	1	1	1	1
Total	168.7	173.5	178.7	183.5

Source: Soedarmo (1998) which has been modified

The research procedure for making biscuits by adding nilem fish protein concentrate according to Sunaryo (1985) modified by Hiswaty (2002) is as follows: Eggs sugar, margarine, beaten until fluffy for 15 minutes until homogeneous. Wheat flour, vanilla, baking powder, milk are put in the dough. After that it is printed and baked in a 155 ° C oven for 20 minutes then it becomes a biscuit.

2.4 Parameter Observed

The Parameters observed made include proximate and organoleptic. Organoleptic biscuits which include the color, aroma, texture and taste. Proximate tests were carried out on protein content, water content, ash content, and fat content of biscuits by adding nilem protein concentrate flour to the most preferred control and treatment treatments.

2.5 Data Analysis

Organoleptic data were analyzed statistically non-parametrically using thetest two-way variance analysis *Friedman* [6]. The statistics used in thetest are *Friedman* defined by the following formula:

$$X^2 = \frac{12}{nk(k+1)} \sum_{i=1}^{t} (Rj)^2 - 3n\,(k+1)$$

Description:

X^2 = Friedman Test Statistics
N = Repeat
K = Treatment
Rj = Total Ranking of each treatment

If there is a similar number, a correction factor calculation (FK) is calculated using the following formula:

$$\text{FK} = 1 - \frac{\sum T}{nk\,(k-1)}$$

$$X^2 c = \frac{x^2}{FK}$$

Significant value of X^2 c observations can be determined by using the Chi-squared critical prices table with db = k-1 ; α = 0.05. The decision rule to test the hypothesis is:

H0 = the treatment did not have a significant effect on the level of preference
H1 = the treatment had a significant effect on the level of preference.

If the value of X ^ 2 c arithmetic <X ^ 2 c tables, then H0 is accepted and H1 is rejected. Meanwhile, if the value of X ^ 2 c count> X ^ 2 c table, then H_1 is accepted and H_0 is rejected. While H_1 is accepted, there is a difference between treatment and testing followed by a multiple comparison test to determine differences between treatments. The multiple test formula is as follows:

$$|Ri - Rj| \geq Z \left[\frac{\alpha}{k\,(k-1)}\right] - \sqrt{\frac{nk\,(k+1)}{\in}}$$

Description:

| Ri-Rj | = Difference in average ranking. The normality value / weight of the criteria obtained is multiplied by the median value of the organoleptic test results for each treatment criterion then summed, so that an alternative value is obtained.

Ri = Average rating of the 1st sample
Rj = Average rating of the jth sample
α = Experiment wise wise.
n = Number of data or replications.
k = Number of treatments
Z = Value in table Z for Multiple Comparison (α / k (k-1))

Determination of biscuit formulation with the addition of nilem protein concentrate flour is best done using the performance index test (method *Bayes*).Method *Bayes* is one technique that can be used to analyze the best decision making from a number of alternatives or treatments by considering criteria ([6].

3. RESULTS AND DISCUSSION

Based on test results of organoleptic tests on the color, aroma, taste and texture of biscuits added to the concentration of nilem fish protein from the assessment of 20 rather trained panelists were as follows.

(a)

(b)

(c)

(d)

Figure 1. Biscuits with the Treatment of Adding Fish Protein Concentrates
(a) Without the addition of nilem protein concentrate**, (b)** 7.5% addition of nilem protein concentrate, **(c)** 10% addition of nilem protein concentrate, **(d)** 12.5% addition of nilem protein concentrate,

3.1 Level of Preference for the Color of Biscuits

The color is the overall state of the biscuits visually causing consumers to be attracted to the product. Consumers will prefer products with a neat, nice and intact form compared to products that are not neat and incomplete.

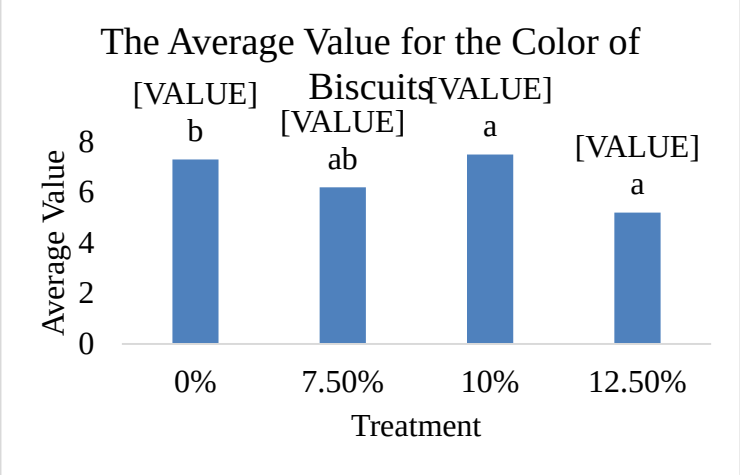

Figure 2. The Average Value for the color of Biscuits

Based on the hedonic test results using Friedman analysis shows that the addition of nilem protein concentrate into biscuits has a significant influence on the level of biscuit color preference. Biscuits with the addition of a 10% nilem protein concentrate have the highest average value of 7.5 producing biscuits with bright yellow appearance with brownish spots, intact and neat. The color of biscuit with the addition of 12.5% nilem protein concentrate has the lowest average value of 5.2 resulting in a dark yellow colored appearance with lots of brown spots, intact and neat. The increasingly brownish color of the cookies is caused by an increase in protein content and the presence of the Maillard reaction, this is according to Anugrahati *et al.* (2012), an increase in protein content makes the resulting biscuit color brownish [1]. This is related to Maillard's reaction that occurs in making biscuits.

The results of statistical tests show that all treatments can still be liked and accepted by panelists because the average value of color is still above the value limit of product rejection. The color of biscuits with the addition of a nilem protein concentrate by 10% is preferred by panelists compared to other treatments because the color of the biscuits is not as pale as the color of the biscuits without the addition of the nilem protein concentrate.

3.2 Level of Preference for the Aroma of Biscuits

Aroma is an important organoleptic characteristic in the reception of a food product. A change in the aroma of a product is one indication of a decline in the quality of a product, especially if the aroma that arises is not pleasant.

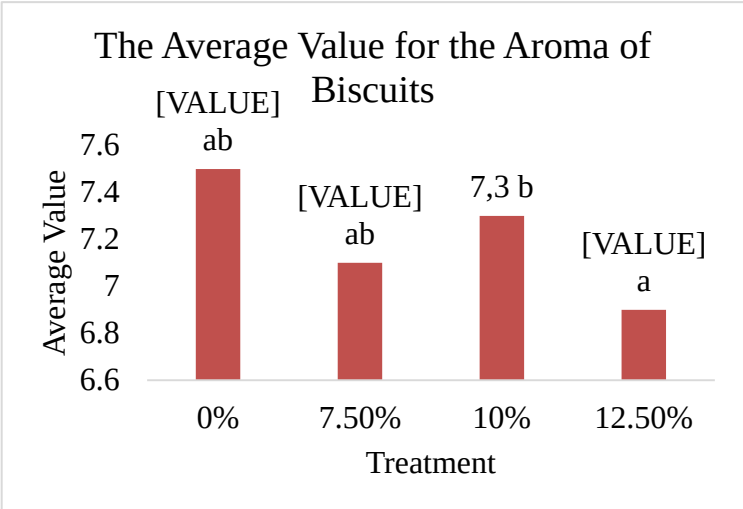

Figure 3. The Average Value for the Aroma of Biscuits

Based on the hedonic test results using Friedman analysis shows that the addition of nilem protein concentrate into biscuits has a significant influence on the level of biscuit aroma preference. Based on the assessment of the aroma of biscuits by adding nilem protein concentrate, treatment of 0% it has the highest average of 7.5 with the aroma of biscuits that smell is the aroma of milk and butter. The lowest average aroma value was found in the treatment of 12.5% which is 6.9 where this happened because the biscuits smelled

the specific aroma of fish, causing the panelists dislike the biscuits. The 7.5% and 10% treatments smelled a bit of fish rather so the biscuits were still typical of biscuits.

The specific aroma of fish is reduced due to the extraction process when making nilem protein concentrate. This is because hexane used is a non-polar solvent that is often used to dissolve oil.

Based on the results of statistical tests, the treatment of the addition of nilem protein concentrate has an effect on the aroma of biscuits and based on the average value of the aroma found in all treatments is still above the product rejection limit. The aroma of biscuits without the addition of the nilem protein concentrate is preferred by the panelists compared to other treatments.

3.3 Level of Preference for the Texture of Biscuits

Texture is one of the factors that influence consumer acceptance of a product. The texture of a material depends on the physical state of the product so that the assessment of the texture can be hardness, elasticity and crispness.

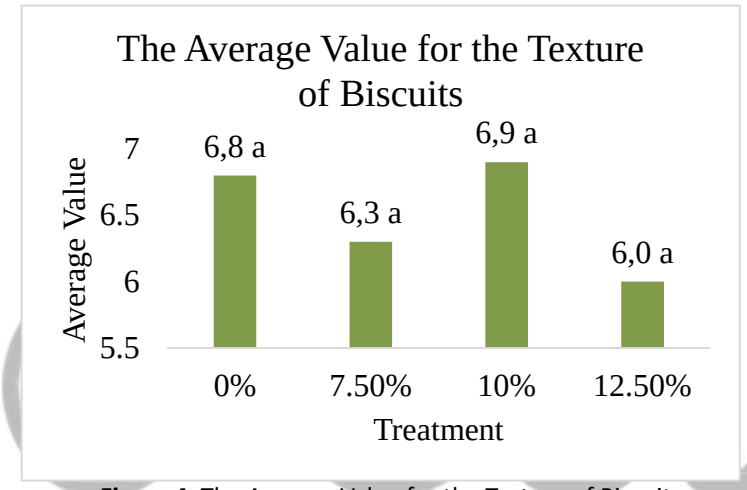

Figure 4. The Average Value for the Texture of Biscuits

Based on the results of Friedman's analysis test, it shows that the treatment of the addition of the nilem protein concentrate has no significant effect on the taste level of biscuits. In the figure above shows the highest texture value is at 10% treatment and the lowest average texture value is at 12.5% treatment. From the results of the study it can be seen that the panelists preferred the texture of biscuits with the addition of a 10% nilem protein concentrate this is because in the treatment of 10% the nilem protein concentrate did not greatly affect the texture of the biscuits.

Biscuits with the highest addition of nilem protein concentrate have a harder texture compared to other treatments, making it less preferred by panelists. The more addition of the nilem protein concentrate, the texture of the biscuit will be harder and not too soft. The texture of food products is very dependent on the ingredients to be used, especially the protein content, where the high protein content will cause the ability to bind the water smaller and so the mixing process becomes difficult.

Based on the results of statistical tests, the treatment of the addition of nilem protein concentrate had no effect on the texture of the biscuits and based on the average aroma value found in all treatments was still above the product rejection limit. Biscuit texture with the addition of nilem protein concentrate by 10% is preferred by panelists compared to other treatments.

3.4 Level of Preference for the Taste of Biscuits

Taste is a very important factor in the acceptance or rejection of a food product by panelists. The taste can be assessed as a panelist response to the stimulation of basic types of taste such as sweet, salty, sour and bitter

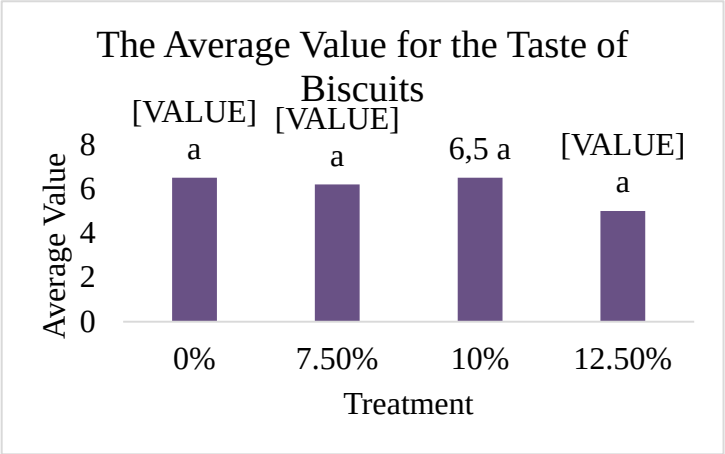

Figure 5. The Average Value for the Taste of Biscuits

Based on the results of Friedman's analysis test, it shows that the treatment of the addition of the nilem protein concentrate has no significant effect on the taste level of biscuits. In the Figure 5. above shows the highest taste value is in the treatment of 0% and 10% by 6.5 and the lowest average taste value is in the treatment of 12.5% by 5. From the research results it can be seen that the panelists prefer the taste of biscuits by adding nilem protein concentrate 0% and 10%. In the treatment of 0% biscuits have a sweet taste derived from sugar, treatment with the addition of 7.5% of nilem protein concentrate produces a sweet taste that has not been savory. While biscuits with the addition of 10% nilem protein concentrate produce a slightly sweet and slightly savory taste. The addition of the nilem protein concentrate 12.5% produced a savory taste. This is due to the effect of adding nilem protein concentrate to the product.

Based on the results of statistical tests, the treatment of the addition of nilem fish protein concentrate had no effect on the taste of biscuits and based on the average value of the flavors found in all treatments were still above the product rejection limit. The taste of biscuits with the addition of nilem protein concentrate by 10% is preferred by panelists compared to other treatments.

3.5 Bayes Test

Decision making on alternative values and criteria for color, aroma, taste and texture of biscuits is performed by pairwise comparison test (*Pairwase Comparison*). Paired comparison test data results on the color, aroma, texture, and taste criteria of 20 panelists. The completion of the pairwise comparison results is done by manipulating the matrix to determine the criteria value. The results of the calculation of the weight criteria for color, aroma, texture, and flavor of the nilem filet marinate are presented in Table 2.

Table 2. Weight Value of Marinate Filet Nilem

Criteria	Value of Criteria
Color	0.11
Aroma	0.20
Texture	0.22
Taste	0.46

Based on the calculation of the value criteria for color, aroma, texture and taste of biscuits, the results show that the taste produces a greater value compared to other criteria with a criterion value of 0.46, this proves that taste has the most influence on the assessment of biscuits by adding nilem protein concentrate flour. This shows that although other assessments are good, if the taste of the biscuits is not liked by the panelists, the product will be rejected by the panelists. The criteria for color, aroma, texture, and taste of the biscuits adding the nilem protein concentrate are presented in Table 3.

Table 3. Bayes method

Treatment	Criteria				Alternative Value
	Color	Aroma	Texture	Flavor	
0	7,30	7,50	7,20	6,50	6,95
7,5	6,20	7,10	7,30	6,20	6,63
10	7,50	7,30	7,50	6,50	**7.00**
12.5	5.20	6.90	5.80	5.00	5.59
Criteria Value	0.11	0.20	0.22	**0.46**	30.00

Based on calculations using the Bayes method the results showed that biscuits with the addition of 10% nilem protein concentrate were the most preferred biscuits, seen from the highest alternative value of color and texture which was 7.00, while the treatment of adding 7.5% nilem fish protein concentrate had an alternative value of 6.63 addition of 12.5% fish protein concentrate had the lowest alternative value of 5.59 and without the addition of fish protein concentrate has an alternative value of 6.95. Based on the treatment of nilem fish protein concentrate concentrate on biscuits, the treatment of adding 10% nilem protein concentrate is the most preferred treatment by panelists.

3.3 Recapitulation of Observation

Results The overall results of observations of the nilem filet marinate are presented in Table 4.

Table 4. Recapitulation of Observation Results of Biscuits

Observations	The Average Treatment of Addition of Nilem Fish Protein Concentrate			
	0%	**7.50%**	**10%**	**12.50%**
Organoleptic (Hedonic)				
Color	7.3 b	6.2 ab	7.5 b	5.2 a
Aroma	7.5 ab	7.1 ab	7.3 b	6.9 a
Texture	6.8 a	6.3 a	6.9 a	6.0 a
Taste of	6.5 a	6.2 a	6.5 a	5.0 a
Bayes Method				
Alternative Value	6.95	6.63	7.00	5.59

Based on the organoleptic results that have been done, the addition of nilem fish protein concentrate has an effect on each treatment of characteristic color, aroma, texture and taste of nilem protein concentrate biscuits. The aroma characteristic on biscuits without the addition of nilem protein concentrate (0%) had the highest value, while the characteristic color, texture and taste had the highest average value in the treatment of adding nilem protein concentrate by 10%. The Bayes method test results showed that the addition of the 10% nilem protein concentrate has the highest alternative value of 7.00, so it can be concluded that the biscuits with the addition of a 10% nilem protein concentrate are the most preferred by the panelists.

The test results obtained that the biscuits adding nilem protein concentrate at 0%, 7.5%, 10% and 12.5% treatments were still favored by the panelists, but the 10% treatment was the panelists' most preferred treatment. The organoleptic test results of biscuits with the addition of nilem protein concentrate by 10% have the highest value of color, texture and taste characteristics, this shows that biscuits with the addition of 10% nilem protein concentrate are the most preferred treatment compared to other treatments.

Conclusion

Based on the results of biscuit research with the addition of nilem protein concentrate, all treatments were still favored by panelists. Acceptance of biscuits with the addition of nilem protein concentrate to color, aroma, texture, taste and overall preference is the most popular biscuits with the addition of a 10% nilem protein concentrate and the least preferred biscuit is the addition of a 12.5% nilem protein concentrate.

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