



The Proximate Analysis of Cakwe with Addition of Nilem Fish Protein Concentrate

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Authors' contributions

This work was carried out in collaboration among all authors. Author TA designed the research, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author Junianto managed the analyses of the research. Authors IR and RIP managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Nilem fish (*Osteochilus hasselti*) are native Indonesian fish that live in freshwaters, such as rivers and swamps. This research aims to obtain the composition of proximate cakwe with the addition of Nilem fish protein concentrate. Proximate parameters observed were water content, protein content, fat content, and ash content using the Association of Official Analytical Chemists (AOAC) method. This research was conducted from March 2019 to January 2020 at the Laboratory of Fishery Product Processing, Faculty of Fisheries and Marine Sciences, Padjadjaran University and Laboratory of Chemistry Research, PPBS, Padjadjaran University. The method used is an experimental method with the treatment of 5% Nilem fish protein concentrate. The proximate test results showed that cakwe with the addition of Nilem fish protein concentrate contained 27.72% water content, 10.42% protein content, 5.36% fat content, and 4.38% ash content.

Keywords: Cakwe; fish protein concentrate; Nilem; proximate.

1. INTRODUCTION

Nilem fish (*Osteochilus hasselti*) is a native Indonesian fish that lives in freshwaters, such as rivers and swamps [1]. Nilem is a freshwater fishery commodity with potential value for cultivation because it has advantages, including a relatively easy cultivation technique and a very delicious meat taste [2]. Fish farming is less than that of other consumption fish because Nilem fish has many spines, thin meat, and a substantial portion of gonads so that Nilem fish is less desirable for direct consumption [3]. Therefore, it is necessary to promote processed fishery products, one of which is fish protein concentrate flour.

Fish protein concentrate (FPC) is produced by removing air and fat from fish meat, thereby increasing protein and other nutritional ingredients [4]. The advantages of FPC are that it has a long shelf life and is more flexible in its use [5], besides having very high protein. The use of FPC as an additional ingredient in the manufacture of low protein food products can be an alternative for processing fishery products to improve the nutritional quality of protein.

Cakwe is one of the snacks that is quite popular and is favored by children to adults. It has low nutritional protein content. The addition of Nilem fish protein concentrate to cakwe is expected to increase the nutritional protein value of cakwe. In this research, the addition of a 5% Nilem fish protein concentrate was the most preferred by the panelists. Then it is necessary to do a proximate analysis of cakwe which has been added to fish protein concentration.

2. MATERIALS AND METHODS

2.1 Place and Time

The research was conducted from March 2019 to January 2020 at the Laboratory Fisheries Product Processing, Faculty of Fisheries and Marine Science, Padjadjaran University, Indonesia.

2.2 Materials and Tools

The tools used in this research are a digital scale, knife, cutting board, food processor, spoon, basin, pan, baking sheet, glass jar, measuring cup, cloth, oven, blender, sieve, rolling pin, and frying pan. The materials used in

this research are Nilem fish, hexane, NaHCO_3 , water, wheat flour, baking powder, baking soda, instant yeast, cooking oil, salt, and sugar.

2.3 Research Methods

The method used in this research is an experimental method. The treatment used was the treatment of adding Nilem fish protein concentrate on the flour-based cakwe used.

- A. 0% or without the addition of Nilem fish protein concentrate.
- B. 5% addition of Nilem fish protein concentrate.

The formulation for making cakwe is presented in Table 1.

The procedure for making cakwe by adding Nilem fish protein concentrate is based on Irmadona [6] with slight modifications as follows as:

- Mix warm water, yeast, and sugar, then let stand until foamy.
- Dry ingredients such as wheat flour, Nilem FPC flour, baking powder, baking soda, and salt are mixed.
- The yeast dough is mixed with the dry ingredients, then stir, and then add the remaining water.
- Add enough oil then knead the cakwe dough until all the ingredients are perfectly emulsified.
- Leave the cakwe mixture until it expands for about 1.5 hours.
- Shape the cakwe dough as per need.
- Fry the cakwe dough until it expands.

2.4 Parameter Observed

The parameters observed in this research were the levels of water, protein, fat, and ash in the control treatment and the most preferred treatment panelists, where the procedure of testing the four parameters.

2.4.1 Water content

Porcelain dishes are dried in the oven for 1 hour at 105°C , then cooled in a desiccator for 30 minutes, then weighed to a constant weight. A sample of 2 g was weighed, then put in a porcelain cup and dried in a 105°C oven for 5 hours. After drying, the cup containing the sample is then cooled in a desiccator for 30 minutes and weighed to a constant weight. If a constant weight has not been obtained,

Table 1. Formulation of making cakwe

Materials	Treatment	
	A (0%)	B (5%)
Flour (g)	100	100
Fish Protein Concentrate (FPC) (g)	0	5
Yeast powder (g)	1.2	1.2
Baking powder (g)	0.8	0.8
Baking soda (g)	0.8	0.8
Salt (g)	2	2
Sugar (g)	1.2	1.2

the porcelain cup is heated again in the oven (105°C) for 30 minutes. The formula for calculating water content is as follows.

$$\text{Water content (\%)} = \frac{\text{initial weight} - \text{final weight (g)}}{\text{sample weight (g)}} \times 100\%$$

2.4.2 Protein content

Step in testing the protein content, which consists of: these who consist of:

- 1) Destruction. The sample was weighed 1-5 g and then put into the Kjeldahl flask and added with the selenium Kjeldahl tab and 10 ml H₂SO₄. Pumpkin is placed in a heater with a temperature of 400°C in an acid chamber. Destruction is done until the solution becomes clear (1-1.5 hours). The product is then cooled and diluted with distilled water slowly until it reaches 100 ml.
- 2) Distillation. The result of the destruction is a 10 ml pipette and put in a distillation flask. Erlenmeyer 125 ml containing 25 ml of H₃BO₃ solution (boric acid) and 2-4 indicator drops (a mixture of 2 parts methyl red 0.1% in alcohol and 1 part Brown Cresol Green (BCG) 0.1% in alcohol) are placed just before distillation begins. The tip of the condenser must be submerged under a solution of boric acid. Destructive samples were added to 8-10 ml NaOH solution then distilled until bluish green.
- 3) Titration Distillation titration using 0.01 N HCl solution until the solution is pink.

The formula for calculating protein content according to is as follows:

$$\text{Nitrogen content (\%)} = \frac{\text{Titration Volume} \times N \text{ HCl} \times BM \ N}{mg \ sample} \times 100\%$$

$$\text{Protein content (\%)} = \text{Nitrogen Content} \times 6.25.$$

2.4.3 Fat content

The volumetric flask is dried in the oven at 105°C, then weighed to a constant weight. A sample of 2 g was wrapped in fat-free filter paper and then put into a fat sleeve. The cartridge is inserted into the Soxhlet tube. As much as 150 ml of chloroform is put into the fat flask. The sample is refluxed for eight hours when the solvent looks clear, indicating all the fat has been extracted. The solvent in the fat flask is then evaporated to separate the solvent and fat after it is dried in a 105°C oven for 30 minutes. Volumetric flask fat is then weighed until a constant weight is obtained. The formula for calculating fat content is as follows.

$$\text{Fat content (\%)} = \frac{\text{last volumetric flask weight} - \text{initial volumetric flask weight (g)}}{\text{sample weight (g)}} \times 100\%$$

2.4.4 Ash content

Porcelain dishes are dried in an oven for one hour at 105°C, cooled for 30 minutes in a desiccator, and weighed to a constant weight. The sample was weighed as much as 2 g then put in a porcelain cup and flattened on an electric stove until it became charcoal. Porcelain cup containing a sample that has become charcoal is put into a muffle with a temperature of 600°C for 6 hours until it becomes whitish ash, the muffle is left until it shows room temperature, then just opened the lid. Porcelain plates are cooled by placing them in an oven at 105°C for 1 hour and then put in a desiccator until they cool. Porcelain plates that have been cooled are then weighed. The formula for calculating ash content is as follows.

$$\text{Ash content (\% db)} = \frac{\text{Ash weight (g)}}{\text{Dry sample weight (g)}} \times 100\%$$

3. RESULTS AND DISCUSSION

3.1 Proximate Analysis

The proximate test consisted of testing the water content, protein content, fat content, and ash content of the control treatment cakwe and the most preferred treatment cakwe (addition of 5% nilem fish protein concentrate).

3.1.1 Water content

Water content is the amount of water contained in the material which is expressed in percent. Water content is also a very important characteristic of food because water can affect the appearance, texture, and taste of foodstuffs [7]. According to Winarno [8], the water content in food will affect food resistance due to microbial attacks, where the higher the water content in food, the food will not last long. The cakwe water content test results with the addition of nilem FPC can be seen in Fig. 1.

Based on the two treatment results, the water content in cakwe still meets the quality requirements. Referring to the quality requirements for donuts based on SNI 01-2000, the maximum water content in the donuts is 40% [9].

Based on the above statement, it can be seen that the moisture content in the control treatment cakwe is lower than the 5% treatment. The addition of nilem fish protein concentrate to cakwe resulted in cakwe with a higher water content than cakwe without the addition of nilem fish protein concentrate. This is inseparable from the protein's involvement in the nilem FPC; the higher the percentage of nilem FPC added, the more water is bound to the cakwe. In line with Dewita and Syahrul's [10] statement, that FPC has hygroscopic properties or can absorb water. According to Yenni [11], the higher the fish protein concentrate used, the lower the moisture content of the product, because fish protein concentrate has properties in the form of flour to absorb the water contained in the product.

3.1.2 Protein content

Protein plays a vital role in the human body because protein is one of the macronutrients that function as a building block, regulator, immune protection, and repair damaged tissue [12]. The results of the cakwe protein content test with the addition of nilem FPC can be seen in Fig. 2.

Based on Fig. 2, the protein content of cakwe with the addition of the nilem FPC resulted in higher protein content than the protein content of cakwe without the nilem FPC's addition. This shows that the addition of fish protein concentrate on cakwe can increase the protein content in cakwe. In line with the research of Defira et al. [13], which states that the higher the concentration of catfish protein concentrate fortified into a sweet bread, the higher the value of the product protein content, this is due to the high protein content in the fish protein concentrate.

Based on Azmi's research [14], it is stated that water content is inversely proportional to protein content. The higher the water content of the food used, the lower the protein content because myogen and protein are water-soluble. Vice versa, this supports the results obtained in this research.

Several factors can influence the protein content in processed food products such as cakwe with nilem FPC's addition. Factors that influence are the type of flour, the ratio of adding flour, other ingredients added, processing method, and heating temperature [15]. The protein content in a product is very much determined by the manufacturing process, where one of the properties of protein is that it is not resistant to heat.

3.1.3 Fat content

Fat is found in almost all foodstuffs with varying contents [16]. Fat is a food substance that is important as a source of energy and maintains a healthy body. The cakwe fat content test results with the addition of nilem FPC can be seen in Fig. 3.

Based on Fig. 3, this shows that cakwe with the addition of nilem FPC contains lower fat content than cakwe without nilem FPC's addition. In accordance with research conducted by Defira [13] stated that the fat content of sweetbreads that were fortified with tilapia FPC decreased. This happened because it was related to the increasing percentage of tilapia FPC additions. The fat content of a product has decreased along with the increase in FPC addition due to high protein content and low-fat content. The high percentage of protein can reduce the percentage of fat in food products [17].

3.1.4 Ash content

Ash is an organic residue from the combustion of organic materials; usually these components

consist of potassium, calcium, sodium, iron, manganese, and magnesium [10]. Ash is also all the material that remains in the form of ash after ashes. The ash content can indicate the large

number of minerals contained in these foodstuffs [13]. The results of the cakwe ash content test with the addition of nilem FPC can be seen in Fig. 4.

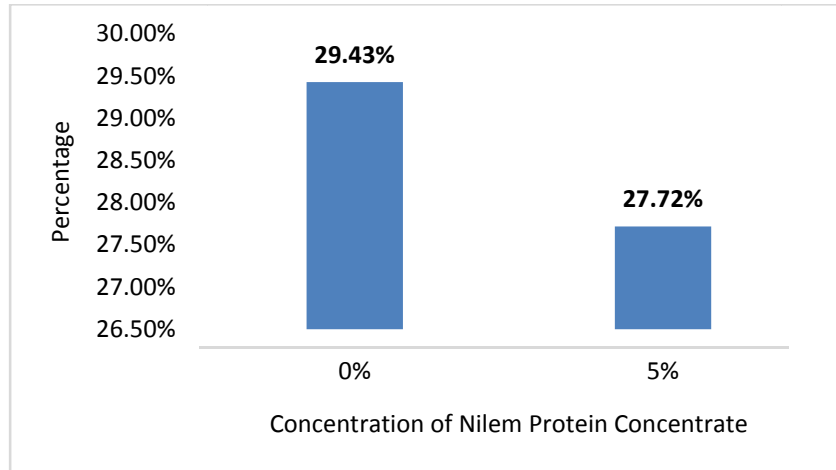


Fig. 1. Water content of cakwe

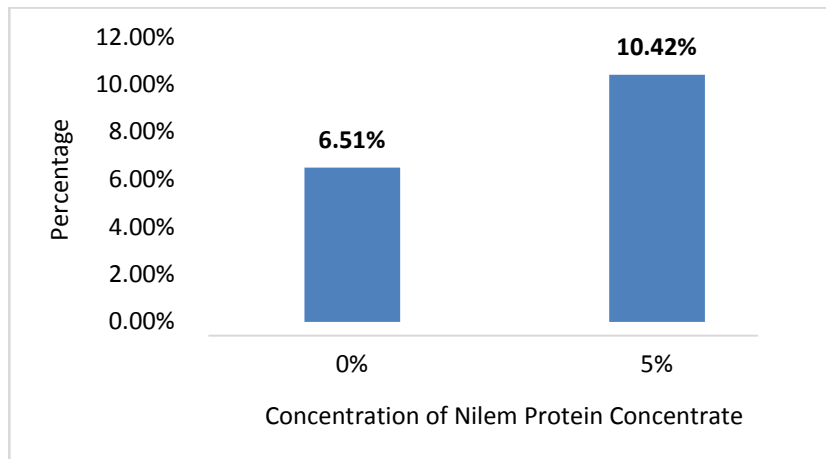


Fig. 2. Protein content of cakwe

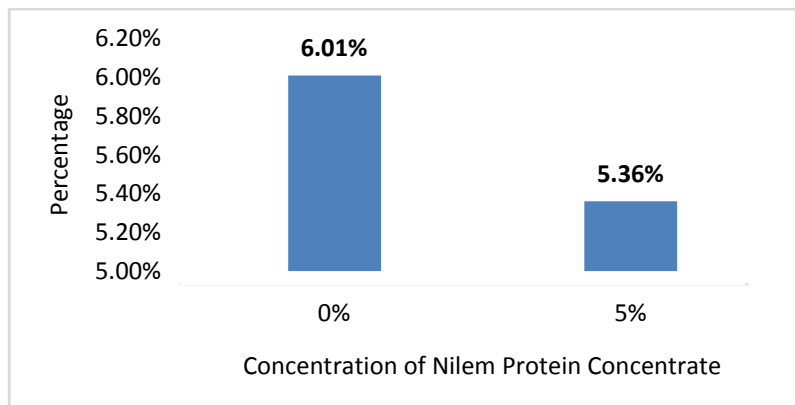


Fig. 3. Fat Content of Cakwe

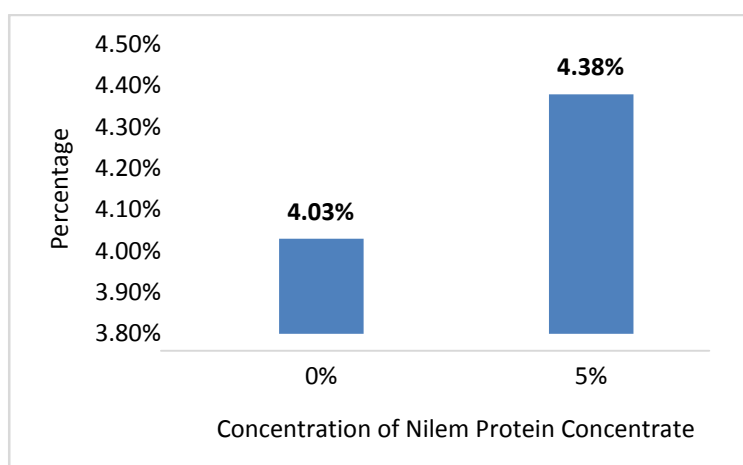


Fig. 4. Ash content of cakwe

Fig. 4 shows an increase in ash content in the treatment cakwe with a 5% Nile FPC's addition. The increase in ash content in cakwe can be caused by the ingredients used in making cakwe.

Andarwulan et al. [18] revealed that foodstuffs have different amounts of ash content because ash is composed of various types of minerals that vary depending on the type of food source. Ash content can indicate the large number of minerals contained in these foodstuffs [19]. The amount of ash in food products is very limited. If a food item contains high ash content, it is a very high potential hazard for human consumption.

4. CONCLUSION

Cakwe with the addition of 5% Nile fish protein concentrate from 100 grams of flour produces cakwe with a value of water content of 27.72%, protein content of 10.42%, fat content of 5.36%, and ash content of 4.38%.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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