

Proximate of Pempek Instant Flour and Sensory Evaluation of Pempek from Mackerel Fish (*Scomberomorus Commersonii*)

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Abstract - Fish contains nutrients and functional compounds that are good for human health. Nutritional and chemical compounds that act as functional foods include protein, vitamin E, fats and minerals, which have good effects on health, such as preventing cardiovascular disease. Pempek is a traditional food from South Sumatera, Indonesia. This study evaluates the proximate of pempek instant flour and sensory evaluation of pempek from mackerel fish (*Scomberomorus commersonii*). The values ranged on dry weight basis for: moisture (13,67-18,60%/100 g), ash (2,86%-6,40%/100 g), protein (33,68%-53,80%/100 g), fat (0,61%-2,35%/100 g) and total carbohydrate (18,84%-49,17%). Formula 1 (75% of mackerel fillets and 25% of tapioca flour) presented high moisture, ash, protein, and fat values, meanwhile lower total carbohydrate. Formula 2 (50% of mackerel fillets and 50% of tapioca flour) received the highest scores in sensory evaluation based on overall acceptance.

Keywords: *proximate, pempek, instant, flour, pempek, fish.*

I. INTRODUCTION

Indonesia is an island nation that has a sea area of around 3.1 million km². One of the results of marine resources is fish. In 2017, fisheries production in Indonesia was 7,071 tons, while in 2016 it was 6,580 tons [1]. Around 110 million tons of fishery products in the world, as many as 2.9 billion people, at least 15% of the average protein intake per capita [2].

Fish contains nutrients and functional compounds that are good for human health. Nutritional compounds and chemical compounds that act as functional foods

include protein, vitamin E, fats and minerals, which have good effects on health, such as preventing cardiovascular disease. Several epidemiological and clinical studies have been carried out to determine the health effects of fish consumption [3], [4].

One of the famous fish processing products in Indonesia is Pempek. Pempek is a traditional food from South Sumatra, Indonesia [5]. and until now, the culture of consuming pempek has into the Bangka Belitung Islands Province. Pempek is made from fish fillets and tapioca flour (or sago). Some studies suggest that different ratios of fillets and tapioca flour will produce products with different nutritional and sensory values (taste, colour, aroma, texture and overall acceptance).

In general, the basic material for making pempek is Gabus fish (*Channa striata*) [5]. In Bangka Belitung Province, the basic material of pempek is mackerel fish (*Scomberomorus commersonii*) and tapioca flour. Mackerel fish included in a large pelagic group, commonly found in the waters of Sumatra. Mackerel fish production in 2015 is quite large at 821.4 tons so that mackerel fish is easily obtained in the market and has soft meat texture characteristics [1] Pempek made from cork fish have a shelf life of 27–33 hours [6]. The shelf life of pempek is very important parameter to be accepted from producers to consumers. The low shelf life of pempek is thought to be due to the high moisture

content of pempek. Moisture content can affect the shelf life of a food item [7]. Moisture content of pempek is very high at 50-60% [8].

One of the efforts to extend the shelf life of pempek made from mackerel fillets is to make pempek instant flour. Pempek instant flour is made through a drying process. The drying method is one method that is often done in a food industry, using certain air temperature [9]. Pempek instant flour is expected to have a low moisture content so that it has a longer shelf life.

II. METHOD

Source of materials

Mackerel fillets, tapioca flour, salt, mono sodium glutamate (MSG), and ice water used for the study were sourced from a market traditional in Pangkalpinang, Bangka Belitung Province. The experiment was conducted in three steps. The first step was the preparation and formulation of pempek instant flour from mackerel fillets. The second steps was an analysis of proximate content (moisture, ash, protein, lipids (AOAC, 2005) and carbohydrate (by difference). The last step was a sensory evaluation pempek making from pempek instant flour (taste, colour, aroma, texture and overall acceptance).

Preparation and Formulation of Pempek Instant Flour

The principle of making pempek instant flour is drying. Briefly, the mackerel fillets was mixed with tapioca flour, salt, MSG and ice water. The ratio of mackerel fillets, salt, tapioca flour, MSG and ice water in Formula 1 (F1), Formula 2 (F2), and Formula 3 (F3) can be seen in Table 1. All ingredients were kneaded in a kitchen food processor for 5 min until smooth, then dried using a temperature of 50 0C for 3 hours, then ground until it receives the consistency of a powder. After grinding the flour, use a sieve size of 60 mesh to sift the powder.

Table 1. Formulated of pempek instan flour

Ingredients	Formulation*		
	Formula 1 (F1)	Formula 2 (F2)	Formula 3 (F3)
Mackerel fillets (g)	375	250	125
Tapioca flour (g)	125	250	375
Salt (g)	10	10	10
MSG (g)	5	5	5
Ice water (ml)	20	20	20

Explanation: F1 (75% of mackerel fillets + 25% of tapioca flour), F2 (50% of mackerel fillets + 50% of tapioca flour), F3 (25% of mackerel fillets + 75% of tapioca flour)

Analysis of Proximate Pempek Instant Flour

Moisture, ash, crude fat, and protein contents of mackerel pempek were analyzed using official methods (AOAC, 2005) and expressed in percentages. Values for carbohydrate were obtained by subtracting the sum of the other proximate values from 100 percentages (AOAC, 2005).

Sensory Evaluation of Pempek

The method of Murtado [10] with slight modification was followed in the preparation of pempek. Add warm water (500 C) into pempek instant flour until it forms a mixture with a diameter of 1 cm and a length of 5 cm. The formed pempek were boiled until fully cooked (floating). The cooked pempek were drained and cooled off to ambient temperature before packed in polyethylene pouches and refrigerated until sensory evaluation.

Three samples pempek of each formula were randomly coded, and presented to 30 untrained panellists as respondents (students from Department of Nutrition, Health Polytechnic of Pangkalpinang MoH Indonesia Pangkalpinang) to evaluate samples according to the degree of likeness in respect to taste, texture, colour, aroma and overall acceptance. The panellists were served with the samples and an evaluation form with a 5- point hedonic scale: “1” was dislike very much, “2” was dislike slightly, “3” was neither like nor dislike, “4” was like slightly, “5” was like very much.

Statistical analysis

Data obtained from respondents were analyzed using a weighted mean, while those from other parameters of the study were subjected to analysis of variance (p<0.05), and Duncan multiple range test was used to separate the means where significant differences exists. Statistical analysis software (SPSS 16.0.1 for Windows) was used for all the analysis.

III. RESULTS

3.1. Proximate of Pempek Instant Flour

The pempek instant flour samples were used in this part of the study. Proximate component which includes moisture, ash, fat, protein, and carbohydrate of pempek instant flour are shown in Table 2. The determination of the proximate compositions was done in duplicates. All the data obtained were from dry basis and expressed in percentage (%).

Table 2. Proximate content (%) of pempek instant flour

Proximate Compositition	Mean±std dev (%)	p value
Moisture		
Formula 1	18,60±0,08c	0,000
Formula 2	16,20±0,49b	
Formula 3	13,67±0,10a	
Ash		
Formula 1	6,40±0,00c	0,000
Formula 2	4,50±0,00b	
Formula 3	2,86±0,25a	
Protein		
Formula 1	53,80±2,98b	0,000
Formula 2	33,68±3,64a	
Formula 3	33,69±2,22a	
Fat		
Formula 1	2,35±0,41b	0,013
Formula 2	1,25±0,05a	
Formula 3	0,61±0,09a	
Carbohydrate Total		
Formula 1	18,84±2,48a	0,003
Formula 2	44,36±3,21b	
Formula 3	49,17±2,46b	

Source: Primer Date, 2019

Explanation: F1 (75% of mackerel fillets + 25% of tapioca flour), F2 (50% of mackerel fillets + 50% of tapioca flour), F3 (25% of mackerel fillets + 75% of tapioca flour)

The moisture content of mackerel pempek instant flour ranged from 13,67% to 18,60%. F3 and F1 having the lowest and the highest values, respectively. There was significant difference ($p < 0.05$) in the moisture content of F1, F2 and F3 sample. The percentage of ash content mackerel pempek instant flour which is an index of the total mineral matter in the sample, was between 2,86% to 6.40%. There was significant difference ($p < 0.05$) in the ash contents of the samples. The ash content of the F1 was found to be higher than the other mackerel pempek instant flour.

The protein content ranged from 33,69% to 53,80%, with pempek instant flour F1 having the highest value and was significantly different ($p < 0.05$) from pempek instant flour of F2 and F3. The total carbohydrate contents in the samples ranged between 11,84% and 49,17%, with F1 and F3 having the highest and the lowest values, respectively. The total carbohydrate contents of the differently formulas was significantly differently ($p < 0,05$) from each other sample. The fat content ranged from 0,61% to 2,35%, with pempek instant flour F1 having the highest value and was significantly different ($p < 0.05$) from pempek instant flour of F2 and F3 sample.

3.2 Sensory Evaluation of Pempek from Pempek Instant Flour

The panelists did identify any significant difference ($p < 0.05$) in the colour, texture, and overall acceptance

of the pempek making from pempek instant flour. Meanwhile, the parameter sensory in the taste and aroma was not significant difference ($p > 0,05$).

Table 3. Sensory Evaluation of Pempek

Sensory Quality Parameter	Mean Score	p value
Taste		
Formula 1	3,50±0,97b	0,065
Formula 2	3,27±0,69ab	
Formula 3	3,00±0,78a	
Colour		
Formula 1	3,10 ± 0,66 ^a	0,000
Formula 2	3,97 ± 0,32 ^b	
Formula 3	3,47 ± 1,00 ^a	
Aroma		
Formula 1	3,03±1,06a	0,919
Formula 2	3,20±0,71a	
Formula 3	3,23±0,56a	
Texture		
Formula 1	2,07±0,82a	0,000
Formula 2	3,73±0,74c	
Formula 3	2,90±0,96b	
Overall acceptance		
Formula 1	2,93±0,94a	0,000
Formula 2	3,97±0,71b	
Formula 3	3,17±0,83a	

Explanation:

- Mean scores in each sensory quality parameter with the same superscripts are not significantly different ($p > 0.05$)
- 5 point sensory scale was used for liking of pempek made from mackerel pempek instant flour (1 = dislike very much, 2 = dislike slightly, 3 = neither like nor dislike, 4 = like slightly, 5 = like very much)

In the colour, texture and overall acceptance, the highest scores were observed to F2 sample which presented significantly difference ($p \leq 0.05$) between of each other sample.

IV. DISCUSSION

4.1 Proximate of Pempek Instant Flour

In our research, pempek instant flour is made by drying techniques. The temperature used is 60 °C for 3 hours. Drying process for making pempek instant flour is a treatment for maintenance of mackerel fish because its quality is preserved for long time period.

The results showed that the difference in the ratio of mackerel fillets and tapioca flour in each formula had an effect on the moisture content of the pempek instant flour ($p < 0.001$). The more mackerel fillets that is added to the formula, the higher the moisture content of the pempek instant flour. This is due to the moisture content of the raw material for making instant pempek instant flour. Fish is one of the most perishable foods because it has a high water content [11].

The results showed that the difference in the ratio of mackerel fillets and tapioca flour in the formula

affected the ash content of the pempek instant flour produced ($p=0.000$). One indicator to determine the nutritional quality of a food ingredient is the ash content in the food ingredient. Ash content is an inorganic compound that can be found in food stuffs [12]. Ash is one of the components in food ingredients, consisting of minerals such as potassium, sodium and natrium [13]. Even though the amount is very small, the minerals in food are needed by the human body. The ash contents were within the value of pempek instant flour reported and within the acceptable standard by the SNI (Standar Nasional Indonesia) about fish flour [14]. The difference in ash content of each formula is thought to be caused by the difference in the ratio of mackerel fish and tapioca flour in each formula and processing factors [12].

One of the essential macro nutrients for the body are protein and fat. Protein serves as fuel to the formation of new tissues, while fat is a source of energy for the body. Protein can replace damaged tissues and maintain existing tissues. The results showed that there were significant differences in protein and fat content in pempek instant flour ($p<0.005$). The difference in protein and fat content of mackerel fish as the basic material causes differences in protein and fat content in pempek instant flour. This is because mackerel fish has a higher protein and fat content compared to tapioca flour. Mackerel fish has a protein content of 18%-22% [15]. All formula sample which showed that pempek instant flour from mackarel fillets was high in protein.

The results showed that the difference in the ratio of mackarel fillets and tapioca flour had an effect on the total carbohydrate content of pempek instant flour. Carbohydrates are a component of food which is the main source of energy that affects the body's physiological processes. Carbohydrates that can be digested by the body will be converted into monosaccharides which will be absorbed by the body and provide energy for metabolic processes [16]. The carbohydrate contents in fishing fillet is generally very low compared with protein or fat content [17].

4.2 Sensory Evaluation of Pempek

Physicochemical properties of fish and fish products are characterized by color, texture, and taste. These properties are salient determinants of the quality of fish and fish products, which translate into consumer acceptability [18]. The sensory evaluation of pempek making from pempek instant flour were evaluated for sensory attributes as taste, color, aroma, texture, and overall acceptance (Table 3).

The taste and aroma of pempek in all formulations was not significantly different ($p>0.05$). Although not

significantly different, the taste of pempek F1 (75% mackerel fillets and 25% tapioca) and aroma of pempek F3 (25% mackerel fillets and 75% tapioca) were the most preferred by the panelists. The pempek of F1 has a tasty and delicious taste while the pempek F3 has a distinctive aroma of fish but is not dominant. Taste is one important factor in mackerel pempek product, and generally the one which has the highest influence on the success of product or a menu [19]. The texture of pempek F2 was most liked by panelists because it had a soft texture, while the textures pempek F3 and F1 were less liked by panelists because it had a slightly rough texture.

Overall acceptance is considered very important for many implications; with this attribute panelist can include their own parameters for sensory assessment. Based on sensory evaluation about the overall acceptance of pempek, the pempek of F2 with a ratio of 50% mackerel fish and 50% tapioca flour has the highest sensory score compared to pempek F1 and F3.

V. CONCLUSION

The composition of 75 % mackerel fillets and 25% tapioca flour can increase the moisture, ash, fat and protein content of pempek instant flour. Pempek instant flour of Formula 1 has the highest moisture, ash, protein and fat content between Formula 2 and Formula 3. Formula 3 (25% of mackerel fillet and 75% of tapioca flour) has the highest total carbohydrates between of Formula 1 and Formula 2. There was a significant difference ($p<0.05$) between the pempek instant flour formulas for moisture, ash, fat and total carbohydrate, but the protein of the pempek instant flour from each other formulas was not significant ($p>0.05$).

Based on the sensory evaluation by the panelists, the pempek Formula 2 was the most preferred based on color (score 3.97), texture (score 3.73) and overall acceptance (score 3.97). Pempek Formula 1 was the most preferred based on taste (score 3.50), while pempek Formula 3 was the most preferred based on aroma (score 3.23).

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