



## Fortification of Carrot Flour to the Preference Level of Mackerel Pempek

Aditya Ramadhan<sup>1</sup>, Rusky Intan Pratama<sup>2</sup>, Herman<sup>2</sup>, Iis Rostini<sup>2</sup>

Departemen of Fisheries Faculty of Fisheries and Marine Science Universitas Padjadajran

Jl. Raya Bandung Sumedang KM.21, Jatinangor 45363 Indonesia

Corresponding author: [adhityaramadhann@gmail.com](mailto:adhityaramadhann@gmail.com)

Fax: (+22)7811947

### Abstract

Increasing the content of vitamin-A in fish jelly products in the community, such as pempek, can be done by adding carrot flour. This study aims to determine the proportion of carrot flour based on the level of preference for mackerel fish pempek. The research was conducted from January 2021 to February 2021. Pempek processing and organoleptic testing were carried out at the Fisheries Product Processing Laboratory, Faculty of Fisheries and Marine Sciences Padjadjaran of University and chemical tests were carried out at the Food Technology Laboratory, Faculty of Engineering, Pasundan University, Bandung. The method used in this research is an experimental method with 5 treatments of adding carrot flour and 20 semi-trained panelists as replications with 0% treatment; 10%; 20%; 30%; and 40%. The parameters observed were organoleptic characteristics which included appearance, aroma, texture, taste of pempek, folding test, and chemical tests (protein content, ash content, moisture content, carotene content) in the control treatment and the most preferred. The results showed that the addition of carrot flour by 20% was the most preferred treatment with a median appearance of 8 (highly preferred), aroma, texture and taste by 7 (preferred) and the results of the elasticity test for the 20% treatment folding test results have a chewy pempek, with proximate test results of water content 48.64%, ash content 1.61%, protein content 10.02% and carotene content 55.32 ppm.

**Keywords:** carrot flour, levels of preference level, organoleptic, pempek, surimi

### 1. Introduction

Mackerel (*Scomberomorus commerson*) is a type of pelagic seawater fish that has a distinctive taste and is favored by the community. Mackerel is the most popular fish and is the prima donna of the main catch (KPL Mina Sumitra 2013). Pempek is a typical food of Palembang Municipality. Pempek is a traditional food product that can be classified as a fish jelly product or fishery product that forms a gel. In addition to pempek and kamaboko, other fish jelly products, namely nuggets, meatballs and other preparations, can also be used as raw materials for making fish jelly. Pempek is made from mashed fish meat, tapioca flour, salt and water. Pempek can be said as a snack food source of animal protein because it is made with fish meat as raw material. Pempek mackerel per 100 grams contains 7.2 grams of protein, but pempek mackerel does not contain vitamin-A (Ministry of Health of the Republic of Indonesia 2012). Provision of vegetables such as carrots will be able to overcome the lack of vitamin-A in the pempek produced. Vitamin-A is one of the micronutrients that have very important benefits for the human body, especially in human vision (Triana 2006). Vitamin A is found in fatty foods, both plant and animal.

Fortification of mackerel pempek products needs to be done so that the vitamin-A content in mackerel fish pempek increases. Processed mackerel pempek if given one type of vegetable such as carrots will further increase the source of vitamins and fiber. The need for this vitamin is relatively small, but its role in the human body is very important for health. Fortification is a deliberate attempt to add essential micronutrients, namely vitamins and minerals to food. Fortification can improve the nutritional quality of the food supply and provide public health benefits with minimal risk to health (WHO 2006).

Fortification can be applied to the manufacture of fish jelly products such as nuggets, pempek, otak-otak, meatballs and others with the addition of nutrients in it. Research on the level of preference is important to do in order to produce products that are liked by consumers. Changes in the organoleptic characteristics of pempek that occur will have an impact on the assessment of the level of preference for pempek by being tested by several panelists. Carrots can be made into flour, so that they are easy to mix

with the dough. The addition of carrot flour to be added to the pempek dough must also have a limit on the addition so that it is still liked by consumers. Therefore, it is necessary to conduct research on the fortification of carrot flour as a source of vitamin-A on the level of preference for mackerel pempek.

## **2. Materials and Methods**

This research was conducted at the Fisheries Product Process Laboratory of the Faculty of Fisheries and Marine Sciences, Padjadjaran University for organoleptic test and physical test. Food Technology Laboratory, Faculty of Engineering, University of Pasundan, Bandung for proximate analysis (protein content, water content, ash content, carotene content). The materials used in this study were 500 gr surimi mackerel, tapioca flour, wheat flour, thick coconut milk, seasonings (salt, onion, pepper, sugar), carrot flour, eggs and the tools used in this study were, scales, basin, Filet Knives, Cutting Boards, Meat Grinders, Gas Stoves, Frying Pans and Plates.

### **2.2 Research method**

The method used in this study was an experimental method consisting of 5 treatments and 20 semi-trained panelists as replicates, while the percentage of adding carrot flour was 0%, 10%; 20%; 30%; and 40%. Consists of five treatments with 20 semi-trained panelists with the addition of carrot flour. Parameters observed were hedonic test (preferred test) based on organoleptic properties which included appearance, aroma, texture, and taste. Physical test (pempek elasticity) and chemical test (moisture content, ash content, protein content and carotene content) for the control treatment and the most preferred).

#### **2.2.3 Procedure For Making Pempek**

The procedure for making pempek using mackerel refers to Parmanto (2012) which is modified: Surimi that has been frozen in the freezer at  $-20^{\circ}\text{C}$  is taken and then thawed in cold water at  $0^{\circ}\text{C}$  until the ice melts. The melted surimi is transferred to a container, then 350 ml of thick coconut milk is added and then stirred again until the dough is smooth. Add two egg whites, stir until evenly distributed, then add shallots (100 g), pepper (4 g), salt (16 g), wheat flour (50 g), tapioca flour (150 g), carrot flour (according to treatment). ) then stirred until evenly distributed. The dough is divided into several parts and shaped into rounds like a ball done manually using hands. Pempek is then fried for 4-5 minutes at a temperature of around  $176^{\circ}\text{C}$ - $190^{\circ}\text{C}$ .

#### **2.2.4 Proximate Composit**

The macronutrient of pempek was determined according to AOAC methods. Protein content was determined using the Kjeldahl method, fat content was determined by the Soxhlet method. Ash content was determined by ashing the samples overnight at  $550$ - $600^{\circ}\text{C}$ . Water content was determined by drying the samples overnight at  $105$ - $110^{\circ}\text{C}$ . Carotene content Absorbance (optical density).

### **2.3 Data Analysis**

Analysis of the data in this study for water content, ash content, protein content and carotene content and elasticity in pempek used a comparative descriptive method. Sensory test was carried out with non-parametric statistical analysis, two-way analysis of variance test with Chi-square test, followed by multiple comparison test (to determine differences in treatment. Pairwise comparison test was carried out to make panelist decisions on the preferred product criteria, followed by the Bayes method for making the best decision from several alternatives by considering the weight of the criteria (Marimin 2004).

## **3.3 Organoleptic Test**

### **3.3.1 Appearance**

Appearance is the first characteristic that consumers assess a product. Although appearance does not determine the absolute level of preference, appearance can affect consumer judgment. Based on the results of statistical analysis of pempek appearance, the addition of carrot flour to the brains had a significant effect on pempek (Table 1). Based on the appearance parameters of Pempek, the median value generated at the level of preference for the appearance of the brains of each assistance received by carrots

obtained a median value between 5 - 8. median 8 with uniform shape, intact, and brownish in color. The lowest average value of appearance was found in the addition of 10% carrot flour, which was 5.2 with a median value of 5 with a uniform shape, intact and dark brown in color. Brown color is a melanoidin compound produced from the Maillard reaction (Rahmawati 2008 in Trisnawati 2015). The Maillard reaction is a reaction between carbohydrates and proteins, especially reducing sugars with primary amino acid groups contained in the material so that it will produce a brown material called melanoidin (Zayas 1997). According to Abu Bakar (2009), the higher the addition of carrot flour, the lower the brightness level of the pempek. The dark brown color of pempek is caused by the Maillard reaction. The Maillard reaction occurs because of the amino acid lysine and glucose which react at high temperatures to produce brown melanoidin.

### 3.2.2 Aroma

Aroma is one of the factors that will determine consumers to choose products because aromas can attract consumers' attention to these food products (Bakhtiar et al. 2019). The aroma received by the nose and brain is more of a mixture of the four main aromas, namely fragrant, rancid, sour and burnt (Winarno 1991). The aroma of otak-otak produces the same aroma in each gift. The average aroma of pempek with the addition of carrot flour can almost be seen in Table 2. Based on the aroma parameters of pempek, the median produced at the level of preference for the appearance of pempek for each carrot treatment obtained a median value of between 5 and 7. This value indicates that the product is favored by panelist. The average value of the appearance of the highest value produced in the 20% treatment had an average value of 6.5 with a median value of 7 and the lowest with the addition of carrot flour in the 40% treatment had an average value of 5.5 with a median value of 5. The aroma of pempek is added with carrot flour. Carrot flour has a distinctive aroma so that the more carrot flour is added, the pempek produced tends to have a stronger carrot aroma. According to Sayekti (2014) the addition of carrots to food has an unpleasant aroma. Lestario et al (2010) stated that carrots usually cause a sluggish aroma. This research was used first with the drying technique and then processed into flour. Drying will cause the lethargic aroma of the carrots to disappear.

### 3.2.3 Texture

Texture is a food quality factor that is related to the level of elasticity of a product. According to Winarno (2004), texture is a characteristic of a product and the main criterion in predicting food quality. The results of statistical analysis show that texture affects the level of preference of the panelists. Based on the Friedman test, it is known that the addition of carrot flour to pempek has an effect on the level of texture preference, so a multiple comparison test was conducted. Based on the results of statistical analysis of brain texture, the addition of carrot flour to the brain had a significant effect on the brain (Table 3). Based on the texture parameters of pempek, all treatments were still accepted by the panelists with a median value of 5 to 7 which means they are in the normal to preferred category. This value indicates that the product is accepted and liked by the panelists. The highest average value was found in the treatment (20%) with an average value of 7.2 with a median value of 7 while the lowest average value was found in the 40% treatment, namely 5.5 with a median value of 5. Carrot fortification flour treatment 40% , has a less chewy texture resulting in a slightly cracked and hard texture. The increase in the texture of the carrot flour pempek affects the level of elasticity. According to Tika's research (2014), the concentration of the binder used will affect the texture of the resulting empek-empek. Carrot formulation greatly affects the hardness and elasticity of the product. Hardness by dietary fiber, the higher the dietary fiber, the tougher the texture of the product. This study is the same as Abdillah's research (2010), the addition of carrot flour which contains dietary fiber will affect the level of elasticity of the nuggets, the results of this study were nuggets produced by the addition of carrot flour in high treatment, the nuggets had a less chewy texture due to the large addition of dietary fiber to the food. in nuggets.

### 3.2.4 Taste

Taste is a sensory response to nerve stimuli such as sweet, bitter and sour to the sense of taste and so on. Taste is the most dominant factor in a product. Although some of the other parameters look good, if

the taste is not liked by consumers, then the product is rejected. Based on the Friedman test, it showed that the addition of carrot flour had a significant effect on the level of preference for the taste of pempek, so that a Multiple Comparison test was carried out. Based on the results of statistical analysis of pempek taste, the addition of carrot flour to the brain had a significant effect on the brain (Table 4). Taste is an agreed parameter using the sense of taste or tongue. Based on the taste of pempek parameters, all meetings were still accepted by the panelists with a median value range of 5 to 7 which means that they are included in the normal accepted category. The highest average value is found in the 20% treatment, which is 7.4, while the lowest average value is found in the 40% treatment, which is 5.2. The 20% treatment was the most preferred by the panelists because the treatment produced a carrot flour taste but still retained the savory taste of pempek. Treatment of 40%, experienced a strengthening of the taste of carrot flour and the savory taste of pempek was reduced, due to the addition of too many carrots, so that the panelists did not like the taste so that they got the lowest score. has a very strong carrot taste, this is due to the addition of too many carrots, so the panelists do not like the taste. According to Karneta (2013) pempek is made from a mixture of mashed fish meat, tapioca flour, water, salt, and seasonings as a flavor enhancer. The taste caused can be caused by several factors including the addition of spices in making pempek. The composition of the spices, in the use of tapioca flour and carrots also contributes to the taste of the pempek mackerel. The taste also comes from the hydrolysis of proteins in fish meat into amino acids glutamate which gives the mackerel fish a distinctive taste.

### 3.3 Decision Making with Bayes Method

The preferred pempek decision is made by the Bayes method. Bayes method is one of the techniques that can be used to analyze the best decision making from a number of alternatives that aim to obtain optimal results. The results of the calculation of the weight of the appearance criteria are 0.25; fragrance 0.17; texture 0.14 and taste 0.45. Based on the weight gain criteria of appearance, aroma, texture and taste, it was found that the taste assessment is the most important criterion that will determine the final decision of the panelists. The decision matrix for evaluating pempek using the Bayes method is presented in Table 5. Based on the Bayes method, it was found that pempek with the addition of carrot flour was almost 20% which was the most preferred treatment by the panelists with an alternative value of 7.28. While the lowest alternative value is 40% with a value of 5.50.

### 3.4 Folding Test

Folding test is a physical test to determine the level of elasticity of a product. Elasticity is based on the ease of chewing time without losing tissue properties that deserve to be removed (Sudrajat 2007). The folding test was carried out in order to determine the level of elasticity in mackerel fish pempek with carrot flour added. Based on the results of the folding test on mackerel fish pempek, it was found that the addition of carrot flour in all treatments included the criteria of being chewy and quite chewy. The addition of mackerel surimi to pempek was treated with 0% treatment for pempek products; 10% and 20% had chewy criteria, while in the treatment of 30% and 40% there was a decrease in the elasticity value of mackerel fish pempek. As the carrot flour increases, the elasticity of the pempek decreases. Changes in the elasticity value of pempek are influenced by several factors, namely the amount of mackerel added with fillers in pempek and carrot flour as an additional ingredient. Making pempek flour composition greatly affects the elasticity and compactness of the pempek product. According to Nurjanah et al. (2005), the formation of a compact texture is caused by the composition of flour and fish meat added to the dough. Flour improves the emulsion, reduces during steaming and forms a dense texture (Sahlan et al. 2018). According to research by Renate (2015) carrot extract provides the composition of carbohydrates needed to make meatball dough and will affect the gelatinization process and dough quality. This affects the elasticity of the resulting meatball product. The addition of 20% extract is sufficient to provide the preferred elasticity. The preferred texture of snakehead fish balls is chewy, but has a free and smooth surface. The elasticity of the meatballs is influenced by the composition of the ingredients. The use of binders aims to assist the gelatinization process, so as to produce products with good sensory values. According to the research of Tika et al (2014), the concentration of the binder used will affect the texture of the resulting empek-empek. Carrot formulation

greatly affects the hardness and elasticity of the product. Increasing the addition of flour will cause the texture to become denser and tend to be harder.

### **3.5 Proximate Composition**

#### **3.5.1 Water Content**

Water is an important component because it can affect the texture, appearance and taste of a food ingredient (Putri 2012). Water is an important component in food because it can affect the texture, appearance and taste of food (Winarno 2008). The results of testing the water content of mackerel fish pempek with the addition of carrot flour control and treatment were preferred 20%, namely 49.90% and 48.64%. The water content in mackerel fish pempek decreased this was due to the addition of carrot flour in mackerel fish pempek. The addition of carrots to mackerel fish pempek affects the water content, the greater the addition of carrots to mackerel fish pempek the lower the water content. Water content of pempek has decreased, presumably due to differences in the water absorption capacity of the raw materials. The concentration used is the same for each treatment so that tapioca flour and carrot flour are factors that affect the decrease in the water content of pempek.

#### **3.5.2 Ash Content**

Ash is an inorganic substance left over from the combustion of an organic material. The more mineral content, the higher the ash content and vice versa (Sari et al. 2016). The ash content contained in a product can describe the amount of minerals contained in the product (Khalisi 2011). The results of proximate testing of ash content in mackerel fish pempek in 0% treatment was 1.72% while in 20% treatment it was 2.22%. The ash content in the mackerel fish pempek increased this was due to the addition of carrot flour to the mackerel fish pempek. According to Widriani (2005), the ash content obtained from the material is related to the minerals contained in a material. The increase in ash content produced apart from fish, carrots also contain minerals so that the more carrots used, the higher the ash content produced. The increase in ash content was caused by the mineral content from the addition of carrot flour.

#### **3.5.3 Protein Content**

Protein is a nitrogen-containing food substance which is believed to be an important factor for body function, so there is no life without protein (Muchtadi 2010). Proteins function as forming new tissues that always occur in the body and replace damaged body tissues (Asni 2004). The results of proximate testing of protein levels in pempek in the 0% treatment were 9.76% while the 20% treatment was 10.02%. The increase in protein content in pempek occurs due to the addition of protein derived from carrot flour. Based on SNI 01-3819-1995 regarding the standard, the minimum pempek protein content is 9%. Protein content in pempek has met the standards set by BSN (1995). The results showed that the protein content without the addition of carrot flour and the treatment with the addition of 20% carrot flour were 9.64% and 10.02%, respectively. This shows that besides being preferred, pempek has a higher nutritional content in the form of protein content than pempek without the addition of carrot flour.

#### **3.5.2 Carotene Content**

Carotene is a red-orange pigment that is very abundant in plants and fruits. The benefits of beta-carotene for the body is to prevent and reduce the risk of cancer. Consumption of foods or fruits that contain beta-carotene is expected to support nutritional needs and increase immunity. Based on the observation of the carotene analysis of mackerel pempek with the preferred treatment of 20%, the value of 55.32 g was obtained with five pempek. The carotene content in pempek products comes from carrot flour. The more carrot flour added to the pempek product, the more beta carotene content will be added. This is due to the fact that carrots are a vegetable source of provitamin A, which has a high carotene content (Ali and Rahayu 2001). The need for vitamin-A in humans is 375-600 g/day depending on age according to Widyakarya Pangan and Gizi (2004). The addition of 20% carrot flour resulted in the carotene content of 55.32 g. Consumption of 11 pieces of pempek in a day,  $\pm$  250 grams per fruit. Then the amount of vitamin-A content in mackerel fish pempek with the addition of 20% carrot flour was 608.52 g. This means that the content

of vitamin-A in the addition of carrot flour, which is the most preferred by 20% panelists, is 608.52 g which can meet the needs of vitamin-A for humans/day.

**4. Conclusion**

Based on the results of the research, it can be concluded that all treatments of adding carrot flour in the manufacture of mackerel fish pempek products are still favored by the panelists, but the treatment of adding 20% carrot flour is the preferred treatment, based on the level of organoleptic characteristics with a median value of appearance of 8 (very favorable), aroma, texture and taste 7 (preferred) with proximate test results of 49.90% water content, 2.22% ash content, 10.02% protein content, and 55.32 g carotene content.

**5. Confession**

The author would like to thank the staff of the Department of Fisheries and Fishery Products Processing Laboratory, Food Engineering Laboratory, Pasundan University who have provided facilities for us to carry out research.

**Table 1 :** Average Pempek Appearance Various Treatment of Carrot Flour Addition

Addition of Carror Flour	Median Value	Average Appearance
0	7	7,0 b
10	5	5,2 a
20	8	7,5 b
30	5	6,0 ab
40	5	5,7 a

**Table 2 :** Average Pempek Aroma Various Treatment of Carrot Flour Addition

Addition of Carror Flour	Median Value	Average Aroma
0	7	6,2 a
10	5	5,7 a
20	7	6,7 a
30	5	5,9 a
40	5	5,5 a

**Table 3 :** Average Pempek Texture Various Treatment of Carrot Flour Addition

Addition of Carror Flour	Median Value	Average Texture
0	7	6,4 ab
10	5	5,8 ab
20	7	7,2 b
30	5	5,6 ab
40	5	5,5 a

**Table 4 :** Average Pempek Taste Various Treatment of Carrot Flour Addition

Addition of Carror Flour	Median Value	Average Taste
0	7	7,3 b
10	5	5,6 a
20	7	7,4 b
30	6	6,4 ab
40	5	5,2 a

**Table 5 :** Decision Matrix For The Pempek Assessment Using The Bayes Method

Addition of Carror Flour (%)	Criteria				Value Alternative	Value Priority
	Appearance	Aroma	Texture	Taste		
0	7,00	6,20	6,40	7,30	6,91	0,22
10	5,20	5,70	5,80	5,60	5,55	0,18
20	7,50	6,70	7,20	7,40	<b>7,28</b>	<b>0,23</b>
30	6,00	5,90	5,60	6,20	6,02	0,19
40	5,70	5,50	5,50	5,40	5,50	0,18
<b>Nilai Kriteria</b>	0,25	0,17	0,14	<b>0,45</b>	31,26	1,00

**Table 6 :** Folding Test Based On The Addition Of Carrot Flour

Addition of Carrot	Average	Ranking	Elasticity
0	4	A	Kenyal
10	4	A	Kenyal
20	4	A	Kenyal
30	3	B	Cukup Kenyal
40	3	B	Cukup Kenyal

**Table 7 :** Proximate Composition Of Pempek

Compotition	Treatment	
	0%	20%
Water (%)	49,90	48,64
Ash (%)	1,72	2,22
Protein (%)	9,76	10,02
Carotene (ppm)	-	55,32

**Source:** Laboratory of Engineering Food, University of Pasundan

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