



Fortification of Carrot Flour as a Source of Vitamin-A for Levels of Preference of Otak-otak Snakehead Fish.

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Abstract

Increasing the vitamin-A content in fish jelly fish products can be done by adding carrot flour. This study aimed to produce the most preferred otak-otak based on the percentage of carrot flour addition. The study was conducted from December 2019 to January 2020. Otak-otak processing and organoleptic testing were carried out at the Fisheries Product Processing Laboratory, Faculty of Fisheries and Marine Sciences and chemical analysis carried out at the Food Technology Laboratory of the Faculty of Engineering, Pasundan University, Bandung. The method used in this research is an experimental method with 5 treatments adding carrot flour and 20 semi-trained panelists as replicates with a level of 0%; 5%; 10%; 15%; and 20%. The parameters observed were the yield of carrot flour, organoleptic characteristics which include appearance, aroma, texture, taste of the otak-otak folding test and chemical tests (protein content, ash content, water content, carotene content in control treatments and the results of the study concluded that the addition of carrot flour by 10% is the most preferred treatment having a median appearance value of 8 (highly preferred), aroma, texture and taste 7 (preferred) with proximate test results of 11.50% protein content, levels ash 1.61%, water content 34.27%, and carotene content 29.6 ppm or 32.26 IU.

Keywords: *carrot flour, levels of preference level, organoleptic, otak-otak.*

1. Introduction

Fortification is a deliberate effort to add important micronutrients, namely vitamins and minerals to food, so that it can improve the nutritional quality of food supplies and benefit public health with minimal risks to health (WHO 2006). Fortification can be applied to the manufacture of jelly fish such as nuggets, otak-otak, meatballs and others with the addition of nutrients in it. Fortification in this study is the creation of otak-otak using carrot flour with snakehead fish.

Snakehead fish has economic value because snakehead fish can be used as raw material in making crackers, pempek, meatballs and other processed products. Snakehead fish has a very high albumin content. Nugroho (2013) that snakehead fish have a high protein content of 25% and albumin content of 6.22% compared to other types of freshwater fish such as milkfish 20%, and carp 16%. Snakehead fish has white flesh and has many bones and is often used in making fish jelly (Abrori 2003).

Otak-otak are fishery-producing products that use a minimum of 30% of the meat and vegetable or surimi (National Standardization Agency 2013). Otak-otak are one of the processed products that are quite popular with children to adults. Processed otak-otak if given one type of vegetable will further increase the source of vitamins and fiber. Vegetables that contain vitamin-A nutrients such as carrots.

Carrots are a healthy type of vegetable for humans that need to be cultivated even more to meet human needs. Carrots can be made into flour, so they can be easily mixed with the mixture. Flour making is one type of making that is very important for certain food ingredients, because it can be used to save a lot for its use to make various types of food (Handayani 1994 in Sopiandi 2016).

The addition of carrot flour in the manufacture of otak-otak is to increase the vitamin A content in snakehead fish otak-otak products and will increase the organoleptic characteristics produced, namely appearance, the scent, texture and taste. Changes in organoleptic characteristics in the otak-otak will have an impact on the level of otak-otak preference. This research is very important to study the effect of adding carrot flour on the snakehead fish otak-otak based on the level of panelist preference.

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 research are 4 kg of snakehead fish, Carrot Flour, tapioca flour, flour, eggs, thick coconut milk, ice cube, spices (salt, garlic, pepper, leeks, pepper), water and the tools used in this research are, digital scales, food processors, filet knives, basins, cutting boards, stainless steel pans, gas stoves, pans, blenders, plates, spoons, pans, cling wrap, spatulas, cups, filters.

2.2 Research method

The method used in research was an experimental method consisting of 5 treatments and 20 semi-trained panelists as replications, while the percentage of carrot flour addition was, namely, 0%, 5%; 10%; 15%; and 20%. Consists of five treatments with 20 semi-trained panelists with the addition of carrot flour. The parameters observed were physical tests (carrot flour, and elasticity in the otak-otak), chemical tests ((protein content, water content, ash content, carotene content) were low for the control treatment and most preferred), hedonic test (test preference) based on organoleptic characteristics which include appearance, aroma, texture, and taste.

2.3 Procedure For Making Carrot Flour

Carrots are washed in runny water, dikupasengrot carrot and cut into small pieces and stored plates. Wortelblender until smooth and placed in the pan and covered by Cling Wrap. Wortel included in the blower with a temperature of 40-60°C for less than 20 hours. Carrots that have been driving are smoothened using blenders, in more or less 10 minutes, then using 80 mesh to get finer and more homogeneous carrot flour.

2.3.2 Procedure For Making Otak- Otak

Snakehead fish is weeded, by removing the scaly, gills and stomach contents, then washed and drained. Filet meat is placed in a basin that has been given ice cubes to prevent the increase in temperature and inhibit the growth of bacteria. The meat of the filet is cut into pieces and ground using a food processor. Spices added like white egg, stirred until evenly distributed, then put white onion, pepper, sugar cucumber, flour, tapioca flour, carrot flour (according to treatment) and then added to the average dough. Add thick coconut milk and add chives and thick coconut milk. The mixture is mixed, then steamed using a 2-level pan (stainless steel) The temperature used in steaming ranges from 60-90oC, the steaming process takes 10-30 minutes. The dough that has been steamed is stirred on a tray and allowed to stand so the otak-otak cool. Otak-otak that have been cooled are done by frying.

2.3.3 Proximate Composi

The macronutrient of otak-otak was determined according to AOAC methods [2]. 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 550-600oC. Watre content was determined by drying the samples overnight at 105-110oC. Carotene content Absorbance (optical density)

2.4 Data Analysis

Analysis of the data in this research for protein content, water content, ash content, carotene content and elasticity in the otak-otak using a comparative descriptive method. Sensory test were analysis used non-parametric statistics, analysis of two-way variance friedman test with Chi-square test, followed by using multiple comparison tests (to determine differences in treatment. Pairwise

comparison tests were conducted to take panelist decisions on the criteria of the preferred product, followed by the Bayes method for the best decision making from several alternatives taking into account the weight of the criteria (Marimin 2004).

3. Results and Discussion

3.1 The yield of Carrot Flour

Based on the research results of carrot yield, carrot flour produced 121 g, from the weight of 1200 g fresh carrots so that the yield of carrot flour yield is 10.08%. Carrot flour drying is done using an oven blower with a temperature of 50 - 60°C for $\pm$ 20 hours which can affect the final yield of carrot flour. Good carrot flour has a low water content, so that in the process many components of water are reduced due to evaporation. The low yield due to the effect of the dry, roast and evaporation process (Cucikodana 2012 in Annisa 2017). The end result contains ingredients that are free of water or contain low amounts of water. The yield value of carrot flour is largely determined by the water content. The lower the dry material and the higher the water content it contains carrots, the lower the yield. According to Saranaung et al. (2018), the finer the material, the higher the yield produced. Yield carrot flour produced is used as an ingredient added to the otak-otak as a substitute for vitamin-A fortification.

3.2 Elasticity In The Otak-otak

Folding Test (folding test) is a physical test to determine the level of elasticity of a product. A folding test was carried out on the products of snakehead fish otak-otak with the aim to determine the level of elasticity. The elasticity is based on the ease of time to chew without losing the characteristics of the network that are worth eliminating (Sudrajat 2007). Based on the results of folding tests on snakehead fish otak-otak, it was found that the addition of carrot flour in all treatments included the criteria of springy and quite springy. Carrot flour fortification of 15% and 20% has a value of 3 with a fairly elastic level. In the control treatment, 5% and 10% have a value of 4 which means chewy. Addition of carrot flour to otak-otak more and more will produce otak-otak that are less springy. The elasticity of the otak-otak is influenced by several factors, namely the number of snakehead fish added and the filling material in the otak-otak. The composition of tapioca flour in fish otak-otak greatly influences the elasticity or texture of the otak-otak themselves. In making carrot flour otak-otak there are carrots which also contain fiber content. According to Munawwarah (2017), carrots are classified as high sources of dietary fiber vegetables, and natural sources of antioxidants. The assessment of the folding test of the snakehead fish otak-otak with the addition of carrot flour can be seen in Table 1.

3.3 Organoleptic Test

3.3.1 Appearance

Products with neat, uniform, uniform forms will be more questionable by consumers compared to products that are less tidy and incomplete (Soekarto 1985). Based on the Friedman test shows that the addition of carrot flour significantly influences the level of likeness to the appearance of the otak-otak, so that the Multiple Comparison test is performed. Based on the results of the statistical analysis of the appearance of otak-otak, the carrot flour addition to the otak-otak has a significant effect on otak-otak (Table 2). Based on the parameters of the appearance of the otak-otak, the median value generated at the preference level of the appearance of the otak-otak of each aid obtained by carrots obtained a median value between 5 - 8. The value indicates the product expected and received by the panelists. The highest average appearance was produced in the 10% training has an average value of 7.4 with a median value of 8 and the lowest in the administration of carrot flour in the training of 20% has an average value of 5.3 with a median value of 5. The color orange in the otak-otak because carrots have color pigments in carrots as an additional raw material. Reddish yellow carrot bulbs that contain high carotene (Berlian and Hartuti 2003). The higher success rate of carrot flour will produce an orange color in the snakehead otak-otak that are more equal. According to Winarno (2011) carrots have a natural coloring agent, beta-carotene which can provide an orange color that is suitable for food.

3.2.2 Aroma

The aroma received by the otak-otak and otak-otak is more mixed than the main aroma which is fragrant, rancid, sour and scorched (Winarno 1991). Scent assessment to determine the delicacy of food based on the five sense of smell. The scent of the otak-otak produces the same scent with each gift. The average aroma of otak-otak with the addition of carrot flour is almost as can be seen in Table 3. Aroma is one of the factors that will determine consumers to choose a product because the aroma can attract consumers' attention to these food products (Bakhtiar et al. 2019). Based on the aroma parameters of otak-otak, the median value generated at the level of likeness of the appearance of otak-otak per carrot support is obtained median values increased between 6 to 7. The value indicates the product produced and received by the panelists. The average value of the aroma of the otak-otak with the highest carrot flour produced on approval (10%) has an average value of 7.1 with a median value of 7 and the lowest on carrot flour in the care of 20% has an average value of 6.0 with a value of median 6. The aroma of food determines the delicacy of these foods. The aroma of fish otak-otak used by herbs in the formulation and use of banana leaves as packaging for otak-otak during steaming. Otak-otak from snakehead fish raw material decomposed in the processing process. This is caused by the reaction of proteins and fats into compounds that are easily degraded by food ingredients by heat. According to Pratama et al. (2018), Volatile compounds contained in ingredients give the aroma to the aroma characteristics of a product. The characteristic aroma of the product and the volatile components contained in it is one of the important factors in determining the quality of a food ingredient. The aroma components can influence the organoleptic characteristics of a food ingredient in the end giving a role on the level of acceptance and consumption of the final product.

3.2.3 Texture

Texture is one of the factors that can determine the level of acceptance of the otak-otak. Texture factors include palpability, tenderness and easy chewing (Meilgaard et.al. 1999) and wetness, dryness, hardness, smoothness, roughness, crispness and oiliness (Soekarto and Hubeis 2000). According to Winarno (2004), texture is a characteristic of a product and the main criteria in estimating food quality. Based on the Friedman test shows that the addition of carrot flour in otak-otak gives an influence on the level of texture preference so that a multiple comparison test is performed. Based on the results of the statistical analysis of the texture of otak-otak, the carrot flour addition to the otak-otak has a significant effect on the otak-otak (Table 4). Based on the texture parameters of the otak-otak, all treatments are still accepted by panelists with a median value between 5 and 7 which means they are in the normal to preferred category. This value indicates that the product was received and liked by the panelists. The highest average value found in the treatment (10%) has an average value of 7.0 with a median value of 7 while the lowest average value is in the 20% trance of 4.9 with a median value of 5. Addition of carrot flour 20 % produces a less springy texture and the texture is a bit cracked and hard. Whereas the 10% treatment that is preferred has a chewy texture.

According to Ali et al (2003) states that the orange color in carrots shows that it contains β -carotene as a source of natural antioxidants, food fiber, tocopherol, ascorbic acid, and γ -tocopherol. The more additions of carrot flour contained in otak-otak, the less chewy the resulting texture will be a little cracked and hard. Violence is affected by food fiber, the higher the food fiber, the harder the texture of the product. Offer and Knight (1998) state that the amount of water contained in food affects the texture and level of violence.

3.2.4 Taste

Taste is a very decisive factor in the panelists' final decision to accept or reject a food, because taking into account other parameters that are good but have unnecessary taste, the product will be rejected (Soekarto 1985). Based on the Friedman test shows that the addition of carrot flour significantly influences the level of likeness to the taste of the otak-otak, so that the Multiple Comparison test is performed. Based on the results of the statistical analysis of the taste of the otak-

otak, the carrot flour addition to the otak-otak has a significant effect on the otak-otak (Table 5). Taste is a parameter that is agreed upon using the taste buds or tongue. Based on the parameters of taste for the otak-otak, all meetings are still accepted by panelists with a range of median values from 5 to 7 which means they are included in the normal category to be accepted. The highest average value at 10% treatment is 7.2 with a median value of 7 while the lowest average value at 20% treatment is at 5.3 with a median value of 5. Taste in the processing otak-otak by 20% increases the strengthening of the more dominant carrot flour, thereby eliminating the savory taste of these otak-otak compared to other aids. The 10% carrots supported by panelists have a nice and chewy taste and have a balanced fish and carrot flavor. The addition of carrot flour which is higher makes the resulting fish taste less and less. The taste can be caused by several factors caused by seasonings (salt, garlic, onion, pepper, sugar and coconut milk). The composition of seasoning, in the use of tapioca flour and carrots also contributes to the taste of snakehead fish otak-otak. The taste of snakehead fish otak-otak during processing, especially in steaming using banana leaf packaging, causing a distinctive aroma and taste. The taste is also important from the hydrolysis of protein in fish meat to glutamic amino acids which give rise to a characteristic taste in the snakehead fish otak-otak. According to Ozden (2005), amino acids which directly contribute to taste and taste and can be precursors for aromatic components. Glutamic acid contributes to the taste of umami if the concentration in food products is above the threshold of taste (Zhao et. Al. 2016) According to Suryaningrum (2002), the taste of food is needed by the components that are in food such as protein, fat, and carbohydrates. arrange it. More taste tests involve the senses of the tongue which can be identified through the solubility of food in contact with the taste nerves.

3.3 Decision Making with Bayes Method

The best otak-otak decision is made by the Bayes method. The Bayes method is one technique that can be used to analysis the best decision making from a number of alternatives that aim to obtain optimal results. The results of the weight calculation of the appearance criteria are 0.18; aroma 0.16; texture 0.20 and taste is 0.46. Based on the weight gain of appearance criteria, aroma, texture and taste, it was found that taste assessment was the most important criterion that would determine the final decision of the panelist. The decision matrix for the otak-otak assessment using the Bayes method is presented in Table 6. Based on the Bayes method, it was found that otak-otak with the addition of carrot flour was almost 10% which was the most preferred treatment for panelists with an alternative value of 7.18. While the lowest alternative value is 20% with a value of 5.16.

3.4 Proximate Composition

3.4.1 Protein content

Protein is an important food for the body. Apart from being a fuel, protein is also used as forming new tissues that can be done in the body and replacing damaged body tissues. The main function of proteins is to form new tissue and maintain existing tissue (Asni 2004). Based on the test results, the protein value of the otak-otak produced increases with increasing amount of carrot flour. Protein levels without using 8.99% carrot flour, while proteins with 10% carrot flour levels increased to 11.50%. This added by carrot flour has added protein content, so that the protein levels of the snakehead fish otak-otak increases.

3.4.2 Water content

Water is an important component in food because it can affect the texture, appearance and taste of food (Winarno 2008). Based on the test results, the value of the water content of the otak-otak produced decreases along with the increasing amount of carrot flour. Otak-otak water content value without the addition of carrot flour is equal to 38.90% decreases to 34.37% in the treatment of adding 10% carrot flour. This is influenced by the high water content in added carrot flour, so that the otak-otak water level decreases. Water content decreased with the addition of 10% carrot flour. The process

of making carrot flour uses drying at a temperature of 50-60°C for $\pm$ 20 hours. The longer a material is in direct contact with heat, the water content will also be lower.

3.4.3 Ash content

Ash content in a product can be seen the amount of minerals contained in the product (Khalisi 2011). The more mineral content, the higher the reverse (Sari et al. 2016). Based on the results, the ash levels of the otak-otak without using carrot flour were 1.56%, while the ash levels of the otak-otak in the treatment require 10% carrot flour which is equal to 1.61%. Increased gray content by higher mineral content of carrot flour.

3.4.4 Carotene content

Carotene is the most abundant pigment found in carrots. The role of carotene is important because part of the carotene, β -carotene is a precursor of vitamin-A (Abdillah 2006). Based on observations of carotene snakehead fish otak-otak analysis with a treatment of 10%, a value of 29.68 μ g was obtained. The carotene content in otak-otak products comes from carrot flour. The more additions to carrot flour, the more beta-carotene content in the otak-otak products produced. This is caused by carrots which are a source of provitamin A vegetables, which have high carotene content (Ali and Rahayu 2001).

4. Conclusion

The results addition of carrot flour as much 10% the most preferred treatment by the panelist. carrot flour doesn't affect the aroma but seems to improve the color, texture, taste, and elasticity with a favorite value for appearance 8 (very liked) aroma, texture, and taste 7 (liked). The result proximate composition of protein content is 11.5%, ash content is 1,61%, water content is 34,27%, and carotene content is 29,68%.

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Table 1 : Elasticity Based On The Addition Of Carrot Flour

Addition of Carrot Flour (%)	Average	Ranking	Elasticity
0	4	A	Chewy
5	4	A	Chewy
10	4	A	Chewy
15	3	B	cukup kenyal
20	3	B	cukup kenyal

Tabel 2 : Average Otak-otak Appearance Various Treatment of Carrot Flour Addition

Addition of Carror Flour	Median Value	Average Appearance
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(%)		
0	7	7,1 b
5	7	6,9 b
10	8	7,4 b
15	5	5,7 ab
20	5	5,3 a

Tabel 3 : Average Otak-otak Smell Various Treatment of Carrot Flour Addition

Addition of Carror Flour (%)	Median Value	Smell Average
0	7	6,9 a
5	7	6,3 a
10	7	7,1 a
15	7	6,2 a
20	6	6,0 a

Tabel 4: Average Otak-otak Texture Various Treatment of Carrot Flour Addition

Addition of Carror Flour (%)	Median Value	Average Texture
0	7	6,7 b
5	7	6,9 b
10	7	7,0 b
15	7	6,0 ab
20	5	4,9 a

Tabel 5: Average Otak-otak Taste Various Treatment of Carrot Flour Addition

Addition of Carror Flour (%)	Median Value	Average Taste
0	7	6,4 ab
5	5	5,6 a
10	7	7,2 b
15	7	6,1 a
20	5	5,3 a

Description: Values followed by the same letter show no significant difference in the multiple comparison test at the level of 5%

Tabel 6 : Decision matrix for the otak-otak assessment using the Bayes method

	Kriteria				Value Alternative	Value Priority
	Appearance	Aroma	Texture	Taste		
0,0	0	7	7	7	7	7,00
2,5	5	7	7	7	5	6,08
5,0	10	8	7	7	7	7,18
7,5	15	5	7	7	7	6,61
10	20	5	6	5	5	5,16
Criteria Weight	Criteria Value	0,18	0,16	0,20	0,46	32,06

Table 7 : Proximate composition of otak-otak

Compotition	Treatment	
	0,0%	5,0%
Protein (%)	8,99	11,50
Ash (%)	1,56	1,61
Water (%)	38,90	34,27
Carotene (ppm)	-	29,68

Source: Laboratory of Engineering Food, University of Pasundan

6. References

1. Afrianto, E dan E. Liviawaty.. Pengawetan dan Pengolahan Ikan. Kanisius, Jakarta, 1989.
2. Ali, N dan Rahayu, E. 2001. *Wortel dan Lobak*. Penebar Swadaya. Jakarta.
3. Association of Official Analytical and Chemistry [AOAC]. Official Methods of Analysis. 18thed. Association of Official Analytical Chemists Inc. Marylan. 2007.
4. Cahyono, B. 2002. *Wortel Teknik Budi Daya Analisis Usaha Tani*. Kanisius. Yogyakarta.
5. Direktorat Gizi Departemen Kesehatan Republik Indonesia. 2000. *Kandungan Gizi Zat Makanan*. Departemen Kesehatan Republik Indonesia. Jakarta.
6. Laksmi R. 2012. *Daya Ikat Air, Ph Dan Sifat Organoleptik Chicken Nugget Yang Disubstitusi Telur Rebus*. Animal Agriculture Journal. Semarang.
7. Marimin. Pengambilan Keputusan Kriteria Majemuk. Grasindo, Jakarta. 2004.
8. Offer G, Knight P. 1988. The structural basis of water holding in meat. Development in Meat Science-4. Lawrie R. London: Elsevier Applied Science.
9. Pratama, R.I., I. Rostini., dan E. Liviawaty. 2014. Karakteristik Biskuit dengan Penambahan Tepung Tulang Ikan Jangilus (*Istiophorus* sp.). *Jurnal Akuatika*, 5 (1): 30-39.
10. Soekarto, T dan Suwarno. 1985. *Penilaian Organoleptik untuk Industri Pangan dan Hasil Pertanian*. Bharata Karya Aksara. Jakarta.
11. Susiwi, S. 2009. *Penilaian Organoleptik*. Universitas Pendidikan Indonesia. Bandung.
12. Suzuki T. 1981. *Fish and Krill Protein*. Processing Technology. London: Applied Sci. Publ.
13. Winarno, F.G. 2002. Ilmu Pangan dan Gizi. Gramedia Pustaka Utama. Jakarta.
14. WHO and Agriculture Organization of the United Nations. 2006. *Guidelines on food fortification with micronutrients*.