

Original Research Article

THE EFFECT OF ADDITION NILEM FISH PROTEIN CONCENTRATE FLOUR ON THE PREFERENCE LEVELS OF MOCHI CAKE

ABSTRACT

Nilem fish (*Osteochilus hasselti*) is a type of freshwater fish that is widely farm in West Java. Nilem fish can be made into fish protein concentrate (FPC) flour, so we can use it widely. The addition of fish protein concentrate flour to the mochi cake might affect the organoleptic characteristics. This research aims to determine the properly concentration of nilem fish protein concentrate to get the mochi cake that was preferred by panelists. This research was conducted from August 2019 - January 2020 at the Laboratory of Fisheries Product Processing, Faculty of Fisheries and Marine Sciences, Padjadjaran University. The method used in this research was experimental with four treatments, which is the addition of 0%, 3.5%, 4.5% and 5.5% nilem fish protein concentrates from white glutinous rice flour was used. The parameters observed were the preference level of color, aroma, texture, and taste of Mochi cake. The results showed that mochi cake with the addition of 4.5% nilem fish protein concentrate flour produced a mochi cake that most preferred by panelists, which has characteristics an ivory white color, a bit of fish smell, chewy but dense enough and sweet taste with a little typical flavor of nilem fish protein concentrate.

Keywords: Aroma, Color, Fish Protein Concentrate, Nilem Fish, Taste, Texture

1. INTRODUCTION

Nilem fish (*Osteochilus hasselti*) is a type of freshwater fish that is widely farm in West Java [1]. Nilem has been developed into a superior product of freshwater aquaculture. People, in general, consume nilem fish in the form of fried, jerked, smoked, and pindang. Lack of serving style of nilem fish can make consumers bored. Nilem fish also have many fish bone that make consumers choose not to consume it. Another processing of nilem fish is made into fish protein concentrate (FPC) flour.

Fish protein concentrate has a high protein concentration because in its process the water and fat are removed [2]. Fish protein concentrate is made in the flour form, this is can make very large utilization. Fish protein concentrate flour can be applied to a variety of processed foods, especially low-protein food products [3]. Fish protein concentrate flour has a long shelf life because of less content of water and fat. Utilization of fish protein concentrate flour in food can attract public interest because it has a high protein content so that it becomes one of the sources of animal protein. Increasing the nutritional value of food products can be done by fortification of food ingredients, such as fortification of proteins, vitamins and minerals [4].

Comment [DE1]: OF NILEM

Comment [DE2]: farmed

Comment [DE3]: concentrate

Comment [DE4]: so that it can have wide application

Comment [DE5]: proper

Comment [DE6]: 3.5%, 4.5% and 5.5%

Comment [DE7]: 4.5%

Comment [DE8]: Was preferred most

Comment [DE9]: a characteristic ivory white color

Comment [DE10]: farmed

Comment [DE11]: look for a better word to use to qualify this

Comment [DE12]: method of processing

Comment [DE13]: during processing

Comment [DE14]: into

Comment [DE15]: please rephrase

One kind of snack that loved by people is mochi cake. Mochi cake is one of the cake types originating from East Asia, especially China and Japan, which has glutinous rice flour as base ingredients [5]. Mochi cake is a type of semi-wet cake that has a sweet taste and chewy texture due to the gelatinization process from the ingredients [6]. Mochi cake has developed in Indonesia and is make as one of the typical foods from Sukabumi. Mochi cake can be made into various variants, such as dough, filling, and flavors. The addition of nilem fish protein concentrate flour to mochi cake is also can added value and increase people's interest in consuming fish. The addition of fish protein concentrate flour to the mochi cake can affect the organoleptic characteristics. Not much research of mochi cake and nilem fish protein concentrate flour. Based on this, it is necessary to do research on the proper concentration of nilem fish protein concentrate to get the mochi cake that was preferred by panelists.

Comment [DE16]:

Comment [DE17]: remove

Comment [DE18]: can add

Comment [DE19]: has been done on

2. MATERIAL AND METHODS

2.1 TIME AND PLACE

This research was conducted from August 2019 - January 2020 at the Laboratory of Fisheries Product Processing, Faculty of Fisheries and Marine Sciences, Padjadjaran University.

2.2 MATERIALS AND TOOLS

The materials used in this research were nilem fish size 150-250 g tail⁻¹ from majalaya, NaCl, N-Hexane solvent, water, Sodium bicarbonate (NaHCO₃), white glutinous rice flour, white sugar, peanuts, and tapioca flour. The tools used in this research were steaming pots, teflons, 10 and 50 ml measuring cups, calico cloth, jars, sieves, thermometers, digital scales, food processors, blenders, stainless steel bowl, ovens, and gas stoves.

2.3 PROCEDURE OF MAKING MOCHI CAKE

The procedure of making mochi cakes refer to Lungga et al. [5] with modified by adding of nilem fish protein concentrate. The first step is making nilem fish protein concentrate flour. The second step is making mochi cake dough. White glutinous rice flour and white sugar are mixed on stainless steel bowl. Nilem fish protein concentrate flour is added according to treatment. All materials is mixed with water little by little to prevent clot until the mixture is homogeneous. The steaming pots are heated until water boiling (100°C), then the mixture is steamed for 10 minutes. Take away the mixture and stirred for 1-2 minutes, then steamed again for 20 minutes until cooked. Dough that has been cooked is put on a base that has been sprinkled with roasted tapioca flour and then flattened and cooled at room temperature. The third step is making mochi cake filling. Roast the peanuts and removed the seed coat, then refined with a blender. Peanuts that have been refined, mixed with sugar and then add water so that become denser. The last step is mochi cake forming. Mochi cake dough is cutted and put the filling into the dough. Mochi cake is formed into round shape and coated with roasted tapioca flour. The formulation of mochi cake [5] with addition of nilem fish protein concentrate flour is show in Table 1.

Comment [DE20]: which was

Comment [DE21]: are

Comment [DE22]: is

Comment [DE23]: the mixture is taken away and stirred for

Comment [DE24]: cut

Comment [DE25]: filling put into the dough

Comment [DE26]: shown

Table 1. The formulation of mochi cake with addition of nilem fish protein concentrate

flour

Ingredients	A (0%)	B (3,5%)	C (4,5%)	D (5,5%)
<i>Mochi Cake Dough</i>				
White glutinous rice flour (g)	100	100	100	100
White sugar (g)	60	60	60	60
Water (ml)	100	100	100	100
Nilem fish protein concentrate flour (g)	0	3,5	4,5	5,5
<i>Mochi Cake Filling</i>				
Peanuts (g)	50	50	50	50
White Sugar (g)	20	20	20	20
Water (ml)	5	5	5	5

Comment [DE27]: please correct in all the table as 3.5%, 4.5% etc not 3,5

2.4 RESEARCH METHOD

The method used in this research is experimental with four treatments by hedonic test. Hedonic test was carried out using 20 semi-trained panelists who were students of the Faculty of Fisheries and Marine Sciences, Padjadjaran University who had experience in organoleptic testing. The organoleptic characteristics tested included the color, aroma, texture and taste of the mochi cake. The treatments in this research are: 1) Treatment A: 0% addition of Nilem FPC, 2) Treatment B: 3,5% addition of Nilem FPC, 3) Treatment C: 4,5% addition of Nilem FPC, and 4) Treatment D: 5,5% addition of Nilem FPC, from the white glutinous rice flour used.

Comment [DE28]: color and texture are physical characteristics not organoleptic properties

2.5 DATA ANALYSIS

Data from organoleptic test using hedonic test were analyzed using Friedman's two-way variance analysis at the 95% confidence level. This analysis aims to determine there is an effect of addition Nilem fish protein concentrate flour on the mochi cake preference level. If the treatment has a significant effect on the object, the analysis followed by a multiple comparison test. This analysis aims to determine the differences between treatments. Decision making is done using the Bayes method. The Bayes method is used by considering the criteria value and median values [7].

Comment [DE29]: if

Comment [DE30]: of

3. RESULTS AND DISCUSSION

3.1 PREFERENCE LEVEL ON COLOR OF MOCHI CAKE

Panelist first judged a product based on its appearance, such as shape and color. Shape and color is the first sensory that can be seen directly by the panelists. Determination of the quality of foodstuffs generally depends on the color they have, colors that did not deviated from the way it should be can give the special impression for the panelists [8]. Preference level value of mochi cake color is show in Table 2.

Comment [DE31]: deviate

Table 2. The median and average values of preference level of mochi cake color from various treatments by adding Nilem FPC flour

Treatment	Median	Color Average
A (0%)	7	7,70a
B (3,5%)	7	7,00a
C (4,5%)	7	7,60a
D (5,5%)	7	6,50a

The highest average value of preference level on color of mochi cake color is treatment A (0%) at 7,70, followed by treatment C (4,5%) at 7,60 and the lowest is treatment D (5,5%) at 6,50. The color of mochi cake without addition of the Nile fish protein concentrate flour is most preferred by the panelists and its characteristics were clean white color and has a round shape like mochi cakes at public market.

Based on the statistical analysis of Friedman's two-way variant test at a 95% confidence level, the treatment of addition of Nile fish protein concentrate did not significantly affect the preference level on color of mochi cake that was produced ($F_{\text{calculate}} (6,142) < F_{\text{table}} (7,81)$). This shows that the preference level of color of mochi cake from all treatments was relatively equal. The color and shape of the mochi cake for all treatments can be seen in Figure 1.



Fig. 1. Appearance of mochi cake according to treatment

Mochi cake which was added 4,5% Nile fish protein concentrate flour had an average value which was slightly lower than the 0% treatment. The results showed that some panelists dislike the mochi cake which added by 4.5% Nile fish protein concentrate flour. The addition of fish protein concentrate flour made the color of mochi cake become slightly brownish, not as white as mochi cake from 0% treatment. According to Andriaryantoet al. [9], fish protein concentrates contain proteins that can react with fat oxidation products and form an imine compound then become brownish.

Comment [DE32]: please remember to correct using 4.5 instead 4.5

Comment [DE33]: an

3.2 PREFERENCE LEVEL ON AROMA OF MOCHI CAKE

Preference level on aroma of a product in the food industry is considered important because it can quickly provide an assessment of the production result, whether the product is accepted or not by consumers [10]. Preference level value of mochi cake aroma is shown in Table 3.

Table 3. The median and average values of preference level of mochi cake aroma from various treatments of adding Nile FPC flour

Treatment	Median	Aroma average
A (0%)	7	6,80a
B (3,5%)	7	6,30a
C (4,5%)	7	7,50a
D (5,5%)	7	6,30a

The highest average value of preference level of mochi cake aroma is treatment C (4,5%) at 7,50, followed by treatment A (0%) at 6,80 and lowest is treatment B (3,5%) and D (5,5%)

each at 6,30. Based on the statistical analysis of Friedman's two-way variant test at a 95% confidence level, the treatment of addition of nilem fish protein concentrate did not significantly affect the preference level on aroma of mo-chi cake that was produced (Fcalculate value (7,67) <Ftable (7,81)). This shows that the preference level on aroma of mochi cake from all treatments was relatively equal.

Comment [DE34]: confidence

Mochi cake with addition of 4,5% nilem fish protein concentrate flour, has a slightly distinctive aroma derived from nilem fish, while the addition of 5,5%, the fish smell is stronger. This strong aroma causes it to be less favored by panelists. Based on the research of Andriaryantoet al. [9], mochi cake with the addition of 4,5% snakehead fish protein concentrate flour has the highest aroma value with a characteristic aroma of snakehead fish and no additional odor, while 0% treatment only has a neutral aroma of glutinous rice flour.

3.3 PREFERENCE LEVEL ON TEXTURE OF MOCHI CAKE

Texture is a material characteristic as a result of a combination of several physical quality which include size, shape, amount and elements of material formation that can be felt by the sense of touch and taste, including the senses of mouth and vision [11]. Preference level value of mochi cake texture is show in Table 4.

Table 4. The median and average values of preference level of mochi cake texture from various treatments of adding nilem FPC flour

Treatment	Median	Texture average
A (0%)	7	7,10b
B (3,5%)	7	7,00a
C (4,5%)	7	7,10b
D (5,5%)	5	5,30a

The highest average value of preference level of mochi cake texture is treatments A (0%) and C (4,5%) each at 7,10, followed by treatment B (3,5%) at 7,00 and the the lowest is treatment D (5,5%) at 5,30. Based on the statistical analysis of Friedman's two-way variant test at a 95% confidence level, the treatment of addition of nilem fish protein concentrate did significantly affect the preference level on texture of mochi cake that was produced (Fcalculate (10,6) >Ftable (7,81)).

The texture of mochi cake with the addition of 4,5% nilem fish protein concentrate flour is most preferred by the panelists because it has the characteristic of being chewy, quite dense, flexible and soft when chewed, while on the addition of 5,5% the mochi cake is less chewy and denser. Based on the research of Andriaryantoet al. [9], mochi cake with the addition of 4,5% snakehead fish protein concentrate flour has the highest texture value with chewy, supple and soft characteristics (not too hard or too soft). White glutinous rice flour is the main ingredient in making mocha dough. Based on that, mochi cake has chewy and supple characteristics. Glutinous rice flour has 79,45% starch content and contains amylopectin ([12], [13]). Amylopectin is what makes sticky characteristic in glutinous rice when cooked [14]. Carbohydrates have important functional properties in food processing and play a role in determining the rheological characteristics of various types of food ingredients or products [15].

Comment [DE35]: your citation is supposed to have year of publication

3.4 PREFERENCE LEVEL ON TASTE OF MOCHI CAKE

Taste is influenced by several factors namely chemical compounds, temperature, concentration and interactions with other taste components [16]. Preference level value of mochi cake taste is show in Table 5.

Comment [DE36]: components

Table 5. The median and average values of preference level of mochi cake taste from various treatments of adding nilem FPC flour

Treatment	Median	Taste average
A (0%)	7	6,70a
B (3,5%)	7	6,40a
C (4,5%)	9	7,90b
D (5,5%)	5	5,60a

The highest average value of preference level of mochi cake taste is treatment C (4,5%) at 7,90, followed by treatment A (0%) at 6,70, then treatment B (3,5%) at 6,40 and the lowest is treatment D (5,5%) at 5,60. Based on the statistical analysis of Friedman's two-way variant test at a 95% confidence level, the treatment of addition nilem fish protein concentrate did significantly affect the preference level on taste of mochi cake that was produced ($F_{\text{calculate}} (17.6) > F_{\text{table}} (7.81)$).

Mochi cake with the addition of 4,5% nilem fish protein concentrate has a sweet taste with a slight taste from the nilem fish protein concentrate flour, while the addition of 5,5% fish flavor is more stronger. The sweet taste of mochi cake causes by adding sugar at the making process. Sugar is a general term that is often interpreted for any carbohydrate used as a sweetener. White sugar from sugar cane has 99,8% purity (sucrose) and 0,1% moisture content [17]. If a food is treated, it can be influenced by a combination of flavors caused by existing components [12]. These results are the same as those of Andriaryantoef *et al.* [9], where mochi cake with the addition of 4,5% snakehead fish protein concentrate flour has the highest taste value with good specific taste characteristics. Amino acids and fats in snakehead fish give extra taste to mochi which is good distinctive taste.

Comment [DE37]: concentrart

Comment [DE38]: the sweet taste of Mochi cake comes from the sugar added in the process of making it.

Comment [DE39]: remove

Comment [DE40]: year

3.5 DECISION MAKING USING BAYES METHOD

Decision making using Bayes method needs information in form of probability of each alternative present at deal a problems and next will be result prospect value as base for decision making [18]. The assesment of decision making using bayes method ofmochi cake is show at Table 6.

Comment [DE41]: to deal with the problem

Table 6. Matrix of mochi cake valuation decisions by Bayes method

Treatment	Color	Aroma	Texture	Taste	Alternative value	Priority value
A (0%)	7,70	6,80	7,10	6,70	6,89	0,26
B (3,5%)	7,00	6,30	7,00	6,40	6,59	0,25
C (4,5%)	7,60	7,50	7,10	7,90	7,63	0,28
D (5,5%)	6,50	6,30	5,30	5,60	5,67	0,21
Criteria value	0,08	0,10	0,25	0,56		

The quantification results of criteria value of color, aroma, taste and texture of mochi cake showed that the taste has the highest criteria value, this proves that the taste criteria most influential on the assessment of mochi cake and become the main consideration in selecting products [19].

Comment [DE42]: criteria has

Comment [DE43]: influence

Comment [DE44]: for

Based on the alternative value by Bayes method, shows that the treatment C which is mochi cake with the addition of 4,5% nilem fish protein concentrate flour has the highest alternative value at 7,63. These results were followed consecutively with treatments A (0%), B (3,5%) and C (5,5%). Based on these alternative values, mochi cake with the addition of 4.5% nilem fish protein concentrate flour is more preferred treatment by panelists compared to other treatments. The mochi cake characteristics is an ivory white color, a bit of fish smell, chewy texture but dense enough and sweet taste with a little typical flavor of nilem fish protein concentrate.

Comment [DE45]: was a

4. CONCLUSION

The results showed that mochi cake with the addition of 4,5% nilem fish protein concentrate flour produced mochi cake which panelists preferred over other treatments. The mochi cake characteristics is an ivory white color, a bit of fish aroma, chewy texture but dense enough and sweet taste with a little typical flavor of nilem fish protein concentrate.

REFERENCES

1. Tarigan N, Supriatna I, Setiadi MA, Affandi R. The Effect of Vitamin E Supplement in The Diet on Gonad Maturation of Nilem (*Osteochilus hasselti*, CV). *Jurnal Perikanan UGM*. 2017;19(1):1-9.
2. Romadhoni AR, Afrianto E, Pratama RI, Grandiosa R. Extraction of Snakehead Fish [*Ophiocephalus striatus* (Bloch, 1793)] Into Fish Protein Concentrate as Albumin Source using Various Solvent. *Aquatic Procedia*. 2016;7:4-11.
3. Rieuwpassa FJ, Santoso J, Trilaksana W. Characterization of Functional Properties Fish Protein Concentrate of Skipjack Roe (*Katsuwonus pelamis*). *Jurnal Ilmudan Teknologi Kelautan Tropis*. 2013;5(2):299-310.
4. Purwandani L, Indrastuti E, Ramadhia M. Fortifikasi Tepung Ikan Lele (*Clarias gariepinus*) pada Pembuatan Snack dari Pati Jagung (*Zea mays*). *Vokasi*. 2013;9(2):175-179.
5. Lungga A, Karyatina M, Kurniawati L. Characteristics of Mochi Cake with Red Guava Leaf Extract (*Psidium guajava*) and Ginger (*Zingiber officinale*). *Jurnal Ilmiah Teknologi dan Industri Pangan UNISRI*. 2016;1(1):29-34.
6. Sagala H, Ilza M, Sari I. The Effect of *Spirulina* sp Flour Fortification on The Sensory-Chemical Characters of Mochi Cake. *Jurnal Online Maha-siswa UNRI*. 2017;4(2):1-12.
7. Fajrita I, Junianto, Sriati. Tingkat Kesukaan Petis dari Cairan Hasil Pemindangan Bandeng dengan Penambahan Tepung Tapioka yang Berbeda. *Jurnal Perikanan Kelautan*. 2016;7(2):121-127.
8. Negara JK, Sio AK, Rifkhan, Arifin M, Oktaviana AY, Wihansah RRS, Yusuf M. Microbiologist Aspects and Sensory (Flavor, Color, Texture, Aroma) In Two Different Presentation Soft Cheese. *Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan*. 2016;4(2):286-290.
9. Andriaryanto, Dewita, Syahrul. The Assessment of Mochi Quality Was Fortified Snakehead Fish (*Channa striata*) Protein Concentrate. *Jurnal Online Mahasiswa UNRI*. 2015;2(1):1-9.
10. Dewita, Syahrul. Fortifikasi Konsentrat Protein Ikan Patin Siam pada Produk Snack Amplang dan Mi Sagul Instan Sebagai Produk Unggulan Daerah Riau. *Jurnal Pengolahan Hasil Perikanan Indonesia*. 2014;17(2):156-164.
11. Midayanto DN, Yuwono SS. Penentuan Atribut Mutu Tekstur Tahu untuk Direkomendasikan Sebagai Syarat Tambahan dalam Standar Nasional Indonesia. *Jurnal Pangan dan Agroindustri*. 2014;2(4):259-267.
12. Singgih WD, Harijono. The Effect of Proportion Glutinous Rice Flour and Potatoes on Wingko Processing. *Jurnal Pangan dan Agroindustri*. 2015;3(4):1573-1583.

13. Schilling RL, Rafael S, Schilling J. Method of Producing Granulated and Powdered Moch-Like Food Product and Wheat Flour Substi-tute. United States Patent, US. 2014. Accessed 4 December 2019. Available: <https://patents.google.com/patent/US8846128B2/en>.
14. Sutedja AM, Trisnawati YC. PemanfaatanTepungBerasKetanHitam (Oryza sativa glutinuosu L.) Pregelatinisasipadaproduk flake.Prosiding Seminar Nasional PATPI. 2013:193-204.
15. Andarwulan N,Kusnandar F,Herawati D.AnalisisPangan. Jakarta: Dian Rakyat; 2011.
16. Afriani RR, Kurniawati N,Rostini I. PenambahanKonsentrat Protein IkanNilaTerhadapKarakteristikKimia danOrganoleptikBiskuit.JurnalPerikananKelautan UNRI. 2016:7(1):6-13.
17. Buckle KA, Edwards RA, Fleet GH, Wootton M.IlmuPangan. Jakarta: UI-Press; 2013.
18. Siregar SL, Ariswoyo S,Sembiring P. PengambilanKeputusanMenggunakanMetode Bayes padaEkspetasiFungsiUtilitas. SaintiaMatematika. 2014:2(1):47-54.
19. Widjaya FP, Liviawaty E, Kurniawati N. Fortifikasi Protein SurimiManyungTerhadap Tingkat KesukaanDonat. JurnalPerikananKelautan. vol. 6, No. 1, pp. 15-22. 2015:6(1):15-22.

Comments

1. There should a statement written to indicate if there is conflict of interest amongst authors.
2. Please look at comments made properly and make appropriate corrections as the use of English seems to be your major challenge