Original Research Article

ACCEPTANCE LEVEL OF WET SPRING ROLLS WITH THE ADDITION of PATIN FISH (*Pangasius* sp) BONE FLOUR AS A SOURCE OF CALCIUM

ABSTRACT

Patin is a commodity fish that is in great demand from year to year. Utilization of fish bone waste has not been done much. Patin bone waste from the fillet industry can be used as flour. Patin bone flour has a high calcium content. This study aims to determine the percentage of patin fishbone flour in the manufacture of wet spring roll skin which is the most preferred by the panelists. The method used was an experimental method with the addition of patin fishbone flour at 0%, 6%, 8%, and 10%. Observations parameters made were the level of preference including color, taste, aroma, texture and tested using the Friedman test and the Bayes method. The addition of patin fishbone powder to spring roll skin was significantly different in aroma and taste, but not significantly different in color and texture. The results showed that the addition of 6% patin fishbone flour was the most preferred treatment by the panelists because it had an alternative value of 7.55.

Keywords: Fortification, Spring Roll Skin, Patin Fishbone Flour, Level of Preference

1. INTRODUCTION

Patin is a commodity fish that is in great demand from year to year. In 2017, patin production reached 319,967 tons, an increase. In 2020, the national Patin production reached 408,538 tons [1](Suryana 2021). Patin are usually processed in the form of fillets. In 2019, patin fillets for export to Saudi Arabia reached 236,000 tons [2](Widarti 2019). The Patin fillet industry produces a yield of about 33%, while the remaining 67% is waste in the form of skin, head, bones, stomach contents [3](Suryaningrum 2008).

Utilization of fish bone waste has not been attempted much. Generally, the handling of residual waste from the fishing industry is only buried or used as animal feed material [4] (Putranto et al. 2015). Waste pollution is difficult to avoid if the disposal is carried out without going through a waste treatment process or using waste first. Patin bone waste from the fillet industry can be used as flour. Patin bone flour has a calcium content of 1002 mg/100g [5] (Afrinis 2018).

Calcium is one of the minerals that the body needs for the growth of bones and teeth, regulates the blood clotting process [6](Dewi 2010). Calcium deficiency can cause osteoporosis in the elderly, and rickets in children. Data in 2018 shows that 25.7% of adolescents aged 13-15 years and 26.9% of adolescents aged 16-18 years have short nutritional status [7]. Mulyani's research (2015)[8] revealed that the average calcium intake in Java by region showed a difference. The average intake of calcium in urban and rural areas is 1108.84 mg/day and 980.28 mg/day.

Popular sources of calcium are milk and its derivatives, namely cheese and supplements calcium. The high cost of these products can be replaced by utilizing fish bone waste into products that can be consumed. There are many ways to process fish bone waste that is added to food products, one of which is in the manufacture of spring roll skins.

Based on the literature study, there are several studies regarding the use of patin bone flour in various food products. Afrinis et al (2018) [5] the formulation and characteristics of high protein and calcium with the addition of patin bone flour for stunting toddlers with 4%, 6%, 8%, 10% of 100 gram weight of rice flour and cornstarch. The results of the study showed that the vermicelli with the addition of 4% was the most preferred by the panelists. The results obtained were 230 kcal of energy, 6.5 grams of protein, 4.7 grams of fat, 40.3 grams of carbohydrates, 82.1 mg of calcium and 90.3 mg of phosphorus.

Pangestika et al (2021) researched about the use of patin bone flour in the manufacture of cookies, with the treatment of giving 8%, 16%, 24% of each fish in the treatment in making cookies. The results of the calcium content obtained in the addition of 8% patin bone flour was 47.7 mg/100 g, and the addition of 8% tuna bone flour was 120.2 mg/100 g.

Harmain et al (2016) researched about the development of traditional ilabulo food as a functional food fortified with seaweed (Kappahycus alvarezii) and patin bone flour (Pangasius sp). This study used 3 treatments, the ratio of patin bone flour: seaweed pulp, namely A (10%: 5%), B (15%: 10%), C (20%: 15%). The results showed that formulation C (20%:15%) was the most preferred treatment by panelists with 54.46% moisture content, 11.54% ash content, 7.78% protein content, 8.91% fat, 0, 61% fiber content, 22.07% carbohydrate, 0.315% calcium content addition of patin bone flour in traditional ilabulo food.

Mukhaimin et al (2022) [19] researched about the addition of patin bone flour in the manufacture of white bread with 4 treatments, namely 0%, 2.5%, 5%, and 7.5%. The results showed that the addition of 2.5% was the most preferred treatment. This treatment resulted in 17.76% water content, 2.54% ash content, 12.15% protein content, 2.52% fat content, and 65.03% carbohydrate content.

Fajaria et al (2019) investigated the addition of patin bone flour and white oyster mushroom on calcium levels and sensory characteristics of crackers. This study was tested using a completely randomized design with two factors. The first factor was tapioca formulation: patin bone flour: white oyster mushroom with three treatment levels (86%: 8%: 6), (86%: 10%: 4%), and (90%, 5%, 5%) . The results showed that the best treatment was crackers with formulation (86%:10%:4%) with calcium content 568.345mg/100g, water content 8.96%, ash content 0.63%, fat content 0.22%, protein content 1.46%, carbohydrate content of 88.72%, and phosphorus content of 20.28 mg/ 100g. Research on the addition of patin bone flour has been carried out on various products, but there has been no research on the addition of patin bone flour in coating foods, especially spring roll skin.

Spring roll skin is a food coating used to protect the main filling of a food. Spring roll skin is round and thin, widely used in making pisang aroma, martabak, risoles. Other coating foods are dumpling skin and dimsum skin. Spring roll skin is used as a fortification option compared to other products such as dumpling skin. The advantages of this product are quite a lot to be found and in demand by the public, or food sellers who use spring roll skins on their products. Spring roll skin products are often found both in the market and in places selling snacks. The high demand for spring roll skin in the market can be seen from the spring roll skin production house. Mughis (2018)[9] in his interview with Central Java Today Magazine, explained that in a day he can produce four sacks of wheat flour with each bag containing 1400 pieces of spring roll skin. Hermawan (2019) [10] in IDN Times (2019) together with the Dandi Abadi Production House in Siantar Sumatra stated that the production house was able to sell 3000-4000 pieces of spring roll skin per day. While the drawback of this product is that the basic ingredients are relatively low in calcium.

Fortification of Patin bone flour on spring roll skin can affect the level of consumer preference. In order for fortification to work effectively, the product must be liked by consumers. This study aims to determine the percentage of addition of Patin bone flour in the manufacture of the most preferred wet spring roll skin.

2 METHODOLOGY

2.1 Time and Place of Research

This research was conducted in February 2022. Making patin bone flour, making spring roll skin and organoleptic testing (hedonic test) were carried out at the Fishery Product Processing Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University.

2.2 Research Tools and Materials

The tools used in making patin bone flour are cutting boards, toothbrush, pressure cooker, blender, 80 mesh sieve, electric oven, basin, knife, pan. The tools used in making spring roll skin are Teflon, brush, basin, spoon, measuring cup, plastic plate.

The material used in the manufacture of bone flour is 2 kg of patin bone waste obtained from the Patin Fish Fillet Company PT. KMMP Purwakarta. The ingredients used to make spring roll skin are water, salt, wheat flour, egg white and vanilla.

2.3 Research methods

The method used in this research is the experimental method, which consists of 4 levels of treatment. Each treatment can be seen in Table 1.

Table 1. Spring Rolls Skin Formulation with Various Treatments Treatment

Ingredients	Treatments			
	A	B	C	D
Flour (g)	200	200	200	200
Bone Flour (g)	0	12	16	20
Egg White (ml)	100	100	100	100
Salt (g)	1	1	1	1
Water (ml)	200	200	200	200
Vanili (g)	1	1	1	1

Treatment A : Spring roll skin without the addition of patin bone flour
Treatment B : Spring roll skin with the addition of 6% patin bone flour
Treatment C : Spring roll skin with the addition of 8% patin bone flour
Treatment D : Spring roll skin with the addition of 10% patin bone flour

2.4 Procedure of Making Patin Fish Bone

Patin bone flour is made using the fish bone making procedure [11]. The fish bones are washed and cleaned with water until they are clean of any remaining meat that is still attached, then steamed for 10 minutes so that the meat that is still attached is easy to clean, then the bones are washed again with running water. Clean patin bones are boiled in a pan for 30 minutes at 100 ^{o}C, then cut into ± 5 cm and put in a pan for 90 minutes with the aim of making the bones soft at 100 ^{o}C. The patin bones are cleaned again with a small brush, until the meat that is still attached is gone from the fish bones, then dried in an oven with a temperature of ± 100 ^{o}C for 1 hour until bones are dry. The bones are ground using a blender with the aim of crushing the bones until they are smooth like flour. The results of the milling were then sieved with a Tyler sieve with a size of 80 mesh to obtain a homogeneous and soft fishbone flour.

2.5 The Procedure of Making Spring roll

The ingredients; wheat flour, fish bone flour, egg white, salt, water, shaken using a dough spoon until the dough is well mixed. After the dough is finished, a a Teflon/non-stick pan was heated over very low heat (at 50 ^{o}C). The dough was applywith a brush quickly and evenly. After about 1 minute when the edges of the dough start to peel the skin was removed and then greased the spring roll skin with flour so it doesn't stick. Spring roll skin formulations can be seen in **Table 1.**

2.6 Parameters Observation

Oranoleptic parameters were observed. Organoleptic parameters were tested with hedonic test (liking). This hedonic test consisted of parameters such as appearance, aroma, texture, and taste and was carried out with 20 semi-trained panelists. Hedonic testing aims to determine the level of panelists' preference for a product by scoring method very like (9), like (7), neutral/ordinary (5), dislike (3), very dislike (1)[13]. The rejection limit for this product is a scale of 3, which means that if the product being tested gets a value equal to or smaller than the number 3 then the product is not favored by the panelists [13]

2.7 Data Analysis

Hedonic test results were analyzed statistically using non-parametric statistics. This analysis uses non-parametric statistical analysis using a two-way analysis of variance Friedman test with Chi-square test [14]. Then continued by using multiple comparison test (Multiple Comparison) to determine the differences between treatments. Comparison test (Pairwase Comparison) was conducted to make panelist decisions on the preferred product criteria, followed by the Bayes method. Bayes method is used for making the best decisions based on alternative values and considering the weight of the criteria[15].

3 RESULTS AND DISCUSSION

3.1 Color

Color is a parameter that determines the first impression by panelists who are assessed using the sense of sight [16]. Attractive colors with a neat, good, and intact appearance will be preferred by consumers compared to products that are less neat and incomplete [13]. Based on the Friedman test analysis with a 95% confidence level on the level of preference for the color of the spring roll skin, it was found that the addition of patin bone flour in the manufacture of spring roll skin did not have a significant effect. The results of the median value of the panelists' assessment of the skin color of the spring rolls was 7, which means the color of the skin of the spring rolls with the addition of patin bone flour was still favored by the panelists. The highest average color value was found in the spring roll skin treatment without the addition of patin bone flour (control), while the lowest average color value was found in the spring roll skin with the addition of 8% and 10%, namely 6.5. The addition of patin bone flour to spring roll skin based on the results of statistical tests had no effect on all treatments.

The control treatment (with 0% patin bone flour) resulted in a cloudy white spring roll skin, which is quite similar to the color of the commercial spring roll skin, which was cloudy white. The 6% treatment resulted in the lumpia skin having a slightly yellowish white color. The 8% treatment resulted in the color of the spring roll skin which was not too much different from the 6% treatment, which was cloudy white, slightly yellowish. The 10% treatment produced spring roll skin with a yellowish cloudy white color exceeding the 8% treatment. The patin bone flour produced in this study had a slightly yellowish white color. Based on the results of data processing, the panelists still like the color of the spring roll skin produced and so it doesn't really affect the level of color preference. This is in line with Afrinis' research (2018) [5] .The addition of patin bone flour in the manufacture of vermicelli has no effect on the color of the vermicelli. Mulia (2004) [18] added that the addition of patin bone flour to noodles had no effect on the color of the noodles, and the research of Mukhaimin et al (2022)[19] stated that the addition of patin bone flour had no significant effect on the level of preference for white bread.

The color of the spring roll skin is affected by the flour used. Wheat flour as a source of carbohydrates in the spring roll skin gives color and texture to the spring roll skin. Wheat flour which has a white color makes the spring roll skin in this study dominantly white. Spring roll skin color is also affected by heat. The longer the spring roll skin is on Teflon, the whiter the spring roll skin color will then start to brown slightly due to the *Maillard*, which is a reaction that changes color to brown caused by a reaction between protein and carbohydrates [20] .

3.2 Aroma

Assessment aims to determine the delicacy of food ingredients based on the sense of smell. The aroma produced in food products mostly comes from the ingredients added to the dough.

Based on the Friedman test analysis with a 95% confidence level on the level of preference for the aroma of the spring roll skin, it was found that the addition of patin bone flour in the manufacture of spring roll skin was significantly different. Based on **Table 3**, the aroma of spring roll skin treatment was 0% (control) and was not significantly different from the addition of 6% treatment based on multiple comparison, but significantly different from the 8% and 10% treatments. The median value obtained for all treatments ranged from 5 to 7. The aroma of spring roll skin in the 10% treatment had the lowest median value, 5. The highest median value was in the 0% and 6% treatment with a value of 7. Addition of patin bone flour to the spring roll skin was significantly different in terms of aroma. The more the addition of patin bone flour, the more the aroma of patin bones increases.

The skin of the wet spring rolls has a dominant aroma of wheat flour. The addition of fish bone flour to the spring roll skin affects the aroma of the spring roll skin in general. The control treatment 0% had an average value of 7.3 which produced spring roll skin with the dominant aroma of flour and vanilla dough. The control treatment was the most preferred by the

panelists because it had an aroma like spring roll skin in general and did not produce a fishy odor. The 6% treatment had an average of 7.2 producing spring roll skin with an aroma that was not much different from the control treatment, but the fishbone flour smelled a little. The 8% treatment had an average of 6.1, in this treatment the spring roll skin began to smell the aroma of fish bone flour which was stronger than the 6% treatment, but not dominant. The 10% treatment with an average value of 5.1 resulted in a fishy aroma of patin bone flour that smelled better than the 8% treatment, but all panelists still received the addition of fish flour up to 10% treatment, but preferred the 0% and 6% treatment because it had no fishy aroma.

The more fish bone flour you add, the stronger the fishbone flour will smell. This is similar to what Afrinis (2018) [5] said, the more patin bone flour added, the more will affect the aroma of the vermicelli produced. Research by Mukhaimin et al (2022)[19] showed that the more patin bone flour added, the lower the panelists' preference level. Pangestika (2021)[21] the more the addition of patin bone flour, the average level of preference for the aroma of cookies decreases. The aroma is produced from volatile compounds. These volatile compounds have an influence on the aroma characteristics of a product (Pratama et al 2018)[22].

3.3 Texture

Texture is one of the organoleptic parameters that aims to determine the panelists' preference for the elasticity of a product. Texture assessment in this study was carried out using the sense of touch. Food texture is determined by the content of water, fat, protein, and carbohydrates [20].

Based on the Friedman test analysis with a 95% confidence level on the level of preference for the texture of the spring roll skin, it was found that the addition of patin bone flour in the manufacture of spring roll skin did not have a significant effect. Based on the results of panelists' assessment of the wet spring roll skin texture, the median value for all treatments was 7 which means like.

Spring roll skin generally has an elastic texture and is not easily torn. Treatment of 0% (control) with an average value of 7.3 produced spring roll skins that were elastic, and not easily torn. Treatment of 6% with an average value of 7.5 and treatment of 8% with an average value of 7.2 resulted in spring roll skin with an elastic texture and not easy to tear. Similarly, the 10% treatment with an average value of 6.9 resulted in a spring roll skin which was quite elastic and not easily torn. The addition of fish bone flour to the spring roll skin texture had no significant effect. Research by Afrinis et al (2018)[5] also showed that the addition of patin bone flour does not make a significant difference to the texture of the vermicelli produced, and Tabakka's research (2004)[23] stated that the addition of patin bone flour had no effect on the texture of the crackers produced.

Making lumpia skin dough, requires the addition of water, so that the dough becomes compact. When the finished dough is affected by temperature (baked on Teflon), gelatinization will occur. Gelatinization is a process of swelling of starch granules in flour dough due to water absorption which is influenced by heating temperature, which causes the breakdown of starch granules [24]. Gelatinization of these starch molecules will help the dough to form a good texture of hardness, viscosity and elasticity.

The gelatinization process in spring roll skin is partial gelatinization, where the starch granule swelling process is sufficient to prevent damage to the granule structure in most of the existing starch granules[25]. The addition of fish bone flour has an effect on gelatinization, because the more bone flour is added, the water content that can be absorbed by the starch in the spring roll skin will decrease, resulting in increased hardness. Pangestika's (2021) [21] research indiated that when the more fish bone flour is added the produced cookies become harder.

3.4 Taste of Spring Rolls

Taste is one of the sensory properties in performing hedonic tests on a food product. Taste is assessed through the sense of taste (tongue) which is a unified interaction between the sensory properties of aroma, taste, and texture[16]. The factors that determine whether a product is accepted or not by the panelists are in terms of taste, although there are other assessment parameters, but if the taste is not liked, then the product will be rejected.

Based on the Friedman test analysis with a 95% confidence level on the level of preference for the taste of the spring roll skin, it was found that the addition of patin bone flour in the manufacture of spring roll skin gave a significant difference. Based on Table 5, 0%, 8% and 10% treatments were not significantly different. The 0%, 6% and 8% treatments were also not significantly different, while the 6% and 10% treatments were significantly different based on the multiple comparison test.

Based on the results of the panelists assessment of the taste of the spring roll skin (Table 5), it was known that the median value of the 0% and 8% treatments was 7. The 6% treatment had a median value of 8, while the 10% treatment had a median value of 6, which means the taste of the spring roll skin was still favored by the panelists. The 0% treatment had an average value of 7 producing a tasteless spring roll skin taste (bland), so that the panelists did not really like the 0% treatment. The average value of the highest taste is found in the addition of spring roll skin treatment of 6% with an average of 7.9 which produces a savory skin taste due to the addition of fish bone flour. Treatment of 8% with an average value of 7.1 produced spring roll skin with a savory taste, with a distinctive fish taste that was quite pronounced. The lowest average value was in the 10% treatment, with a median value of 6 (preferred) producing a savory spring roll skin taste and the dominant fish bone flour was quite strong and left a slight impression. calcareous, so it is quite disliked by the panelists. This is because fish bone flour has a high ash/calcium mineral content, resulting in the resulting product leaving a *aftertaste* [26]. The aftertaste of spring roll skin at 10% treatment left a chalky impression after consumption. Afrinis' research (2018) [5] the addition of patin bone flour was significantly different to the panelists' preference level. The more fish bone flour added affects the level of preference for the taste of the vermicelli. Pangestika (2021) [21] the addition of fish bone flour has an effect on the level of preference for cookies. The research of Mukhaimin et al (2022) [19] stated the same thing that the addition of patin bone flour had an effect on the level of preference for white bread. The addition of too much fish bone flour reduced the panelists' preference level.

Table 2. Average Skin Color of Spring Rolls with the Addition of Patin Bone Flour

Treatments (%)	Median	Average Color
0	7	7,1a
6	7	7a
8	7	6,5a
10	7	6,5a

Note: The average number of treatments followed by the same letter showed no significant difference based on the multiple comparison test at the 5% level.

Table 3. Average Lumpia Skin Aroma with the Addition of Patin Bone Flour.

Treatments (100%)	Median	Average of Smell
0	7	7,3a
6	7	7,2a
8	6	6,1b
10	5	5,1b

Note: The average number of treatments followed by the same letter shows no significant difference based on multiple comparison test at the 5% level

Table 4 . Average Skin Texture of Spring Rolls with the Addition of Patin Bone Flour.

Treatments (%)	Median	Average Texture
0	7	7,3a
6	7	7,5a
8	7	7,2a
10	7	6,9a

Note : The average number of treatments followed by the same letter shows no significant difference based on multiple comparison test at the 5% level.

Table 5. Average Spring Rolls Taste with the Addition of Patin Bone Flour.

Treatments (%)	Median	Average Taste
0	7	7 ab
6	8	7,9 b

8	7	7,1 ab
10	6	5,7 a

Note : The average number of treatments followed by the same letter shows no significant difference based on multiple comparison test at the 5% level.

3.5 Determination of the Panelist's Preference Level Based on the Bayes Method

Decision making using the Bayes is a technique used to carry out an analysis by considering the weight of the criteria [15]. Decision making on the weight value and alternative values of the appearance, aroma, texture, taste of the spring roll skin was carried out by pairwise comparisons (Pairwase Comparisson).

Based on the results of the weighted criteria for the assessment of color, aroma, taste, and texture **Table 6**, respectively, they are 0.12; 0.15; 0.18; 0.55. The taste of spring roll skin has the highest value, which is 0.55. So it can be concluded that if the taste of the spring roll skin of patin bone flour is not liked by the panelists, the product will not be accepted or will be rejected by the panelists even though other assessments are good.

Based on the calculation of the Bayes , it was found that the spring roll skin with 6% patin bone flour fortification treatment was the most preferred treatment by the panelists based on the hedonic test results because it had alternative values and the highest priority values were 7.55 and 0.274. In the second place, namely 0% with alternative values and priority values, namely 7.00 and 0.254. The third highest order treatment is 8% with alternative values and priority values, namely 6.85 and 0.249. The lowest order is in the 10% treatment with alternative values and priority values, namely 6.15 and 0.223. Overall, the lumpia skin with patin bone flour fortification of up to 10% was still acceptable to the panelist

Table 6 . Bayes Criteria

Treatments	Criteria				Alternative Value	Priority Value
	Color	Aroma	Texture	Taste		
0%	7	7	7	7	7,00	0,254
6%	7	7	7	8	**7,55**	**0,274**
8%	7	6	7	7	6,85	0,249
10%	7	5	7	6	6,15	0,223
Priority Value	0,12	0,15	0,18	**0,55**	27,55	1,00

4 CONCLUSION

Based on the results of the hedonic test on the organoleptic characteristics of the spring roll skin, it was stated that all treatments were still favored by the panelists, but the most preferred treatment was the addition of patin bone flour as much as 6%, with the highest alternative value of 7.55.

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