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Effect Ratio of Milkfish Payus with Tapioca Flour and Proportion of Water to Organoleptic, Physical and Chemical Characteristics of Fish Crackers

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Abstract. SMEs producing fish crackers in Socah, Bangkalan do not have a composition standard for Milkfish Payus and the water proportion. Thus product quality cannot be maintained. Oftentimes, the fish crackers have darker color and harder texture. This research aims to determine the effect of ratio of Milkfish Payus with tapioca flour composition and the proportion of water to organoleptic, physical, and chemical characteristics of the fish crackers. The research design used in this research was a 2x2 factorial design. The data collection technique used in this research was laboratory observation and testing. Observations were done with a questionnaire using a Likert scale, including organoleptic tests (color, aroma, taste) and physical tests (crispness, blooming). The respondents of the research were 30 respondents. The data analysis technique used was the Chi-Square test with SPSS using a significance level below 5% (lower than 0.05). Result of the experiment indicated that ratio of Milkfish Payus fish, tapioca flour, and water have a significant effect on organoleptic properties on the aroma and the physical properties of the crispness and blooming, but have no significant effect on the color and taste of Milkfish Payus fish crackers.

Introduction

Crackers are snacks that contain high starch ingredients. In terms of the shape crackers are divided into two types: crackers that are printed similar to noodles, and crackers which are compacted and sliced in the production process [1]. There has been no standard for the ingredient composition crackers. Usually, producers have their own recipes and tastes for cracker products to be produced. Crackers are composed of two ingredients, namely raw materials and additional ingredients. Raw materials are materials whose functions cannot be replaced by other ingredients other than those used in large quantities while additional ingredients are materials used in the production process to supplement the raw materials.

Crackers can be assessed in terms of organoleptic properties (color, taste, aroma), physical properties (crispness), and chemical properties (water content). Organoleptic testing is a test carried out using the five human senses as the main measuring instruments. In organoleptic testing there are three properties that are tested, namely color, aroma, and taste [2]. Color is one of the organoleptic properties used to determine the quality of food ingredients before other factors are considered visually. The color of a food product can be directly observed visually by using the sense of vision. Aroma is one of the organoleptic properties used to assess a food product. The aroma of a food product can be assessed using the sense of smell. Taste as one of the organoleptic properties is used to assess a food product. The taste of a food product can be assessed using a taster or tongue [3].

The physical properties of crackers are the texture of crackers that have been fried. The physical properties of crackers refer to the blooming and agility. Crunchiness is one factor indicating the quality of crackers. Crackers are considered bad if the cracker texture is weak or soft [1]. The

blooming of crackers is an important indicator of the quality. Basically, the blooming of crackers is caused by vapor pressure formed by heating the water content in crackers so that it urges the structure of the material and makes the product blooming. The chemical nature of crackers here is the water content in crackers. The quality standard of water content in fish crackers is maximum 12%. The results of laboratory analysis shows that the water content will decrease after being fried around 1.05% to 5.48% because the water evaporates [1].

SME *Sumber Jokotole* produces fish crackers in Socah, Bangkalan, Madura. The SME produces shrimp and Milkfish Payus crackers. The Milkfish Payus crackers are the featured product of the SMEs, because the raw material, which is payus, can easily be obtained from the area. However, The SMEs face a problem with regard to the quality of the products. Chemical and organoleptic properties of the fish crackers do not meet the Indonesian National Standard (SNI). Thus, it is difficult for the SMEs to develop and the increase of their monthly sales is not significant. This problem occurs because the composition of fish crackers produced does not have a composition standard of raw materials so that the quality and taste are often different. This often leads to complaints from consumers. The selection of ingredients by the SME *Sumber Jokotole* is also not carried out optimally and there is a lack of innovation in the selection of flavors in processed fish crackers.

Research on the effect of raw material composition ratios on the physical, organoleptic and chemical properties of crackers have been carried out, such as the ratio of Lele fish to Tapioca [4]. The effect of Proportion of Tapioca and Red Rice Flour on the physical and chemical properties of red rice crackers [5]. The effect of Proportion of Milkfish Payus fish and Shrimp and addition of red bean puree to the Organoleptic Properties of Crackers [6]. The Effect of Flour (Tapioca – Tempe) Proportion and dough processing method on the organoleptic and physical properties of Tempe crackers [2]. However, research to analyse proportion of water have not been done.

This research aims to examine the effect ratio of Milkfish Payus with tapioca flour and its proportion of water on the organoleptic, physical, and chemical properties of Milkfish Payus fish crackers of the SME. Currently, the composition used by the SME in making the dough is as follows: 2.5 kg of Payus Milkfish Payus, 5 kg of tapioca flour, and 5 cups of water (1,200 ml). Due to the lack of proper standard composition of Milkfish Payus crackers, the quality of the products oftentimes varies. For example, the water content is still high, making the cracker not bloom when being fried. From the problem, the researchers propose a new composition to improve the quality of the fish crackers by using the 2x2 factorial design of experiment method [7,8].

Methodology

The ratio of clean Milkfish Payus with tapioca flour used in this research is the actual ratio of production process from the SME, which is 250 gr: 500 gr, hence the proposed ratio is 250 gr: 550 gr). The water used in this research was the actual water portion from the SME, which was 120 ml, and in this research the amount of water was slightly reduced to 110 ml. Table 1 describe the experimental design applied in this research. The data collection methods in this research were observation and laboratory tests. Observation in this research was conducted to observe the quality of fried crackers by organoleptic test and physical test. Meanwhile, laboratory tests were used to measure water content of fried crackers. Organoleptic test and physical test are methods of testing carried out using the five senses of as a measure of acceptance of a product. The tests carried out include five criteria for the assessment of the fried Milkfish payus cracker, which are color, aroma, taste, crispness and blooming by using a questionnaire. The respondents taking the organoleptic and physical tests were 30 students of Agricultural Industrial Technology, University of Trunojoyo. The questionnaire include color, aroma, taste, crispness, and blooming. The data analysis technique used was the Chi-Square test with SPSS using a significance level below 5% (lower than 0.05) [9,10,11].

The criteria for Milkfish Payus crackers can be seen from the following rating scores:

1. Color Criteria

Score 5: Brownish white
 Score 4: White tends to light brown
 Score 3: Light Brown
 Score 2: a bit brown
 Score 1: Dark brown

2. Aroma Criteria

Score 5: Enough flavored fish
 Score 4: A little scented fish
 Score 3: Scented fish
 Score 2: Very flavorful fish
 Score 1: Not scented with fish

3. Taste Criteria

Score of 5: Very tasty and enough to taste fish
 Score 4: Savory and rather fishy
 Score 3: Pretty tasty and taste fish
 Score 2: Less savory and highly flavored fish
 Score 1: Not tasty and doesn't taste fish

4. Crunch Criteria

Score 5: Very crunchy
 Score 4: Crispy
 Score 3: Pretty crunchy
 Score 2: Less crunchy
 Score 1: Not crispy

5. Blooming Criteria

Score 5: Very expands
 Score 4: Expand
 Score 3: Enough to expand
 Score 2: Less expands
 Score 1: Does not expand

Table 1 Design Factor of Research

Ratio of Milkfish Payus fish with Tapioca flour (B)	Water proportion (A)	
	120 ml (A ₁)	110 ml (A ₂)
1:2 (B ₁)	A ₁ B ₁	A ₂ B ₁
1:2,2 (B ₂)	A ₁ B ₂	A ₂ B ₂

The factorial design used is 2x2, thus the experiment is divided into four product, as follows:

- A₁B₁ (Product 1): Proportion of 120 ml water with ratio of clean Milkfish Payus with Tapioca flour is 250 gr: 500 gr or 1:2.
- A₂B₁ (Product 2): Proportion of 110 ml water with ratio of clean Milkfish Payus with tapioca flour is 250 gr: 500 gr or 1:2.
- A₁B₂ (Product 3): Proportion of 120 ml of water with ratio of clean Milkfish Payus with tapioca flour is 250 gr: 550 gr or 1:2,2.
- A₂B₂ (Product 4): Proportion of 110 ml water with ratio of clean Milkfish Payus with tapioca flour is 250 gr: 550 gr or 1:2,2.

Laboratory tests were carried out at the Agricultural Industry Technology Laboratory, Trunojoyo Madura University. Laboratory tests were carried out to determine the chemical properties of the water content contained in Milkfish Payus crackers.

3. Result and Discussion

Table 2 describes the results the organoleptic properties test involving 30 respondents from the Department of Agricultural Industrial Technology, University of Trunojoyo Madura.

Table 2 Descriptive Statistics of Color Criteria

<i>Descriptive Statistics</i>					
	N	Mean	Std. Deviation	Minimum	Maximum
Criteria_Color_Product1	30	4.6	0.498272879	4	6
Criteria_Color_Product2	30	4.566666667	0.568320777	3	5
Criteria_Color_Product3	30	4.366666667	0.718395402	3	5
Criteria_Color_Product4	30	4.5	0.62972353	3	5

The expected color of Milkfish Payus fish crackers is brownish white. Based on the organoleptic test in Table 2, and Figure 1 it can be seen that the lowest mean value of 4.37 is product 3 with a ratio of Milkfish Payus fish with tapioca flour (1: 2.2) and the addition of water as much as 120 ml, obtained by the color of light brown Milkfish Payus cracker. Meanwhile the highest mean value of 4.6 is product 1 with a ratio of Milkfish Payus fish with tapioca flour (1: 2) and the addition of water as much as 120 ml, obtained by the results of the color of the white Milkfish payus cracker color rather light brown. The Chi-Square test of the color criteria is the value of Asymp. Sig 0.273 (more than 0.05). Therefore, the hypothesis is rejected, which means that the ratio of Milkfish Payus fish with tapioca flour and the addition of water does not significantly influence the color of Milkfish Payus fish crackers.

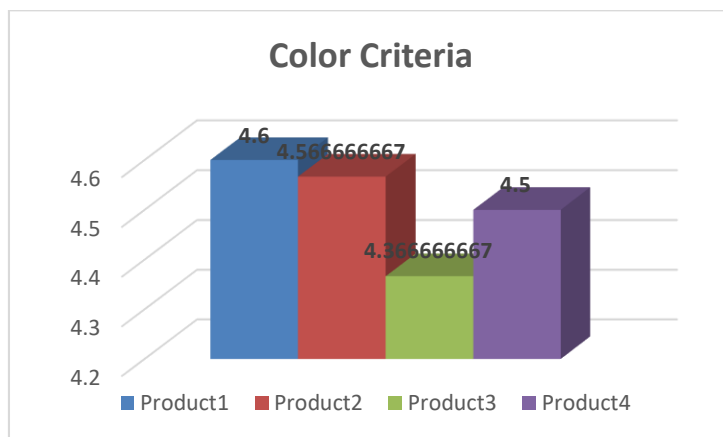


Fig. 1 Ratio of mean value of color criteria

Table 3 Descriptive Statistics of Aroma Criteria

<i>Descriptive Statistics</i>					
	N	Mean	Std. Deviation	Minimum	Maximum
Criteria_Aroma_Product1	30	3.466666667	1.613164235	1	5
Criteria_Aroma_Product2	30	3.133333333	1.676065453	1	5
Criteria_Aroma_Product3	30	2.533333333	1.455864084	1	5
Criteria_Aroma_Product4	30	2.7	1.643167673	1	5

The expected aroma of Milkfish Payus fish crackers is quite flavourful with fish. Based on the organoleptic test in Table 3 and Figure 2, it can be seen that the lowest mean value of 2.533 is product 3 with a ratio of Milkfish Payus fish with tapioca flour (1: 2.2) and the addition of 120 ml of water, the scent of fish-flavoured payus scent crackers is obtained. The highest mean value of 3,466 is product 1 with a ratio of Milkfish Payus fish with tapioca flour (1: 2) and the addition of water as much as 120 ml, obtained by the results of the aroma of Milkfish payus cracker is quite flavourful with fish. The Chi-Square test of the aroma criteria was the value of Asymp. Sig 0.035 (less than 0.05). So the hypothesis is accepted, which means that the ratio of Milkfish Payus fish with tapioca flour and the addition of water has a significant effect on the aroma of Milkfish Payus fish crackers.



Fig. 2 Ratio of mean value of aroma criteria

Table 4 Descriptive Statistics of Taste Criteria

<i>Descriptive Statistics</i>					
	N	Mean	Std. Deviation	Minimum	Maximum
Criteria_taste_Product1	30	3.533333333	1.252124631	1	5
Criteria_taste_Product2	30	3.166666667	1.234094205	1	5
Criteria_taste_Product3	30	2.333333333	1.321789105	1	5
Criteria_taste_Product4	30	3.433333333	1.250746903	1	5

The expected taste of the Milkfish payus crackers is very tasty and quite flavorful with fish. Based on the organoleptic test in Table 4 and Figure 3 , it can be seen that the lowest mean value of 2,333 is product 3 with the ratio of Milkfish Payus fish with tapioca flour (1: 2,2) and the addition of water as much as 120 ml. Meanwhile the highest mean value of 3,533 is product 1 with a ratio of Milkfish Payus fish with tapioca flour (1: 2) and the addition of water as much as 120 ml, obtained by the taste of savory Milkfish Payus crackers and rather fish taste. The following are the results of the Chi-Square test on taste criteria: From the Chi-Square test the taste, the value of Asymp. Sig 0.423 (more than 0.05). So the hypothesis is rejected, which means that the ratio of Milkfish Payus fish with tapioca flour and the addition of water does not significantly influence the taste of Milkfish Payus fish crackers.

The physical properties consist of crispness and blooming. The following are the results of the physical properties test for 30 respondents.

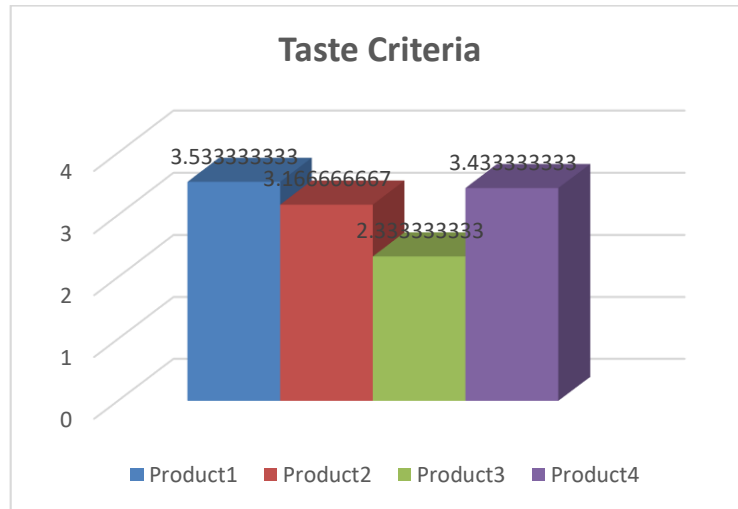


Fig. 3 Ratio of mean value of Taste criteria

Table 5 Descriptive Statistics of Crispness Criteria

<i>Descriptive Statistics</i>					
	N	Mean	Std. Deviation	Minimum	Maximum
Criteria_Crunchiness_Product1	30	4.366666667	0.718395402	2	5
Criteria_Crunchiness_Product2	30	3.6	0.723973709	2	5
Criteria_Crunchiness_Product3	30	2.4	1.162636718	1	4
Criteria_Crunchiness_Product4	30	3.6	1.220514307	1	5

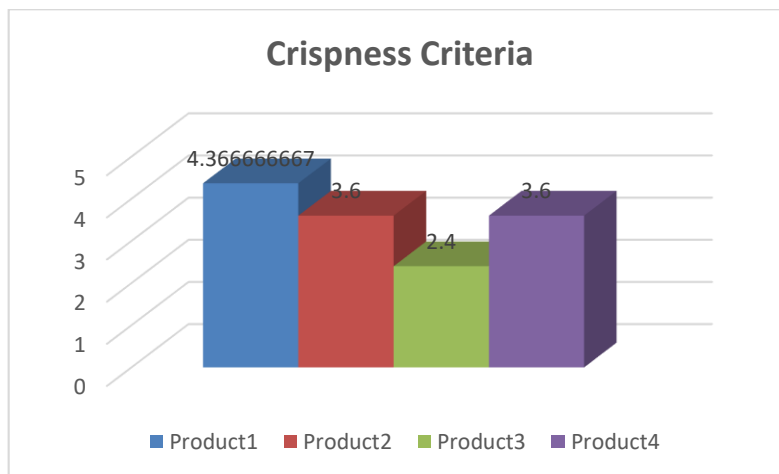


Fig. 4 Ratio of mean value of Crispness criteria

In term of crispness, the Milkfish Payus fish crackers are very crunchy. Based on the organoleptic test in Table 5 Figure 4, it can be seen that the lowest mean value of 2.4 is product 3 with a ratio of Milkfish Payus fish with tapioca flour (1: 2.2) and addition of 120 ml of water, resulting in crispy Milkfish Payus fish crackers. The highest mean value of 4.36 is product 1 with a ratio of Milkfish Payus fish with tapioca flour (1: 2) and the addition of water as much as 120 ml, obtained by the crispness of Milkfish Payus fish crackers. The value of Asymp. Sig 0.00005 (less than 0.05). So the hypothesis is accepted, which means that the ratio of Milkfish Payus fish with tapioca flour and the addition of water has a significant effect on the crispness of Milkfish Payus fish crackers.

Table 6 Descriptive Statistics of Blooming Criteria

<i>Descriptive Statistics</i>					
	N	Mean	Std. Deviation	Minimum	Maximum
Criteria_Blooming_Product1	30	4.166666667	0.530668631	3	5
Criteria_Blooming_Product2	30	3.566666667	0.817200154	2	5
Criteria_Blooming_Product3	30	1.5	0.62972353	1	3
Criteria_Blooming_Product4	30	3.7	1.055363967	2	5

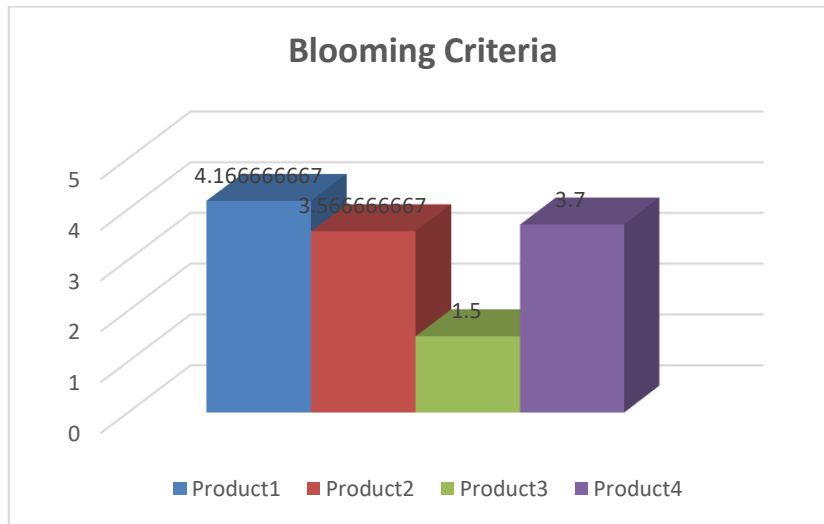


Fig. 5 Ratio of mean value of Blooming criteria

The expected blooming of Milkfish Payus fish crackers is very fluffy. Based on the organoleptic test in Table 6 and Figure 5, it can be seen that the lowest mean value of 1.5 is product 3 with the ratio of Milkfish Payus fish with tapioca flour (1: 2.2) and the addition of water as much as 120 ml. The highest mean value of 4.16 is product 1 with a ratio of Milkfish Payus fish with tapioca flour (1: 2) and the addition of water as much as 120 ml, obtained from the blooming of Milkfish Payus fish crackers that expand. The value of Asymp. Sig 0.00006 (less than 0.05). So the hypothesis is accepted, which means that the ratio of Milkfish Payus fish with tapioca flour and water addition has a significant effect on the blooming of Milkfish Payus fish crackers.

The chemical properties in this study are the water content contained in the cooked Milkfish Payus fish crackers. Water content test was carried out in the Laboratory of Department of Agriculture Industry Technology, University of Trunojoyo. Table 7 describes the results of the test of the water content of Milkfish Payus fish crackers.

Table 7 Water content Test Results

Sample	Water Content (%)
A (Product 1)	0.40
B (Product 2)	0.48
C (Product 3)	0.82
D (Product 4)	0.74

The water quality standard contained in fish crackers is maximum 12%. The water content will decrease after being fried around 1.05% to 5.48% due to evaporation. In this study the mature test of the water content of cooked Milkfish Payus crackers was done using the gravimetric method. Based on the water content test carried out, it can be seen that the lowest water content is in the product experiment 1 with a ratio of Milkfish Payus fish with tapioca flour (1: 2) and the addition of water as much as 120 ml which is 0.40%. The highest water content is found in the product experiment 3 with a ratio of Milkfish Payus with tapioca flour (1: 2.2) and the addition of water as much as 120 ml which is 0.82%.

Conclusion

Ratio of Milkfish Payus fish and tapioca flour and the addition of water have a significant effect on organoleptic properties on the aroma of Milkfish Payus fish crackers, but have no significant effect on the color and taste of Milkfish Payus fish crackers. Ratio of Milkfish Payus fish with tapioca flour and the addition of water have a significant effect on the physical properties of the crispness and blooming of Milkfish Payus fish crackers. The results of the mature Milkfish Payus cracker water test showed that the lowest water content in this research experiment was on product 1 with a ratio of Milkfish Payus fish with tapioca flour (1: 2) and 120 ml addition water which is 0.40%. Meanwhile the highest water content was in the product experiment 3 with a ratio of Milkfish Payus with tapioca flour (1: 2.2) and the addition of water as much as 120 ml which is 0.82%. Further research is needed to examine the length of storage of Milkfish Payus fish on the freezer and the length of drying of crackers in the blooming of Milkfish Payus fish crackers.

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