Fortification of Yellow Potatoes Sweet Flour and Jamblang Fruit Paste (Syzygiumcumini) in the Making of Biscuits on it’s Sensoric Characteristics and Mineral Content

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Abstract. Biscuits are consumed by all age groups, both babies and adults with different types. However, commercial biscuits on the market have a less balanced nutritional content (Setyowati and Nisa, 2014). Most biscuits have high carbohydrate and fat content, while mineral content is relatively low and does not contain antioxidants. For this reason, researchers make mineral-rich biscuits and finding out the level of acceptance of panelists through a hedonic test of the biscuits produced. This research will use factorial completely randomized design (CRD) consisting of 2 (two) factors. The first factor is the concentration of yellow sweet potatoes flour consisting of 3 (three) levels: K1 (20%), K2 (40%), K3 (60%). The second factor was the concentration of jamblang fruit paste that consists of 3 (three) levels: J1 (15%), J2 (30%) and J3 (45%) of 200 grams in total flour. The treatment combination in this study was 3x3 (nine) treatments. Furthermore, this study used 3 (three) replications, resulting in 27 (twenty seven) unit of experiments. The analysis carried out in the study were ash content and organoleptic test consisting of color, taste, odor and texture. The addition of yellow sweet potatoes flour has a very significant effect (P≥0.01) on ash content, and organoleptic value of taste, color, odor and texture. The addition of jamblang fruit paste had a very significant effect (P≥0.01) on the organoleptic value of taste, odor and texture, and had a significant effect (P≥0.05) on biscuit color and had no significant effect (P≤0.05) on biscuit ash content. The interaction of the addition of yellow sweet potatoes flour with the addition of jamblang fruit paste had a very significant effect (P≥0.01) on the organoleptic value of smell and texture, and had a significant effect (P≥0.05) on the organoleptic value of the biscuit color and had an unreal effect (P≤0.05) to the ash content of the organoleptic value of the biscuit flavor.

1. Introduction

Besides rice, there are several food commodities in Indonesia that have the potential as a source of carbohydrates, such as the greatest potential sources is cassava, corn and sweet potatoes commodities. As a food of choice carbohydrate sources other than rice which is worth consider its development by processing agricultural commodities into intermediate products which is form as flour for the next industrial raw material. Sweet potatoes flour is one of the way of preserving and saving storage space.
In this study, sweet potatoes used for flour processing is yellow sweet potatoes. Yellow sweet potatoes flour will be used to replace some wheat flour as raw material for processing biscuits. Carbohydrates in sweet potatoeses consist of monosaccharides, oligosaccharides, and polysaccharides. Sweet potatoeses contain about 16-40% dry matter and about 70-90% of this dry material is carbohydrate which consists of starch, sugar, fiber in the form of cellulose, hemicellulose, and pectin [1].

Biscuits are one of the snacks or crispy snacks that consumed by the community. This product is a dry product that has low water content, based on industry association data, in 2012 biscuit consumption is expected to increase 5% -8% driven by the increase in domestic consumption.

Biscuits are consumed by all age groups, both babies and adults but with different types. However, commercial biscuits on the market have a less balanced nutritional contents [2]. Most biscuits have high carbohydrate and fat content, while relatively low mineral content. For this reason, researchers make mineral-rich biscuits and want to find out the level of acceptance of panelists through a hedonic test of the biscuits produced.

Jamblang (Syzygiumcumini) is enrich with anthocyanin compounds, glucosides, ellagic acid, isoquercetin, kaemferol and myrecetin. Jamblang fruit content for every 100 gr is 84-86 gr, water, 0.2-0.7 gr protein, 0.3 g fat, 14-16 gr, carbohydrate, 0.3-0.9 gr, fiber, 0 , 4-0.7 gr ash, 8-15 gr phosphorus, 1.2 mg iron, 0.01 mg, riboflavin, 0.3 mg niacin, and 5- 18 mg vitamin C [3]. The flesh is used to make jam, jelly, juice, vinegar and pudding. Thus researchers want to do research on making biscuits from yellow sweet potatoes flour with substitution of jamblang pasta, so as to produce biscuits that are enrich with minerals and favored by consumers.

2. Methodology
The ingredients used for the producing of these biscuits are yellow sweet potatoeses, jamblang fruits, wheat flour, shortening, sodium carbonate, baking powder, kitchen salt, granulated sugar, milk powder, fructose syrup, eggs, and water. The tool used in this study consisted of materials for making products and materials for analysis.

The tools used for product processing consist of knives, pans, cutting boards, spoons, mixers, stoves, basins, measuring cups, analytic scales, ovens, thermometers, baking pans, and molds. The tools used for analysis consist of ovens, aluminum plates, furnaces, poselin plates, analytic scales and desiccators.

Research procedure
2.1. Making Yellow Sweet Potatoes Flour
Yellow sweet potatoes skin is peeled and washed immediately to remove soil dirt that sticks to the tubers. Yellow sweet potatoes is sliced using grater and immediately soaked in 5% vinegar solution for 30 minutes (this technique aims to prevent browning of yellow sweet potatoeses when dried), then yellow sweet potatoes is drained. Then dried using sunlight (± 6 hours) followed by drying using a dryer at a temperature of 60oC until the water content of about 7% or until dry is indicated by if the yellow sweet potatoes slices can be broken by fingers. Then milling or sanding is done using a milling machine. The flour produced from the grinding process is sieved using an 80 mesh sieve. The finished yellow sweet potatoes flour is packed into plastic packaging.

2.2. Making Jamblang Fruit Paste
Jamblang fruit is washed and the meat is separated from the skin. Then the fruit flesh is ground to form a pasta. Jamblang fruit pasta is packed into plastic and coated with aluminum foil on the outside to prevent loss of antioxidant levels contained in the jamblang fruit flesh. Furthermore, the packed paste is stored at 4 to 2°C in the refrigerator.
2.3. Biscuit Production

40 grams of eggs are shaken with 40 grams of sugar then added 22 grams of vegetable fat, sodium carbonate 3.2 grams, 12 grams of fructose syrup, 4 grams of salt and 40 grams of skim milk for 5-10 minutes. After mixing, it is added by using a mixture of yellow sweet potatoes flour according to the experimental treatment, flour and jamblang fruit pasta according to the experimental treatment. Stir until evenly formed, then make it into thin layer, then casting. Baked into a 100°C oven for 20 minutes.

2.4. Experimental design

This study will use a completely randomized design (CRD) factorial pattern consisting of 2 (two) factor. The first factor was the addition of yellow sweet potatoes flour consisting of 3 (three) levels, namely K1 (20%), K2 (40%), K3 (60%). The second factor was the addition of jamblang fruit paste consisting of 3 (three) levels, namely J1 (15%), J2 (30%) and J3 (45%) of 200 grams in total flour.

The treatment combination in this study was 3x3 (nine) combination treatments. Furthermore, this study used 3 (three) replications, resulting in 27 (twenty seven) unit of experiments. The composition of the treatment combination could be seen in Table 2.2.4.

| Yellow Sweet Potatoes Flour Addition (K) | Jamblang Fruit Paste Addition (J) |
|-----------------------------------------|----------------------------------|
| K1 (25%)                                | J1 (15%)                         |
| K2 (50%)                                | K1J1U1                           |
| K3 (75%)                                | K2J1U1                           |
| K1 (25%)                                | K3J1U1                           |
| K2 (50%)                                | K1J2U2                           |
| K3 (75%)                                | K2J2U2                           |
| K1 (25%)                                | K3J2U2                           |
| K2 (50%)                                | K1J3U3                           |
| K3 (75%)                                | K2J3U3                           |
| K1 (25%)                                | K3J3U3                           |

The data obtained will be analyzed statistically using ANOVA (analysis of variance). If the results of the treatment test show a real influence, then it will be followed by a further test of the smallest significant difference (BNT) [4].

2.5. Observation analysis

The analysis carried out in this study was ash content, ash content and organoleptic test (taste, color, odor and texture)

3. Results and Discussion

3.1. Ash Content Analysis

Ash content is a non-volatile component, stay in the combustion and annealing of organic compounds. Ash content is closely related to the mineral content found in food ingredients. Ash content can be determined by measuring the residue after the sample has been oxidized with a solvent at high temperature (500-600°C) and get volatilization. The ash content of the ingredients shown the mineral content, purity and cleanliness of the ingredients produced [5]. The results of the analysis showed that the ash content ranged from 0.83% - 1.40% with an average of 1.09%.
Figure 1. One of biscuits sample researched with the addition of 25% yellow sweet potatoes flour and 15% jamblang fruit paste (K1J1)

Table 1. Average results of biscuit ash content analysis at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| Yellow Sweet Potatoes | Jamblang Fruit Paste Addition (J) |
|-----------------------|----------------------------------|
| **Flour Addition (K)**| **J1 (15%)** | **J2 (30%)** | **J3 (45%)** |
| K1 (25%)              | 0.83      | 0.84      | 0.86      |
| K2 (50%)              | 1.06      | 1.09      | 1.09      |
| K3 (75%)              | 1.36      | 1.35      | 1.40      |

From Table 3.1 (a) it is known that the lowest ash content was found in the addition of 25% yellow sweet potatoes flour and jamblang fruit paste 15% (K1J1) of 0.83%. While the highest ash content was found in the addition of 75% yellow sweet potatoes flour and 45% jamblang fruit paste (K3J3) of 1.40%.

Table 2. ANOVA (analysis of variance) of ash content at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| SK Treatment | DB | JK | KT | F Count  | F Table |
|--------------|----|----|----|----------|---------|
|              |    |    |    |          |         |
| K            | 2  | 0.840     | 0.420     | 1072.894** | 4.26    | 8.02 |
| J            | 2  | 0.003     | 0.002     | 3.957tn    | 4.26    | 8.02 |
| K X J        | 4  | 0.002     | 0.0004    | 1.064tn    | 3.63    | 6.42 |
| Error        | 18 | 0.007     | 0.0004    |           |         |     |
| Total        | 26 | 0.852     |           |           |         |     |

Note: ** = Had significant effect
tn = Had no significant effect

Based on table 3.1 (b) the analysis of variance showed that the addition of yellow sweet potatoes flour (K) gave a very significant effect (P≥0.01) on the ash content of biscuits. While the addition of jamblang fruit paste and the interaction of the addition of yellow sweet potatoes flour and
jamblangfruit paste (KJ) gave no significant effect (P ≤ 0.05) on biscuit ash content. The effect of adding sweet potatoes flour to biscuit ash content could be seen in the following Figure 3.1:

![Figure 3.1](image)

**Figure 2.** The effect of adding yellow sweet potatoes flour to biscuit ash content at BNT \textsubscript{0.01} (0.156) and KK (11.67) (the value followed by the same letter shows an unreal difference)

Based on Figure 3.1 showed that the higher the addition of yellow sweet potatoes flour the higher the ash content of the biscuits produced. The increase in ash content in biscuits is caused by the addition of yellow sweet potatoes flour with different percentages. The ash content in general contained in yellow sweet potatoeses is 0.99% in 100 grams of yellow sweet potatoeses. Besides that in yellow sweet potatoeses also contain other mineral elements such as calcium 57 mg, phosphorus 52 mg, and iron 0.7 mg. The ash content produced from yellow sweet potatoes flour in this study was 0.98%. Based on the average value of ash content of yellow sweet potatoes flour biscuits and jambang fruit paste that is equal to 1.09% is stated to have met the biscuit quality requirements that have been determined by the Indonesian National Standard (SNI) with a maximum ash content of 1.6%.

### 3.2. Biscuit Organoleptic Test

According to Sofiah and Achsyar (2008), one of the organoleptic tests is preference test or hedonic test. Hedonic testing is a test in which panelists are asked to give a personal response about their likes or dislikes and their level to the samples.

![Figure 3](image)

**Figure 3.** Sample preparation for hedonic testing
3.2.1. Taste
Taste is an important factor in deciding for consumers to accept or reject a food. Sensitivity to taste is found in the taste buds of the tongue [6]. More sense involves the five senses. Food ingredients that have stimulating properties of taste nerves will cause certain feelings that will affect the taste that is caused by these ingredients [6]. The results of the analysis showed that the organoleptic value of taste ranged from 3.83 (neutral) - 4.35 (like) to an average of 4.08 (like).

**Table 3** The average organoleptic value of biscuit taste at each level of addition of yellow sweet potatoes flour and jamblang fruit paste.

| Yellow Sweet Potatoes Flour Addition (K) | Jamblang Fruit Paste Addition (J) |
|----------------------------------------|----------------------------------|
| K1 (25%)                               | J1 (15%) 0.83                    |
|                                       | J2 (30%) 0.84                    |
|                                       | J3 (45%) 0.86                    |
| K2 (50%)                               | J1 (15%) 1.06                    |
|                                       | J2 (30%) 1.09                    |
|                                       | J3 (45%) 1.09                    |
| K3 (75%)                               | J1 (15%) 1.36                    |
|                                       | J2 (30%) 1.35                    |
|                                       | J3 (45%) 1.40                    |

From Table 3 it is known that the lowest sense of organoleptic value was found in the addition of 25% yellow sweet potatoes flour and 15% jamblang fruit paste (K1J1) of 3.83 (neutral). Whereas the highest sense of organoleptic value was found in 50% yellow sweet potatoes flour and 30% jamblang fruit paste (K3J3) of 4.35 (like).

**Table 4.** ANOVA (analysis of variance) sense of organoleptic value at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| SK treatment | DB | JK | KT | F Count | F. Tabel |
|--------------|----|----|----|---------|----------|
| K            | 2  | 0.176 | 0.088 | 30.878** | 4.26     | 8.02     |
| J            | 2  | 0.183 | 0.091 | 32.049** | 4.26     | 8.02     |
| KXJ          | 4  | 0.052 | 0.013 | 2.268tn | 3.63     | 6.42     |
| Error        | 18 | 0.051 | 0.003 |         |          |          |
| Total        | 26 | 0.461 |        |         |          |          |

**Note**: ** = Had significant effect  
            tn = Had no significant effect

Based on table 4 variance analysis data showed that the addition of yellow sweet potatoes flour (K) and jamblang fruit paste (J) had a very significant effect (P≤0.01) on the organoleptic value of the biscuit flavor. While the interaction of the addition of yellow sweet potatoes flour (J) and jamblang fruit paste (KJ) gave no significant effect (P≤0.05) on the organoleptic value of the biscuit flavor. The effect of adding sweet potatoes flour and jamblang fruit paste to the organoleptic value of biscuit flavor could be seen in Figure 4. (a).
Figure 4. The effect of the addition of yellow sweet potatoes flour to the organoleptic value of biscuits at BNT 0.01 (0.071) and KK (1.36%) (the values followed by the same letter indicate a non-significant difference).

Based on Figure 3 the highest taste of organoleptic value was obtained from biscuit treatment with the addition of yellow sweet potatoes flour K2 (50%) of 4.19 (like), while the lowest taste of organoleptic value was obtained from biscuit treatment with the addition of sweet potatoes flour yellow K1 (25%) is 3.95 (neutral). This is due to the addition of 50% yellow sweet potatoes flour giving an additional sweet taste of biscuits with a sufficient dose and the taste of biscuits produced by yellow sweet potatoes flour. Yellow sweet potatoes flour contains a total of 58.21% carbohydrates and one part of the carbohydrate is sugar content. The sugar content contained in yellow sweet potatoes flour is 0.38-5.64% [7].

According to [8] reported that taste is a factor that determines the final decision of consumers to accept or reject a product. Although the color and aroma of a product is good but the taste is not good, the food will be rejected.

Figure 5. The effect of jamblang fruit paste addition toward the biscuit organoleptic test on BNT 0.01 (0.071) and KK (1.36%) (the value with word related to unreal differences)
Based on Figure 4 the highest sense of organoleptic value was obtained from biscuit treatment with the addition of J2 jamblang fruit paste (30%) of 4.22 (like), while the lowest taste of organoleptic value was obtained from biscuit treatment with the addition of jamblang J1 fruit paste (15 %) equal to 3.99 (neutral). This is due to the addition of 45% jamblang fruit pasta which gives excessive flavor to the biscuits, while the addition of 15% jamblang fruit pasta and 30% does not create bitter flavor on the biscuits. One of the ingredients contained in the jamblang fruit that can cause bitter taste in biscuits is tannin and some other organic compounds. According to Kota and Kusriani (2014) that jamblang fruit contains volatile oil, tannin, phenol (methyl-xanthoxylin), alkaloids (jambosine), organic acids, and triterpenoids.

3.2.2. Color

According to [6], color is a substance found on the surface of an object so that when illuminated with perfect white light will give a certain color sensation that can be captured by the eye. The color of food from food can be caused by several sources, and one of the most important is due to the pigments present in vegetable ingredients or animal ingredients. The results of the analysis showed that the organoleptic color values ranged from 3.83 (neutral) - 4.23 (likes) to an average of 4.08 (like).

Table 5. The average value of biscuit color organoleptic at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| Yellow Sweet Potatoes | Jamblang Fruit Paste Addition (J) |
|-----------------------|----------------------------------|
| Flour Addition (K)    | J1 (15%) | J2 (30%) | J3 (45%) |
| K1 (25 %)             | 3.83     | 4.13     | 3.90     |
| K2 (50 %)             | 4.10     | 4.23     | 4.08     |
| K3 (75 %)             | 4.05     | 4.00     | 4.08     |

From Table 5 it is known that the lowest color organoleptic value is found in the addition of 25% yellow sweet potatoes flour and 15% jamblang fruit paste (K1J1) of 3.83 (neutral). Whereas the highest taste of organoleptic value was found in 50% yellow sweet potatoes flour and 30% jamblang fruit paste (K3J3) of 4.23 (like).

Table 6. ANOVA (analysis of variance) of organoleptic color values at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| SK Treatment | DB   | JK   | KT   | F Count | F Table |
|--------------|------|------|------|---------|---------|
| K            | 2    | 0.101| 0.050| 14.520**| 4.26    |
| J            | 2    | 0.053| 0.026| 7.560*  | 4.26    |
| KXJ          | 4    | 0.077| 0.019| 5.520*  | 3.63    |
| Error        | 9    | 0.031| 0.003|         | 6.42    |
| Total        | 17   | 0.261|      |         |         |

Note  : ** = Had significant effect  
       * = Had no significant effect

Based on table 6 variance analysis data showed that the addition of yellow sweet potatoes flour (K) gave a very significant effect (P<0.01) on the organoleptic value of biscuit color. Whereas the jamblang fruit paste (J) and the interaction of the addition of yellow sweet potatoes flour (J) and
jamblang fruit paste (KJ) gave a significant effect (P≥0.05) on the organoleptic value of the biscuit color. The effect of the interaction of yellow sweet potatoes flour and jamblang fruit paste on the color of the biscuit color organoleptic can be seen in Figure 3.2.2.

**Figure 6.** Effect of the interaction of the addition of yellow sweet potatoes flour and jamblang fruit paste toward the color of biscuit, color organoleptic at BNT0.05 (0.187) and KK (9.42%) (the value followed by the same letter indicates an unreal difference)

Based on Figure 5 the highest color of organoleptic value obtained from biscuit treatment with the interaction effect of adding yellow sweet potatoes flour K2 (50%) and the addition of jamblang fruit paste J3 (30%) was 4.23 (like), while the lowest color organoleptic value was obtained from biscuit treatment with the addition of yellow sweet potatoes flour K1 (25%) and jamblang fruit paste J1 (15%) of 3.83 (neutral). The increase in panelists' preference for biscuit color was greatly influenced by the increase in the amount of yellow sweet potatoes flour and jamblang fruit paste. The level of panelists' preference for biscuit color will decrease along with the increase in the amount of yellow sweet potatoes flour and jamblang fruit paste. The results above showed that panelists prefer the color of biscuits with the use of 50% yellow sweet potatoes flour and 30% jamblang fruit paste. The increase in the number of uses of yellow sweet potatoes flour and jamblang fruit paste produces biscuits that are dark brown in color so that the panelists doesn’t like it. This is related to the high temperature roasting process that causes the breakdown of glycosidic bonds from sucrose and fructose contained in yellow sweet potatoes flour. At that time there is a maillard reaction that can affect the color of the biscuits produced [9]. The process of caramelization of sugar and Maillard browning from proteins and reducing sugars causes browning of the outer layer. In addition the addition of jamblang fruit paste also affects the color of the biscuits produced because inside the jamblang fruit contains anthocyanin which can be used as a source of natural coloring. The types of anthocyanins present in this fruit include malvidin-3-glucoside, petunidine-3-glucoside, petunidine-3-rhamnose, and several other types according to the variety [10].

3.2.3. Odor

Fragrance in food products can be influenced by ingredients used in the process. The use of high temperatures in biscuit making causes volatile compounds disappear due to evaporation. The results of the analysis showed that the organoleptic value of odor ranged from 3.83 (neutral) - 4.20 (like) to an average of 4.04 (like).
Table 7. The average organoleptic value of biscuit odor at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| Yellow Sweet Potatoes Flour Addition (K) | Jamblang Fruit Paste Addition (J) |
|----------------------------------------|---------------------------------|
|                                        | J1 (15%) | J2 (30%) | J3 (45%) |
| K1 (25 %)                              | 3.83     | 4.10     | 3.90     |
| K2 (50 %)                              | 4.10     | 4.20     | 4.08     |
| K3 (75 %)                              | 4.08     | 4.08     | 3.98     |

From Table 7 it is known that the lowest value of organoleptic smell was found in the addition of 25% yellow sweet potatoes flour and 15% jamblang fruit paste (K1J1) of 3.83 (neutral). While the highest organoleptic smell value was found in 50% yellow sweet potatoes flour treatment and 30% jamblang fruit paste concentration (K2J2) of 4.20 (like).

Table 8. ANOVA (analysis of variance) organoleptic value of odor at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| SK Treatment | DB        | JK        | KT        | F Count | F Tabel |
|--------------|-----------|-----------|-----------|---------|---------|
|              |           |           |           |         | 0.05    | 0.01    |
| K            | 2         | 0.101     | 0.051     | 80.889**| 4.26    | 8.02    |
| J            | 2         | 0.072     | 0.036     | 57.556**| 4.26    | 8.02    |
| KXJ          | 4         | 0.040     | 0.010     | 15.889**| 3.63    | 6.42    |
| Error        | 18        | 0.011     | 0.001     |         |         |         |
| Total        | 26        | 0.224     |           |         |         |         |

Based on Table 8, variance analysis data showed that the addition of yellow sweet potatoes flour (K) and jamblang fruit paste (J) and the interaction of the addition of yellow sweet potatoes flour (J) concentration and jamblang fruit paste concentration (KJ) gave an effect very real (P≥0.01) to the organoleptic value of the biscuit odor. The effect of the interaction of yellow sweet potatoes flour and jamblang fruit paste on the organoleptic value of biscuit odor could be seen in Figure 3.2.3.

Figure 7. The effect of the interaction of the addition of yellow sweet potatoes flour and jamblang fruit paste on the organoleptic value of biscuit odor at BNT0.01 (0.187) and KK (1.48%) (the value followed by the same letter indicates an unreal differences)
Based on figure 7 the highest organoleptic value of odor was obtained from biscuit treatment with the interaction effect of adding yellow sweet potatoes flour K2 (50%) and adding additional jamblang fruit paste J3 (30%) by 4.20 (like), while the lowest organoleptic aroma value was obtained from biscuit treatment with addition of yellow sweet potatoes flour K1 (25%) and jamblang fruit paste J1 (15%) of 3.83 (neutral). The odor of biscuits with the addition of yellow sweet potatoes flour and jamblang fruit paste produces a distinctive odor that is strong enough so that the odor of yellow sweet potatoes flour and jamblang fruit paste is more dominant compared to the aroma of flour and other additives. So that the greater the percentage used, the stronger the distinctive odor of yellow sweet potatoes flour and jamblang fruit paste on the biscuits research results. However, panelists still prefer biscuits that are added with 50% yellow sweet potatoes flour and 30% jamblang fruit paste. The composition of yellow sweet potatoeses and jamblang fruit paste can affect the odor of biscuits. The increase in the amount of yellow sweet potatoes flour and jamblang fruit paste caused the sweet potatoes and jamblang aroma to be quite strong biscuits and less favored so that the increase in the use of yellow sweet potatoes flour and jamblang fruit paste lowered the favorite score.

3.2.4. Texture
Texture testing method is a test done by touching the shape of the biscuit. As reported by [3], that texture is often observed by mouth and palation using fingers. Texture properties involve hard or soft sensation when touched. The results of the analysis showed that the organoleptic value of texture ranged between 3.83 (neutral) - 4.25 (like) with an average of 4.03 (like).

Table 9. The average organoleptic value of biscuit texture at each level of addition of yellow sweet potatoes flour and fruit paste

| Yellow Sweet Potatoes Flour Addition (K) | Jamblang Fruit Paste Addition (J) |
|-----------------------------------------|----------------------------------|
|                                         | J1 (15%) | J2 (30%) | J3 (45%) |
| K1 (25 %)                               | 3.83     | 4.10     | 3.90     |
| K2 (50 %)                               | 4.10     | 4.25     | 4.05     |
| K3 (75 %)                               | 4.05     | 3.98     | 4.05     |

From Table 9 It is known that the lowest texture organoleptic value is found in addition to 25% yellow sweet potatoes flour and 15% jamblang fruit paste (K1J1) of 3.83 (neutral). Whereas the highest organoleptic aroma value was found in 50% yellow sweet potatoes flour and 30% jamblang fruit paste (K2J2) of 4.25 (like).

Table 10. ANOVA (analysis of variance) organoleptic value of texture at each level of addition of yellow sweet potatoes flour and jamblang fruit paste

| SK Treatment | DB | JK | KT | F Count | F Tabel |
|--------------|----|----|----|---------|---------|
| K            | 2  | 0.111 | 0.055 | 36.273** | 4.26    | 8.02    |
| J            | 2  | 0.051 | 0.025 | 16.636** | 4.26    | 8.02    |
| KXJ          | 4  | 0.081 | 0.020 | 13.227** | 3.63    | 6.42    |
| Error        | 18 | 0.027 | 0.002 |         |         |         |
| Total        | 26 | 0.270 |    |         |         |         |

Note: ** = Had significant effect
Based on table 10 analysis of variance showed that the addition of yellow sweet potatoes flour (K) and jamblang fruit paste (J) and the interaction of addition of yellow sweet potatoes flour (J) and jamblang fruit paste (KJ) had a very real effect (P≥0.01) to the organoleptic value of biscuit texture. The effect of the interaction of yellow sweet potatoes flour and jamblang fruit paste on the organoleptic value of biscuit texture can be seen in Figure 3.2.4.

Based on table 3.2.4 (b) analysis of variance showed that the addition of yellow sweet potatoes flour (K) and jamblang fruit paste (J) and the interaction of addition of yellow sweet potatoes flour (J) and jamblang fruit paste (KJ) had a very significant effect (P≥0.01) to the organoleptic value of biscuit texture. The effect of the interaction of yellow sweet potatoes flour and jamblang fruit paste on the organoleptic value of biscuit texture could be seen in Figure 8.

Figure 8. Effect of the interaction of the addition of yellow sweet potatoes flour and jamblang fruit paste on the organoleptic value of biscuit texture at BNT $0.01(0.077)$ and KK $1.55\%$ (the value followed by the same letter indicates a non-significant difference)

Based on Figure 8 the highest organoleptic value of the texture was obtained from the biscuit treatment with the interaction effect of adding yellow sweet potatoes flour K2 (50%) and adding the addition of jamblang fruit paste J3 (30%) of 4.25 (like), while the lowest organoleptic value of aroma obtained from biscuit treatment with the addition of yellow sweet potatoes flour K1 (25%) and jamblang fruit paste J1 (15%) of 3.83 (neutral). Biscuit texture with the addition of yellow sweet potatoes flour and the lowest jamblang fruit paste is less preferred by panelists because it has a hard texture, while the biscuit texture with the addition of yellow sweet potatoes flour and the highest jamblang fruit pasta has a slightly sticky texture. The sticky product texture is influenced by the viscosity of the dough added with yellow sweet potatoes flour and high jamblang fruit paste. So the panelists prefer biscuits with 50% yellow sweet potatoes flour and 30% jamblang fruit paste.

The viscosity of the sweet potatoes starch peaks is higher than wheat due to the different types of starch (tubers and cereals), in addition to the levels and structure of amylose and amylopectin. In addition, high sugar content in sweet potatoes flour has the potential to inhibit the gelatinization process so that sweet potatoes flour cannot be used within large quantities. This is because sugar is hygroscopic so it can absorb the water needed to gelatinize starch [11]. In addition, the biscuit texture is also influenced by the addition of jamblang fruit paste due to the large amount of water contained in jamblang fruit paste which is added in biscuit dough.

4. Conclusion
1. The addition of yellow sweet potatoes flour has a very significant effect (P≥0.01) on ash content and organoleptic value of taste, color, odor and texture.
2. The addition of jamblang fruit paste had a very significant effect ($P \geq 0.01$) on the organoleptic value of taste, odor and texture, and had a significant effect ($P \geq 0.05$) on the organoleptic value of the biscuit color, and the effect was not significant ($P \leq 0.05$) the ash content of biscuits.

3. The interaction of the addition of yellow sweet potatoes flour with the addition of jamblang fruit paste had a very significant effect ($P \geq 0.01$) on the organoleptic value of odor and texture, and had a significant effect ($P \geq 0.05$) on the organoleptic value of the biscuit color and had an unreal effect ($P \leq 0.05$) on the ash content of biscuits.

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