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Chemical and Organoleptic Quality of Beef Sausage by Substitution of Tapioca with Kepok Banana (*Musa paradisiaca formatypica*) Flour

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ABSTRACT

One of the beef processing is sausage, which is well known in the community. At this time, the need for fast food (ready-to-cook) is increasing. The main ingredient used to produce sausages for stuffing is tapioca flour. The increasing price of tapioca flour is due to the high demand for its use in processed foods, so it is necessary to find alternative fillers that are more affordable. Kepok banana flour (*Musa paradisiaca formatypica*) has a starch content that is relatively similar to tapioca, so it can be used as an alternative raw material. This study aimed to determine the chemical and organoleptic quality of beef sausage made with Kepok banana flour. This study used a completely randomized design (CRD) consisting of 5 treatments, namely X0 = (control) 0% Kepok banana flour + 20% tapioca; X1 = 5% Kepok banana flour + 15% tapioca; X2 = 10% Kepok banana flour + 10% tapioca; X3 = 15% Kepok banana flour + 5% tapioca; X4 = 20% Kepok banana flour + 0% tapioca, with each treatment consisting of 4 replicates. The variables observed were protein content, moisture content, crude fibre, fat content, ash content and organoleptic of beef sausage. The results showed that the addition of Kepok banana flour in beef sausage processing had a significant effect ($P<0.05$) on protein content, fat content, moisture content, crude fibre, color, flavour, and aroma, but no significant effect ($P>0.05$) on ash content and texture of beef sausage. It is concluded that beef sausage made with kepok banana flour as a substitute for tapioca flour produces sausage with better chemical and organoleptic properties than beef sausage made with tapioca flour only. Kepok banana flour can be used as a filler in the production of beef sausage.

Keywords: Chemical quality, organoleptic, beef sausage, kepok banana flour

INTRODUCTION

Meat is one of the most important food sources for humans. Meat is the largest producer of animal protein compared to vegetable products. The protein content in 100g of fresh beef is 18.8g (Maiyena and Mawarnis, 2022), while chicken meat has a protein content of 17.8 g in 100 g. (Sundari, et al., 2015). Beef has high nutrition because it has complete and balanced amino acids. Efforts can be made to maintain beef quality by processing to reduce damage or spoilage.

Processing beef into sausages is a well-known meat processing in the community. Currently, the demand for ready-to-cook food is increasing. Independent survey data conducted by a private company shows that sausage consumption by Indonesians is growing at about 4.46% per year (Herlina et al., 2015). The raw materials used in the production of sausages consist of main ingredients and additional ingredients. The main ingredient is meat; the additional ingredients are fillers, flavourings, and other permitted food ingredients.

The sausage ingredient used as a filler is tapioca flour. The function of tapioca flour is to bind the meat to make it more uniform to produce sausages with a chewy, dense texture. It also can bind restructuring materials determined by its ability to bind ingredients. Tapioca flour contains 17% amylose and 83% amylopectin, which increases water absorption during cooking (Syamsir et al., 2011). The rising price of tapioca starch is due to the high demand for its use in processed foods, so it is necessary to find alternative fillers that are more affordable. One alternative is to use starch from other local commodities with similar physical properties, such as bananas. Bananas are also found in Sulawesi and are primarily used in cakes.

Banana fruit is a source of fibre, carbohydrates and calcium. Banana flour processed by oven drying has a carbohydrate content of 88.60 g in starch, glucose, dextrose, fructose and sucrose. The benefits of the banana fruit can be taken from the starch, making it similar to tapioca, which can be used to make sausages. The amylose content of Kepok banana flour is 19.2%, and amylopectin is 79.5% (Yulian et al., 2014). The amylose and amylopectin content can increase the chewiness and density of a product. Banana Pomegranate Flour has been used in processed meat products such as

meatballs (Kolo et al., 2023), beef sausage (Toni et al., 2023), kampung chicken sausage (Bansele et al., 2022), and broiler chicken sausage (Dethan et al., 2022). Meanwhile, banana fruit flour was only studied for its use in making beef meatball products (Anjalani et al., 2023) and has never been studied for its use in the production of beef sausage. Therefore, a study used kepok banana flour as a substitute for tapioca flour as a filling material at different levels to produce good sausage products in terms of chemistry and consumer acceptability.

MATERIALS AND METHODS

Tools and Materials

The tools used in this research consist of a stuffer, food processor (Idealife brand), cutting board, sleeve, rope, thermometer, digital scale (Acis), pH meter (Hanna) oven (Binder), knife, stove, pot, and spoon. The ingredients needed are beef, kepok banana flour (Hasil Bumiku brand), tapioca flour (Rumah Kelinci), salt, flavouring, garlic, skim milk (Ampec), pepper, corn oil (Mazola), chicken eggs, and ice cubes.

Research Design

This study used a completely randomized design (CRD) consisting of 5 treatments and four replicates with 20 treatment units. The treatments are: X0 = (control) 0% kepok banana flour + 20% tapioca; X1 = 5% kepok banana flour + 15% tapioca; X2 = 10% kepok banana flour + 10% tapioca; X3 = 15% kepok banana flour + 5% tapioca; X4 = 20% kepok banana flour + 0% tapioca.

Research Procedures

Beef that has been cut into small pieces, cleaned of connective tissue, and then finely ground using a grinder/food processor. Salt, pepper, spices, garlic, and eggs were added and ground to Table 1. Ice cubes were added, treatments with different concentrations of each dough were combined according to Table 2, and then ground again for 1 minute. The dough was then added to skim milk, mixed, and mashed for 1 minute. After crushing, corn oil was added to the dough and crushed again for 1 minute.

The dough is returned to the stuffer. The stuffer is used to stuff the dough into the casing. Once stuffed, the casings are tied at the ends every 10 cm. The sausages are steam-cooked at 100º C for 30 minutes. The sausages were then removed and aerated for further testing. Each treatment was repeated four times.

Table 1. Ingredients for making beef sausage

Ingredients	Percentage
Beef	200g
Ice Water	80ml
Corn Oil	32ml
Skim Milk	16g
Salt	4g
Sugar	2g
Pepper	1g
Yolk Eggs	2

Table 2. Treatment Combination of Kepok Banana Flour and Tapioca Flour

Combination	Treatment				
	X0 (control)	X1	X2	X3	X4
Kepok banana flour	0 %	5 %	10 %	15 %	20 %
Tapioca flour	20 %	15 %	10 %	5 %	0 %

Description: X0 = (control) kepok banana flour + 20% tapioca; X1 = 5% kepok banana flour + 15% tapioca; X2 = 10% kepok banana flour + 10% tapioca; X3 = 15% kepok banana flour + 5% tapioca; X4 = 20% kepok banana flour + 0% tapioca

Parameter Tests

Chemical Quality

1. Protein Content (AOAC, 2005)

The sample weighed 0.25 g and was placed in a 100 mL Kjeldahl flask. 0.25 g of selenium and 3 mL of H2SO4 were added to the sample and decomposed for 1 hour until the solution was clear. After cooling, 50 mL of distilled water and 20 mL of 40% NaOH were added to the solution and distilled. The distillate was collected in an Erlenmeyer containing 10 mL H3BO3 solution and two Brom Cresol Green-Methyl Red pink drops. The distillation was stopped when the distillate volume was 10 mL and the color was bluish. The distillate was then titrated with 0.1 N HCl until it turned pink. The same treatment was applied to the blank. The protein content was calculated using the formula Protein content = 6.25 × % nitrogen, where the

percentage of nitrogen can be calculated by formula 1.

$$\text{Nitrogen (\%)} = \frac{(S-B)\times N\ HCL\times 14}{W\times 1000}\times 100\%$$

(1)

Description:
S : Sample titrant volume (mL)
W: Dry weight of sample (g)
B: Volume of blank titrant (mL)
N: Normality

2. Water Content (AOAC, 2005)

Samples were weighed as much as 1 g in a porcelain cup. The samples were placed in an oven at 105 ºC for 8 hours, cooled in an applicator and weighed. Moisture content was calculated in formula 2.

$$\text{Water Content (\%)} = \frac{\text{initial weight}-\text{final weight}}{\text{initial weight}}\times 100\ \%$$

(2)

3. Fat Content (AOAC, 2005)

The sample was weighed as much as 2 g and spread on a cotton pad with filter paper. The filter paper was rolled up to form a thimble and put into a soxhlet flask. The sample was extracted for six hours with 150 mL hexane solvent. The extracted fat was dried in an oven at 100 ºC for one hour. Fat content was calculated using the formula 3.

$$\text{Fat Content (\%)} = \frac{\text{extracted fat weight}}{\text{sample weight}}\times 100\%$$

(3)

4. Crude Fiber

The procedure for measuring crude fibre is as follows: Dry the fibre bag in the oven for about 1 hour, then weigh it, place the fibre bag in the carousel, weigh the sample without fat and place it in the platinum dish. The fibre content is calculated using formula 4.

$$\text{Fiber Content (\%)} = \frac{(M3-M1-M4)-(B3-B1-B4)}{M2}\times 100\ \%$$

(4)

Description:
M1: Filter Paper Weight (g)
M2: Sample weight (g)
M3: Weight of cup + Filter paper (g)
M4: Weight of cup + ash after burning (g)
B1: Weight of filter paper blank (g)
B3: Weight of blank platinum cup + filter paper that has been in the oven (g)
B4: Weight of blank platinum cup + ash that has been burned (g)

5. Ash Content (AOAC, 2005)

The sample is weighed as much as 1 g in a porcelain cup. The samples were burned or charred in a furnace at 600 ºC for 2 hours or until they were smokeless. The samples were then weighed after being cooled in an applicator. Ash content is calculated using formula 5.

$$\text{Ash Content (\%)} = \frac{\text{ash weight}}{\text{sample weight}}\times 100\ \%$$

(5)

Organoleptic Test

The panellists used were semi-trained, i.e., people who had tasted and had knowledge of sausage products. Before carrying out the evaluation, the panellists were gathered, trained, and given sufficient explanation about the organoleptic test to be carried out. The panellists were 30 people. The organoleptic evaluation was carried out using the hedonic quality test. The hedonic quality test is a quality test that not only says whether you like it or not but also gives an impression of good or bad. This sound or lousy impression is called the hedonic quality impression. Hedonic quality can be general, good to bad, and specific, such as soft to hard, fluffy to hard, bland to sour, etc. The hedonic scale ranges from extremely good to extremely bad. As with the liking test, the hedonic quality test allows the rating data to be converted to a numerical scale and then statistically analyzed for interpretation (Meilgaard, Civille, dan Carr 2015; Setyaningsih, Apriyantono, dan Sari 2018). The hedonic quality attributes tested on beef sausage were color, aroma, flavour, and texture. The susceptible values for each assessment attribute are presented in Table 3.

Table 3. Hedonic quality tests vulnerable values on each assessment attribute

Scale	Hedonic quality attributes			
	Color	Aroma	Flavor	Texture
1	White	Very banana-flavored	Very banana-flavored	Very rough
2	White browned	Banana-flavoured	Tastes banana	Somewhat rough
3	Light brown	Somewhat banana-flavoured	Somewhat banana flavour	Somewhat chewy
4	Brown	Meat flavored	Slightly tasted banana	Chewy
5	Dark Brown	Very meaty	No banana flavour	Very smooth

Data Analysis

Data collected were protein, fat, moisture, crude fibre, ash, and organoleptic tests, including color, aroma, flavour, and texture. Data were analyzed by analysis of variance (ANOVA) and processed with SPSS software ver. 16. Duncan's method further tested Treatments that showed a significant effect ($P<0.05$). The organoleptic test was analyzed using non-parametric analysis, Kruscal-Wallis and Man withney further test.

RESULTS AND DISCUSSION

Chemical Quality

The results of the chemical quality test of beef sausage using tapioca substitution with kepok banana flour are presented in Table 4. It shows that the substitution of tapioca with kepok banana flour has a significant effect ($P<0.05$) on the crude protein, moisture, crude fat, and crude fibre content of beef sausage but no effect ($P<0.05$) on the ash content of beef sausage. The results of Duncan's further test showed significant differences between tapioca flour substitution treatment levels with Kepok banana flour on the crude protein, water, crude fat, and crude fibre contents of beef sausage.

Crude Protein

The crude protein content of beef sausage increased as the degree of substitution of tapioca flour with kepok banana flour increased. Table 4 shows that using kepok banana flour significantly increases beef sausage's crude protein content. The crude protein value is shown in the treatment of 20% Kepok banana flour without the provision of tapioca flour, with a value of 14.64 ± 0.24%. The crude protein of beef sausage can be increased by up to 3.78% compared to the use of tapioca. This is because kepok banana flour has a higher crude protein than tapioca flour. The protein content of Kepok banana flour can reach 2.6% (Oktaviana, Hersoelistyorini, dan Nurhidajah 2017); even in other studies, it is mentioned that the protein of kepok banana flour ranges from 3.36 - 4.12% (Ramadhani, Dwiloka, dan Pramono 2019), while tapioca flour only has a protein content of 0.76% (Nurainy, Ribut Sugiharto, dan Sari 2015).

The value of crude protein content in treatments X0 and X1 did not meet the beef sausage protein content quality standards. In contrast, treatments X2, X3 and X4 in this study met the quality requirements for beef sausage protein content specified in SNI 01-3820-1995, which is at least 13.0% (Badan Standardisasi Nasional Indonesia 1995). This shows that using kepok banana flour is very good in increasing the crude protein of beef sausage.

Table 4. Average chemical quality test of beef sausage with tapioca flour and kepok banana flour addition

Variable	X0	X1	X2	X3	X4	SNI*
Crude Protein (%)	10.86±0.25^{a}	11.48±0.18^{b}	13.15±0.58^{c}	13.89±0.21^{d}	14.64±0.24^{e}	Min 13.0
Water (%)	66.23±0.77^{c}	63.91±0.15^{a}	65.32±0.51^{b}	66.22±0.15^{c}	66.82±0.07^{c}	Max 67.0
Crude Fat (%)	3.63±0.10^{b}	4.89±0.16^{d}	3.24±0.11^{a}	4.75±0.09^{d}	4.08±0.05^{c}	Max 25.0
Crude Fiber (%)	0.44±0.04^{b}	0.46±0.04^{b}	0.58±0.02^{c}	0.54±0.01^{c}	0.13±0.07^{a}	-
Ash (%)	1.88±0.33	1.67±0.30	1.58±0.31	1.90±0.06	1.82±0.07	Max 3.0

Source: Primary data from the study (2023). Note: different superscripts on the same line indicate significant differences ($P<0.05$). X0 = (control) 0% kepok banana flour + 20% tapioca; X1 = 5% kepok banana flour + 15% tapioca; X2 = 10% kepok banana flour + 10% tapioca; X3 = 15% kepok banana flour + 5% tapioca; X4 = 20% kepok banana flour + 0% tapioca. * = SNI 01-3820-1995 (Badan Standardisasi Indonesia 1995).

Water Content

The moisture content of beef sausages decreased with increasing substitution of tapioca flour with pisang kepok (X1 and X2). Still, it then increased again with increasing substitution of tapioca with kepok banana flour (X3 and X4). There was no significant difference (P>0.05) between beef sausage using only tapioca (X0 = 40% tapioca) and beef sausage using only kepok banana flour (X4 = 40% kepok banana flour). This indicates that the quality of the use of tapioca flour is the same as that of kepok banana flour in the variable moisture content of beef sausage, so the use of tapioca flour can be replaced entirely with kepok banana flour in the production of beef sausage.

Generally, food ingredients containing high amylose will be more accessible to absorb water (2007). According to Imam et al. (2014), the amylose content of tapioca flour ranges from 20 - 28 %, while according to Wahyuningtyas et al. (2014), The amylose content of tapioca starch is 17.41%, and the amylose content of kepok banana flour is about 20.5%. This is what causes the value of water content not to be different in beef sausages produced in X0 and X4 treatments because the amylopectin content is relatively the same between tapioca starch and Kepok banana flour.

The moisture content value of beef sausage in this study has met the quality standard for beef sausage moisture content in SNI 01-3820-1995, which does not exceed 67.0% (Badan Standardisasi Nasional Indonesia 1995). The water content value in all treatments did not exceed the quality standards set in SNI 01-3820-1995. This shows that kepok banana flour can be used as a substitute for tapioca flour in making beef sausage.

Crude Fat

The crude fat content of beef sausage showed an increasing trend after the substitution of tapioca flour with kepok banana flour, where the highest level of increase was observed in treatment X1 (4.89 ± 0.16%), followed by treatment X3 (4.75 ± 0.09%) and the lowest value in treatment X2 (3.24 ± 0.11%). This shows that replacing tapioca with kepok banana flour can increase the crude fat in beef sausage. The fat content of kepok banana flour is higher than tapioca flour's. The fat content of kepok banana flour was 3.41% (Putri et al., 2019), while the fat content of tapioca flour was 0.3%. (Aristawati, et al., 2013).

Substituting tapioca flour with the same amount of kepok banana flour (X2 = 10% kepok banana flour + 10% tapioca) can reduce beef sausage's fat content. The source of fat in sausage products comes mainly from the essential beef ingredients used; using fillers such as flour can minimize the fat content in processed sausage products. Tapioca and banana flours have high enough carbohydrate content that their addition can reduce the crude fat value in beef sausages. The desired flour for food processing ingredients is low-fat (Putri et al., 2019).

Based on SNI 01-3820-1995, the fat content of beef sausage does not exceed 23.0%. (Badan Standardisasi Nasional Indonesia 1995). The results showed that crude fat in all treatments did not exceed the established quality standards. The highest crude fat value was obtained in treatment X1 with a crude fat percentage of 4.89 ± 0.16%. This indicates that the use of Kepok banana flour as a substitute for tapioca flour in the production of beef sausage can be done without reducing the quality of the beef sausage.

Crude Fiber

Based on the results of data analysis, the crude fibre value in Table 4 shows a significant effect (P<0.05) among treatments. The crude fibre value of beef sausage tended to decrease as the degree of substitution of tapioca flour with kepok banana flour increased. The highest crude fibre value was found in the balanced combination of tapioca flour and kepok banana flour (X2) at 0.58 ± 0.02%. The lowest value was found in the treatment of kepok banana flour without tapioca flour (X4) at 0.13 ± 0.07%.

The results of this study were different from the results of research conducted by (Ramadhani et al., 2019) that with the increase in the use of Kepok banana flour in steamed sponge cake (T0 = 0%, T1= 15%, T2 = 30%, dan T3 = 45%), the crude fibre of steamed sponge cake will increase. Replacing wheat flour with banana flour can increase the crude fibre content because the fibre content of banana flour is higher than that of wheat flour. According to (Putri et al., 2019), the crude fibre content of white kepok banana flour is 4.09%, while according to the study, the crude fibre content of white kepok banana flour is 2.28%. (Sudirman and Ninsix, 2015) The crude fibre content of tapioca flour was lower at 0.60%. The decrease in crude fibre can be caused by the processing done on beef sausage. (Putri, et al., 2019) Suggests that the cell walls of foodstuffs can break down during

processing. Furthermore, (Winarno, 2004) argues that processing can reduce the nutritional value of food and processing can soften food fibre.

Ash Content

The results of data analysis (Table 4) showed that the level of kepok banana flour treatment had no effect (P<0.05) on the ash content of beef sausage. There was no difference in ash content between beef sausage made with tapioca and beef sausage made with Kepok banana flour. The ash content of the beef sausage obtained ranged from 1.88 to 1.90%. The results of this study are different from the opinions of Suryani et al. (2018) that the use of more kepok banana flour will reduce the ash content of the food products produced. This also differs from Bansele et al. (2022), who state that the more banana flour is added to chicken sausage, the more the ash content increases. This is believed to be due to the difference in composition ratio between banana flour and tapioca flour. The percentage of ash content in tapioca flour is low, so when the concentration of added banana flour is higher than that of tapioca flour, the ash content tends to increase. The ash content produced in this study still meets the quality standards for ash content for meat sausages, namely a maximum of 3.0 according to SNI 01-3820-1995 (Badan Standardisasi Nasional Indonesia 1995). This indicates that Kepok banana flour can be used as an excellent alternative to tapioca flour substitution in the production of beef sausage without affecting the quality of ash content of the beef sausage produced.

Organoleptic Test

Sensory testing, or organoleptic testing, is used to determine the acceptability and assess the quality of a product (Setyaningsih et al., 2018). The hedonic quality test gives a more specific impression of product quality regarding texture, color, flavour, and aroma. Based on the analysis of variance, the organoleptic test of beef sausage with the substitution of Kepok banana flour and tapioca is shown in Table 5.

Table 5. Mean organoleptic test of beef sausage with added tapioca flour and kepok banana flour

Variables	X0	X1	X2	X3	X4
Color	2.10±0.48^{a}	2.70±0.65^{b}	2.90±0.66^{b}	3.23±0.72^{c}	4.57±0.56^{d}
Flavour	4.40±0.93^{a}	4.33±0.95^{ab}	4.30±0.87^{ab}	3.83±1.08^{b}	4.43±1.00^{a}
Aroma	3.83±0.53^{a}	3.87±0.57^{a}	3.77±0.56^{a}	3.63±0.85^{a}	4.20±0.66^{b}
Texture	3.43±1.27	3.07±1.04	3.23±1.00	2.87±1.07	3.07±1.04

Source: Primary data from the study (2023). Note: different superscripts on the same line indicate significant differences (P<0.05). X0 = Control (0% Kepok Banana Flour + 20% Tapioca, X1 = 5% Kepok Banana Flour + 15% Tapioca, X2 = 10% Kepok Banana Flour + 10% Tapioca, X3 = 15% Kepok Banana Flour + 5% Tapioca, X4 = 20% Kepok Banana Flour + 0% Tapioca.

Color

The mean organoleptic score evaluation of the color of beef sausage with banana and tapioca flour substitution is presented in Table 5. There was a significant difference (P<0.05). The panellists' evaluation score of sausage color showed that the increasing level of kepok-banana flour would increase the color score of beef sausage. The highest score was found in treatment X4 with dark brown color (4.57). At the same time, the lowest average score was found in treatment X0 with a brownish-white color (2.10). This is due to banana flour's dark brown colour, so adding the highest level of banana flour produces a dark brown sausage color compared to the pure white color of tapioca flour. The brownish-yellow color formed in the product may be caused by the Maillard reaction, which is a browning reaction that occurs when reducing sugars react with NH2-containing compounds (proteins, peptides, amino acids, and ammonium) under hot conditions, or it may be caused by the caramelization process (Winarno, 2004).

Research on free-range chicken sausage with banana pith and tapioca flour substitution produced a slightly brown sausage color (Bansele et al., 2022). Furthermore, the study of broiler chicken sausage substituting banana ponggol flour and tapioca flour produced a dark red sausage color (Dethan et al., 2022). So the color of regular sausages depends on the type of livestock, fillers or substitutes.

Flavor

The flavour is a sensory response produced by food placed in the mouth and perceived by the taste buds. Taste is initiated by the response of the taste buds to chemical stimuli.

The organoleptic evaluation of the flavour of beef sausage with banana and tapioca flour substitution presented in Table 5 showed a significant difference ($P<0.05$) between treatments. The panellists' evaluation of the beef sausage flavour showed that treatment X4 with the addition of 20% Kepok banana flour produced a slight banana flavour response that was still acceptable to consumers.

Ayadi et al. (2009) reported that using carrageenan at the 1.5% level would reduce the sausage flavour score. The carrageenan added in this study was 5%, much higher than in previous studies. Research on substituting banana stem flour in broiler chicken sausage produced a somewhat favourable response. The banana stem has a distinctive taste due to its sap or tannin content, resulting in a less palatable sausage. Hence, the panellists gave a low score (Dethan et al., 2022).

Aroma

The results in Table 5 show that the substitution of tapioca flour with Kepok banana flour had a significant effect ($P<0.05$) on the aroma of the sausage. Treatments X0, X1, X2 and X3 showed no difference, while treatment X4 with the addition of 20% banana flour showed a difference with the results of the beef sausage response being very meaty. The banana flour added to the sausage is not banana-flavored. Adding banana flour to the beef sausage does not give the sausage a banana flavour to make it acceptable to the panellists. According to Sujianti et al. (2023), The distinctive aroma of sausage can be influenced by several factors, namely the combination of spices and meat used, so that the resulting sausage can bring out the distinctive aroma of meat. The lack of influence of the aroma of banana flour and the 80% meat content in the sausage production in this study is why the treatment results have a very meaty aroma.

The results of this study are consistent with research conducted by (Dethan et al. 2022). It was found that the aroma of broiler chicken sausage with the addition of banana stem flour resulted in an aroma score response of 1.47 (very fishy smell). The addition of banana stem flour did not affect the flavour of the chicken meat used. Another study conducted by (Apriantini et al., 2021) using durian seed flour as a substitute for flour in making meatballs gave similar results. They reported that using durian seed flour in making sausages resulted in a sausage aroma that was not durian-scented. This is believed to be because the aroma of durian seed flour is not intense, and the addition of spices so that the addition of durian seed flour does not affect the aroma of the meatballs.

Texture

The mean value of the organoleptic test on the texture of beef sausage with the addition of banana flour and tapioca flour (Table 5) showed that the results were not significantly different between treatments ($P<0.05$). The average response of the panellists was slightly chewy. It is because tapioca and banana flours have amylose and amylopectin values that are not so far apart in percentage. The percentage of amylose in banana flour is about 19.2% (Wibowo, et al., 2008) Amylose content in tapioca flour 17% (Syamsir, et al., 2011). Tapioca flour contains 83% amylopectin with a 3 - 3.5 μ particle size. This increases the water absorption process during cooking. (Syamsir et al., 2011). The amylopectin content of Kepok banana flour was 79.5 % (Yulian and Novitasari, 2014). Amylopectin causes starch to gelatinize, thicken and form a more compact granule structure, resulting in chewier sausages. (Wibowo et al., 2008).

CONCLUSION

The best combination of adding 10% banana flour and 10% tapioca flour can be used as a filling material to manufacture beef sausage. The same was true for organoleptic quality. The beef sausage made with banana kepok is still acceptable to the panellists and has a response value that is not different from the beef sausage made with tapioca flour. The beef sausage's overall quality value met the meat sausage standards based on SNI 01-3820-1995. The use of kepok banana flour as a substitute for tapioca flour in beef sausage can be done without affecting the quality of the chemical and organoleptic of the sausage produced.

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