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THE EFFECT OF VARIOUS TYPES OF FLOUR AS FILLER MATERIALS ON PHYSICAL, CHEMICAL AND ORGANOLEPTIC CHARACTERISTICS OF SALAMI CULLED LAYING HENS

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Abstract

The aim of this study was to determine the effect of various types of flour on the physico-chemical and organoleptic characteristics of salami as a filler. The study was conducted using a completely randomized design with 5 treatments P1 (corn flour), P2 (sorghum flour), P3 (sago flour), P4 (wheat flour) and P5 (tapioca flour) each treatment was repeated 4 times. Variables measured included physical properties (Water Holding Capacity, Cooking Loss, and Tenderness) chemical properties (proximate) as well as organoleptic tests. Data were analyzed using ANOVA and continued with the Honest Significant Difference Test. Based on the research results obtained physical quality such as the highest cooking shrinkage of corn flour 19.62; The highest water binding capacity of sago flour is 42.03; the highest tenderness of sago flour 52; chemical quality such as the highest water content using sago flour (47.11%), the highest protein in wheat flour 20.65%, the highest fat in tapioca flour 20.46%, the highest carbohydrate in corn flour 19.58%; The organoleptic score for color was 2.66 (liked) using sago flour, aroma 2.77 (like) corn flour, texture 2.90 (neutral) using sago flour and taste 2.30 (like) using wheat flour.

***Key words**: corn flour, sorghum, sago, flour, tapioca, salami.*

INTRODUCTION

In Indonesia, foods such as tubers, corn, sago and sorghum have begun to be promoted and are an alternative to solving problems due to scarcity of food ingredients such as rice. Judging from the nutritional value of sorghum, it is quite adequate as a food ingredient, which contains about 83% carbohydrates; 3.50% fat, and 10% protein (dry basis). Although its use as a food ingredient is still very limited, in addition to the lack of production it is also because the general public is not used to consuming it. Sorghum is an alternative food ingredient to replace carbohydrates where the carbohydrate content according to the USDA (2001) reaches (74.63 gr/100 gr ingredient) higher than wheat (71.97 gr/100 gr ingredient) and ranks third after rice (79.15 gr/100 gr ingredient), and corn (76.85 gr/100 gr of material).

Sago flour is processed from the processing of thatch stems or sago tree trunks. It is pale white in color with a rather rough texture. Sago flour can be used as a filler material aimed at improving texture, increasing water holding capacity, and small shrinkage, increasing product weight at relatively low prices so as to reduce production costs (Harsanto, 1986).

Wheat flour is a food ingredient that is still imported as a supporting material for the processing of food products such as sausages as a filler, while domestically there are many other types of flour such as corn flour, sorghum flour and tapioca flour, sago flour and wheat flour for salami products, as well as indirectly giving appreciation and new innovations to sausage and even salami producers, in addition to reducing producers' dependence on imported products so that producers are not at a loss looking for substitutes.

The addition of various types of flour as a filler can affect the physico-chemical and organoleptic properties of food products.

Based on the above background, research has been carried out to determine the effect of various types of flour on the physico-chemical and organoleptic characteristics of salami.

In addition to determining the right formulation in the processing of fermented sausages (salami) from various types of flour as filler.

MATERIALS AND METHODS

Tools and materials

The equipment used is a Philips HR 7620 Food Processor used to grind meat and mix sausage dough, a thermometer to measure temperature. Harnir as a filling tool for sausage casings, sausage casings with a size of 30 cm to wrap salami. Casing straps (mattress thread), hand stuffer, smoker for smoking salami, basin for storing meat, plastic tray for storing spices, gloves, electric scale, knife and cutting board. The materials used included Isa Brown strain culled laying hens aged 96 weeks.

The culled laying hens used were obtained from a livestock company in the village of Tetey, Dimembe District, Minahasa Regency. Spices for making salami such as garlic, ginger, pepper, nutmeg, sugar and salt, flour, skimmed milk, fat, ice or ice water. The starter cultures for fermentation were *Lactobacillus plantarum* and *Lactobacillus acidophillus* which were obtained from Nutrition Food Science Study Program, Gadjah Mada University, Yogyakarta.

Research methods

The study was carried out using a completely randomized design (CRD) with 5 treatments and each treatment was repeated 4 times to obtain 20 treatment sets (Steel and Torrie, 1995). Data were analyzed using ANOVA and continued with the Honest Significant Difference Test (Steel and Torrie, 1995).

Research procedure

The main ingredients for making salami consist of culled laying hens meat and fat in a ratio of 80: 20. The meat and fat are ground together, then frozen for 24 hours. Then it is ground again using a food processor together with spices, salt, sugar, garlic, ginger, pepper, nutmeg, and starter cultures of *Lactobacillus plantarum and Lactobacillus acidophillus* with a ratio of 1: 1: and 2% yeast. As treatments, namely sorghum flour, tapioca flour, sago flour, corn flour, wheat flour each 15%. To the salami dough is added skim milk, fat, ice or iced water and vegetable protein (Pearson and Tauber, 1984). After being thoroughly mixed, the dough is put into a casing with a diameter of 30 mm, then tied. Then hung on a rack and left (conditioning) for 24 hours at room temperature (Arief et al., 2008). After the salami has gone through the conditioning process, it is then fermented for 6 days at room temperature. Fermentation is interspersed with the smoking process for 1 hour per day. The temperature during smoking is maintained at 30-35°C. The fuel used is dry coconut shells.

Parameters measured

1. Physical quality, namely water holding capacity, cooking loss and tenderness 2. Chemical quality, namely proximate analysis (water content, protein, fat, carbohydrates) (AOAC, 2005) 3. Organoleptic Quality (color, aroma, texture and taste).

RESULTS AND DISCUSSIONS

Effect of Treatment on Physical Quality

Data from the results of the study influenced the treatment using various types such as corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour; and wheat flour and tapioca flour as filler for Cooking Loss (%), Water Holding Capacity (%), and Tenderness (%) of salami are presented in Table 1.

Table 1. Mean Cooking Loss (%), Water Holding Capacity (%), and Tenderness (mm/g/10 second) culled laying hens salami Using corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour; and wheat flour and tapioca flour as filler

	Average (%)		
Treatment	**Cooking Loss**	**Water Holding Capacity**	**Tenderness** mm/g/10 second
P1	**19.62[a]**	**32.49[c]**	**50.51[b]**
P2	**17.70[b]**	**36.35[b]**	**48.13[d]**
P3	**15.70[c]**	**42.03[a]**	**52.00[a]**
P4	**16.01[c]**	**41.16[a]**	**48.37[c]**
P5	**17.78[b]**	**34.94[c]**	**42.67[e]**

Note: Different letters in the same column indicate a significant difference ($P < 0.05$)

The data in Table 1 shows that the highest cooking losses were found in treatment P1 (corn flour) which was 19.62% while the lowest cooking losses were obtained in treatment P3 (sago flour) of 16.01%. thus sago flour is a type of flour that has the lowest cooking losses compared to other types of flour. This means that sago flour has the ability to bind water or the amount of water bound and between muscle fibers and even other compounds found in salami, cooking losses become small. Low cooking loss means that the quality of the salami using sago flour is better than other treatments, because if a food product has a low cooking loss, it means that the product is of good quality. This is supported by Soeparno (2005); Aberlie et al. (2001) that meat or processed meat products with low cooking losses have better quality than meat with large cooking losses because the loss of nutrients during cooking will be less.

According to Kusmajadi (2006), Lawrie (2003) meat with low cooking loss has relatively better physical quality than meat with greater cooking loss. The low cooking loss is caused by a decrease in the pH of the postmortem meat which results in many myofibrillar proteins being damaged, which is followed by a loss of the protein's ability to bind water which in turn increases the cooking loss. The variation in the amount of cooking shrinkage from the results of this study was due to the effect of treatment with various types of flour.

Based on Table 1, it was found that the highest water holding capacity was found in treatment P3 (sago flour) of 42.03% while the lowest was obtained in treatment P1 (corn flour) 32.49% and varied between 32.35-42.03%, it was seen that there was an effect of using various treatments This type of flour as a filler has the ability to bind free water, especially during the process of forming meat emulsions which can grow well in medium with sufficient water content (Fardiaz, 1992). The results of this study are supported by previous studies that when the water holding capacity increases, water is tightly bound by proteins so that water cannot escape as a result the water content becomes high (Hultin, 1985, Aberlie et al., 2001). Another factor is that starch flour can increase its water binding capacity because it has the ability to retain water during processing and heating (Ockerman, 1983). If the starch is heated, it will cause the starch granules to vibrate rapidly until finally the bonds between the molecules are broken and the hydrogen side will be able to bind more water (Boyer and Shannon, 2003; Bulkaini et al., 2020).

The addition of fillers to meat products mainly increases stability, water holding capacity, flavor and product slice characteristics as well as reduced formulation costs. The results of Ratna Yulistiani's research (2011) reported that the best fillers in the manufacture of mackerel sausages such as corn flour (Arjuno variety) with a concentration of 6% obtained a high WHC value of 88% with fillers (rice flour, wheat flour, corn flour). But Suradi (2006) in his statement that the decrease in water holding capacity was due to the influence of the pH of the meat because the pH of the meat was low as well as the holding capacity of water was low. The higher the water holding capacity, the lower the cooking losses. Likewise with the results of this study obtained high water holding capacity but low cooking losses (Table 1).

Based on Table 1, it was found that the highest tenderness was found in treatment P3 (sago flour, 52 mm/g/10 seconds) while the lowest was obtained in treatment P5 (tapioca flour, 42.67 mm/g/10 seconds). The variation in the rate of tenderness from the results of this study was due to the different types of flour used as fillers for each treatment which gave different responses of tenderness. This shows that the use of various types of flour in salami processing can increase tenderness, causing more bound water and thus increasing tenderness as well. According to Ockerman (1983, Lawrie, 2005) that high water holding capacity will also be followed by high tenderness. The high rate of tenderness of sago flour (52 mm/g/10 seconds) in this study was due to sago starch with 27% amylose and 73% amylopectin having the same concentration as sago starch with high viscosity compared to starch solutions from other cereals (Harsanto, 1986) .

Meat tenderness is influenced by three meat components such as myofibrillar structure and muscle contraction, connective tissue content and the binding capacity of water and meat juices (Soeparno, 2005). According to Aberle et al. (2001) and Lawrie (2003) stated that the main component of meat tenderness is influenced by connective tissue, muscle fiber groups and fat groups. Connective tissue, especially collagen and the number of cross-links play a role in the tenderness of the meat.

Effect of Treatment on Chemical Quality

Fillers are materials added in the process of making processed meat products that must have the ability to bind a certain amount of water. Data The results of the proximate analysis of each flour used in this study are presented in Table 2.

Data from the results of the study influenced the treatment using corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour; and wheat flour and tapioca flour as fillers for the content of water, protein (%), fat and carbohydrates in salami are presented in Table 3.

Table 2. Proximate analysis results of corn flour, sorghum flour, sago flour and wheat flour and tapioca flour

	Average (%)			
Flour Type	Content water	Fat	Protein	Carbohydrate
Corn flour	13.49	0.4	9.27	76.77
Sorghum flour	12.20	1.23	9.44	75.55
Sago flour	16.51	0.23	2.22	80.62
Wheat flour	13.43	0.65	13.92	71.47
Tapioca flour	12.57	0.38	6.34	80.64

Dairy Animal Nutrition Laboratory, Department of Nutrition Science and Feed Technology. Faculty of Animal Science, IPB, (2021)

Table 3. Average Moisture Content (%), Protein (%), Fat (%) and Carbohydrates (%) Salami chicken laying hens using corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour and wheat flour and tapioca flour as filler

	Average (%)			
Treatment	**Content water**	**Protein**	**Fat**	**Carbohydrate**
P1	**41.51^{c}**	**19.39^{ns}**	**16.13^{bc}**	**19.58^{a}**
P2	**40.85^{c}**	**20.36^{ns}**	**18.09^{b}**	**17.45^{b}**
P3	**47.11^{a}**	**19.32^{ns}**	**14.41^{d}**	**15.35^{c}**
P4	**43.86^{b}**	**20.65^{ns}**	**17.15^{b}**	**14.17^{c}**
P5	**41.48^{c}**	**19.44^{ns}**	**20.46^{a}**	**14.86^{c}**

Description:
P1 = Salami using 15% corn flour ; P2 = Salami using sorghum flour (*Sorghum bicolor* L.) 15%
P3 = Salami using 15% sago flour ; P4 = Salami using 15% wheat flour; P5 = Salami using 15% tapioca flour;
Different letters in the same column indicate a significant difference ($P < 0.05$)

Based on the data in Table 3, the use of various types of flour such as corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour; and wheat flour and tapioca flour as fillers (filler) produce a fairly low water content for all types of flour used. This data is supported by data (Table 2) from the analysis of the water content of corn flour 13.49%, sorghum flour with a moisture content of 12.2%, sago flour 16.51%, wheat flour 13.43% and tapioca flour 12.57%.

The low water content (Table 3) of salami using various types of flour as filler is not in line with the results of a study by Sing *et al.* (2001), that the moisture content of smoked chicken sausage with a smoking temperature of 50 ^{o} C for 20 minutes without starter yeast and lactic acid bacteria, followed by smoking 50 ^{o} C for 90 minutes obtained a moisture content of 56.53%, with a final internal temperature of the sausage 70^{o} C. It is strongly suspected that the low water content in this study indicates the effect of *L. acidophyllus and L. plantarum* starters in reducing the moisture content of smoked chicken sausages. The results of this study were supported by Arief et al. (2014) which stated that the water content of fermented beef sausage with kefir paste starter produced a lower water content than fermented lamb sausage with *L. plantarum* IIA-2C12, namely 65.11%. Likewise with the results of research conducted by Sulaiman (2016) that fermented lamb sausages with *L. plantarum* IIA-2C12 starter produced a moisture content of 60.75% and sausages with *L. acidophilus* IIA-2B4 starter produced a moisture content of 59.06%. In contrast to Sembor et al. (2020) in a report that the water content (34.97%) decreased with increasing levels of sorghum as a filler in salami using *L. acidophyllus* and *L plantarum*. The low water content of the salami is due to the fact that during the processing it undergoes fermentation and smoking. The research product is salami in the category of fermented sausage (dry sausage).

According to Hui et al. (2001) fermented sausages or dry sausages (dry sausage) have a moisture content of 30%-40%, close to the results of this study.

Asma Nisa (2016) also reported that smoked sausages will cause the surface to dry due to water evaporation from the sausages. It is also said that at the time before fermentation some water molecules form hydrates with other molecules containing oxygen atoms, nitrogen, carbohydrates, proteins, salts and other organic compounds so that bound water turns into free water. The free water will evaporate when it is dried during fermentation, so the higher the activity of the enzyme to break the bound water bonds into free water. According to Buckle *et al.* (2009) water is needed by microorganisms to grow and function normally. The decrease in water content is also due to the low pH value of the product because the production of lactic acid by the starter culture results in water not being tightly bound by the meat so that the water easily escapes during smoking (Fardiaz, 1992).

The data in Table 2 based on the results of variance shows that the protein content of salami using various corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour; and wheat flour and tapioca flour as fillers gave results that were not significantly different (P>0.05) on the protein content of salami. The highest protein content data was obtained in the P4 (wheat flour) treatment followed by P2 (sorghum flour) while the lowest protein content was obtained in the P3 (sago flour) treatment. The decrease in protein content was caused by protein denaturation which caused the protein to lose its secondary and tertiary structure due to external pressure. Although the protein content between treatments did not show a significant difference on average 19.39-20.65%, it was still above the SNI standard 01-3820-1995 which recommended a minimum protein content of 13%, so this result was still far above the recommendation.

Based on the data in Table 2 shows that the highest fat content was obtained in treatment P5 (15% tapioca flour) which was 20.46% followed by treatment P2 (18.09%), P4 (17.15%), P1 (16.13%) and the lowest was in treatment P3. (14.41%). The result of fat analysis for tapioca flour was 0.33% (Table 2). Data in Table 2, it shows that overall, the research results meet the National Standardization Agency standard 01-3820-1995, namely a maximum fat content of 25%, although there are no recommendations for salami products, such as sausages. The high fat content of the results of this study was due to the material used in the form of culled laying hens which had a high fat content. In addition, using lactic acid bacteria such as *L. acidophyllus* and *L. plantarum*. Lactic acid bacteria have secondary lipolytic activity, can break down fat into simple chemical compounds. Lipolytic activity is controlled by the lipase enzyme which is owned by lactic acid bacteria so that it can free fatty acids (Reported by Asma Nisa, 2016). In contrast to the results of the study by Bulkaini et al. (2020) showed that the treatment without the addition of tapioca flour (0%) actually gave the highest sausage fat content, namely 2.82 ± 0.24, followed by the addition of tapioca flour of 10% of the total Sausage-making materials gave a value of 1.63 ± 0.55%, sausages with tapioca flour 20% (0.70 ± 0.21%) and the lowest was the addition of 30% tapioca flour (0.67 ± 0.08%). Sembor et al (2020) reported that the use of sorghum (*Sorghum bicolor* L.) flour at different levels (0%, 5%, 10%, 15% and 20%) as a filler in processing salami obtained fat levels ranging from 13 – 18% and the lowest fat content at the level of 15%. Fat acts as a discontinuous phase in the sausage emulsion and the fat content affects the tenderness and juice of the meat

The data in Table 2, shows that the use of various types of flour as filler in chicken laying hens salami resulted in highly significant different carbohydrate levels between treatments, although the highest carbohydrate content was obtained in treatment P1 (19.58% using corn flour) while the lowest carbohydrate content was obtained. in treatment P4 (14.17% using wheat flour as a filler).

The results of this study are in line with Boyer and Shannon, (2003) who stated that the largest chemical component in corn is carbohydrates, which is about 72% of the seed weight, most of which are starch, such as amylose 25-30% and amylopectin around 70-75%. Differences in the treatment of various types of flour as a source of carbohydrates in the manufacture of salami produce different levels of carbohydrates. The use of various types of flour as a filler with 2% each of *L. acidophyllus and L. plantarum* as a starter, plus 2% yeast resulted in a decreased but stable salami carbohydrate content. This means that sago flour, wheat flour and tapioca flour did not show significant differences in carbohydrate content. In addition, because in the manufacture of salami, a starter of lactic acid bacteria is used as a fermenter with the same amount, both the number and type of lactic acid bacteria used. The most important characteristic of lactic acid bacteria is that they are able to ferment sugar into lactic acid (Fardiaz, 1992).

The quality of flour increases with the addition of microbes such as lactic acid bacteria in flour causing the development of bread (Gerez et al., 2006). Lactic acid bacteria are a group of bacteria that produce lactic acid as the main product of carbohydrate or sugar fermentation. Among the lactic acid bacteria groups that are widely used are *L. casei and L. bulgaricus* (Buckle et al., 2010). In this study, *lactic acid bacteria L. acidophyllus and L. plantarum* were used as starters in the processing of salami (fermented sausages) and various types of flour as fillers. The composition of amylose and amylopectin affects the starch profile. Ratnayake et al. (2002) and Bulkaini et al (2020) stated that amylopectin affects the development process of starch granules. Amylose can inhibit the increased expansion of starch granules so that complexes with fat are formed which inhibit the increase in peak viscosity at high pasting temperatures (Sang et al., 2008; Singh et al., 2010). Suparti (2003) states that tapioca flour can function as an adhesive and filler for meatball or sausage dough, so that the number of meatballs or sausages produced increases.

Starch has two main components, namely amylose and amylopectin. The composition of starch generally consists of 80-90% amylopectin and the remaining 10-20% amylose. The content of crude fiber and amylose in corn starch can increase water absorption (Niken, Ayu, 2013). Starch with high amylose content has the ability to absorb water and expands larger because amylose has the ability to form hydrogen bonds while high amylopectin content affects the swelling properties of starch (Suarni, 2009).

Effect of Treatment on Organoleptic Quality

The results of statistical analysis of salami were chicken laying hens using corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour; and wheat flour and tapioca flour as fillers for the color, flavour, texture and taste of various treatments can be seen in Table 4.

Table 4. Average of Salami Organoleptic Test Results on Color, Flavour, Texture and Taste

Treatment	Number of panelist	Color	Flavour	Tekstur	Taste
Averate					
P1	**30**	**2.77^{b}**	**2.27^{c}**	**3.23**	**3.10^{a}**
P2	**30**	**3.93^{a}**	**3.60^{b}**	**3.97**	**3.60^{a}**
P3	**30**	**2.66^{b}**	**5.37^{a}**	**2.90**	**3.53^{a}**
P4	**30**	**3.27^{a}**	**5.23^{bc}**	**3.17**	**2.30^{b}**
P5	**30**	**2.97^{a}**	**4.07^{b}**	**3.10**	**3.80^{a}**

Information: Different letters in the same column indicate significantly different (P 0.05).
Score 1 = very much like, 2 = like 3 = somewhat like, 4 = neutral, 5 = somewhat dislike, 6 = dislike, 7 = very much dislike

The data in Table 4 shows that the organoleptic test for salami color used corn flour, sorghum flour (*Sorghum bicolor* L.) sago flour; and wheat flour and tapioca flour as fillers (filler) showed that treatment P2 (sorghum flour) was very significantly different ($P < 0.01$) from treatment P1 (corn flour) and P3 (sago flour), but not significantly different ($P > 0.05$) with P4, and P5. The most preferred panelists were salami products using sago flour (P3) with a score of 2.66 with henic like quality. The data from this study are almost the same as Sembor, et al (2019) with a hedonic score of 1.83 (likes) using sorghum flour as a filler.

In contrast to the research results of Djukrana Wahab et al. (2017) showed that the organoleptic assessment of the composition of fresh tempeh, sago flour and smoked fish in the manufacture of tempeh sausage products was favored in the P3 treatment (30% fresh tempeh composition, 50% sago flour and smoked fish 20%) with an organoleptic score of color 3.93% (like), aroma 4.23% (like), taste 4.10% (like) and texture 4.58% (like). The results of Sofyan et al's research (2018) found that sago flour as a filler had the highest average value, namely 4.50 and tapioca flour as filler had the lowest average value, namely 3.83 in white oyster mushroom sausage.

The color of the product is influenced by the smoking process (Soeparno, 2005), as well as the salami product in this study after undergoing the smoking process, the color becomes more brown for all treatments. According to Lawrie (2003), during the smoking process, the smoke component is absorbed by the surface of the product and causes a brownish color due to the reaction between the carbonyl groups of the smoke and the proteins found in the meat. Arief et al, 2008; Fadda et al., 1998), the color of fermented sausage is classified as dark due to the presence of H_2O_2 produced by microorganisms resulting from aerobic metabolism. However, the color of the salami as a result of the study became a slightly dark brown color. The ability of H_2O_2 to oxidize causes changes in the enzyme system of microbial cells so that it is used as an antimicrobial. H_2O_2 can cause the red color of sausage to decrease due to the formation of brown metmyoglobin (Varnam and Sutherland, 1995). Color changes in fermented sausages can also be caused by biochemical reactions due to the direct influence of temperature, relative humidity, curing time, meat composition, salt and nitrite concentrations, as well as the addition of culture in sausage processing (Arief et al., 2008; Fadda et al., 1998).

Based on the data in Table 4, the organoleptic test for odor/aroma showed a very significant effect ($P < 0.01$). The highest average value was obtained in the treatment using tapioca flour (P3), which was 5.37 (rather disliked) and the lowest was in the corn flour treatment with an average value of 2.27 (liked). The aroma of salami is caused by the addition of spices, the level of acidity because it uses lactic acid bacteria such as *L. acidophyllus* and *L. plantarum* and yeast so that it gets a sour aroma plus the aroma of smoke during the smoking process so that it produces a distinctive aroma from salami which is acidic. Other volatile compounds determine the aroma of cooked meat such as pyrazine and other compounds such as sulfur and oxygen, ammonia, acetaldehyde, acetone, diacetyl, as well as several compounds in small amounts including formic, acetate, propionate, butyrate and isobutyrate, and dimethylsulfide acid. However, in the combustion process, phenolic compounds become high and Policyclyc Aromatic Hydrocarbon (PAH) compounds are formed which are carcinogenic; The PAH compound is produced through a pyrolysis process during the burning of meat using charcoal and when meat fat drips onto hot coals, the PAH compound increases during direct cooking of meat with charcoal (Terzi et al., 2008., Fadda et al., 1998).

Based on the data in Table 4, the organoleptic test on the texture of the diversity analysis test results showed that the results were not significantly different ($P>0.05$) for each type of flour used. The sample using sago flour with a value of 2.90 (like) was the most preferred texture by the panelists, while salami using tapioca flour was 3.10 (somewhat like) by the panelists although statistically it did not show a significant difference ($P>0.05$). There was no significant difference in the texture attributes in this study because the filler used was both flour. So each treatment gave the same response to the culled laying hens salami products.

Texture is closely related to the balance of addition of water, fat and protein. If it contains a little fat, it will produce a hard and dry product (Toldra, 2002; Lawrie, 2003; Soeparno, 2005). The use of the type of filler can affect the texture, so it has quite different preference values, especially in the content of amylopectin and amylose. This is supported by the opinion of Matz (1962) that starch with a high amylopectin content will form a non-rigid gel, whereas starch with a low amylopectin content will form a stiff gel. Meanwhile, according to Tjokroadikoesoemmo (1986), the addition of tapioca will affect the chemical composition and taste organoleptic properties. The greater the amylopectin content or the lower the amylose content, the more sticky the processed product will be.

The results of organoleptic test observations on salami taste used wheat flour (2.30) which was the most preferred, followed by corn flour (liked with a score of 3.10) as a filler. Taste is the main factor of a food product. Assessment of taste shows consumer acceptance of a food ingredient. Taste is influenced by flavors that can stimulate the sense of acceptance when tasting and the impression left on the sense of taste after someone ingests a food product (Winarno, 2002). The addition of spices to the manufacture of salami (fermented sausages) is the most dominant component in shaping the taste elicited in salami products (Arief et al., 2014). In this study, salami processing using various types of flour as filler with a fermentation time of 6 days using Lactic Acid Bacteria and yeast caused a decrease in pH and is thought to cause an increase in total acid so that the taste becomes more sour. So far, people are not very familiar with salami or fermented sausage products, so only a few panelists like it and most panelists prefer salami which tastes less sour.

CONCLUSIONS

Based on the research results obtained physical quality such as the highest cooking loss of corn flour 19.62; The highest water holding capacity of sago flour is 42.03; the highest tenderness of sago flour 52; chemical quality such as the highest water content using sago flour (47.11%), the highest protein in wheat flour 20.65%, the highest fat in tapioca flour 20.46%, the highest carbohydrate in corn flour 19.58%; The organoleptic score for color was 2.66 (liked) using sago flour, aroma 2.77 (like) corn flour, texture 2.90 (neutral) using sago flour and taste 2.30 (like) using wheat flour.

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