JETISH: Journal of Education Technology Information Social Sciences and Health
Vol. 1 No. 2 November 2022

Organoleptic Quality of Beef Meatballs Substituted with Tuna Fish Meat (Thunnus Sp)

Fransiskus Kelvin Renwarin[1] Nafly Comilo Tiven[2] Isye Jean Liur[3]
Studi of Animal Husbandry, Faculty of Agriculture, University of Pattimura, Ambon City, Indonesia[1,2,3]
Email: kelvinrenwarin08@gmail.com[1]

Abstract
This study aims to determine the organoleptic quality of beef meatballs substituted with tuna fish meat. Beef (Biceps femoris muscle) and tuna fish meat (Thunnus sp) fillet parts, each mashed separately, for the manufacture of meatballs with a composition of 70% beef, 16% tapioca flour, 9% ice water, 2% salt, as well as 3% spices consisting of 2.2% garlic and 0.8 fine pepper. Beef is substituted with tuna meat with levels of 0%, 20% and 40%, then all the ingredients are finely ground until evenly mixed to form a dough. The dough is formed round (± 2 cm) manually by hand, then boiled until cooked (until the meatballs float), then organoleptic tested using untrained panelists. The variables observed are the color, smell, chewiness, texture and taste of meatballs. The data obtained were analyzed variance with a complete random design, with 3 treatments, namely P0 (Beef without being substituted with tuna meat), P1 (20% substituted beef with tuna fish meat), P2 (Beef substituted 40% with tuna fish meat). If there are differences between treatments, it is further tested with the Duncan test. The results showed that the substitution of beef meatballs with tuna meat had an insignificant effect on the color, smell, chewiness, texture and taste of beef meatballs.
Keywords: Organoleptic Quality, Meatballs, Beef, Tuna Meat

INTRODUCTION

Meat is a highly nutritious food and excellent protein quality. The high nutritional content of meat causes the meat to be easily damaged. The composition of different types of meat varies, but in general it contains about 72% water, 21% nitrogen component, 5% fat, 1% carbohydrates and 1% minerals (Kauffman 2001). The anticipation for meat damage is that meat is processed in various product displays that produce economic value and extend the storage period or are durable. One of the products from processed meat that is in demand by many consumers is meatballs.

Meatballs are traditional ball-shaped food products obtained from a mixture of meat or fish that has been mashed by grinding. According to the Indonesian National Standard SNI 01-3818-2014 meatballs have a moisture content of 70%, a maximum fat content of 10%, a minimum protein content of 11%, a maximum ash content of 3% and no preservatives in their products. Meatball raw materials can come from various types of livestock meat, such as: beef, pork, chicken and fish (Lourine et al, 2017).

Beef meatballs are processed beef by grinding and molding in a round shape and boiling with boiling hot water until cooked into meatballs. According to Nurwanto et al (2012) beef has a fairly complete nutritional content such as water, protein, fat, mineral content and a small carbohydrate content. The chemical composition of meatballs is determined by the chemical composition of their constituent ingredients. The use of beef in making meatballs is preferred because it has a better and savory taste, a more pleasant aroma and a chewier and denser texture compared to other types of meatballs. But the use of beef in the manufacture of meatballs is not always good for health. There are several things that cause beef to be bad for health, including saturated fatty acids that are high in the body can increase blood cholesterol and atheroclerosis which causes coronary heart disease (Emawati et al, 2004). USDA (2015) in Soeparno (2015) revealed that the cholesterol content of beef reaches 80-101 mg per 100 grams of meat weight. Seeing the lack of beef, alternatives that have a high nutritional content are needed, such as beef, namely fish meat.

Meatballs can also be made from fish meat, Fish balls are one of the most popular and quite popular Indonesian specialties because fish balls are one of the most popular foods among the public (Manuhara et al, 2015). The raw materials for making fish balls generally consist of the main raw materials and additional raw materials. The main raw material for making fish balls is fish meat, while the additional raw materials are fillers, namely tapioca flour, salt, spices, and ice (Wibowo 2005). According to Muchtadi et al. (2010) fish balls have an advantage because they contain higher protein by 21.61%. According to Baaras (1994), the fats contained in fish are generally unsaturated fatty acids which include linoleic acid, linolenic, eicosapentaenoic acid (EPA) and docosahexaethanoic acid (DHA), while the more dominant ones in fish oil are EPA and DHA. One type of fish that has a high protein content is tuna. Tuna is a type of fish with a high protein content, ranging from 22.6 - 26.2 g / 100 g of meat and low fat ranging from 0.2 - 2.7 g / 100 g of meat, minerals calcium, phosphorus, iron and sodium, vitamin A (retinol), and B vitamins (thiamin, riboflavon, and niacin). According to Asatawan (2008) Tuna fish contains Omega 3 beneficial for health and growth. about 28 times more than freshwater fish, vitamins, proteins per 100 grams are about 22 gr and minerals.

The substitution of the two foodstuffs, namely beef and tuna meat in the manufacture of meatballs, also requires the testing used, namely organoleptic testing assisted by several panelists to provide an assessment of the meatball products made. Organoleptic testing can assess the presence of desired and unwanted changes in the product or ingredients of the formulation, identify development, determine what optimizations have been obtained, evaluate competitors' products, observe what changes occur during the process or storage, and provide the necessary data for product promotion (Anonymous 2014). Based on this description, the author wants to conduct research on "The organoleptic quality of beef meatballs substituted with tuna fish meat". It aims to have good organopletic characteristics in meatballs so as to get a type of meatballs that are of high quality and beneficial to consumers and related agencies.

RESEARCH METHODS

This research was carried out at the Laboratory of Livestock Product Technology (ENT) of the Department of Animal Husbandry, Faculty of Agriculture, Pattimura University, Ambon, for 1 month from May 1, 2022 to May 31, 2022. The equipment used includes a meat cutting knife, blender, digital scales, steaming pan, hock stove, plastic plate for serving samples, gloves, spoons, basins, and label paper. The ingredients used include fresh hamstring beef (Biceps femoris), tuna fish swallow, tapioca flour, fine pepper (pepperku), salt, garlic, ice cubes, and aquades. Beef (Biceps femoris muscle) and tuna fish meat swallow (Thunnus sp) fillet parts, each mashed separately, for the manufacture of meatballs with a composition of 70% beef (700 g), 16% tapioca flour (160 g), 9% ice water (90 g), 2% salt (20 g), as well as 3% spices consisting of 2.2% garlic (22 g) and 0.8% fine pepper (8 g). Beef is substituted with tuna fish meat with levels of 0%, 20% and 40%, then all the ingredients are finely ground until evenly mixed to form a dough. The dough is formed round (± 2 cm in diameter) manually by hand, then boiled until cooked (until the meatballs float). Meatballs are removed and drained, followed by organoleptic quality tests.

The method used in the study was an experimental method with a complete randomized design of 1 factor, namely the substitution of beef meatballs with tuna fish meat (Thunnus Sp). The treatment used is as follows:
P0 = 0% substituted beef with tuna meat
P1 = 20% substituted beef with tuna meat
P2 = 40% substituted beef with tuna meat

Organoleptic quality test of meatballs using 15 untrained panelists from students of the Department of Animal Husbandry, Faculty of Agriculture, Pattimura University, Ambon. The organoleptic qualities of meatballs observed include color, taste, texture and tenderness. Each panelist was given 3 meatball treatments separately, where each treatment consisted of 2 meatball seeds, bringing the number to 6 meatball seeds per panelist. Each treatment is presented randomly so as not to cause other interpretations of the panelists. The condition of the space is kept bright, stable, free from noise disturbances and other odor influences from the environment that may affect the concentration of panelists' assessments (Kartika et al., 1988).

Panelists are asked to see/observe, smell, hold and taste each sample and then fill out the questionnaire (attachment) according to the predetermined score (Suryanto, 2000), as shown in the table below:

Table 1. Scores and Parameters For Organoleptic Tests

Score	Color	Aroma/Smell	Resilience	Texture	Taste
1	White	Very unsmelling of meat	Very mushy	Very rude	Very unsavory
2	Grayish white	Odorless meat	Soft	Rough	Not savory
3	A bit gray	Slightly smells of meat	A bit mushy	A bit rough	Somewhat savory
4	Gray	Smells of meat	Supple	Soft	Savory
5	Blackish-gray	Smells strongly of meat	Very chewy	Very smooth	Very savory

The variables observed in this study are the organoleptic quality of meatballs, including: Meatball Color, Meatball Smell, Meatball Chewiness, Meatball Texture and Meatball Flavor. The data obtained will be analyzed by variance analysis using a completely randomized design with 3 levels of tuna meat substitution treatment, namely 0%, 20% and 40%, with 17 tests. If there are differences between treatments, it will be further tested with Duncan's New Multiple Range Test (Gupta et al., 2016).

RESULTS OF RESEARCH AND DISCUSSION

Meatball Color

The effect of tuna meat substitution on the color of meatballs, can be seen in Figure 1. The results of statistical tests (Appendix 1), showed that beef substituted with tuna fish meat, had an unreal effect on the color of meatballs. P0 = Beef substituted 0% tuna fish meat; P1 = Substituted beef 20% tuna fish meat; P2= Beef substituted 40% tuna meat.

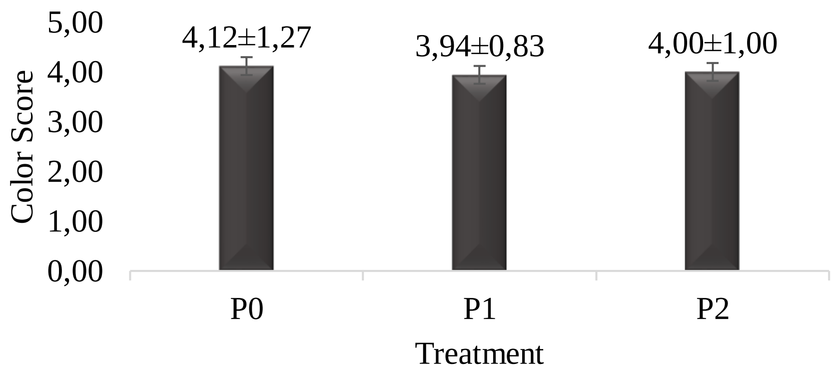

Figure 1. Average Color Score of Tuna Meat Substituted Beef

The results of statistical tests (Appendix 1), showed that beef, which was substituted with tuna meat, had an unreal effect on the color of meatballs. This shows that the substitution of tuna meat as much as 20% (P1) and 40% (P2), does not change the color of beef meatballs significantly. The color of beef meatballs substituted for tuna meat ranges from 3.94-4.12 (slightly gray). Beef meatballs without tuna meat substitution (P0) are grayish-white (4.12) after being substituted for tuna meat by 20% (P1) the color becomes slightly gray (3.94). This shows that the substitution of tuna meat makes the color of beef meatballs slightly changed, but not significantly. It is suspected that this is due to the color in beef and tuna meat which is not too different. According to Zakaria et al (2010), the color of meatballs is determined by the raw materials and binders used. Balinese beef tends to have a bright red color (Merthayasa et al., 2015), while tuna meat is dark red (Wodi et al., 2014).

Aroma/Smell of Meatballs

The effect of tuna meat substitution on the smell of meatballs, can be seen in Figure 2. The results of statistical tests (Appendix 1), showed that beef, which was substituted for tuna meat, had an unreal effect on the smell of meatballs. P0 = Beef substituted 0% tuna fish meat; P1 = Substituted beef 20% tuna fish meat; P2= Beef substituted 40% tuna meat.

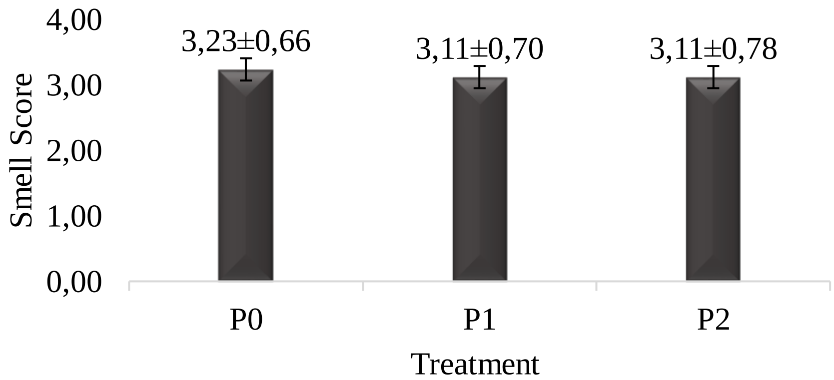

Figure 2. Average Score of Beef Smell Substituted for Tuna Meat

The results of statistical tests (Appendix 1), showed that beef substituted with tuna meat had an unreal effect on the smell of meatballs. This shows that the substitution of tuna meat as much as 20% (P1) and 40% (P2), does not significantly change the smell of meat balls. The smell of beef meatballs substituted for tuna fish meat ranges from 3.11-3.23 (slightly smells of meat). When viewed from the smell score, beef meatballs without tuna fish meat substitution

(P0) have a slightly meaty smell (3.23), after being substituted for tuna meat by 20% (P1) and 40% (P2), there was a slight decrease in the score value by 0.12 to 3.12, but there was no significant change in the smell of meatballs. This is because the smell of beef on meatballs decreases slightly when adding tuna meat. According to Merthayasa et al (2015), the smell of Balinese beef is categorized as the smell of fresh meat and is more dominant in the smell of fresh blood. According to Suwarno et al (2012) tuna fish is not very It gives rise to a fishy smell, so it is very good as a raw material for making sashimi.

Chewiness of Meatballs

The effect of tuna meat substitution on the chewiness of meatballs, can be seen in Figure 3. The results of statistical tests (Appendix 1), showed that beef, which was substituted with tuna meat, had an unreal effect on the chewiness of meatballs. P0 = Beef substituted 0% tuna fish meat; P1 = Substituted beef 20% tuna fish meat; P2 = Substituted beef 40% tuna fish meat.

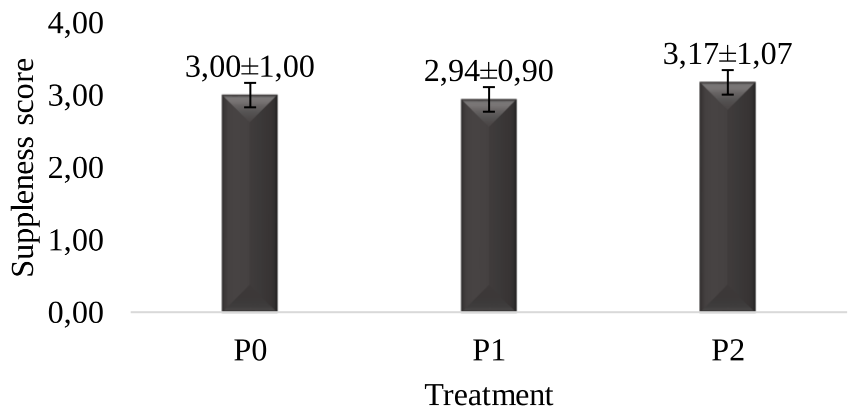

Figure 3. Average Score of Chewiness of Beef Substituted for Tuna Fish Meat

The results of statistical tests (Appendix 1), showed that beef, which was substituted with tuna meat, had an unreal effect on the chewiness of meatballs. This shows that the substitution of tuna meat as much as 20% (P1) and 40% (P2), does not significantly change the chewiness of beef meatballs. The chewiness of beef meatballs substituted for tuna meat ranges from 2.94-3.17 (mushy – slightly mushy). When viewed from the chewiness score, beef meatballs without tuna meat substitution have a chewiness score of 3.00 (slightly mushy), after substituting tuna meat as much as 20% (P1), the chewiness score becomes 2.94 (mushy). After being substituted again with tuna meat as much as 40% (P1), the chewiness score became 3.17 (slightly mushy). This suggests that a 40% (P1) substitution of tuna meat can affect the meatball chewiness score, but not significantly. The substitution of tuna meat at a higher level will increase the protein supply of tuna fish meat, which can provide a denaturation effect so that the molecules expand. The temperature in the meatball cooking process can trigger the protein denaturation process in the meatballs so that a gel is formed. The gel formation process will occur in a salt state of 0.6 M, pH 6, and a temperature of 650C. The cooking process is carried out using boiling water or using hot steam at a temperature of 85-900 C (Yunarni, 2012).

Meatball Texture

The effect of tuna meat substitution on the texture of meatballs can be seen in Figure 4. The results of the statistical test (Appendix 1), showed that beef substituted with tuna fish meat, had an unreal effect on the texture of meatballs. P0 = Beef substituted 0% tuna fish meat; P1 = Substituted beef 20% tuna fish meat; P2= Beef substituted 40% tuna meat.

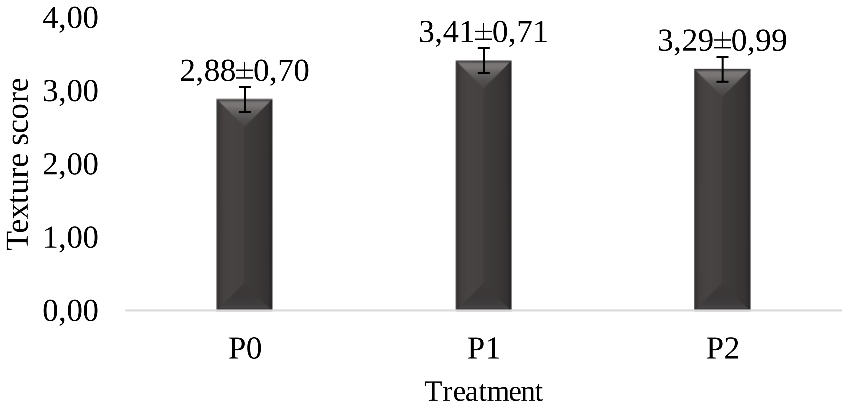

Figure 4. Average Score of Texture of Beef Substituted for Tuna Fish Meat

The results of the statistical test (Appendix 1), showed that beef, which was substituted with tuna meat, had an unreal effect on the texture of the meatballs. This shows that the substitution of tuna meat as much as 20% (P1) and 40% (P2), does not significantly change the texture of beef meatballs. The texture of beef meatballs substituted for tuna fish meat ranges from 2.88-3.41 (rough – slightly rough). When viewed from the texture score, beef meatballs without tuna fish meat substitution (P0) have a texture score of 2.88 (rough). After substituting tuna meat by 20% (P1) and 40% (P2), the meatball texture score changed to 3.41 and 3.29 (slightly rough). This shows that the substitution of tuna meat makes the texture of beef meatballs slightly changed, but not significantly. This may be due to the finer fiber of tuna meat than beef fiber, so that when substituted, it makes the texture of the meatballs somewhat smoother. According to Soeparno (2015), the flesh of the hamstrings (silverside) in the Biceps femoris muscle is tougher than the meat that comes from other muscle locations, because the Biceps femoris muscle has more activity. The assessed aspect of the texture of meatballs is characterized by the coarse or fineness of the resulting product (Montolalu et al., 2013).

Meatball Flavor

The effect of tuna meat substitution on the taste of meatballs, can be seen in Figure 5. The results of statistical tests (Appendix 1), showed that beef, which is substituted with tuna meat, has an unreal effect on the taste of meatballs. P0 = Beef substituted 0% tuna fish meat; P1 = Substituted beef 20% tuna fish meat; P2= Beef substituted 40% tuna meat.

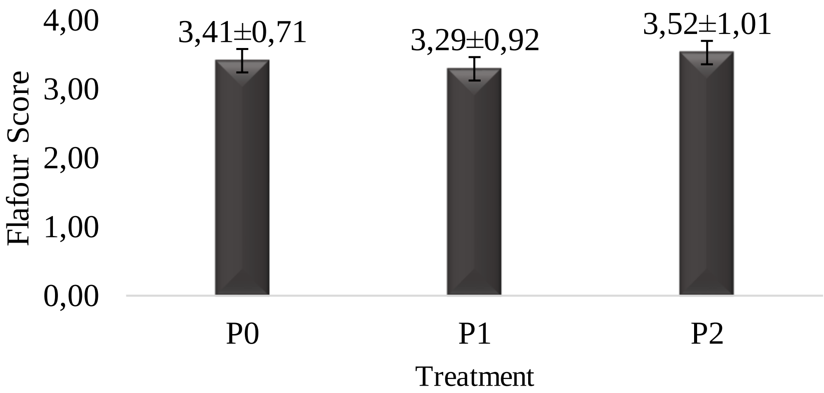

Figure 5. Average Taste Score of Beef Substituted for Tuna Fish Meat

The results of statistical tests (Appendix 1), showed that beef substituted with tuna fish meat, had an unreal effect on the taste of meatballs. This shows that the substitution of tuna meat as much as 20% (P1) and 40% (P2), does not significantly change the taste of beef meatballs. The taste of beef meatballs substituted for tuna fish meat ranges from 3.29-3.52 (slightly savory). When viewed from the taste score, beef meatballs without tuna meat substitution (P0) and after substitution of tuna fish meat 20% (P1), have a taste score of 3.41 and 3.29 (slightly savory).

When the tuna meat substitution was raised to 40% (P2), the taste score increased by 0.24 to 3.53 (somewhat savory). This suggests that tuna meat substitution at a higher level (P2), can change the meatball flavor score, but not significantly. The taste of beef, which tends to increase to be delicious, is thought to be due to the influence of additional fat from tuna meat due to a higher increase in substitution (40%). Tuna meat (Thunnus, sp) contains high levels of essential unsaturated fatty acids (ALTJ) (omega-3: EPA and DHA), namely 20.22% DHA and 3.27% EPA (Haka et al., 2019). Fat will give a certain taste to food and make food more delicious (Nugraheni, 2015).

CONCLUSION

The organoleptic quality of beef meatballs substituted with tuna meat showed insignificant differences. When viewed from the scores of each variable, the substitution of beef with tuna meat as much as 40% (P2) produces meatballs with a smell, chewiness, texture and taste are better, compared to beef meatballs that are not substituted with tuna meat (P0) and which are substituted for tuna meat 20% (P1). This research is then recommended to conduct further research on the physical quality and chemical quality of beef meatballs substituted with tuna fish meat.

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