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The Effect of Catfish Meat Substitution on the Physical and Organoleptick Quality Of Meatbals with Rejected laying HenMeat

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Abstract. Consumer pleasure for meatballs needs to be innovated with various ingredients including catfish meat and chicken meat. This study aims to determine the effect of catfish substitution on the physical and sensory quality of rejected laying hen meatballs. This study used an experimental method which is a completely randomized design (CRD) with 5 treatments and 5 repetitions. The treatment used was as follows, (P0) 100% meat of rejected layers, (P1) 80% meat of rejected layers: 20% catfish, (P2) 70% meat of rejected layers: 30% catfish, (P3) 60% meat of rejected layers: 40% catfish, (P4) 50% meat of rejected layers: 50% catfish. The parameters measured in this study were the organoleptic test of meatballs of rejected laying hen meat which had no significant effect (P>0.05) on all variables including color, shape, aroma, texture, taste and general acceptance of meatballs, aroma, tenderness, taste, texture and color of meatballs.

Keyword: aroma, catfish, meatballs, organoleptic quality, rejected chicken meat

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1. Introduction

Rejected laying hens are laying hens that are around 80 weeks old with an egg production percentage below 70% so that the hens are no longer productive in producing eggs. Rejected laying hens can be used as broiler chickens for meat production but have lower meat quality than broiler chickens because they have a specific odor and are tough. Rejected laying hens contain 56% water, 25.4% to 31.5% protein, and 1.3% fat, but have tough meat due to old age [1].

Efforts to utilize or increase the usability of the meat of the culled layers need to be processed into a product that is of a higher quality and is liked by consumers and to change the distaste for the meat of the culled layers. It is necessary to make combinations and variations of processing,

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including meatballs. Meatballs are processed products that have great potential in the Indonesian market [2].

Bakso is a typical Indonesian processed meat product that is usually served hot and has high nutritional value. It is rich in animal protein which is needed by the human body, especially for growth. Making meatballs generally uses beef, chicken and fish. Meatballs are made from ground meat then added tapioca flour, binding agents, spices, water, so that dough is formed and shaped like small balls (8-10 g) and then boiled for 10 minutes [3].

Catfish (*Clarias batrachus*) is a food that has high nutritional value. Compared to other types of fish such as tilapia and snakehead fish, catfish are easier to obtain and the price is cheaper. The nutritional value of catfish increases if it is properly processed which is found in fresh catfish. Besides being rich in high-quality protein, vitamins that are abundant in fish are fat-soluble vitamins (vitamins A and D). Catfish contains unsaturated fatty acids. Compared to other animal fats, fish fat contains very little cholesterol. This is very beneficial for health because excess cholesterol can cause blockage of blood vessels and coronary heart disease.

2. Research Methods

2.1. Location and time of research

This research was conducted at the Laboratory of the Animal Product Technology Unit, Faculty of Animal Husbandry, Halu Oleo University, Kendari, from February to April 2023.

2.2 Research Materials

The material used in this study was rejected laying hens meat which was obtained from traders in Kendari City Market. Supporting ingredients consist of water, pepper, garlic, salt, tapioca flour, flavoring, ice cubes. The tools used in this research are basins, spoons, knives, pans, bowls, and meat grinders.

2.3. Research design

The design used in this study was an experimental method with a completely randomized design with a one-way factor pattern, namely substitution with catfish with 5 treatments and 5 replications. The treatment used is as follows:

P0=100% rejected laying hens meat

P1 = 80% rejected laying hens meat : 20% catfish

P2 = 70% rejected laying hens meat :30% catfish

P3 = 60% rejected laying hens meat : 40% catfish

P4 = 50% rejected laying hens meat : 50% catfish

2.4. Organoleptic Test

Organoleptic testing using the hedonic test of semi-trained panelists from animal husbandry students at least in the 6th semester with a specialization in Animal Product Technology (ENT). i.e. the hedonic test of preferences for aroma, tenderness, taste, texture and color of meatballs. Organoleptic testing was carried out by 25 semi-trained panelists with criteria as follows : honest, not sick, not hungry, and doesn't smoke. The panelists were Halu Oleo University animal husbandry students. Before the organoleptic test was carried out, the panelists were given an explanation of the procedure for testing the organoleptic quality of the meatballs. The meatballs served to the panelists were meatballs that had been cooked until cooked, served using a bowl or plate as a container. The scoring test with a score of 1-5 (1 lowest score and 5 highest score) on the hedonic scale can be seen in Table 1.

Table 1. The hedonic scale used int the organoleptic test

Organoleptic Test	The Hedonic Scale	Criteria
Form	5	Very round
	4	Round
	3	Somewhat round
	2	Flat / flat
	1	Irregular
Color	5	Red
	4	Reddish brown
	3	Pink chocolate
	2	Brownish gray
	1	Pale white
Aroma	5	Liked a lot
	4	Preferred meat
	3	spices
	2	Liked enough
	1	Dislike
Taste	5	Very disliked
	4	Nice
	3	Pretty tasty
	2	Not good
	1	So bad
Texture	5	Very smooth
	4	Fine
	3	Rather rough
	2	Rough
	1	Very rough
Elasticity	5	Very soft
	4	Soft
	3	Soft enough
	2	Not soft
	1	Very not soft

General acceptance	5	Really like
	4	Like
	3	Enough Like
	2	Do not like
	1	Very dislike

Source: Modification of Hafid and Syam (2007); Hafid et al. (2020)

2.5. Data Analysis

The data obtained were analyzed using a complete randomized design (CRD). Furthermore, if the treatment shows a significant effect, then it is continued with the Duncan Test (DMRT). Data processing is done using SPSS IBM 26**.**

3. Result and Discussion

The organoleptic quality assessment was carried out using the level of preference (hedonic) and descriptive with a scale of 1 - 5 with a total of 25 semi-trained panelists. The parameters tested include color, shape, texture, aroma, taste, elasticity and general acceptance/favorability. Can be seen in "Table 2".

Table 2. Mean Organoleptic Test of meatballs of culled laying hens substituted for catfish meat

Variables	**Treatments**				
	P0	**P1**	**P2**	**P3**	**P4**
Color	4,7±0,47	4,7±0,47	4,6±0,5	4,7±0,47	4,6±0,5
Form	3,8±0,52	3,7±0,44	3,7±0,47	3,5±0,50	3,6±0,5
Texture	3,7±0,54	3,9±0,52	3,9±0,43	3,9±0,4	3,7±0,54
Aroma	4,16±0,49	3,92±0,52	3,84±0,62	3,76±0,66	3,96±0,45
Taste	3,8±0,37	3,5±0,50	3,5±0,50	3,5±0,50	3,6±0,50
Elasticity	3,7±0,45	3,6±0,64	3,4±0,48	3,2±0,5	3,2±0,62
General acceptance	4,1±0,4	4,0±0,28	3,8±0,55	3,9±0,4	3,8±0,5

Note: Different superscripts on the same line show significant differences ($P < 0.05$).

3.1. Color

The results of the analysis of variance showed that the production of meatballs for discarded laying hens substituted for catfish meat had no significant effect ($P>0.05$) on the color of beef meatballs. The average color obtained from the 25 panelists in this study ranged from 4.6 to 4.7. These results indicate that from the treatment P0, P1, P2, P3 and P4 have the same color, namely gray. Substitution of catfish meat does not affect the color of the meatballs which is thought to be caused by the type of raw materials and additives used [4].

Good meatballs are usually fresh gray in color evenly distributed in all parts, both on the sides and in the middle. One of the factors that influence the color change in the resulting meatball

product is thought to be caused by the myoglobin content found in the meat. The higher the myoglobin of the meat, the redder the color of the meat. The red color of the meat will change to brownish gray during cooking due to the oxidation process or the loss of some pigments due to the release of cell fluids during cooking or processing so that the color intensity will decrease [5].

The color of the meatballs produced can be affected by the process of heating or boiling the meatball dough. During heating the color of the meat will change gradually from pink to paler. The color change is due to the amount of myoglobin pigment which is oxidized to metmyoglobin and protein polymerization. The use of pre-rigor beef will also affect the color of the meatballs produced. The use of post-rigor beef will produce a whiter meatball color when compared to using pre-rigor beef [6].

3.2. Form

The results of the analysis of variance showed that the production of meatballs with culled layers substituted with catfish meat had no significant effect (P>0.05) on the shape of the meatballs. The average shape obtained from the 25 panelists in this study ranged from 3.5 to 3.8. This means that the shape of meatballs with catfish meat substitution tends to be round in shape. Substitution of meat in the meatball mixture does not affect the process of forming meatballs because the catfish meat can be ground perfectly so that it can blend with the meatball mixture of rejected layers. This makes it easier to form or round the meatball dough.

The printing process manually by hand is one of the factors that influence the shape differences in meatball products [7]. Meatballs are finished products made from meat and shaped into round shapes of various sizes, almost all of the consumer survey respondents (95.0%) liked round beef meatballs [8].

3.3. Texture

The results of the analysis of variance showed that the production of meatballs with culled layer chicken substituted with catfish meat had no significant effect (P>0.05) on the texture of the meatballs. The average texture obtained from the 25 panelists in this study ranged from 3.7 to 3.9. This means that the texture of meatballs with catfish meat substitution tends to be smooth. The addition of flour to the dough for laying hen meatballs which are substituted for catfish meat does not affect the texture because meat and flour have the same content, namely there is a low fat content so that it can bind a dough with a smooth texture and not have holes. The texture of the meatballs is determined by the fat content, type of carbohydrates and water content. High fat content will produce meatballs that have holes so that it can affect the texture of the meatballs, while high water content will produce a soft meatball texture [9].

Texture is a sensation associated with touch or touch. However, this property plays an important role in the formation of meat quality. Differences in texture are influenced by species, age, sex, and refrigeration, withering and freezing, this is because the meat becomes stiffer and chewier

[10]. The texture can be more chewy with the addition of flour to the meatball mixture, so that the texture is soft compared to meat that is not added flour [11].

3.4. Aroma

The results of the analysis of variance showed that the production of meatballs of rejected layers substituted with catfish meat had no significant effect (P>0.05) on the aroma of the meatballs. The average aroma obtained from 25 panelists in this study ranged from 3.76 to 4.16 (likes). Making meatballs for discarded laying hens substituted for catfish meat did not affect the panelists' assessment of the meatball aroma, presumably because catfish meat does not have a strong distinctive aroma when mixed with chicken meat and meatball dough.

Based on the organoleptic results, the panelists liked to smell the aroma of the chicken meatballs, which was suspected to be quite flavourful. One of the factors that influence the difference in aroma in each treatment can be caused by the basic ingredients and additional ingredients in the form of spices added to the meatball dough [12]. That the aroma of the meatballs mostly comes from the spices added to the dough. The more spices you add, the stronger the aroma will be. He also added that the aroma of the meatballs was influenced by the aroma of the meat, the aroma of the flour, the fillers, the spices, and other added ingredients. In addition, the aroma of the meatballs can be influenced by several factors, including the cooking process. During the cooking process various reactions will occur between the fillers and the meat, so that the aroma of the meat is reduced during product processing [13].

3.5. Taste

The results of the analysis of variance showed that the production of discarded laying hens substituted for catfish meat had no significant effect (P>0.05) on the taste of chicken meatballs substituted for catfish meat. The average taste obtained from 25 panelists in this study ranged from 3.5 to 3.8. The taste of meatballs of rejected laying hens substituted for catfish meat produced from each treatment in this study was liked by the panelists so that it became one of the factors that influenced the taste of the meatballs apart from the composition of the dough such as spices and the cooking process or when boiling the meatballs [14]. That the taste of the resulting meatballs is caused by the spices used during processing, namely garlic, pepper and salt [15]. The quality and taste of meatballs is influenced by the composition and type of ingredients used. The taste of beef meatballs is strongly influenced by the protein, fat and carbohydrate content as well as the nutritional content of the gravel contained in the meatballs [16].

3.6. Elasticity

The results of the analysis of variance showed that the production of rejected layers of chicken meatballs substituted with catfish meat had no significant effect (P>0.05) on the elasticity of the meatballs. The average elasticity obtained from the 25 panelists in this study ranged from 3.2 to 3.7, which is quite springy. Factors that affect the elasticity of a product are the content of the raw materials and additional ingredients used, where the materials used in this study originally had a

chewy and soft texture [17]. The elasticity of the meatballs is influenced by the elasticity of the meat as a raw material and other additives. Meat elasticity is influenced by the structure of the meat myofibrils and the degree of cross-linking, as well as the water holding capacity of the meat protein [18].

The elasticity is formed during cooking, where the protein will experience denaturation and the molecules will expand. These conditions cause the reactive groups in the polypeptide chain to open and then re-bind to the same or adjacent reactive groups. In addition, the elasticity of the meatballs is affected by the high water binding capacity of the meat. Water binding capacity can be defined as the ability of meat to retain its water content during external treatments such as cutting, heating, grinding and processing. Increasing the protein content further increases the elasticity of the meatballs because of the higher bound water, thus the panelists' preference for the elasticity of the meatballs is higher [19].

3.7. General Acceptance

General acceptance is part of the sensory parameters of processed meat products on the level of consumer acceptance of all sensory properties of processed meat products [20].

The results of the analysis of variance showed that the production of rejected layers of chicken meatballs substituted with catfish meat had no significant effect (P>0.05) on general acceptance. The average general acceptance obtained from the 25 panelists in this study ranged from 3.8 to 4.1 (likes). The specific value of general acceptance in this study shows that the panelists like the meatball product of culled laying hens substituted for catfish meat, has a gray color, tastes good because it tastes like meat [21]. The addition of flour can improve the taste of meatballs if it is related to the size of the starch granules and the large water absorption capacity so that in addition to absorbing water, flour can also absorb the spices added to improve the taste of the meatballs.

The value of meat is based on the level of acceptability (acceptance) of consumers, the satisfaction derived from meat consumers depends on physiological and sensory responses among individuals [22]. Acceptable satisfaction from consumers depends on physiological and sensory responses among individuals. In addition, color, taste, smell play a very important role in influencing consumer choice and preference for food, so it is not surprising that many food ingredients that have a less preferred color, taste, smell are not chosen by consumers. The taste of a food is one of the factors that determine consumer acceptance [23]. The power of food acceptance is determined by the stimulation caused by food through the senses of sight, smell, taste, or maybe even hearing.

4. Conclucion and Suggestion

In the organoleptic quality test, the substitution treatment for catfish meat in the production of rejected laying hen meatballs had no significant effect (p>0.05) on all variables including color, shape, aroma, texture, taste and general acceptance of the meatballs. This means that the organoleptic quality of meatballs is relatively the same so substitution of catfish meat up to 50% can be applied.

Suggestion

Based on the above conclusions, to produce chicken meatballs derived from culled laying hens can be combined with the addition of catfish meat up to 50%. So that relatively cheap but good quality meatballs are produced

REFERENCES

[1] Fahruzaky, S., Dwiloka, B., Pramono, Y. B., & Mulyani, S. 2020. "Effect of various thawing methods on protein content and mineral content of meatballs from frozen culled laying hens". *Journal of Food Technology*, 4(2), 82-87

[2] Nullah, L. N., Hafid, H., & Indi, A. 2016. "The effect of local fillers on the physical and chemical quality of meatballs of rejected layers". *Journal of Tropical Animal Husbandry Science and Technology*, 3(2), 58-63.

[3] Ahmadi, K., Afrila, and A Adhi, WI.2007. "The effect of the type of meat and the level of addition of tapioca flour on the quality of the meatballs". *Buana Science*, 7 (2), 139-144.

[4] Firahmi N, S Dharmawati and M Aldrin. 2015. "Physical and organoleptic properties of meatballs made from beef with different aging times". *Al-Ulum: Journal of Science and Technology*. 1(1).

[5] Herpandi H, I Widiastuti, A Baehaki, S Sudirman and GD Nugroho. 2022. "Empowering students and the community around the Rhaudul Ulum Sakatiga Islamic boarding school, Ogan Ilir through diversification of fishery products". *Journal of Community Service*. 7(1): 59-65.

[6] Hermanianto J and RY Andayani. 2002. "Study of consumer behavior and identification of beef meatball parameters based on consumer preferences in DKI Jakarta [Study of Consumer Behavior and Identification of Meat Ball Characteristics Based on Consumer Preferences in DKI Jakarta]". *Journal of Food Technology and Industry*. 13(1): 1-1.

[7] Octavianie, Y. 2002. "Nutritional content and palatability of beef meat and heart meatballs". Faculty of Animal Husbandry: Bogor Agricultural Institute.

[8] Hafid H and P Patriani. 2021. "Livestock Post-Harvest Technology". First Print. Widina Bhakti Persada Publisher, Bandung.

[9] Komariah, Surajudin and D. Purnomo. 2005. "Various processed meats". Agro Media Library. Jakarta.

[10] Susanto A, E Radwitya and K Muttaqin. 2017. "Fermentation time and yeast concentration in the manufacture of cassava tape (Manihot utilissima) containing dextrin, and its application in the manufacture of food products". *Journal of Food Technology*. 8(1): 82-92.

[11] Rakhmawati SY and MN Handayani. 2020. "Application of agar-based edible coatingwith the addition of virgin coconut oil (Vco) to chicken meatballs". *Edufortech*. 5(1).

[12] Montolalu S, N Lontaan, S Sakul AD Mirah. 2017. "Physico-chemical properties and organoleptic quality of broiler meatballs using sweet potato flour (Ipomoea Batatas L)". *Zootec*. 32(5).

[13] Wulandari EEP. 2021. The effect of location, product innovation, and taste on purchasing decisions at Eleven Cafe in Bengkulu City. Journal of Entrepreneur and Science Management. 2(1).

[14] Purnama FD and DN Azizah. 2020. "Studying the Concentration of Red Spinach Leaf Extract (Amaranthus Tricolor L.) on the Characteristics of Chicken Meatballs". *Edufortech*. 5(2).

[15] Syam J, KK Irmawaty and K Kasyim. 2019. "Substitution of breadfruit flour (Artocarpus altilis [Parkinson.] Fosber) as filler-binder in beef meatballs". *Indonesian Journal of Animal Husbandry*. 5: 12-20.

[16] Tarigan NN. 2020. "Quality of snapper meatballs (Lutjanus bitaeniatus) with the addition of seaweed pulp (Euchema cottoni)". *AGRISAINTIFIKA: Journal of Agricultural Sciences*. 4(2): 127-135.

[17] Anjalani R, MH Astuti and FD Pertiwi. 2020. "Chemical and organoleptic properties of buffalo meat meatballs with the addition of local taro flour at different levels". *Ziraa'ah Agricultural Scientific Magazine*. 45(1): 38-44.

[18] Rakhmawati SY and MN Handayani. 2020. "Application of agar-based edible coating with the addition of virgin coconut oil (Vco) to chicken meatballs". *Edufortech*. 5(1).

[19] Zurriyati Y. 2011. "Palatability of beef meatballs and sausages from fresh meat, frozen meat and commercial products". *Journal of Animal Husbandry*, 8(2).

[20] Utami DR, AR Rahim, SA Prayitno and A Alfatina. 2022. "Consumer acceptance of home industry chips". *Your Dedication: Journal of Community Service*. 4(3): 257-264.

[21] Tiven NC, M Veerman and H Pembuain. 2019. "The effect of different types of poultry meat on the organoleptic quality of shredded meat". *Journal of Animal and Plant Sciences*. 7(1): 14-19.

[22] Ningsih, Fitrianingsih and H Hafid. 2020. "Physical and organoleptic quality of beef floss with the addition of young jackfruit". *Halu Oleo Animal Husbandry Scientific Journal*. 2(2): 215-216.

[23] Hafid H, O. Afriansyah, N.S. Asminaya. 2023. "Organoleptic Quality of Beef Meatballs Using Chicken Giblets". *Jurnal Peternakan Integratif.* 11(1) : 53-61.