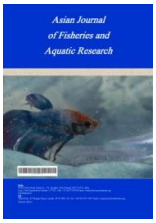

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# The Effect of Different Types of Fish on Physical Characteristic of Fish Meatball

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***Authors' contributions***

*This work was carried out in collaboration between both authors. Author AA played a role in finding materials and writing draft articles. Author NA plays a role in editing and proofreading articles. Both authors have read and approved the articles to be published.*

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## ABSTRACT

Mince fish can be made into a gel-based product. One of the gel-based products is fish ball. Making fish balls can use economical fish to add value to a product. This study aims to determine the differences in the physical characteristics of fish balls with the use of different types of fish. The treatment in this study is to use different types of fish. The types of fish used were Tilapia *(Oreochromis mossambicus*) and Mackerel (*Restrelliger* sp) Other additional ingredients are tapioca flour and seasoning fo making fish ball. The calculating in this study is the yield of fish fillets (skinless) and physical characteristics of product. The results of this study showed that the yield value of tilapia fish fillet is 33, 76% with the number of meatballs produced is 9-13 meatballs. While the yield of mackerel fillet was 49.29% with the number of meatballs produced as many as 24-29 meatballs. The characteristic value of the appearance of the tilapia fish ball is 8 while the mackerel meatball is 7.6. The aroma value of tilapia and mackerel fish balls were 7.4 respectively. Texture value in tilapia fish meatballs is higher than mackerel meatballs, which is 8.2.

*Keywords: Fish meatball; tilapia fish; mackerel fish; minced meat; sensory test.*

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## 1. INTRODUCTION

Processing is one of the efforts to improve quality and increase the shelf life of a food product. Processing can be the first step to add economic value to food ingredients with low economic value. One of the fishery-based foodstuffs that have low economic value is mackerel and tilapia fish. This seawater and freshwater commodity has a relatively cheap selling price in the market. However, basically fish is a food ingredient that is easily damaged and does not last long so it requires further steps or processes such as being processed into various food products.

The definition of fish meatballs according to SNI 7266:2014 is processed fishery products that use minced fish meat or surimi of at least 40% mixed with flour and other ingredients that undergo formation and cooking [1]. In addition to fish balls, there are also other fish-based meatballs such as mashed blood clams (*Andara granosa*) with the addition of carrageenan flour [2]. In general, meatballs are between 25-30 grams in size, but there are many variations in the size of meatballs ranging from small to large sizes [3]. Fish meatballs are one of the fishery product using the main raw materials are 40% minced fish, flour and seasonings then shaped and processed furthermore.

Fish meatballs that are already popular among the public are expected to increase the level of protein consumption among the middle to small people, the relatively cheap price of meatballs is no longer an excuse not to consume them. But in addition there is a need for supervision from the government where there is a fear of misuse in fish raw materials where the fish used must pass good handling or even the materials used should not exceed 1 x 24 hours because fish meatballs are high in protein. and the high water contained in this has an impact on the shelf life of the material [4].

Processing tilapia fish and mackerel into fish balls is one of the efforts to improve the quality of these foodstuffs, increase economic value and increase the shelf life of foodstuffs made from fishery products. Fish meatballs are a product that is very popular with people from various circles and can be served in various ways. For this reason, processing mackerel and tilapia fish into meatballs is a step that needs to be done.

## 2. MATERIALS AND METHODS

The materials used in this study were tilapia fish (*Oreochromis mossambicus*) and mackerel (*Restrelliger* sp) fillet are the main ingredients for making meatballs. Other additional ingredients are tapioca flour, shallots, garlic, ground pepper, salt, flavoring, and ice cubes. While the tools used are food processor, digital scale, basin, and stove.

The procedure for making fish balls is that each 500 grams of mackerel and tilapia fillets are washed, then ground using a food processor until smooth, then each minced fish meat is added with 10% tapioca flour, 2.5% onion, and garlic. 2.5%, 0.25% pepper powder and 1% salt. mashed meat and spices stir until well mixed and smooth. Form the dough into a round and boil at a temperature of $70^{o}$ C - $100^{o}$C for 4-6 minutes until the meatballs float to the surface.

Meatball quality testing was carried out on the physical characteristics of the meatball. The physical characteristics tested were the yield value of fish fillets and the organoleptic value of fish balls based on SNI 7266-2014 which refers to the organoleptic and sensory test instructions in SNI 01-2346-2006 [5]. Data analysis was done by descriptive presentation.

## 3. RESULTS AND DISCUSSION

### 3.1 Yield of Fillet

There are several stages in making meatballs, namely fish filling, softening, molding, and cooking. The results of the yield value in the fish fillet process are presented in Table 1. The yield value is a comparison of the net and the gross amounts of fish. The fish meat yield was obtained by comparing the net weight of the fish meat (*Skinless*) with the whole weight of the fish. The comparison results are converted in the form of percentages.

In this study, the weight of tilapia fish ranged from 201 - 473 grams while the weight of mackerel ranged from 466 - 1000 grams. Based on the table above, it shows that there is a difference in the value of the fillet yield between tilapia and mackerel. The percentage fish yield was 33.76 ± 6.92 of tilapia while the mackerel fish yield was 49.29 ± 4.66. The difference in yield value is 15.53%. The yield value of tilapia fish fillet is less than that of mackerel fillet. This is because the proportion of mackerel meat is higher than other parts. Based on Table 1, it is

known that the number of meatballs produced in mackerel is more than tilapia. This is presumbaly due to the higher yields of mackerel fillets than tilapia. The greater yields of fish fillets, so more meatballs can produced. According to Suzuki [6], the yield of fish varies based on shape, age and conditions before and after laying eggs. Elliptical-shaped fish have yield values above 60%, while flat fish have meat yields of 30-40%. The higher the yield value, the higher the economic value or effectiveness of a material [7]. This result is also not much different from the value of the yield of several kinds of fish both freshwater fish and sea fish, the sailfish amounted to 44.49% [8] and Gurami by 45-51% [9]. Based on the The results of the mashed fish meat yield showed that the number of meatballs obtained in mackerel was more than that of tilapia. The weight of the tilapia fish meatball dough ranged from 118-172 grams, resulting in the number of meatballs being 9-13 items. The mackerel meatball dough ranged from 182-236 grams to produce meatballs as much as 24 - 29%. This is because the yield of mashed mackerel meat is higher so that the weight of the meatball dough becomes more so that it can produce more meatball than tilapia fish fillet.

**Table 1. Fish Fillet Yield Value in Making Fish Meatballs**

| Types of Fish | Initial Weight (gram) | Fillet Weight (gram) | Yield (%) | Number of Meatballs |
|---|---|---|---|---|
| Tilapia Fish | 318,20 ± 128,36 | 105,05 ± 38,42 | 33,76 ± 6,92 | 9 -13 |
| Mackerel Fish | 918,89 ± 278,12 | 450,89 ± 158,67 | 49,29 ± 4,66 | 24 - 29 |

*Mean ± S.E.M = Mean values ± Standard error of means of six experiments*

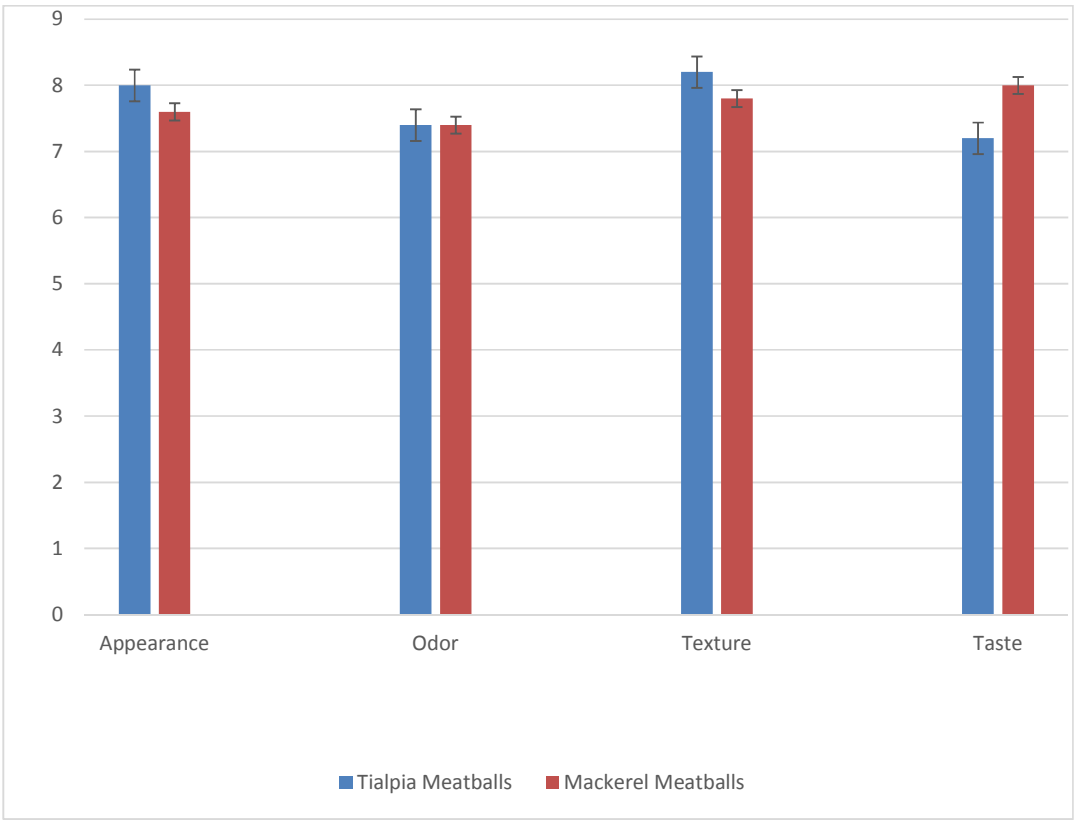


**Fig. 1. Sensory Observation on Fish Meatballs with Different Types of Fish**

## 3.2 Sensory Test

### 3.2.1 Appearance

Testing on fish meatballs refers to SNI 7266-2014 where the parameters tested are appearance, aroma, texture and taste. In this study, a sensory test was carried out with the treatment of different types of fish, namely tilapia and mackerel. Sensory test results in this study are presented in Fig. 1.

Based on Fig. 1, it shows that the appearance of meatballs between tilapia and mackerel is different. The best appearance of fish balls is the use of tilapia fish. The characteristic value of the appearance of the tilapia fish ball ranged from 7.8 to 8.2 while the mackerel fish ball had a texture value ranging from 7 to 8.2. The characteristics of tilapia fish balls are smooth surface, not hollow and bright. While the appearance of mackerel meatballs is a less smooth surface, a little hollow and less bright. The results of this appearance were significantly different between mackerel and tilapia fish balls. This is due to differences in the raw materials used so that it affects the organoleptic value of the fish. The difference in brightness in the appearance of the meatball color is also due to the different color of the meat in each type of fish. According to Moeljanto [10], seawater fish have a dark red and grayish white flesh color. Appearance is also influenced by the addition of tapioca flour. Besides affecting the texture, the addition of tapioca flour also affects the color of the fish balls. This is due to the polyphosphate content in tapioca flour which can reduce drip loss levels, besides that it can bind water bonds which can prevent protein damage during processing [11]. According to [8], the appearance value of the sailfish meatball is 7. The appearance of the color on the meatball is due to the washing factor of the mashed meat. According to Tahergorabi et al. [12] stated that the washing process can remove water, fat and blood soluble ingredients so that it can improve the color of mashed meat. According to Bentis et al. [13] the brightness level of color appearance in surimi is influenced by the washing cycle, washing time, quality and quantity of water used.

### 3.2.2 Odor

Based on Fig. 1, it shows that the aroma of meatballs between tilapia and mackerel is not different. The use of different types of fish produces an aroma with the same value, which is 7.4. The characteristics of the aroma of tilapia and mackerel fish balls are that they have a specific aroma that is somewhat lacking. The aroma produced from processed fish ball products is influenced by the addition of spices or kitchen spices in the form of garlic, onion, and pepper. The spices used in addition to affecting the taste can also inhibit the growth of microbes in fish ball products, besides that the other functions are as antioxidants so that they can reduce rancidity in the meatballs that have been made [11]. The aroma of a food will determine the delicacy and taste of the food [14]. Aroma is the sensation of smell.

Mujair fish balls and mackerel fish balls are made from fresh fish. The formation of aroma in a product, especially frozen products, is caused by oxidation. The oxidation process occurs during cooling and freezing. The longer the freezing process, the lower the aroma value [15]. During the frozen storage process, chemical reactions and microbiological activity will continue to run slowly so that it can affect odor and taste [16]. The strong distinctive aroma of fish in fish balls is also due to the strong specific aroma of fish, but the more additives that are added, such as flour, the aroma of fish in fish balls will decrease.

### 3.2.3 Texture

Based on the results of this study, the texture values of tilapia and mackerel fish balls were 8.2 and 7.8, respectively. These results indicate differences in the texture of fish balls produced by using different types of fish. Texture characteristic value of tilapia fish balls was higher than mackerel fish balls. The texture of the fish balls from tilapia is dense, compact, chewy, while the characteristics of the texture of the fish balls from mackerel are dense, compact and slightly chewy. This is due to the characteristics and chemical composition of the type of fish used. According to [17], the tougher texture of the meatballs is caused by the higher meat content. Meat protein binds to the mashed meat and emulsifies the fat to give it a chewy and compact texture. In addition, the texture is also affected by the addition of more tapioca flour. According to Usmiati and Komariah [18] the use of tapioca flour above 50% produces a harder texture than the addition below 30%. This is because the starch in tapioca flour has a more complex matrix structure and is difficult to break down and degrade.

The protein content of tilapia fish is 16% [19] and 1% fat [20]. While the protein and fat content in mackerel is 10% [21]. The texture of mashed fish meat is influenced by the protein content. The high protein content can increase the strength of the surimi gel. This is because salt-soluble proteins, namely actin and myosin, have the ability to form strong and elastic gels at low temperatures. So that fish raw materials with high protein are more widely used for the manufacture of gel-based products. According to Suzuki [6], the addition of salt in addition to adding flavor, also affects the level of ionic strength of fish meat. The salt dissolves actomyosin to form a sol. Uresti et al. [22], stated that the salt solution has a significant effect on the strength of the fish gel.

#### 3.2.4 Taste

Based on the results of the study, there were differences in the taste characteristics of fish balls using different types of fish. The characteristic value of the taste of the tilapia fish ball is 7.2 while the mackerel meatball is 8. The taste characteristic of the mackerel meatball is product specific, while the tilapia fish meatball is slightly product specific. This is presumably due to the chemical composition of fish of different types of fish. The good taste released by the enzymes in the fish is influenced by the type of fish used and the addition of additional ingredients in the form of tapioca flour which serves to knead the dough and the addition of ice cubes to make the dough solid. For taste, the addition of spices in the form of pepper and garlic and shallots is added. With the right dose, the flavors that arise will be mixed so that it creates a good taste in the fish ball products that are made. Tapioca flour will affect the taste of the meat, so when too much tapioca flour will cover the taste of the meat so that the resulting meatballs have an unpleasant taste [11]. According to Wibowo [23], the taste of meatballs is influenced by the main raw materials and spices used. According to Poernomo et al. [8], the taste and aroma of the gel or crushed fish meat is influenced by the level of fishiness of the fish species. The use of mashed meat as raw material for fish gel will cause a strong fishy aroma. The taste of meatballs is influenced by several factors such as the type of seasoning, the concentration of the seasoning, the filler and the binder. According to Koswara et al. [24], the specific taste of meatball products will be reduced due to the high content of flour which can mask the taste of the meat. The taste of the meatballs is also formed due to the presence of flavor enhancers such as monosodium glutamate and phosphate sequestrants.

## 4. CONCLUSION

The use of different types of fish showed different results in the yield of fillets, the number of meatballs produced and the sensory characteristics of fish balls. The yield value of tilapia fish fillet is 33, 76% with the number of meatballs produced is 9-13 grains. While the yield of mackerel fillet was 49.29% with the number of meatballs produced as many as 24-29 grains. The characteristic value of the appearance of the tilapia fish ball is 8 while the mackerel meatball is 7.6. The aroma value of tilapia and mackerel fish balls were 7.4 respectively. Texture value in tilapia fish balls is higher than mackerel meatballs, which is 8.2. While the sensory test value on the taste of mackerel meatballs was higher than that of namely 8.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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