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THE EFFECT OF ADDING TEMPE ON THE PHYSICAL QUALITY OF SKIPJACK FISH MEATBALLS *(KATSUWONUS PELAMIS)*

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Abstract

Meatballs are processed foods from fish meat that are liked by all people. Meatballs can be made from chicken, beef or fish. One of the fish that can be used for making fishballs is skipjack tuna (Katsuwonus pelamis). Skipjack tuna (Katsuwonus pelamis) is a pelagic fish and has economic value, usually exported abroad so that it can increase the country's foreign exchange. This fish has 2 colors of flesh, namely red and white. the white flesh of this fish will be processed into fish balls. Fish balls have a savory taste and chewy texture. Meatballs with a chewy texture and good quality are obtained by substituting certain ingredients to improve the quality of the meatballs. The material used is tempeh. Tempeh is a processed product from soybeans which contains vegetable protein. This study aims to determine the effect of adding tempe to cakalang fish balls, and to determine the extent of consumer acceptance of these fish balls. There were 2 treatments, namely A (skipjack tuna) , B (tempeh concentration); B1 = 75 gr, B2 = 150 gr. With 2 repetitions. The results showed that taste, texture, folding had a significant effect and smell had no significant effect.
Keywords: Chewy, Tempe, Texture, Taste

INTRODUCTION

Meatballs are processed foods from fish meat that are loved by all walks of life. Meatballs can be made from chicken, beef or fish. One of the fish that can be used for making this fish meatball is skipjack fish (*Katsuwonus pelamis)* . Skipjack fish (*Katsuwonus pelamis)* This is a pelagic fish and has economic value, the fish is usually exported abroad so that it can increase foreign exchange for the country. Meatballs have a savory taste and chewy texture. According to (Yuyun, 2007) that to get meatballs with good quality, the fish used must be of good quality. Meatballs are made from ground fish meat then mixed with flour and spices in shape and boiled (Ayu, 2019). To get meatballs with a chewy texture and good quality, it is necessary to have certain ingredient substitutions that can improve the quality of meatballs and the nutritional value of the meatballs. The substitution ingredient used is tempeh Tempe is a traditional food of the Indonesian nation and is a processed product from kedelei beans which are fermented using the fungus Rhizopus Oligosporus so that it makes the texture of tempeh soft and soft and easy to consume Dirjen Kemenkes, 2022.) In addition to containing vegetable protein, tempeh also contains several nutrients including various vitamins A, D. E and K which are needed by the body because they can prevent anemia ((Harisatunnasyitoh *et all,* 2021)The addition of tempeh to fish meatballs will add to the nutritional value of the meatballs so that they become healthy functional foods. By BSN

(2014) Fish meatballs are a processed fishery product that uses crushed fish meat or surimi. This study aims to determine the effect of the addition of tempeh on skipjack fish balls and to find out the extent of consumer acceptance of the fish balls

METHODS

The method used in this study is the experimental or experimental method. This research will be carried out in the Basic Chemistry laboratory in 2024.

The tools and materials used in this study are:

- Boiler
- 800 gr fish fillet Skipjack fish
- 50 ml ice water
- 6 btr garlic, pureed
- 2.5 tsp pepper powder
- 3/4 sdt left bubuk
- 3/4 tsp salt
- 2 tbsp tapioca flour/starch
- Tempeh
- Garlic goreng

The procedure for making meatballs is as follows:

First of all, select fresh fish raw materials, then wash the fish raw materials until clean and remove the skin and spines, after that the fish is mashed using a blender or choppher using ice water / ice cubes. Grind spices such as garlic and salt and then mix with fish meat that has been mashed using ice cubes. Add tapioca flour then the dough is divided into 2 parts, add fine tempeh that has been mashed according to the concentration of 75 grams and 150 grams. Then add the ground pepper, flavoring, and water. Knead the dough until it can be formed into meatball balls. Bring the water to a boil in a saucepan and add the meatballs. Cook until the meatballs float Remove the dantiriskan then serve with broth and other complementary ingredients

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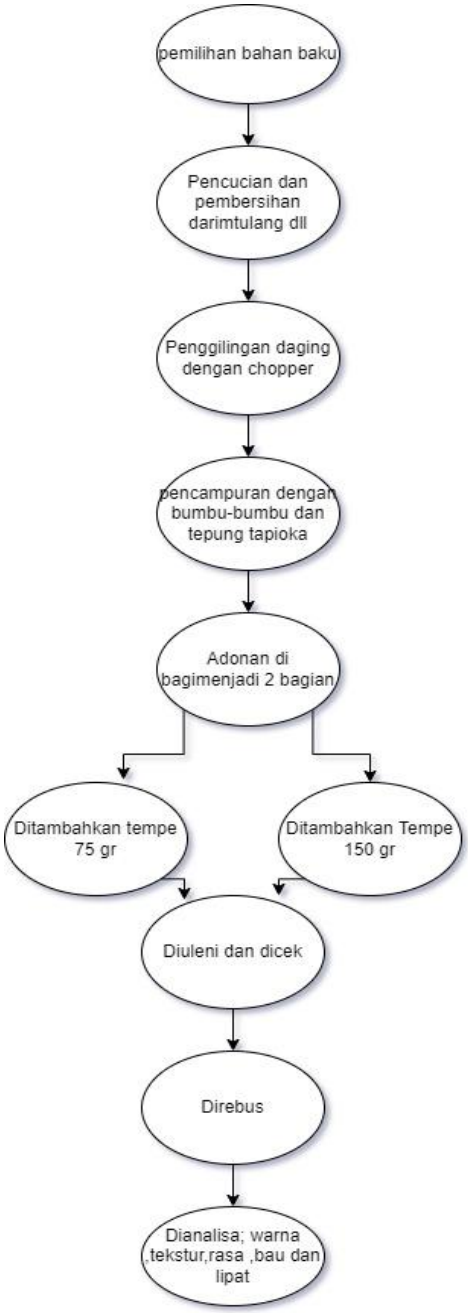

Figure 1. Research Flow Diagram

Data analysis using RAL (Complete Random Design) with 2 Treatments and 2 Replicates, followed by a Real Difference Test { one way anove) to see whether or not there is a real effect using SPSS software version 23 IBM.

The mathematical formula is as follows:

$Yij = \mu + \tau i + \varepsilon ij$

Remarks: Yij = Observation value from the jth repeat that obtains the ith treatment

μ = General middle value τi = Effect of the i-th treatment

εij = Effect of the jth error that obtains the treatment to

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The meatball samples were cut into cubes with a thickness of about 4-5 mm, then the samples were placed in containers (plastic) and ready for testing by the panelists. Panelists will fill out the questionnaire sheet with the one that has been prepared.

Table 1. Color parameter assessment score sheet

Treatment	Deuteronomy	
	I	II
AB1		
AB2		

Information:
4. Pure white
3. White Bones
2. Yellow
1. Chocolate

The meatball samples were cut into cubes with a thickness of about 4-5mm, then the samples were placed in containers (plastic) and ready for testing by the panelists. Panelists will fill out the questionnaire sheet with the ones that have been prepared

Table 2. Folding parameter scoring scoresheet

Treatment	Deuteronomy	
	I	II
AB1		
AB2		

Description: 4.Very easy to fold
3. Folded cracked slightly
2. Folded cracked a lot
1. Destroyed.

The meatball samples were cut into cubes with a thickness of about 4 mm, then the samples were placed in containers (plastic) and ready for testing by the panelists. Panelists will fill out the questionnaire sheet with the ones that have been prepared

Table 3. Flavor parameter assessment scoresheet

Treatment	Deuteronomy	
	I	II
AB1		
AB2		

Description: 4. Very Delicious
3. Tasty
2. Less Tasty
1. Bad

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The meatball samples were cut into cubes with a thickness of about 4-5 mm, then the samples were placed in containers (Plastic) and ready to be tested by the panelists. Panelists will fill out the questionnaire sheet with the ones that have been prepared

Table 4. Texture parameter assessment scoresheet

Treatment	Deuteronomy	
	I	II
AB1		
AB2		

Description: 4. Very chewy
3. Chewy
2. Lack of chewiness
1.Not non-chewy

The meatball samples were cut into cubes with a thickness of about 4 mm, then the samples were placed in containers (plastic) and ready for testing by the panelists. Panelists will fill out the questionnaire sheet with the ones that have been prepared

Table 5. Odor Parameter Assessment Scoresheet

Treatment	Deuteronomy	
	I	II
AB1		
AB2		

Description: 4. Fish smell
3. Medium Fish Smell
2. Less fish smell
1.No fish smell at all

RESULTS AND DISCUSSION

One of the diversified products of processed fishery products that uses crushed fish meat which is then mixed with spices and other necessary additives then undergoes a boiling process called meatballs (BSN, 2014). Fish meatballs can be made from various types of fish as long as they have white meat and a well-formed gel ((Directed by Kaliky, 2022).

From Figure 2 the histogram of texture parameters, it can be seen that in the first treatment, namely the addition of 75 grams of tempeh, namely in the AB1 treatment with a value of 4, and produces a good meatball texture because tempeh contains soybeans which also produces meatballs with a good texture. Fish balls that consumers like if they have a good taste, texture and smell (Agustini et al, 2017).

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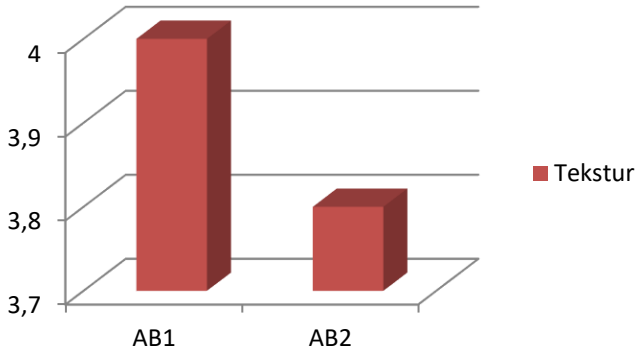

Figure 2. Histogram of Texture Parameters

Based on the results of the anove carrageenan analysis test, it can be seen that the F count of 2.012 has a greater value than the F table which is 1.821 at alpha 0.05, this shows that there is a real influence between the two treatments, this is because the less tempeh is added, the better the texture of the skipjack fish balls produced (Nurhuda at all, 2017). On the contrary, the addition of tempeh with a greater concentration will make the texture of the fish balls decrease in chewiness. The formation of a good gel in the skipjack tempeh fish balls is also influenced by the addition of tapioca flour which functions as a binding agent so that the texture of the resulting meatballs becomes chewy, in addition to the ability of functional properties of fish meat protein which plays a very important role in the formation of the gel (Suranti., 2009).

From the results of the study in figure 3 of the folding parameter histogram, it can be seen that the highest folding value is in the AB1 treatment, which is 3.9 and the lowest is in the AB2 treatment, which is 3.7, this is because with the addition of a small concentration of tempeh, the texture becomes better and easier to fold so that the lpat test value is high. The ability of meatballs to form a gel also depends on the additional ingredients given (Kaliky, 2022)

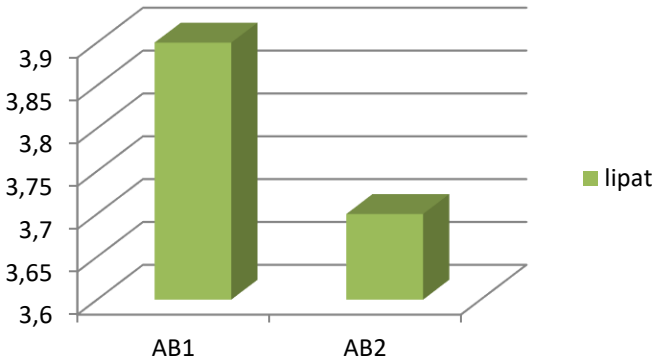

Figure 3. Folding Parameter Histogram

Based on the results of the variance analysis test (anova), it can be seen that the value of Fcal 0.267 is greater than the F Table 0.236 at alpha 0.05, which shows that there is a real influence between the two treatments. This is due to the absence of a non-hard and non-juicy texture of the skipjack fish balls or the texture produced is compact as desired (Sipahutar et al., 2021)The compact texture is also due to the use of ice cubes/ice water in blending fish meat so that the myofibril protein in the fish does

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not undergo denaturation (Suzuki., 1981). And the texture of the resulting meatballs becomes more compact.

A product can be accepted or rejected by consumers/buyers is highly determined by the taste of the product itself. The taste of a product is also greatly influenced by the content of ingredients and also other factors such as temperature, concentration of other flavor components (Winarno, 2014). In addition, the taste of a food is also influenced by the components contained in the food/fish balls such as protein, fat and carbohydrates in addition to other additives.

Based on the results of the research in figure 4. The histogram of taste parameters shows that the taste value by adding tempeh to the AB1 treatment has a good and savory taste, on the contrary, the addition of tempeh to the AB2 treatment will decrease the taste value, this is because the tempeh in the AB1 treatment is evenly mixed with the fish meat so that the tempeh taste is balanced with the taste of fish meat, on the other hand, in the AB2 treatment the tempeh flavor is more dominant in the fish meatballs. According to (Aberle, 2001) which states that the taste of the meatballs is influenced by the cooking process.

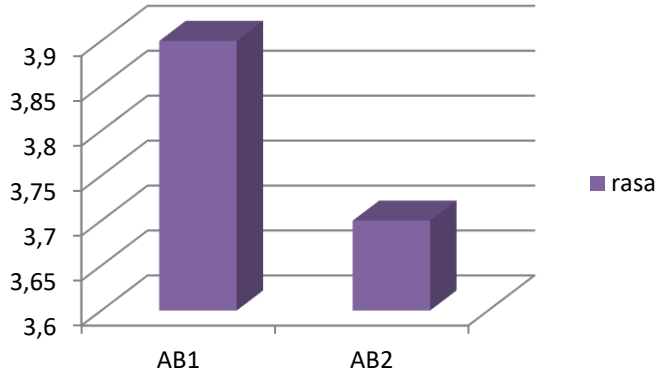

Figure 4. Flavor Parameter Histogram

From the results of the diversity analysis test (anova), it can be seen that the Fcal value of 0.303 is greater than the F value of Table of 0.297, this shows that there is a real influence on the two treatments, which is due to the addition of spices and other additives that have increased the taste of the fish balls (Directed by Cindy, 2023). In addition, the existence of savory, chewy taste and fish meat taste, spice flavor will add to consumers' preference for the fish meatballs Consumers really like meatballs with a distinctive meatball taste and do not smell fishy. To eliminate the fishy smell in the process of making meatballs, spices are used so that the fishy taste is reduced (Kirana, 2019).

From the results of the research in figure 5. Below it can be seen that the value of the odor parameter given by the panelists ranges from 3.7 – 4.0, this shows that the highest value is in the AB1 treatment due to the fact that the addition of spices gives a fragrant smell to the meatballs produced. According to (Hakim, 2013) which states that the aroma produced from the product and received by the panelist's smell can stimulate the panelists' liking for the product.

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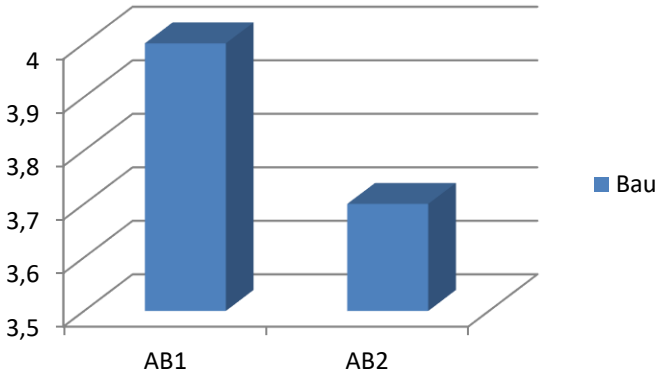

Figure 5. Odor Parameter Histogram

Based on the results of the diversity test analysis, it was obtained that the F Count with a value of 0.221 was smaller than the Ftable value of 0.240, this shows that there is an unreal effect on both treatments resulting from the use of spices such as pepper, garlic and others has increased the smell of the products produced (Bakar et all, 2017) stated that the application of spices aims to improve the smell of the product.

Based on the results of the study that can be seen in figure 6 histogram below, it can be seen that the color produced by meatballs with a tempeh concentration of 150 grams is bone white, this is due to the influence of the color of the kedelei beans so that the meatballs produced are bone white. In addition, color can also determine the shelf life of a food product ((Tatty *et all* 2012). One of the factors that affects the quality of fish meatballs is the initial freshness of the fish used in making meatballs.

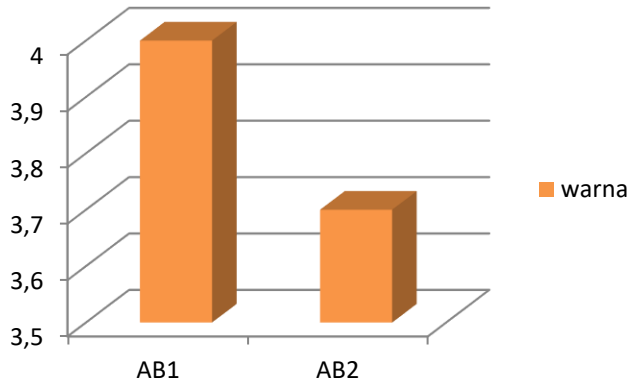

Figure 6. Color Parameter Histogram

From the results of the diversity analysis (anova), it can be seen that the F value of 0.224 is smaller than the F value of 0.132 in the table at alpha 0.05, which shows that there is a real influence between all treatments. The meatballs produced with a pure white color in the first treatment are caused by the addition of only a little tempeh, on the other hand, the meatballs produced from the second treatment show the white color of the bones, this is because the color of the meatballs has been affected by tempeh substitution. According to (Ida Ningrumsari, 2020) which states that the white color in

tempeh is a mold mycelia that grows on the surface of the peanut seed so that the texture of the peanut becomes compact.

CONCLUSION

1. The diversification of fishery products in the form of skipjack fish meatballs added with tempeh produces a good texture, taste and fold in the meatballs.
2. The smell / aroma produced from the meatballs comes from the spices added during the processing process.
3. The color produced from the meatballs is bone-white and is affected by the concentration of tempeh added.

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