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THE EFFECT OF DIFFERENT TYPES OF PACKAGING AND STORAGE TIME ON THE QUALITY OF PETIS FROM STEAMING LIQUID MACKEREL TUNA (EUTHYNNUS AFFINIS) WITH NON-VACUUM PACKAGING METHODS

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ABSTRACT
Petis is a processed product made from fish extract by the process of fermentation and is further fortified or concentrated by the addition of a helper and suction. Seeing that there are fish products that quickly suffer from a decrease in quality, therefore, there is a need for proper packaging and packaging methods so that they are more durable and durable. For this reason, the packaging that will be used in the manufacture of petis in this study is packaging in the form of HDPE, Polypropylene and Aluminum foil. Packaging is a method of providing protection to food produced either in the form of a package or placing a product into a container. Non-vacuum packaging methods are performed without removing the gas and water vapor contained in the product.

KEY WORDS
Barbecue fishing (Euthynnus affinis), Packaging type, vacuum method.

One of the fishery products most consumed by the community and has a high protein content is mackerel tuna. Mackerel tuna fish (*Euthynnus affinis*) is a very interesting species to study both in terms of nutritional composition and in terms of its economy. Mackerel has a high nutritional content, especially protein, which is between 22.6 - 26.2 g/100 g of meat, fat between 0.2-2.7 g / 100 g of meat pindang fish products, because tuna has high protein and has a hard meat texture and is liked by consumers. Pindang fish has high protein content, which is around 20%. Therefore, pindang products must be treated properly so that there is no decrease in chemical and microbiological quality. Pindang fish has high protein content, therefore pindang products must be treated properly so that there is no decrease in chemical and microbiological quality. Pemindangan is one way of preserving fish which is a combination of salting and boiling. One of the uses of boiled waste is fermented products such as fish petis (Adrian, 2013).

Fish petis is a processed fishery product, made from fish extract through a boiling process and then concentrated or thickened with the addition of auxiliary materials and flavoring ingredients. Petis has a semi-solid texture and is added with spices and sugar, so that the color becomes dark brown and tastes sweet (Wijatmoko, 2011). The nutritional elements in petis per 100 g are 161 kcal of energy, 56.0 g of water, 20 g of protein, 0.2 g of fat, 24 g of carbohydrates, 37 mg of calcium, 36 mg of phosphorus, 2.8 mg of iron affected by the addition of filler. The addition of this filler is intended to increase the value of quantity, quality, level of consumer acceptance and the selling value of petis products.

Fish petis found in Indonesia is the result of filtering from the boiling process of fish, from fish that are no longer used but contain high enough nutrients. Petis are generally made from waste of shrimp and fish meat which are deliberately boiled to extract the juice (extracts containing amino acids, vitamins, minerals and flavor components) (Sulistiyanti *et al*., 2017).

Petis can also be categorized as semi-wet food which has moisture content of about 10-40%, an A value of 0.65-0.90. Damage to the petis can be detected by the growth of mold on the surface of the petis. This occurs in petis which has fairly high water content as a result of the fermentation of glucose derived from flour due to the presence of fungi or fungi. The emergence of sour taste and odor and alcohol is the result of the fermentation of glucose

from flour or sugar due to the presence of mold or fungus. To prevent this damage, it is necessary to reduce the water content and use good packaging materials. In order to be stored for a long time, petis whose packaging has been opened should be stored in a refrigerator (Sulistiyanti *et al*., 2017).

Packaging is one way or method to provide protection to food that has been produced in the form of packages. To maintain the quality of malong fish balls, packaging is needed. There are 2 known product packaging methods, namely vacuum and non- vacuum.

Non-vacuum packaging is ordinary packaging, the weakness of this shelf-life method is that there is a possibility that it is not perfect, there are still gaps so that air or moisture can enter, because the heat sealer is operated manually (Delviani *et al*., 2020). Therefore, it is necessary to use packaging materials that must be in accordance with the nature of the packaged materials, namely using packaging in the form of HDPE, PP and Aluminum foil.

METHODS OF RESEARCH

The material used in this study is the waste from boiling tuna (*Euthynnus affinis*) as raw material for making fish petis and other ingredients consisting of white sugar, brown sugar, garlic, cayenne pepper, pepper, and lime. While the materials needed in this study were fish petis suspension, LB (*Lactose Broth*) media, BGLB (*Brilliant Green Lactose Broth*) media, EMBA (*Eosin Methylene Blue Agar*) media, 70% alcohol, spirtus, aquades, cotton fat, aluminum foil and plastic wrap.

The equipment used for making petis is a frying pan, spatula, basin, spoon, digital scale, and bowl. As for the testing tools are Durham tubes, test tubes, test tube racks, 250 ml erlemeyer, glass stirrer, measuring cup, beaker, petri dish, dropper, micropipette, tip, Bunsen, lighter, label, incubator, colony counter and PH meter.

The method used in this research is a laboratory experimental method. This research was conducted to determine the effect of different types of packaging on the quality of the paste from steaming liquid for tuna (Euthynnus affinis) using packaging made of HDPE, PP and Aluminum foil with vacuum packaging.

The experimental design in this study used a completely randomized design (CRD) which was arranged in a factorial manner. In this study, 4 treatments were used with 3 replications. With storage time of 0 days and 10 days.

The quality parameters tested in this study were organoleptic tests (appearance, flavor, taste and texture) and proximal tests (moisture content, ash content, protein content, carbohydrates and fat).

Fish petis to obtain the formulation of the ratio of fish petis with the best results is to prepare the ingredients used and weighed according to what is determined, the first is a ratio of 1:1:1. Filter the liquid from boiling tuna as much as 100 ml, then add 50 ml of brown sugar, 100 ml of white sugar, then stir until the dough becomes flat (temperature (40-50)^{o}C, for ± 5-7 minutes). Then the addition of spices, namely 2.5 grams of fried garlic, 1.25 grams of cayenne pepper, 0.25 grams of pepper, and lime of 0.25 gr. Then the next step is to mix until the dough is smooth (temperature 40-50^{o}C, for ± 10 minutes).

The formulation of the ingredients used in making petis mackerel tuna fish can be seen in table 1.

Table 1 – Petis fish formulation

No.	Ingredient	Treatment			
		VH	VP	VA	VC
1	The liquid from boiling mackerel tuna (ml)	100	100	100	100
2	Brown sugar (ml)	100	100	100	100
3	White sugar (ml)	100	100	100	100
4	Fried Garlic (g)	5	5	5	5
5	Cayenne pepper (g)	2,5	2,5	2,5	2,5
6	Pepper (g)	0,5	0,5	0,5	0,5
7	Lime (g)	0,5	0,5	0,5	0,5

Source: Modification Poernomo et al. (2010).

RESULTS AND DISCUSSION

Based on the results of the average TPC test chart for tuna petis with different packaging and storage time, it can be seen in figure 1.

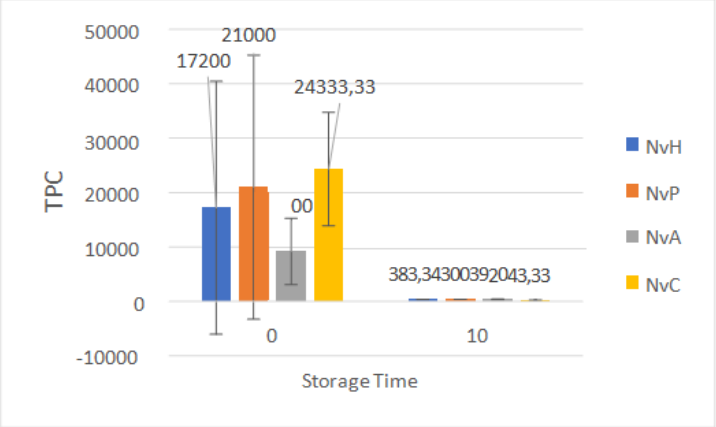

Figure 1 – TPC test average result value

In figure 1 it can be seen that the results of the average TPC test on petis mackerel tuna fish during storage 0 days and 10 days had the highest value in the control treatment, namely on non-vacuum packaging on day 0 of ($243x10^{-2}$) while day 10 ($243x10^{-2}$). Then the lowest value was obtained in the aluminum foil treatment, namely there was non-vacuum packaging on day 0 of ($92x10^{2}$) while on day 10 ($39x10^{-2}$). While the results based on the results of analysis of variance showed that petis mackerel tuna fish with different packaging had a significant effect on the total bacterial cell count (TPC), where Fcount (2.58) < Ftable (2.78) at the 95% confidence level, H0 was accepted and the test was not carried out.

Based on the results of the average pH test chart for mackerel tuna petis with different packaging and storage time, it can be seen in figure 2.

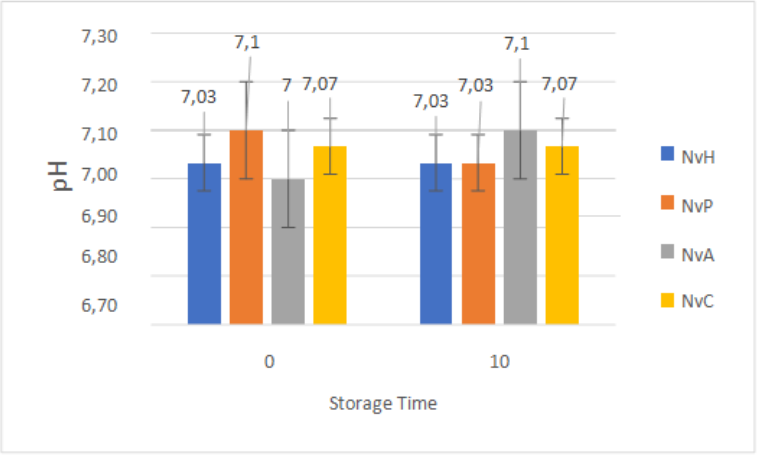

Figure 2 – The value of the average result of the pH test

In figure 2 it can be seen that the average value of pH testing on petis mackerel tuna fish during 0 days and 10 days of storage had the highest value in PP treatment, namely in non- vacuum packaging on day 0 of (7.1) while on day 10 it decreased. of (7.03). Then the lowest value was obtained in PP packaging treatment, namely in vacuum packaging on day 0 of (7.00) while on day 10 (7.1). While the results based on the results of the analysis of variance showed that petis mackerel tuna fish with different packaging had a significant effect on the pH value where Fcount (1.58) < Ftable (2.78) at the 95% confidence level then

H0 was accepted and no further test was carried out.

Based on the results of the average organoleptic color assessment on petis mackerel tuna fish with different packaging and storage time from day 0 to day 10 with non-vacuum packaging, the average yield value can be seen in figure 3.

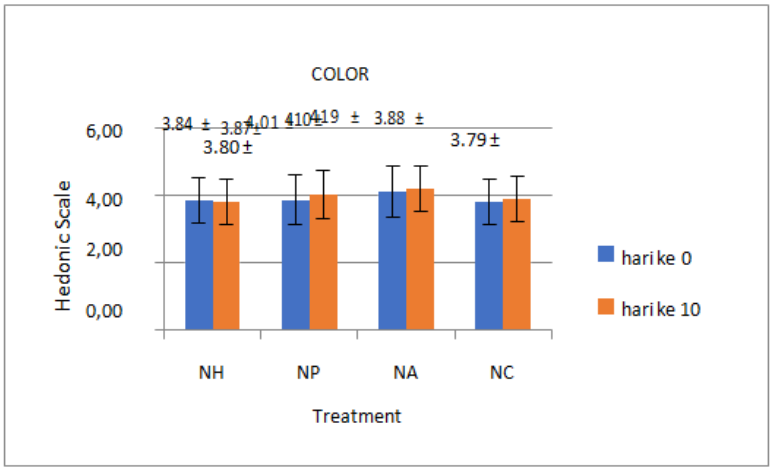

Figure 3 – Color average yield

In figure 3 it can be seen that the results of the average organoleptic test of tuna mackerel petis color during 0 days and 10 days of storage had the highest value in the aluminum foil treatment, namely on non-vacuum packaging on day 0 of (4.10) while on day 10 (4.19) while the lowest value was obtained in the control treatment, namely on non-vacuum packaging on day 0 of (3.79) while on day 10 (3.80). While the results of the analysis of variance showed that tuna petis with different packaging and storage time had a significant effect on the taste value where Fcount (9.08) > Ftable (2.78) at a 95% confidence level then H0 was rejected and further tests were carried out.

The results of color assessment on petis mackerel tuna fish with different types of packaging and storage time decreased organoleptic quality. Changes and decreases in the quality of fish petis are influenced by packaging. In aluminum foil packaging is able to maintain color better than control packaging or other packaging. The oxygen transmission rate of aluminum foil packaging is lower than that of HDPE and PP packaging so that in the control packaging treatment, HDPE and PP are more easily penetrated by light which causes color changes, incoming light will cause heat.

Based on the results of the assessment of the average organoleptic flavor in petis mackerel tuna fish with different packaging and storage time from day 0 to day 10 with non-vacuum packaging, the average value can be seen in figure 4.

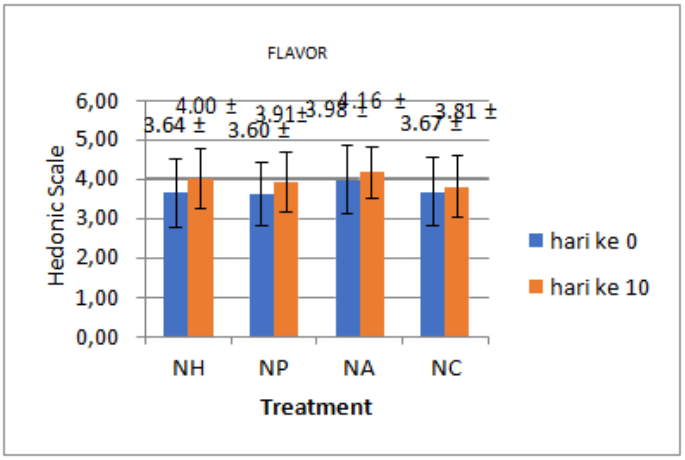

Figure 4 – Flavor yield value

In Figure 4 it can be seen that the results of the average organoleptic test for the flavor of mackerel tuna petis during storage 0 days and 10 days had the highest value in the aluminum foil treatment, namely on non-vacuum packaging on day 0 of (3.98) while on day 10 (4.16). Then the lowest value was obtained in HDPE treatment, namely on non-vacuum packaging on day 0 of (3.60) while on day 10 (3.81). While the results of the analysis of variance showed that petis mackerel tuna fish with different packaging and storage time had no significant effect on the color value where Fcount (9.08) < Ftable (2.78) at a 95% confidence level, H0 was accepted and no further test was carried out.

The treatment of different types of packaging has a significant effect on changes in the flavor of petis fish. There are enzymatic changes and microbial activity that can cause proteins to break down into smaller compounds.

Based on the results of the average organoleptic color assessment on petis mackerel tuna fish with different packaging and storage time from day 0 to day 10 with non-vacuum packaging, the average yield value can be seen in figure 5.

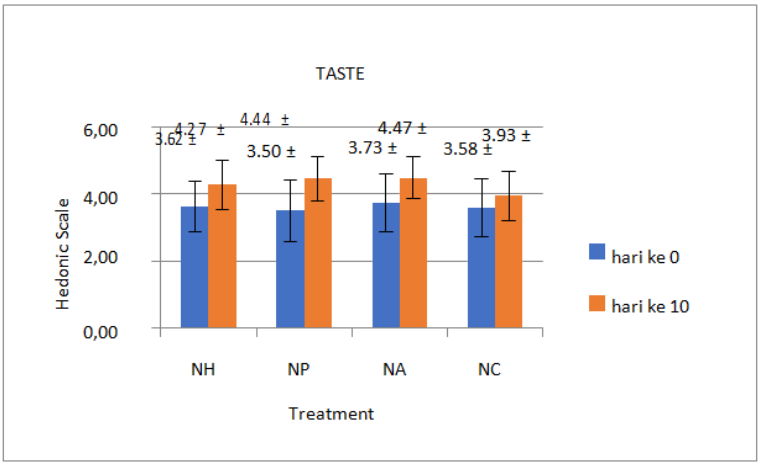

Figure 5 – Taste average yield

In figure 5 it can be seen that the results of the average organoleptic test for mackerel tuna petis flavor during 0 days and 10 days of storage had the highest value in the aluminum foil treatment, namely on non-vacuum packaging on day 0 of (3.73) while on day 10 (4.47) and the results of the lowest value obtained in the control treatment, namely on non-vacuum packaging on day 0 of (3.50) while on day 10 (3.93). While the results of the analysis of variance showed that petis mackerel tuna fish with different packaging and storage time had no significant effect on the taste value where Fcount (2.265) < Ftable (2.78) at a 95% confidence level then H0 was accepted and no further test was carried out.

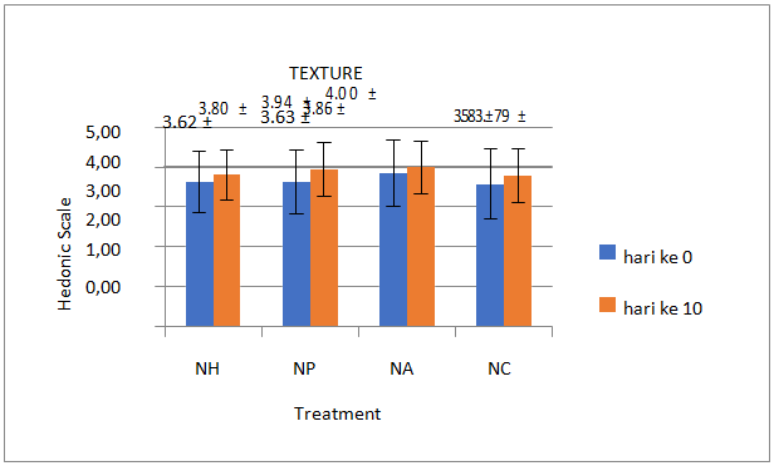

Figure 6 – Texture average yield

Taste is a very decisive factor in the consumer's final decision to accept or reject a food. Although other assessment parameters are better, if the taste is not liked then the product will be rejected.

Based on the results of the average organoleptic texture assessment on petis mackerel tuna fish with different packaging and storage time from day 0 to day 10 with non-vacuum packaging, the average yield value can be seen in figure 6.

In figure 6 it can be seen that the results of the average organoleptic test of mackerel tuna petis texture during storage 0 days and 10 days had the highest value in the aluminum foil treatment, namely on non-vacuum packaging on day 0 of (3.83) while on day 10 (4.00). and the lowest value results were obtained in HDPE treatment, namely on non-vacuum packaging on day 0 of (3.70) while on day 10 (3.80). While the results of the analysis of variance showed that tuna fish paste with different packaging and storage time had a significant effect on the taste value where Fcount (5.04) > Ftable (2.78) at a 95% confidence level then H0 was rejected and further tests were carried out.

The treatment of different types of packaging on the texture of fish paste was not significantly different because it was suspected that the treatment of the type of packaging did not cause the product to have a large enough difference between one another.

CONCLUSION

The results of the study concluded that petis mackerel tuna fish products with different types of packaging during storage 0, and 10 days had no significant effect on the organoleptic test (flavor and taste), while the significant effect on the organoleptic test occurred in (color and texture). Meanwhile, the total bacterial cell count (TPC) and pH test had no significant effect on the type of packaging and storage time.

Based on the parameters that have been tested, the best treatment for tuna petis is aluminum foil packaging for 10 days of storage.

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