Original Research Article

Effect of Packaging Types on Quality of Red Tilapia Shredded Added by Cayenne Pineapple *(Ananas comosus (L) Merr)* Fruit Solution

ABSTRACT

The purpose of this research is to determine the right type of packaging for organoleptic quality and analysis of the peroxide value of red tilapia. This research uses an experimental method consisting of 3 types of packaging, namely (Aluminum Foil), (Plastic *High Density Polyethylene* (HDPE), Plastic *Low Density Polyethylene* (LDPE) using 20 panelists as replication. The parameters observed in this research are organoleptic characteristics (appearance, texture, aroma, and taste) based on the panelists preference level using hedonic test, chemical analysis (peroxide number test) and storage for 28 days in an incubator with a temperature of 25ºC and 45ºC for each treatment. The chemical test results were analyzed descriptively while the organoleptic test results were analyzed using the Friedman test. Based on the Friedman test, it was found that HDPE plastic packaging with the addition of a solution of pineapple *cayenne* was the preferred treatment for panelists compared to other treatments. Based on the Bayes test, taste is the most important criterion compared to appearance, texture, and aroma. The results of the peroxide value analysis for each type of packaging treatment during 28 days of storage at a temperature of 25°C showed results with a peroxide value of 0 meq/kg and 45°C showed results with a peroxide value of 0 meq/kg per week.

Key words: *Shredded, aluminum foil, peroxide value, HDPE, LDPE, organoleptic.*

1. INTRODUCTION

Fish is one of the foodstuffs that are quite easy to obtain in Indonesia, given that the potential of our oceans is so vast coupled with many sources of freshwater aquaculture, one of which is red tilapia *(Oreochromis niloticus)* is one of the aquaculture commodities which is favored for its development by the Ministry of Maritime Affairs and Fisheries (KKP 2010). Fish production per capita in Indonesia from year to year has increased significantly, namely in 2019, the fish consumption figure reached 54.49 kilograms/capita. This figure increased when compared to 2018 which reached 50.69 kg/capita. This figure is slightly higher than the target of 50.65 kg/capita.

According to Kusumayanti (2011) red tilapia (*Oreochromis niloticus)* freshwater fish species was chosen as raw material because it has thick, compact flesh and is easily separated from the bones and spines. Red tilapia has a fat content of 4.1% including low or medium fat fish (Astawan 2003). Fat in meat also contributes to flavor because it is very necessary. From that thought, many business actors started to make processed fishery products made from red tilapia because it is known to have several advantages, one of which is fast fish growth, thick and compact flash compared to black tilapia. , high tolerance for the environment and ease of cultivation, and red tilapia are less susceptible to disease when cultivated when compared to black tilapia. Therefore, it is necessary to use efforts to encourage fishery products, especially red tilapia as raw material for making shredded fish.

Shredded fish is a processed fishery product made from fish meat, through a combination of processing processes, namely the process of steaming, grinding and frying with the addition of spices. Shredded fish is a dry processed product, in its manufacture it uses ingredients such as oil, coconut milk and seasonings so it is sensitive to air, prone to rancidity during storage, even though it is pressed to remove the oil content, but not all of it can be removed. (Tri Diyani 2012). During storage, shredded fish will still experience a decrease in quality due to chemical and physical changes that occur in the shredded fish during storage. According to Sudarmadji *et al.* (2003) during storage of food products containing fat or oil will usually experience a process of rancidity during the storage process, according to Eko et al. (2011) shredded which is processed by *deep frying* has a rancidity value that tends to increase significantly compared to shredded *pan frying* during 29 days of storage at room temperature. This shows that the oxidation process in the shredded that is processed by *deep frying* runs faster than that of the shredded that is processed by *pan frying*. This is due to the fact that the amount of oil used in the shredded is *deep frying* more than the method of pan *frying* so that the more the number of double bonds in the oil, the faster the oxidation rate. The more double bonds there are, the more likely it is for hydroperoxides to form. The use of pineapple solution *cayenne* in the manufacture of red tilapia shredded is intended as a natural preservative as an antioxidant substance to produce good quality shredded fish products.

Pineapple *(Ananas comosus (L) Merr)* is the most economical and highly nutritious food ingredient which has a high concentration of vitamin C, phenolic compounds and -carotene as natural antioxidants (Preeti *et al* 2018). According to Edi et al. (2015) the addition of pineapple juice *cayenne* provided an increase in antioxidant activity against corn cob extract, the increase was due to the increase in the total phenolic content contained in the extract and had a good ability to ward off free radicals.

The shelf life of a food product is influenced by packaging and environmental temperature. During the storage period, the room temperature for shredded tilapia products ranged from 25°C-27°C. The function of the packaging of a product is to maintain the quality of freshness of food products, provide convenience for storage, inhibit contamination from the air, water and surroundings by microorganisms, and provide attractiveness to consumers (Sauvage 1996). Packaging issues are very important and need to be considered, because packaging has a huge influence on the smooth marketing of packaged goods. Therefore, in order to maintain the quality of shredded red tilapia, the type of packaging and storage temperature must receive special attention (Afrianto 2005).

Packaging is one way or method to provide protection for food that has been produced either in the form of packages or placing the product in a container. This is done so that the product can avoid pollution (chemical and microbial compounds), physical damage (friction and impact), environmental compounds (oxygen, water vapor) and animal disturbances such as insects, so that product safety quality is maintained and stored for a long period of time. the longer one. HDPE is a plastic material that is safe to use, because HDPE is able to prevent chemical reactions between plastic made from HDPE and the food or beverage it packs. HDPE has material properties that are stronger, harder, opaque, more resistant to high temperatures and can be used for frozen storage up to -50°C (Arumningtyas 2010).

The basic packaging materials used in shredded products in small industries are *High Density Polyethylene* (*HDPE) plastic* and aluminum foil. Food packaging made of plastic and aluminum foil functions as a packaging material for a wet and dry product as a protective material for the product from damage, contamination from free air, which causes a decrease in the quality of a product. The use of plastic and aluminum foil as packaging for a food product is due to their light weight, multipurpose, strong, easy to shape, and able to ward off water absorption. The use of the type of packaging material is of course adapted to the properties of the packaged material, each type of packaging material will have a different effect on the packaged product (Makinde *et al.*1976). Based on this, the authors are interested in conducting research on the effect of different types of packaging on the quality of shredded red tilapia *(Oreochromis niloticus)* with added cayenne pineapple solution during storage.

2. MATERIALS AND METHODS

2.1 Time and Place

The research was carried out from March to April 2021 at the Fishery Product Processing Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University for the manufacture of shredded tilapia and organoleptic testing. The peroxide value test was carried out at the Food Technology Laboratory, Faculty of Engineering, Pasundan University.

2.2 Materials and Equipment

The materials used in the study included 1500 g of red tilapia fish fillet obtained from the Ciroyom market in Bandung,pineapple *cayenne* 300 ml of solution, spices, 800 ml of cooking oil, HDPE plastic, LDPE plastic and aluminum foil. The tools used are knives, cutting boards, basins, *spinners (*ASTRO), blenders, pans, sieves, analytical scales (Boeco), pots, stoves, incubators (Memmert), measuring cups and spatulas.

2.3 Research Procedure

2.3.1 Making a Cayenne Pineapple Solution

Choose a ripe pineapple then the pineapple solution can be made by smoothing the pineapple pulp using a blender for 5 minutes then separate the pulp and the solution using gauze so that you get a pineapple solution.

2.3.2 Procedure for Making Shredded

Preparation of tools and materials needed during the making of shredded fish. Then the contents of the stomach, gills and scales of tilapia are removed and washed clean after the tilapia is filled, put it in the pan to be steamed for 30 minutes on the stove at a temperature of 100-150°C after steaming the fish cooled, separated between the meat, bones and fish skin so that the fish meat can be shredded. The spices,pineapple *cayenne* and fish meat are mixed and then sauteed until half cooked for 10-15 minutes at 100-150°C then 800 ml of oil is heated at 100-150°C and the shredded tilapia dough is fried until a brown color. Ripe tilapia abon is drained and the oil is removed using a *spinner* until the texture is like meat fibers then the shredded ribs are re-shredded and packaged after cooling.

2.4 Research Methods

The research Method used is the experimental method. Data analysis was carried out with non-parametric statistics with 3 treatments and 20 semi-trained panelists as a test to determine the level of panelists' acceptance of the type of packaging on shredded red tilapia added with a solution of pineapple *cayenne* 20%. The treatments applied in this study were:

1) Treatment A: Aluminum foil packaging
2) Treatment B: HDPE plastic packaging
3) Treatment C: LDPE plastic packaging

Red tilapia shreds were stored in an incubator at 25°C and 45°C for 28 days of storage: Observations were made every 7 days, on the 1st day to determine the effect of different packaging on temperature with the addition of a solution of pineapple *cayenne*, observations on (7th day; 14th day; 21st; 28th) the parameters observed included organoleptic tests (appearance, texture, aroma, and taste) based on the panelists' preference level and chemical analysis (peroxide number test) on shredded to each treatment.

2.5 Data Analysis

The results of the organoleptic test were analyzed using non-parametric methods, namelytest *Friedman's* to determine the panelists' preference for shredded organoleptic characteristics. According to Daniel (1989) if the test *Friedman* shows significant results, a further test is carried out, namely multiple *comparisons to* find out the difference between each treatment carried out using the method *Bayes* by considering the weight of the criteria and the median value. Meanwhile, the peroxide value test was analyzed descriptively.

3. RESULT

3.1 Organoleptic Characteristics of Shredded

Organoleptic test observations were carried out using a hedonic (liking) scale with observation parameters in the form of appearance, aroma, texture, and taste to determine the level of panelists' preference for red tilapia shredded packaged in this type of packaging as a treatment with the addition of pineapple fruit solution *cayenne.*

3.1.1 Appearance

Appearance is one of the organoleptic parameters that has an important role for panelists to assess the quality of a product. Organoleptic characteristics of the appearance of red tilapia shredded on day 1 without incubator storage to determine the effect of different packaging on temperature with the addition of pineapple fruit solution *cayenne* on the appearance characteristics of shredded. The first thing that the panelists noticed when making observations was the color and surface of the shredded. The average value of the hedonic test on the appearance of shredded day 1 is presented in Table 1.

Table 1. Value of Appearance of Red Tilapia Shredded on Day 1

Treatment	Median	Average appearance
A (Alumunium Foil)	9	8,1 a
B (Plastik HDPE)	9	8,2 a
C (Plastik LDPE)	9	8,1 a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on the panelists observations on the 1st day of the appearance value of red tilapia abon in the treatment of the type of packaging added with a solution of pineapple, *cayenne* the average value of appearance characteristics ranges from 8.1 to 8.2. Friedman test results at the 5% test level.showed that the application of the type of packaging with the addition of a solution of pineapple *cayenne* did not give a significant effect on the appearance characteristics of red tilapia shredded with a median value of around 9 on day 1 (organoleptic testing) in each treatment with the appearance of a specific brown color of shredded, homogeneous fiber and color brilliant.

The following average values of hedonic tests on the appearance of shredded 7th day, 14th day, 21st day, and 28th day of incubator storage at 25°C and 45°C for 28 days are presented in Table 2.

Table 2. Appearance Value of Red Tilapia Shredded Storage 28 Days

Day Treatment	A (Alumunium Foil)				B (HDPE Plastic)				C (LDPE Plastic)			
	Median		Average		Median		Average		Median		Average	
	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C
7	9	8	8,0a	7,9a	9	9	8,2a	8,1a	9	8	8,1a	7,9a
14	9	8	8,0a	7,7a	9	8	8,1a	8,0a	9	8	8,1a	7,9a
21	8	8	8,0a	7,5a	9	8	8,1a	7,9a	9	7	8,1a	7,7a
28	7	7	7,1a	6,2a	8	7	7,8a	7,0a	8	7	7,7a	6,5a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on Table 2. The results of panelists observations on the average value of the appearance characteristics of red tilapia shredded in the treatment of the type of packaging added with a solution ofpineapple *cayenne* showed the average value of shredded at a temperature of 25°C ranging from 7.1 to 8.2. The highest average characteristic value on the 7th day was around 8.2 in treatment B, namely HDPE plastic, while the lowest average characteristic value on the 28th day was 7.1 at 25°C in treatment A, namely aluminum foil. Storage at a temperature of 45°C showed the average value of the appearance characteristics of abon ranging from 6.2 to 8.1. The highest average value of shredded on day 7 was around 8.1 in treatment B, namely plastic HDPE, while the lowest average value on day 28 was around 6.2 in treatment A, namely aluminum foil

Friedman test results at the 5% test level showed that the application of the type of packaging with the addition of a solution of pineapple fruit was *cayenne* not significantly different, which means that all treatments of aluminum foil, HDPE plastic, and LDPE plastic did not have a significant effect on the appearance characteristics of red tilapia shredded with a median value. The highest temperatures were at 25°C and 45°C ranging from 9 and 8 in each packaging treatment with the results of the appearance of the shredded brown color being specific for the type of shredded, homogeneous fiber and brilliant color.

The value of appearance in each packaging treatment is generated because of the reaction *Maillard.* The *Maillard* reaction is a reaction between the amino group of a free amino acid peptide chain residue or protein with the carbonyl group of a carbohydrate when both are heated or stored for a long time (Lakshmi 2014).

3.1.2 Aroma

Aroma is the smell of food products caused by volatile compounds from food entering the nasal cavity and being felt by the olfactory system so as to form a response. Aroma can determine the delicacy of food and affect the level of acceptance (Winarno 2002 in Tribaditia 2016). Organoleptic characteristics of red tilapia shredded aroma on day 1 without incubator storage to determine the effect of different packaging on temperature with the addition of pineapple fruit solution *cayenne* on the characteristics of shredded aroma. The average value of the hedonic test on the first day of shredded aroma is presented in Table 3.

Table 3. Aroma Value of Red Tilapia Abon Day 1

Treatment	Median	Average appearance
A (Alumunium Foil)	9	8,1 a
B (HDPE Plastic)	9	8,2 a
C (LDPE Plastic)	9	8,1 a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on the results of observations on the 1st day of the panelists on the aroma value of red tilapia abon in the treatment of the type of packaging added with a solution ofpineapple, *cayenne* the average value of aroma characteristics ranges from 8.1 to 8.2. Friedman test results at the 5% test level.showed that the application of the type of packaging with the addition of a solution of pineapple *cayenne* did not give a significant effect on the aroma characteristics of red tilapia shredded with a median value of around 9 on day 1 (organoleptic testing) in each treatment with the results having a specific aroma of shredded type and not having a fishy smell of fish.

The following average values of hedonic tests on the aroma of shredded meat on the 7th day, 14th day, 21st day, and 28th day of incubator storage at 25°C and 45°C for 28 days are presented in Table 4.

Table 4. Aroma Value of Red Tilapia Shredded Storage 28 Days

Day / Treatment	A (Alumunium Foil)				B (HDPE Plastic)				C (LDPE Plastic)			
	Median		Average		Median		Average		Median		Average	
	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C
7	9	8	8,1a	7,8a	9	8	8,2a	8,0a	9	8	8,1a	7,7a
14	9	8	8,0a	7,8a	9	8	8,1a	7,8a	9	8	8,1a	7,7a
21	8	7	8,0a	6,6a	9	8	8,1a	6,7a	8	7	8,1a	6,5a
28	8	7	8,0a	6,2a	9	8	8,1a	6,6a	8	7	8,1a	6,3a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on Table 4. the results of panelists' observations on the average value of the aroma characteristics of red indigo shredded in the treatment of the type of packaging added with a solution ofpineapple *cayenne* showed the average value of shredded at a temperature of 25°C ranging from 8.0 to 8.2. The highest average characteristic value on the 7th day was 8.2 in treatment B, namely HDPE plastic, while the lowest average characteristic value was 8.0 at 25°C in treatment A, namely aluminum foil. Storage at a temperature of 45°C showed the average value of the characteristics of the shredded aroma ranging from 6.2 to 8.0. The highest average value of shredded on the 7th day was around 8.0 in treatment B, namely HDPE plastic, while the lowest average value on day 28 was around 6.2 in treatment A, namely aluminum foil. Friedman test results showed that the application of the type of packaging with the addition of pineapple solution was *cayenne* not significantly different, which means that all treatments of aluminum foil, HDPE plastic, and LDPE plastic did not significantly affect the aroma characteristics of red tilapia abon with the highest median value at 25**°C.**C and 45°C ranged from 9 and 8 in each packaging treatment with the results of a specific shredded shredded aroma and no fishy smell of fish.

The aroma value in each packaging treatment was still preferred according to the panelist's assessment because the formulation of making shredded in each packaging was the same, and during the frying process, bay leaves, lemongrass stems, and lime leaves were added which are known to be able to remove the thick fishy smell of fish, then when By steaming, fish protein will be hydrolyzed into amino acids, namely glutamic acid, glycine, alanine and lysine, giving rise to an aroma flavor and a delicious savory taste (Winarno 2002). The level of assessment of the aroma characteristics of the panelists did not decrease drastically because during the storage of red tilapia abon there was no oxidation process caused by the lipid peroxide reaction which caused a rancid odor. Food damage can also occur by the environment so that it can be controlled by packaging and

natural preservatives that can be used, for example mechanical damage, changes in the water content of ingredients, and interactions with oxygen, therefore the type of packaging that can control and is often used to package shredded is polyethylene packaging. This is because polyethylene packaging has a high density, is resistant to temperature and humidity, and has a low water absorption capacity so as to protect the quality of shredded meat (Ahmad et al. 2016).

Handling to prevent rancidity in the manufacture of red tilapia shredded using natural preservatives such as the addition of a solution of pineapple *cayenne* as a natural preservative, antioxidant substances to produce shredded fish products that have a specific flavor of shredded, because pineapple *cayenne* is the most economical and highly nutritious food ingredient which has a high concentration of vitamin C, phenolic compounds and -carotene as natural antioxidants (Preeti *et al.* 2018).

3.1.3 Texture

Texture is an organoleptic assessment parameter that affects consumer acceptance of a product. Texture assessment can be done by feeling the texture of the product using a touch of the skin surface or by using the fingertips (Azka et al 2020). Organoleptic characteristics of red tilapia shredded texture on day 1 without incubator storage to determine the effect of different packaging on temperature with the addition of pineapple fruit solution *cayenne* on the texture characteristics of shredded. The average value of the hedonic test on the 1st day of shredded texture is presented in Table 5.

Table 5. Value of Texture of Red Tilapia Shredded on Day 1

Treatment	Median	Average appearance
A (Alumunium Foil)	9	8,1 a
B (HDPE Plastic)	9	8,2 a
C (LDPE Plastic)	9	8,1 a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on the panelists' observations on the 1st day of the texture value of red tilapia shredded in the treatment of the type of packaging added withpineapple fruit solution, *cayenne* the average value of texture characteristics ranged from 8.1 to 8.2. Friedman test results at the 5% test level. showed that the application of the type of packaging with the addition of a solution of pineapple *cayenne* did not give a significant effect on the texture characteristics of red tilapia shredded with a median value of 9 on day 1 (organoleptic testing) in each treatment with the result having a soft fibrous texture and not lumpy.

The following average values of hedonic tests on the shredded texture on the 7th day, 14th day, 21st day, and 28th day of incubator storage at 25°C and 45°C for 28 days are presented in Table 6.

Table 6. Texture Value of Red Tilapia Shredded Storage 28 Days

Day Treatment	A (Alumunium Foil)				B (HDPE Plastic)				C (LDPE Plastic)			
	Median		Average		Median		Average		Median		Average	
	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C
7	9	8	8,0a	7,8a	9	8	8,1a	7,8a	9	8	8,1a	7,7a
14	9	8	8,0a	7,8a	9	8	8,1a	7,8a	9	8	8,1a	7,7a
21	8	7	8,0a	6,8a	8	7	8,1a	6,8a	8	7	8,1a	6,5a
28	8	7	8,0a	6,2a	8	7	8,1a	6,6a	8	7	8,1a	6,3a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on Table 6. the results of panelists observations on the average value of the texture characteristics of red indigo shredded in the treatment of the type of packaging added with a solution ofpineapple *cayenne* showed the average value of shredded at a temperature of 25°C ranging from 8.0 to 8.1. The highest average characteristic value on the 7th day was around 8.1 in treatments B and C, namely HDPE and LDPE plastics, while the lowest average characteristic value was around 8.0 at 25°C in treatment A, namely aluminum foil. Storage at a temperature of 45°C showed the average value of the characteristics of the shredded texture ranged from 6.2 to 7.8. The highest average value of shredded on day 7 was around 7.8 in treatment B, namely HDPE plastic, while the lowest average value on day 28 was around 6.2 in treatment A, namely aluminum foil.

Friedman test results showed that the application of the type of packaging with the addition of pineapple solution was *cayenne* not significantly different, which means that all packaging treatments of aluminum foil, HDPE plastic, and LDPE plastic did not have a significant effect on the texture characteristics of red tilapia with the highest median value at 25°C. and 45°C ranging from 9 and 8 in each packaging treatment with the results of a soft, fibrous shredded texture and no lumps.

Texture value in each packaging treatment was produced because there was no change in texture decline in each packaging treatment by the activity of microorganisms that degraded protein into simpler compounds. According to Nur (2009) the decrease in the level of assessment product texture during storage is caused by the water activity of the food material with the storage environment, therefore the type of packaging that is often used to package shredded is polyethylene packaging. This is because polyethylene packaging has a high density, is resistant to temperature and humidity, and has a low water absorption capacity so as to protect the quality of shredded meat (Ahmad et al. 2016).

3.1.4 Taste

Taste is a parameter that really determines the consumer's final decision to accept or reject a food product, if other parameters are considered good but the taste is not liked then the product will be rejected (Nirmala *et al*. 2016). Organoleptic characteristics of red tilapia abon flavor on day 1 without incubator storage to determine the effect of different packaging on temperature with the addition of pineapple fruit solution *cayenne* on the characteristics of shredded taste. The average value of the hedonic test on the 1st day of shredded taste is presented in Table 7.

Table 7. Value of Taste of Red Tilapia Shredded on Day 1

Treatment	Median	Average appearance
A (Alumunium Foil)	9	8,1 a
B (HDPE Plastic)	9	8,2 a
C (LDPE Plastic)	9	8,1 a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on the panelists observations on the 1st day of the taste value of red tilapia shredded in the treatment of the type of packaging added with a solution ofpineapple, *cayenne* the average value of texture characteristics ranged from 8.1 to 8.2. The results of the Friedman test at the 5% test level showed that the application of the type of packaging with the addition of a solution of pineapple *cayenne* did not give a significant effect on the taste characteristics of red tilapia with a median value of around 9 on day 1 (organoleptic testing) in each treatment with the results having a good taste. Specific shredded fish is very pronounced with a savory taste that tends to be sweet.

The following average values of hedonic test for shredded taste on 7th day, 14th day, 21st day, and 28th day of incubator storage at 25°C and 45°C for 28 days are presented in Table 8.

Table 8. Taste Value of Red Tilapia Shredded Storage 28 Days

Day / Treatment	A (Alumunium Foil)				B (HDPE Plastic)				C (LDPE Plastic)			
	Median		Average		Median		Average		Median		Average	
	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C	25°C	45°C
7	9	8	8,1a	8,0a	9	9	8,2a	8,1a	9	8	8,1a	8,0a
14	9	8	8,1a	7,9a	9	9	8,2a	8,1a	9	8	8,1a	7,9a
21	8	7	8,0a	7,6a	8	8	8,1a	8,0a	8	7	8,1a	7,9a
28	8	7	8,0a	7,2a	8	8	8,1a	8,0a	8	7	8,1a	7,5a

Note: The number followed by the same letter on the average treatment shows that there is no significant difference according to the multiple comparison test with a 5% test level.

Based on Table 8. the results of panelists observations on the average value of the taste characteristics of red tilapia shredded in the treatment of the type of packaging added with a solution ofpineapple *cayenne* showed the average value of shredded at a temperature of 25°C ranging from 8.0 to 8.2. The highest average characteristic value on the day was 8.2 in treatment B, namely HDPE plastic, while the lowest average value for taste characteristics was 8.0 at 25°C in treatment A, namely aluminum foil. Storage at a temperature of 45°C showed the average value of shredded taste characteristics ranging from 7.2 to 8.0. The highest average value of shredded was around 8.1 in treatment B, namely HDPE plastic, while the lowest average value was around 7.2 in treatment A, namely aluminum foil.

Friedman test results showed that the application of the type of packaging with the addition of a solution of pineapple fruit was *cayenne* not significantly different, which means that all the packaging treatments of aluminum foil, HDPE plastic, and LDPE plastic did not have a significant effect on the taste characteristics of red tilapia abon with the highest median value at 25°C and 45°C ranged from 9 and 8 in each packaging treatment with the results having a specific taste of shredded fish that was very pronounced with a savory taste that tends to be sweet.

Value taste in each treatment packs produced for formulation manufacture of shredded on each packaging the same and there is no loss of acidic components-organic acids contained in the shredded red tilapia due during storage at 25°C and 45°C so that the assessment level panelists to taste decrease. Good taste is also influenced by several factors, namely chemical compounds, temperature, concentration and interactions with other taste components.

The process of spreading heat quickly with high temperatures will help speed up the process of releasing volatile compounds so that the unwelcome flavor of fresh fish such as the fishy smell of fish will be reduced. This is in accordance with Herliani (2008) statement that the taste image can be influenced by heating or processing that is carried out so that it results in the degradation of the preparation of the taste image and the physical properties of food ingredients, therefore the level of assessment of taste characteristics is still preferred according to the panelist's assessment. Handling of the specific taste resistance of abon, it is better to use polyethylene packaging to package the shredded meat, with this packaging having advantages, namely the characteristics of water-resistant packaging and a good degree of density (Jayadi 2016).

3.2 Decision Making Method Using Bayes

Method *Bayes* is one tool for measuring a chance of any decision taken by changing the ratio paired with a set of numbers that can present the priority value relative weights of the criteria and alternatives. According to Siregar (2014) decision making using the method *Bayes* requires information in the form of *probabilities* for each alternative which will produce an expected value as the basis for decision making. The average value of the test *Bayes* shredded on the type of packaging with the addition of different concentrations of red ginger essential oil are presented in Table 9.

Table 9. Decision Matrix for Valuing Shredded Tilapia with Bayes Method

Treatment	Criteria				Value	Value
	Appearance	Aroma	Texture	Taste	Alternative	Priority
Alufo	7,00	7,00	8,00	7,00	7,03	0,30
HDPE	8,00	7,00	8,00	8,00	**8,36**	**0,36**
LDPE	9,00	9,00	7,00	7,00	8,11	0,35
Criterion weight	0,20	0,36	0,03	**0,42**	23,50	1,00

Based on the test table *Bayes* above, it can be concluded that taste is the most important criterion compared to appearance, aroma and texture. The use of this type of packaging on shredded with the addition of a solution of nana fruit *cayenne* obtained the highest alternative value of 8.36. Based on the preference test parameters that have been carried out on HDPE plastic treatment on shredded with the addition of a solution of pineapple *cayenne* is the best treatment and is still preferred by the panelists.

4.3 Peroxide Number Analysis

The peroxide value is a measure of the damage or rancidity of an oil. The higher the peroxide number, the more rancid the oil is. The results of the calculation of the peroxide value of red tilapia in the type of packaging treatment with the addition of a solution of pineapple are *cayenne* presented in Table 10.

Table 10. Results of Peroxide Number Analysis on Red Tilapia Shredded

No	Day Storage	Alumunium Foil (meq/kg)	HDPE (meq/kg)	LDPE (meq/kg)
1.	1	0,00	0,00	0,00
2.	7	0,00	0,00	0,00
3.	14	0,00	0,00	0,00
4.	21	0,00	0,00	0,00
5.	28	0,00	0,00	0,00

Based on Table 10. The results of the analysis of the peroxide value obtained on red tilapia shredded in storage on the 7th day, 14th day, 21st day, 28th day at a temperature of 25°C and 45°C in each different packaging treatment. namely treatment A (aluminum foil), treatment B (HDPE plastic), and treatment C (LDPE plastic) was 0 meq/kg which means that there is no peroxide value in red tilapia shredded products every week. This happens because of the type of packaging and the addition of natural preservatives when making shredded which can control the interaction of oxygen which causes the oxidation process caused by the lipid peroxide reaction which causes a rancid smell, one of the treatments is by using the type of packaging that is often used to package the shredded meat. polyethylene (HDPE) packaging. This is because polyethylene packaging has a high density, is resistant to temperature and humidity, and has a low water absorption capacity so as to protect the quality of shredded meat (Ahmad et al. 2016). In contrast to aluminum foil packaging, according to Julianti (2007) the thicker the aluminum foil used, the higher the permeability of the packaging to water vapor and oxygen, while the thickness of the aluminum foil used in this study was 0.05 mm so that the packaging has a fairly high permeability to oxygen. and water vapor. High packaging permeability can lead to oxidation and hydrolysis of fats contained in shredded flying fish (Eka 2010).

According to the statement of Maulana et al (2016) that polyethylene plastic (HDPE) is able to produce the lowest peroxide value every week of 9.33 meq/kg on the 10th day of storage, 13.95 meq/kg on the 20th, 20th day of storage, 02 meq/kg on the 30th day of storage and 24.39 meq/kg on the 40th day of storage at room temperature compared to LDPE plastic and aluminum foil, the presence of this peroxide number causes bad smell and taste and causes rancidity of the oil, the greater the value of the peroxide number means the more peroxide contained in the sample (Ketaren 1986). Further handling with the addition of natural preservatives are used in this study as

antioxidants such as solution pineapple *cayenne* for pineapple *cayenne* is a food that is the most economical and highly nutritious food that has a high concentration of vitamin C, phenolic compounds and β-carotene as antioxidant substances naturally (Preeti *et al.* 2018), so that red tilapia shredded packaged in different types of packaging with the addition of apineapple solution *cayenne* did not have a peroxide value and was good for consumption.

Conclusion

Based on the research results, it can be concluded that red tilapia shredded packaged using HDPE packaging with the addition ofpineapple solution *cayenne* is the preferred treatment by panelists compared to other treatments based on Friedman's test. Based on the Bayes test, taste is the most important criterion compared to appearance, texture, and aroma. The results of the peroxide value analysis for each type of packaging treatment during 28 days of storage at 25°C showed results with a peroxide value of 0 meq/kg and 45°C showed results with a peroxide value of 0 meq/kg per week.

COMPETING INTEREST

There is no competing interest.

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