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Effect of freshness of Mozambique tilapia fillet (*Oreochromis mossambicus*) and thawing method on driploss value during frozen storage

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Abstract
Mozambique tilapia (*Oreochromis mossambicus*) is a high economic value fish with an abundance of raw materials. Mozambique tilapia is a potential commodity to be processed and developed into processing products, especially into fillet. Its abundance will affect the quality of raw materials if not handled properly. The purpose of this study was to determine the effect of different fillet quality and thawing methods stored at low temperatures. Fresh fish fillet and reversed quality fish fillet were used as the raw material for this study. The fish fillet was stored for 3 days in the freezer at -15ºC. The thawing method used are room temperature and flowing water. Observations made after storage were the drip loss value in fish fillets. The results showed that the quality of different fish fillet gave different results to the drip loss value. Different thawing methods had an effect (p <0.05) on the drip loss value of fish fillet. The drip loss value of fresh fish fillets that were thawed at room temperature was 13%, while the flowing water was 6%. Reversed quality fish fillet thawing at room temperature was 18% and with flowing water was 17%.

Keywords: Mozambique tilapia, freshness, thawing method, driploss value

Introduction
Indonesia has a lot of rivers, swamps, lake lakes, pond rice fields and the sea. This is one of the gifts towards the development of fisheries, both land and sea fisheries. All fishery products are forms of food in high protein. These materials are very useful for meeting human nutritional needs in order to live a healthy life. One of the fisheries products that dominated in the archipelago is Mozambique tilapia fish, a fish with a high level of consumption. Mozambique tilapia fish is also easy to cultivate. Mozambique tilapia fish has a slightly thick meat texture with a slightly bland taste. Many people process Mozambique tilapia fish meat by turning it into processed products based on the meat. Mozambique tilapia fish is one of the original Indonesian fish which exist in several rivers in Kalimantan and Sumatra.
The high market demand, high economic value, and very popular with people in several countries makes this fish become very potential commodity to developed by people. The easy process of cultivating tilapia fish and the simultaneous harvesting process makes Mozambique tilapia fish abundant [1]. The abundance of high raw materials will affect the quality of fish during storage [2]. To overcome this problem, it is necessary to handle the raw material stock in the form of processing. One way of processing fish that is often done is fillet. In general, fishery commodities are perishable, causing a very rapid deterioration in quality if not handled properly [3].
Storing fish meat for a long time will make the fish meat tissue destroyed, and myoglobin flows out together with the water. Myoglobin contains a red pigment so that the drips appear red. The Water binding capacity is the ability of meat protein to bind water in the meat or water which is added as long as there is a strong influence from the fish, for example in meat cutting, heating, when grinded or pressed. The fat content will be decreased along with the reduction in water content because some of the fat in the fish body will experience drip loss [4].
The loss of water binding capacity in the meat can be caused by the denaturation process that occurs during the freezing process which will cause a loss of water binding capacity during thawing due to weakening of the muscles in the fish meat. The inability of the muscle fibers to reabsorb all of the water so they will experience a discharge from the clotting process which results in a partial drip. Drip on fish meat can be caused due to the influence of an environment where high humidity and microorganisms will be easy to reproduce or develop, which will lead to deterioration and quality of food. In order to maintain the freshness and nutrition of the food as much as possible to avoid drying as much as possible. With the cooling machine, we will be able to condition and refresh food ingredients. However, damage to frozen products such as denaturation can be caused by water molecules, fat damage and activity in trimethylamine oxidase [5]. So, it is necessary to research the value of driploss on fresh tilapia and reversed quality fish stored at low temperatures.

Materials and Methods
This research was conducted at the PSDKU Fisheries Laboratory Unpad Pangandaran in December 2020. The materials needed in this study were fresh Mozambique tilapia fish fillets and reversed quality Mozambique tilapia fish fillet. Fresh fish raw materials are obtained from live Mozambique tilapia fish which are killed by stabbing them in the head. Meanwhile, the tools used in this study were fillet knife, digital scale, measuring cup, ziplock plastic, thread, and freezer (temperature -15 ºC).

The research was conducted based on two treatments, namely the quality of fillet treatment and the treatment of thawing method. Fresh tilapia fish are filled with fillet knife and used as a sample as fresh fish fillets. While the reversed quality fish fillet is done by filling the fresh Mozambique tilapia fish meat then stored at room temperature for 24 hours. The stored fillet was used as a backward quality fillet sample.

Fresh and quality reversed quality fish fillets are weighed as initial weight. Prior to storage, the fish fillets were tied with threads and then put in a plastic bag. Try to keep the fish meat from touching the walls of the plastic bag. Cover the plastic tightly and hang the fish fillets in the freezer. Store the fish fillets fresh and backtrack for 3 days with a temperature of -15 ºC. Fish fillets that have been stored for 3 days are then thawed using 2 (two) methods, namely left to stand at room temperature until they thaw (P1) and flow in running water (P2) until the fish fillets thaw or do not freeze.

The observations that were observed were the drip loss value after low temperature storage. Drip loss observations are based on [6] where samples are weighed as initial weight (x) and samples that have been stored in the freezer are weighed (y). Drip loss is calculated by the formula:

$$\text{Drip loss} = \frac{x - y}{x}\ x\ 100\%$$

The data obtained were analyzed for variance at the 5% real level, if there was a significant difference, it was indicated by the orthogonal polynomial test [7]. The variables observed were the drip loss value and the amount of drip fluid.

Results and Discussion

Drip loss is the process of releasing fluid from the body of the fish due to different temperatures. In the process the sample fish is frozen first in the freezer and tested by seeing how much water or liquid comes out of the fish meat. According to [6], that drip loss is the loss of some of the meat's nutrient components that accompany the discharge of meat juices. The fluid that comes out and is not reabsorbed by the meat is called drip. This is confirmed by [5] that the thawing method used to thaw frozen fish can affect the quality or quality of the fish, especially the texture.

Table 1: The value of driploss on fish fillets with different thawing methods

Parameter	Fresh Fillet		Reversed Quality Fillet	
	P1	P2	P1	P2
Initial weight (gr)	17,1	23,3	36,1	29,5
Weight after thawing (gr)	14,8	21,8	29,5	24,4
Liquid volume (ml)	1,45	1,00	1,23	1,50
Drip loss (%)	13	6	18	17

Drip loss observations on Mozambique tilapia fish fillets (*Oreochromis mossambicus*) were carried out by giving two treatments to two qualities of fish fillets, namely fresh fish fillets and reversed quality fish fillets. The treatment was carried out in the thawing process, namely by standing at room temperature and flowing the water presented in table 1. The observation results showed that there was a significant difference ($P < 0.05$) between the drip value of fresh fish fillets and reversed quality fish fillets. Different thawing methods had an effect on the drip loss value. Fresh fish that were treated with the standstill had a driploss value of 13% by calculating the ratio of initial to final weight. Meanwhile, fresh fish with the thawing process flowed with water had a driploss value of 6%. For fish with reversed quality of thawing treatment with standstill, the value was 18% and was the largest number of all experiments conducted. Meanwhile, the reversed quality fish that received thawing treatment with water obtained a driploss value of 17%.

The number of drip loss values is thought to be influenced by temperature. Temperature fluctuations occur when dropping from the freezer with the thawing treatment by leaving it at room temperature and running water. According to [8], it is explained that the driploss value will increase if the protein microstructure is damaged. So that, the water binding capacity in the muscle will decrease [8]. By decreasing the water binding capacity of the fish meat, it causes liquid to come out of the fish, thereby reducing the weight of the fish fillets after thawing. The drip loss value is also influenced by the freshness of the fish. In reverse conditions, the percentage value of drip loss is greater than that of fish with fresh conditions. The quality deterioration condition indicates that the fish has experienced physical decline and there has been a biochemical correction in fish meat. Among the changes that have occurred in the condition after the fish have died are the enzymatic corrections and the weakening of the fish muscles. The weakening of the fish muscles is related to the water-holding power of the fish meat, a decrease in the water-holding capacity will cause a large number of driploss values. The existence of an enzymatic process will cause changes in the texture of the fish and lead to spoilage [9].

Drip loss in reversed quality fish is higher than fresh fish. This is because the bonds between cells begin to decrease and release each other when frozen will damage the cell membrane [10]. Drip loss is a measure of water binding capacity with the principle that free water will be released from muscle protein. As the pH of the muscles decreases, the loss of water content is calculated based on the percentage loss of sample weight during cooling to the initial weight of the sample. The drip loss value in reversed quality fish was much higher than that of fresh fish. The factors that affect the drip loss value in fish are if the air is high when hanging the fish, it will cause a high drip loss value. According to [6] that during the thawing process the fish will experience a lot of loss as the nutritional elements. The thawing method which applied to foodstuffs can affect the quality contained in these foodstuffs. The longer the temperature process that is applied to the thawing process can cause a decrease in protein, fat and water content

Conclusions

The results showed that the quality of the fish had an effect on the drip loss value produced during low temperature storage. The drip loss value of fresh fish fillets was lower than that of reversed quality fish fillets. Different thawing methods have an effect on the resulting drip loss value. The thawing method which at room temperature produces a drip value of 13-18%, while the flowing water method ranges from 6-17%.

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