International Journal of Life Sciences
Available online at www.sciencescholar.us
Vol. 5 No. 2, August 2021, pages: 94-106
e-ISSN: 2550-6986, p-ISSN: 2550-6994
https://doi.org/10.29332/ijls.v5n2.1389

Temperature and Storage Long Cob (Auxis thazard) Fermented on the Quality

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Manuscript submitted: 09 May 2021, Manuscript revised: 18 June 2021, Accepted for publication: 27 July 2021

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Keywords

cooling;
fermentation;
long cob;
storage;
temperature;

Abstract

Food products resulting from fermentation are foods that experience changes in their initial properties due to the breakdown of several compounds in foodstuffs. In Fermentation. The most important microbes are Lactic Acid Bacteria. The role of Lactic Acid Bacteria in fermentation is to improve the taste of the product and also reduce the pH of the substrate so that it can suppress the microbial life of Pathogens. The research method used is descriptive. Using two types of treatment, namely storage temperature treatment and the second treatment is storage time. The results showed the best results were storage at cold temperatures with a storage time of three weeks with the results that Organoleptic 7 (Very like) Moisture content 54.125%, Dissolved protein 7.940%, Lactic acid 1.617%, Acetic acid 0.84%, and Butyric acid. 1.49% and FFA 1.16%.

Contents

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1 Introduction

- Background

Fermented food products are foods that experience changes in their initial properties due to the breakdown of several compounds in food ingredients (Sari & Octavian, 2013). Fermented food becomes easily absorbed by the body because compounds are readily available in simple forms such as proteins into amino acids, fats into fatty acids, and glycerol and further broken down into ketone compounds and 3 aldehydes which are the cause of the food's distinctive odor, as well as due to the presence of fermented foods. addition of salt (Ahillah et al., 2017). The role of Lactic Acid Bacteria in fermentation is to improve the taste of the product and also reduce the pH of the substrate so that it can suppress the life of pathogenic microbes/decay (Selia, 2020). There is a problem that must be addressed to be able to utilize fermented cobs in the long term, research is needed to find out packaging materials, storage methods, and storage times that can maintain good and quality fermented cobs.

- Research Objectives

Get quality fermented cobs with the longest shelf life at a certain temperature, using glass jar packaging. Fermented Cobs will be stored for three (3) weeks at two different temperatures (room temperature and cold temperature) and chemical and organoleptic analysis is carried out every week.

- Research Benefits

For practitioners in the field of fisheries, they can make diversification of food made from tuna, to take advantage of the abundance of tuna.

2 Literature Review

- Description and Classification of Tuna Fish

Mackerel is included in the important Economical Fish. The distribution area of tuna is very wide even in almost all coastal areas and the high seas, the coast of Indonesia, and all the waters of the Indo-Pacific. Generally, tuna fish live in the surface layer in coastal and offshore areas with low salt content, with a temperature of 26-28°C. Tuna is the smallest type of tuna with an average length of about 50-50 cm or 200-500 grams/head.

- Fermentation

Fermentation technology is a technology that can increase the benefits of food, usually, fermentation technology will form simple compounds that are easy to digest compared to the original material (Sari & Purwadaria, 2004). Fermentation also provides a preservative effect because fermentation produces organic acids such as Lactic Acid, Acetic Acid, Butyric Acid. Lactic acid bacteria also produce hydrogen peroxide, diacetyl, carbon dioxide, reuterin, and bacteriocin compounds as antimicrobial substances. Bacteria that play a role in food fermentation are Lactic Acid Bacteria (LAB) which is a gram-positive type that is beneficial to humans. In fermentation technology, the role of Lactic Acid Bacteria (LAB) is very important, because the natural nature of LAB can suppress intestinal pathogenic bacteria that cause diarrhea, as well as stimulate the immune system (Rahmiati & Mumpuni, 2017).

- Fish Cooling

Cooling is one of the commonly used methods to slow down the damage to fishery products (Mohammed & Hamid, 2011). Handling of fish caught on board is the most important treatment from the whole process of the fish journey to the consumer. Good handling is to use a cold chain system and prioritize sanitation and hygiene. The handling of fish carried out by fishermen in Indonesia, especially traditional fishermen, has not implemented post-harvest handling and cold storage systems properly, so that the landed fish, in general, have experienced a fairly high-quality decline (Litaay et al., 2017). Many cooling techniques have been carried out including: Using ice (ice cubes, bulk ice, shaved ice, ice cubes), using ice combined with salt, using ice combined with cold air, using refrigeration, ice, slurry ice (liquid ice), and chilled seawater (Ikfi Rahmahidayati et al., 2014).

- Food Packaging

Packaging plays an important role in preserving fishery products which are generally easily damaged, with packaging can help prevent or reduce damage caused by environmental factors and the nature of the product (Winarno & Betty, 1982). Damage caused by environmental factors, namely: damage mechanical changes, changes in the water content of foodstuffs, absorption, and interaction with oxygen, loss, and addition of unwanted flavors, while damage caused by the nature of the packaged product, namely physical changes such as softening, browning, breaking of emulsions. biochemistry and chemistry due to microorganisms or due to interactions between the various components in the product cannot be completely prevented by packaging (Buckle et al., 1987; Ibrahim & Dewi, 2008).

3 Research Methods

- Research place and time

The research was carried out from February 2021 to June 2021 at the Laboratory of the Faculty of Agriculture, Warmadewa University. Sample analysis also used the Food Analysis Laboratory, Faculty of Agricultural Technology, Udayana University. Analysis of samples carried out is chemical analysis Free Fatty Acid Analysis, Dissolved Protein Analysis, Organic Acid Analysis, Water Content Analysis, and Organoleptic.

- Research Materials and Tools

The material used is tuna fish type Auxis thazard, a set of chemicals used for the analysis of Free Fatty Acids, Dissolved Protein, Water Content, and organoleptic. The equipment used is the equipment for Free Fatty Acid Analysis. Moisture Content, Organic Acid Analysis, and Organoleptic Analysis

- Research Method

This study using a descriptive method with two treatments, namely I. Storage Temperature Treatment and Treatment II is Storage Time.

- Research implementation:
  - Prepare homogeneous tuna. Prepare Three types of ferment to be used: Pineapple Fruit, Papaya Fruit, Combination of 50% Pineapple and 50% Papaya
  - Prepare all research support tools and materials, Research by the treatment
  - Fermenting for four (4) days,
  - Storing samples at cold temperature and room temperature
  - Conduct analysis every week for three weeks
  - Analyzing samples chemically and organoleptic

4 Results And Outcomes

- Organoleptic/Subjective and Descriptive Assessment of Research Results

Figure 1. Preparing research materials

Before the research was carried out, all the tools and materials used were well prepared, starting from cutting and cleaning the fish, then smoothing the ferment used. The ferment used is of the type of young papaya and young pineapple by the grating. Fish fermentation uses a combination of young pineapple (25% of fish weight) with young papaya (25% of fish weight) by preparing salt according to the dose (30% of fish weight). All materials used are weighed properly so that the research can take place properly (Soekarto, 1985; Escobar & Gordin, 2018). The weight and dosage of the materials used were recorded so that the research results were not biased. After that, mixing of Fish, Ferment and Salt are done, then put into a Fermentation container, and Fermentation is ready to be carried out for four (4) days in a room at room temperature.

Figure 2. Fish condition before fermentation

The condition of the fish looks very fresh, with red flesh, the skin of the fish is still tight and firmly attached to the meat. In the organoleptic assessment, only the overall appearance of the fish condition is assessed (Sudarmadji & Haryono, 1997; Dali, 2013). For the Organoleptic Value of Tuna before being fermented, the panelists gave a value of 7 (Very Like).

Figure 3. Fish being fermented

From Figure 3 you can see how to put Fermented Fish. The fish has been mixed with Ferment according to the treatment and previously added 30% salt. The purpose of giving salt at the beginning is to occur early selection of microbes and eliminate pathogenic microbes. There is a very thin change between the success of Fermentation and decay (Yessi widya putri, 2018; Yuniati Fajri & Rasmi, 2014). If the Fermentation Process is not successful or an error occurs in the process, there will be decay, which is marked by a foul smell. Successful fermentation is indicated by a product that smells good (there is no smell towards the rotten criteria).

Figure 4. Fish conditions after fermentation

Figure 4 shows that the fish are still wrapped in the ferment used, smells good, there is no indication of a bad smell at all, this means that the fermentation has been successfully carried out. The attached ferment is cleaned using clean water, after that, it is drained, then put into a jar container to be stored according to the treatment (Stored at cold temperature (Fridge temperature 5°C) and room temperature/room temperature).

Figure 5 Containers for storing fermented fish

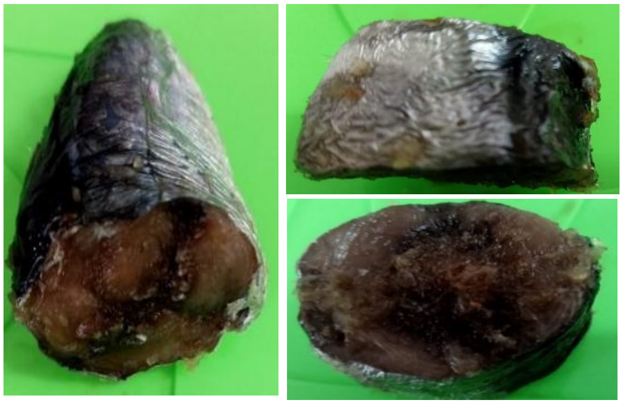

Figure 6. Fish condition after fermentation

As seen in Figure 6 Condition of fermented fish looks fresh. Fermentation was carried out for four (4) days, the condition of the fish was almost the same as fresh fish, except that the skin of the fish looked slightly wrinkled due to extraction by the ferment used (Dissaraphong et al., 2006; Fagbenro & Jauncey, 1998). A very significant difference occurred in fermented fish, namely, there was no indication of a bad smell in fish, fish smelled good. If fresh fish is not fermented even though it is stored in the refrigerator for a period of Four (4) days it will emit an odor leading to a decrease in fish quality, so that by fermenting the fish can maintain its quality longer and give a different smell and taste.

Figure 7. Fermented fish to be stored

Figure 8. Fish condition after one-week storage at cold temperature (refrigerator)

As seen from Figure 8, it can be seen that fermented fish stored at cold temperatures (refrigerator) did not change in terms of color, smell, and texture. The average value of the overall appearance of the panelists is 7 (very much like). It can be concluded that the fermented tuna after being stored for one week in the refrigerator did not change in appearance and the researchers liked the product (Taoukis et al., 1999; Tolstorebrov et al., 2016).

Figure 9. Fish condition after one week of storage at room temperature

Viewed from Figure 9 it can be seen that the fermented fish stored at room temperature for one week in terms of color looks paler, the skin is slightly wrinkled but the fish is still in a chewy condition with a fragrant smell. On average, the panelists gave an overall Appearance score of 6 (likes). Even though the fermented fish had been stored for one week at room temperature, the panelists still liked the product.

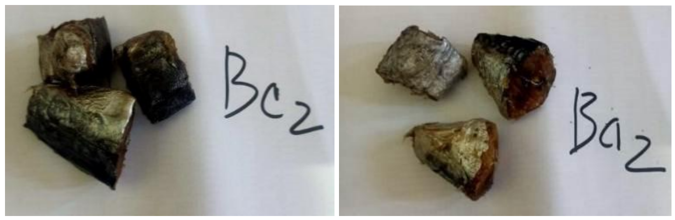

Figure 10. Fish conditions after two weeks of storage at cold temperatures (refrigerator)

Viewed from Figure 10, it can be seen that the fermented fish stored at cold temperatures (refrigerator) for two weeks in terms of color did not change, the skin was slightly wrinkled but the fish was still in a chewy condition with a fragrant smell On average, the panelists gave an overall Appearance score of 7 (very much like). Even though the fermented fish had been stored for two weeks at a cold temperature, the panelists still liked the product very much.

Figure 11. Fish condition after two weeks of storage at room temperature

Viewed from Figure 11 it can be seen that the fermented fish stored at room temperature for two weeks in terms of color looks paler and already covered with white threads which are suspected to mushroom, the skin is wrinkled, the texture of the fish meat is a bit soft, but not yet. Observable indications of odor leading to a decrease in quality. On average, the panelists gave an overall Appearance score of 3 (slightly disliked). Fermented fish that was stored for two weeks at room temperature was indicated to be overgrown with fungus, so the researchers did not continue to carry out objective tests because the panelists representing consumers did not like the product (Riebroy et al., 2007; Hassan & Heath, 1986).

Figure 12. Fish conditions after storage for 3 weeks at cold temperatures (fridge)

Viewed from Figure 12, it can be seen that the fermented fish stored at cold temperatures (refrigerator) for three weeks in terms of color did not change, the skin was slightly wrinkled but the fish was still in a chewy condition with a fragrant smell. On average, the panelists gave an overall Appearance score of 7 (very much like). Even though the fermented fish had been stored for three weeks at a cold temperature, the panelists still liked the product very much (Fagbenro & Jauncey, 1995; Ntzimani et al., 2021).

- Data Analysis of Objective and Subjective Tests of Fermented Cob

Table 1
Data analysis of objective and subjective tests of fermented cob

Code	Total Acid			FFA t(%)	Dissolved Protein (%)	Water content (%)	Organoleptic
	lactat Acid (%)	Acetic Acid (%)	Buturic Acid (%)				
AP1	1.788	0.99	1.61	2.23	6.77	57.509	6
BP1	1.612	0.88	1.54	1.71	6.93	55.518	7
AP2							3
BP2	1.610	0,85	1.53	1.23	8.296	54.944	7
BP3	1.617	0.84	1.49	1.16	7.940	54.125	7
Fresh fish	0.97	0.64	0.95	0.91	10.114	73.247	7

Information :
AP1 = Storage for one week at room temperature
BP1 = Storage for one week at cold temperature (Fridge)
AP2 = Storage for two weeks at room temperature
BP2 = Storage for two weeks at cold temperature (Fridge)
BP3 = Storage for three weeks at cold temperature (Fridge)

- Dissolved Protein Level

As seen from Table 5.1, it can be seen that there is a decrease in the amount of dissolved protein from fresh fish after fermentation, namely from the dissolved protein content of 10.114% to an average of around 7.484%, this happens because in the fermentation process, pineapple extract and papaya extract are added, which are both The fruit extract contains protease enzymes. Protease enzymes are types of enzymes that can hydrolyze peptide bonds in proteins into smaller molecules, namely amino acids (Purwaningsih, 2017). Protease enzymes will hydrolyze polypeptide bonds in proteins into simpler peptide bonds until the formation of amino acids. Hydrolysis will reduce the molecular weight of the protein and increase the number of polar groups, which causes the insoluble protein to turn into a soluble protein (Xu et al., 2018; Giménez et al., 2005). The longer the fermentation, the more substrate will be fermented and the more peptide bonds hydrolyzed by enzymes. Dissolved protein analysis was performed using the Biuret method to calculate the number of peptide bonds, Biuret reagent reacts specifically with proteins, not amino acids. The higher the enzyme concentration, the more hydrolyzed peptide bonds, the lower the number of peptide bonds counted as dissolved protein.

The longer the incubation time, the more protein is hydrolyzed so that the less amount of dissolved protein is calculated using the biuret method (Wijaya & Yunianta, 2015). The results of fermented fish stored at room temperature have the highest percentage of protein content compared to the protein content of fermented fish stored at cold temperatures, this happens because the room temperature has a higher temperature so that the protease enzyme can be more active in the overhaul process compared to the activity of fermented fish. enzymes at cold temperatures. The longer the fermented fish is stored at cold temperatures, the changes in protein levels are relatively small and tend to decrease. This happens because of the accumulation of cold temperatures with the longer storage of fermented fish so that the protease enzymes will be less active along with the decrease in temperature. It was said by Wuryanti (2004) that temperature affects enzyme activity, increasing the temperature will accelerate the reaction to its optimum temperature and will decrease its speed if the temperature exceeds the optimum temperature.

- Moisture Content

Viewed from Table 1, it can be seen that there was a change in the water content from the fresh fish water content of 73.247% to an average of 55.539%. This happens because during fermentation there will be a reshuffle of materials from organic to inorganic in the presence of hydrolysis of the substrate by enzymes. The hydrolysis process will require a certain amount of water. The longer the fermentation occurs, the more water is needed so that the water content will decrease. In addition, the reshuffle of protein into amino acids will reduce the ability of the protein to bind water so that the water content of the substrate decreases. The salt contained in the fermented substrate will also absorb water from the substrate so that some water will be liberated so that the water content of the substrate will decrease (Rochima, 2005). When compared between fermented fish stored at room temperature, it appears to have a higher water content when compared to fermented fish at cold temperatures, and the longer it is stored at cold temperatures, the water content of fermented fish does not change, all of this is caused by the nature of the enzyme activity. change when applied to different temperatures the enzyme.

- Free Fatty Acids (FFA)

FFA is the soluble fat content of fermented fish. If seen from Table 1, it can be seen that there was an increase in FFA levels from fish before and after fermentation. Fresh fish has an FFA of about 0.91% and after being fermented for four (4) days it becomes an average of 1.582 %. The increase in the value of FFA because the principle of fermentation is to remodel organic elements into inorganic so that the release of FFA will be more and more on the substrate. Besides, the increase in the amount of FFA can also occur because the water content of the substrate has decreased so that other elements will increase, one of which is the increase in FFA. The decrease in water content during fermentation causes the decomposition of fat into fatty acids and glycerol cannot run properly (Rochima, 2005).

- Organic Acid Acids (Lactic, Acetic and Butyric)

Viewed from Table 1, it can be seen that the organic acid content (Lactic Acid, Acetic Acid, and Butyric Acid) from fresh fish is lower than the organic acid content after fermentation. This is very influential due to the Fermentation process. The principle of fermentation is the presence of microbial and enzyme activity in organic substrates. There is a breakdown of the starting material content into simpler components. The simpler components include the formation of lactic acid, acetic acid, butyric acid so that after fermentation the amount of these acids increases. Fresh tuna has an average organic acid of 0.85% and after fermentation, it becomes an average of 1.315%. Fermented fish stored at room temperature has a higher amount of organic acids and the longer it is stored in cold temperatures the amount of organic acids decreases, this is closely related to enzyme activity which is influenced by the temperature factor of the storage environment.

5 Conclusion

Judging from the research objective is to obtain quality fermented cobs (Auxis thazard) with the longest shelf life at a certain temperature, using glass jar packaging. From the results of the study, it was found that the longest fermented tuna (Auxis thazard) was stored in cold temperatures (Fridge at 5°C) reaching a storage time of three (3) weeks with good quality with the organoleptic value of 7 (very preferred) Water content 54.125%, Dissolved Protein 7.940%, Lactic Acid 1.617%, Acetic Acid 0.84% and Butyric Acid 1.49% and FFA 1.16%

Suggestion

From the results of the study, it can be suggested that it is best to store fermented tuna (Auxis thazard) at cold temperatures (Fridge with a temperature of 5°C using glass jars. From the observations outside the scope of the study, it turned out that fermented tuna was still of good quality after being stored for four months at cold temperatures in glass jars.

Acknowledgments
We are grateful to two anonymous reviewers for their valuable comments on the earlier version of this paper.

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