Journal of Marinesia
Vol. 1 No. 1 (2024) pp. 1-10
pISSN: | eISSN:
Journal Homepage: https://jurnal.untirta.ac.id/index.php/jm/index

QUALITY OF FRESH MACKAREL TUNA WITH PINEAPPLE JUICE ON BACTERIAL INHIBITION TEST AND ORGANOLEPTIC TEST

Nadya Adharani*[1], Ani Novita Sari[2], Nandya Fitri Rachmawati[3]

[1,2,3] Fisheries Product Technology Study Program, Faculty of Agriculture, PGRI Banyuwangi University, Banyuwangi

Corresponding: Nadya Adharani, Fisheries Product Technology Study Program, Faculty of Agriculture, PGRI Banyuwangi University, Ikan Tongkol No.1, Banyuwangi, East Java, 68416

E-mail: nadya.adharani@gmail.com

Submitted: 27 Agustus 2024 Revised: 1 Oktober 2024 Accepted: 2 Oktober 2024

Keywords:
Quality; Mackarel tuna; Pinaepple juice; Bacterial Inhibition Test; Organoleptic Test

ABSTRACT

Mackarel tuna fish is a perishable food or food that is easily damaged and rotten, and only lasts no more than three hours at room temperature. One of the handling processes to maintain the quality of tuna at room temperature is by adding pineapple juice (*Ananas comosus*). This aim of this research is to determine the quality of tuna mackarel at room temperature by soaking in pineapple juice. The quality of the fish tested is the growth of bacterial inhibition and organoleptic tests with parameters of appearance, aroma and odor. The study used 4 treatments (NI: 0 hours, N2: 8 hours, N3: 12 hours, and N4: 16 hours) and 4 repetitions. The total of bacterial colonies obtained in each treatment was analyzed using Analysis of Variance. Data analysis was followed by the Duncan Test at a 95% confidence level to show a noticeable difference (for paired comparisons of significant mean differences). Organoleptic tests were analyzed using a score or ranking test. he results showed that each treatment had a significant effect on the bacterial inhibition test and was in accordance with food safety standards (SNI. 2729:2013) in the N4 treatment with a total bacterial colony of $63x10^3$ CFU/ml, while the best organoleptic test was obtained in the N1 treatment with an eye specification of 8, gills of 8, meat of 8, smell of 7, and texture of 7.

INTRODUCTION

Mackarel tuna fish is a fishery commodity that has a very rich content of protein, fat, and carbohydrates so that it meets the nutritional needs of the body (Fatich *et al.,* 2023). According to Setyastuti *et al.* (2021), the relatively high content of protein and fat nutrients in mackarel tuna fish makes fish susceptible to fat oxidation which can reduce the nutritional value of mackarel tuna fish. So that the freshness of mackarel tuna fish can be affected by the quality of the fish during the handling and marketing process. Common treatments are cold chains that apply low temperatures such as ice cubes, cold water to fish and some use preservatives such as formalin. According to Vatria (2020), the disadvantage of cooling with ice is that

if it is not handled in a good way, ice can contaminate and damage the physical fish stored, thus affecting the quality of the mackarel tuna fish.

The process of deterioration of fish quality also takes place faster in tropical areas due to high daily temperatures and humidity that cause fish to rot faster (Sulistijowati *et al.,* 2020). This deterioration can occur because the fish's normal defense mechanism is stopped after the fish dies. The factors that cause it are the activity of enzymes, microorganisms and chemical reactions in the body of the fish due to damage and the environment in which the fish is located, which ultimately shortens the shelf life (Zulaihah *et al.,* 2018).

The decline in fish quality occurs after the fish dies and the most dominant and plays a role in the damage or decay of fish is bacteria. The fish's body defense system when alive can suppress the presence of bacteria in fish meat, but after the mechanism in the fish's body is stopped, bacteria multiply and penetrate into fish meat (Lokollo & Mailoa, 2020). According to Mumpuni & Hasibuan (2018), the microbes found in mackarel tuna fish that are not handled properly are one of the pathogenic microbes that appear *Escherichia coli, Salmonella* sp., and *Vibrio cholera* which cause various health problems. So that with the presence of microbes in mackarel tuna fish, it is necessary to handle it well in order to maintain the quality and shelf life of fresh mackarel tuna fish. One of the good handling processes in maintaining this is the addition of natural ingredients, one of which is pineapple (*Ananas comosus).*

Pineapple is a fruit commodity that is loved and consumed by the people of Indonesia, in addition to being consumed fresh, there is also the use of pineapple fruit, which is used to take other brome enzymes (Rikawati *et al.,* 2018). Bromeline enzyme is a protease enzyme that is able to hydrolyze peptide bonds in proteins into smaller molecules, namely amino acids so that they are easily digested by the body and bromelin enzyme is found in all pineapple tissues (Purwaningsih, 2017). In addition to bromelin compounds, pineapples also contain phenol compounds that are able to damage bacterial cell proteins, phenolic compounds and bromelin compounds in pineapples can inhibit the decay process of fish caused by microorganisms. Based on this, this study seeks to determine the quality of fresh mackarel tuna fish stored at room temperature by soaking pineapple juice. Fish quality testing is seen from the total bacteria obtained and organoleptic tests through score tests with ratings.

LITERATURE REVIEW

Mackarel Tuna (*Euthynnus affinis)*

Mackarel tuna fish can be classified as pelagic fish that live in groups and have a wide habitat and distribution. The protein content in mackarel tuna fish is very high, which is 21.6 to 26.3 g/100 g, and mackarel tuna fish is widely liked by consumers because of its protein content that is close to tuna, more affordable and rich in

omega-3 fatty acids. The chemical composition contained in 100 grams is 69.4% water, 1.5% fat, 25.% protein and 0.03% carbohydrates (Ngginak *et al.,* 2023).

Mackerel tuna is a perishable and perishable food. This is because the nutritional composition of fish which is very rich in protein, fat, minerals, and water is a medium for the growth of decaying microorganisms. Fish meat has a water content of 70 to 80% which is one of the main factors in the decay process, there are also proteins and fats are the main factors that play a role in the decay process, besides that protein and fat are also one of the factors that affect the speed and growth of microorganisms.

Pinaepple (*Ananas comosus)*

The content in pineapple has nutrients and vitamins such as calories, protein, fat, carbohydrates, calcium, vitamin A, vitamin C, and a little bit of B vitamins (Riska *et al.,* 2023). According to Lestari *et al.*, (2019) pineapple contains components of citric acid, flavonoids, alkaloids, tannins, vitamin A, steroids, vitamin C and also saponins. According to (Fitri *et al.,* 2023) pineapple humps contain flavonoids, alkaloids, saponins, triterpenoids and bromelin enzymes that function as antibacterial, anti-inflammatory, and antioxidant agents. According to Khuluq *et al.,* (2015) pineapple juice contains bromeline enzymes, flavonoids, triterpenoids, alkaloids, and also saponins. According to Anggraini *et al*., (2012), the content of bromelin enzyme is more abundant in the pineapple stem.

The benefits of pineapple contain 40% bromelin enzymes including the sulfhydryl protease enzyme group which can break down the molecular structure of proteins into amino acids. Bromeline enzyme is a protease enzyme that is able to hydrolyze peptide bonds in proteins into smaller molecules, namely amino acids so that they are easily digested by the body and bromelin enzyme is found in all pineapple tissues (Purwaningsih, 2017). In addition to bromelin compounds, pineapples also contain phenol compounds that are able to damage bacterial cell proteins, phenolic compounds and bromelin compounds in pineapples can inhibit the decay process of fish caused by microorganisms.

Fresh Fish Quality

Fresh fish is fish that has not been processed or preserved other than by being cooled with ice. Maximum freshness of fish like fresh fish, both appearance, smell, taste, and texture. If the fish is not handled properly, the quality of the fish will decrease. Fresh fish processing refers to all handling carried out on fresh fish from the time it is caught until it is received by consumers. This handling is carried out by fishermen, processors, distributors, retailers, or between consumers (Fatich *et al.,* 2023).

The characteristics of fresh fish include clear eyes, cornea, clear, black pupils, convex eyes and fresh red gills. If the quality decreases, the gills are grayish, slimy

and smelly, the scales are strongly attached, shiny and covered with clear mucus, the smell is typical of fish. If the fish is not fresh anymore, it smells bad and usually floats if placed in water. In fish that is still fresh, the meat is elastic and brightly colored, if pressed, it does not cause permanent marks (Suprayitno, 2020). According to SNI 2729:2013, the quality of fresh fish organoleptic has the following characteristics:

a) Appearance : bright, brilliant eyes
b) Odor : fresh specific type
c) Texture : elastic, dense and compact.

Total Bacterial Colonies

This method is an analytical method to test microbial contamination using the dilution method and the pour plate method. The total colony method is a method for calculating the number of bacteria in food samples and agricultural and livestock products. The principle of this method is that if live microbial cells are cultured on agar media, the cells will multiply and form colonies that can be seen directly without using a microscope (Fitri *et al.,* 2023). Total plate count is a method (TPC method) used to calculate the number of microorganisms present in a sample that bacteria in food must be limited and comply with established standards. TPC has two methods, the first method is the pouring method and the second method is the spread method (Suharman *et al.,* 2023). The advantage of the TPC method is to count all the number of cells present in the dish, living cells and other bacteria it contains, because colonies are formed from a single cell, these colonies can also be used to isolate microorganisms (Maulidah & Wahidah, 2021).

METHOD

The research method was carried out experimentally with different treatment of storage time and soaking of pineapple juice, including N1: 0 hours (without soaking); N2: 12h; N3: 24 hours; N4: 36 hours and N4: 48 hours (Nihe *et al.,* 2022), all treatments were repeated 4 times. Mackarel tuna fish quality testing includes total colony tests, organoleptic tests using scoring tests. The total colony data was then analyzed using ANOVA and further tests using Duncan Test.

The Process of Soaking Mackarel Tuna Fish with Pineapple (Biyatmoko *et al.,* 2018)

a. The pineapple used is cleaned first and the flesh is taken.
b. Puree the pineapple using a blender then strain using an 80 mesh.
c. The pineapple juice obtained, calculated as much as 250ml and put it in a plastic container and add 1L of clean water, do it for each treatment
d. Put the mackarel tuna fish whole in a plastic container and then store it according to their respective treatments.

e. Furthermore, an inhibition test (total colony) and an organoleptic test were carried out.

Bacterial Inhibition Test (Adine *et al.,* 2023)

The total colony test uses the total plate count method with Plate Count Agar (PCA) media. Sterilize equipment and media using autoclaves. Take the mackarel tuna fish meat then dilute the sample by taking 1 mL of sample, adding 9 mL of physiological NaCl solution to the test tube and then homogenizing it manually. A total of 1 ml of dilution suspension 10^{-1} is taken and added to 9 ml of physiological NaCl 10^{-2}, performing until dilution 10^{-5}. The next step is to take 1 ml of sample and pour it into a sterile petri dish. A total of 20–25 ml of PCA media was poured and homogenized with the sample. The mixture of media and the inner sample was incubated at 37±1°C for 24 hours. The last step is manually counted the colonies that form through the bottom of the dish.

Organoleptic Test (SNI 2729:2013)

Organoleptic or sensory testing is a test of food ingredients based on the taste and desire for the product. Sensory testing, also called organoleptic testing, is a testing method that uses the human senses as the main tool to measure the acceptance of a product. One of the organoleptic tests that will be carried out is a score test or rating test is a test where panelists are asked to give a certain score on a quality characteristic. Here are the scores used in organoleptic testing.

Table 1. Numerical Values of Organoleptic Tests

No	Category	Specifications	Numerical
1	Appearance	**a. Eyes**	
		Eyeball convex, clear cornea and pupil, shiny specific types of fish	9
		The eyeball is flat, the cornea and pupil are clear, somewhat shiny specific type of fish	8
		Flat eyeball, cornea quite turbid, pupil somewhat grayish, somewhat shiny specific type of fish	7
		Eyeball somewhat concave, cornea somewhat cloudy, pupils somewhat grayish, somewhat shiny specific type of fish	6
		Eyeball rather concav, cornea cloudy. pupil slightly grayish, no shiny	5
		Eyeball concave, cornea cloudy, grayish pupils, no shiny	3
		The eyeball is very sunken, the cornea is very cloudy, the pupil is gray, no shiny	1
		b. Gills	
		Gill color red old or chocolate reddish, bright with A little very mucus transparent	9
		Gill color red old or chocolate reddish, less brilliant with A little mucus transparent	8
		Gill color red young or chocolate young with A little mucus rather cloudy	7

No	Category	Specifications	Numerical
		Gill color red young or chocolate young with mucus rather cloudy	6
		Gill color red young or chocolate young pale with mucus cloudy	5
		Gill color gray or chocolate grayish with mucus milky white curdled	3
		Gill color gray, or chocolate grayish with mucus chocolate clotted	1
		c. Mucus Body Surface	
		Layer mucus clear, transparent, shiny bright	9
		Layer mucus clear, transparent, sufficient bright	8
		Layer mucus start rather cloudy	7
		Layer mucus start cloudy	6
		Mucus rather thick, start changed color	5
		Mucus thick A little clump, change color	3
		Mucus thick clump, change color	1
2.	**Meat**	Incision very bright flesh, specific type, network very strong meat	9
		Incision meat brilliant specific type, network meat strong	8
		Incision meat a little less excellent, network meat strong	7
		Incision meat less excellent, network meat a little less strong	6
		Incision meat start faded, network meat not enough strong	5
		Incision meat dull, network meat not enough strong	3
		Incision very dull flesh, tissue meat damaged	1
3.	**Aroma**	Very fresh, specific type strong	9
		Fresh, specific type	8
		Fresh, specific type not enough	7
		Neutral	6
		A little smell sour	5
		Sour smell strong	3
		Bad odor strong	1
4.	**Texture**	Dense, compact, very elastic	9
		Solid, compact, elastic	8
		A bit soft, a bit elastic	7
		A bit soft, a bit not enough elastic	6
		A bit soft, less elastic	5
		Used software finger visible and very slow is lost	3
		Very soft, used finger No is lost	1

RESULT AND DISCUSSION

Total Bacterial Colonies

The decline in fish quality occurs after the fish dies and the most dominant and plays a role in the damage or decay of fish is bacteria. A bacterial colony is a group of similar bacteria that come together to form a colony. To determine the growth of the bacteria, it was analyzed using an inhibitor. The following are the results of the calculation of the total colony in mackarel tuna fish in each treatment:

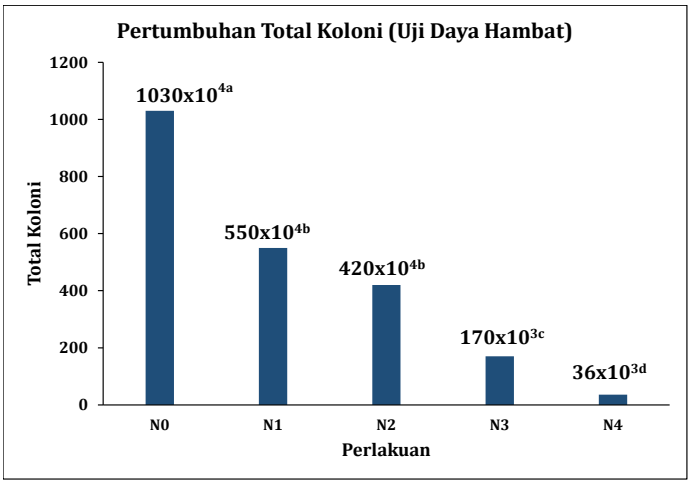

Figure 1. Total Colonies of All Treatments

The graph above shows that the total colonies are different in each treatment. Without pineapple soaking (N0), the total colonies are very large, which is $1030x10^4$ CFU/ml while the smallest total colony at N4 is $36x10^3$ CFU/ml (SNI. 279:2013). Data analysis showed that there were significant differences in each treatment in testing bacterial inhibition, this showed the potential of pineapple to reduce bacterial growth and mackarel tuna fish is suitable for consumption if not stored using cooling media. Pineapple also contains phenolic compounds that have the ability to change the protein properties of bacterial cells. The content of citric acid, phenol and bromelin compounds in pineapple is suspected to inhibit the decay process by microorganisms (Rikawati *et al.,* 2018). This is similar to the research of Nihe *et al.,* (2022) that soaking tilapia using pineapple peel obtained a lower total bacteria so as to inhibit the growth of bacteria in tilapia fish.

Organoleptic Test

The results of the organoleptic test on mackarel tuna fish that have been soaked in pineapple juice using the scoring test are as follows:

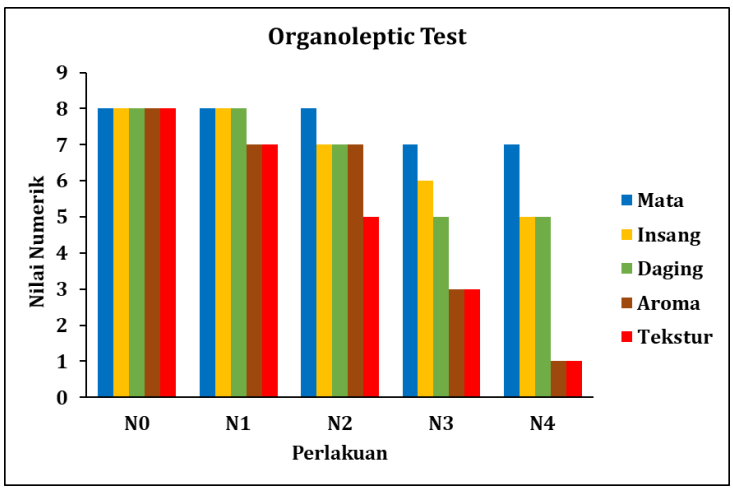

Figure 2. Hasil Test Results (Eyes, Gils, Meat, Aroma, Texture)

It can be seen in the figure above that the parameters in the eyes have decreased in the treatment of N3 and N4 with a value of 7 while N0, N1, and N2 with a value of 8. Soaking with pineapple which is getting longer has a bad impact on the fish's eyes, this results in fish experiencing a decrease in the quality of the fish's eyes with a specification of sunken eyeballs, cloudy cornea, grayish pupils, and not shiny (Wicaksono *et al.,* 2021).

In the gill parameters, there was a decrease in N2 treatment of 7, N3 of 6, and N4 of 5, while N0 and N1 were with a value of 8. Soaking with pineapple that lasts longer has a bad effect on the gills of the fish so that the color of the gills is pale pink or light brown with cloudy mucus. This decrease in gill quality is no longer acceptable and dangerous when consumed (Wicaksono *et al.,* 2021).

The condition of the meat produced from the above data showed a decrease in N2 treatment of 7, N3 and N4 of 6, while N0 and N1 with a value of 8. Fresh fish has chewy and dense meat, when pressed with the fingers of the hand the used will disappear. Fresh mackarel tuna fiah has meat characteristics that are able to bind water so that the texture of the fish meat is still hard or not soft (Fatich *et al.,* 2023), so that the meat paramater of mackarel tuna fish soaked in pineapple is unacceptable and unsuitable for consumption (Wicaksono *et al.,* 2021).

Fresh fish will emit a fishy aroma or smell while fish that have regressed will emit an unpleasant aroma or odor. From the data above, it shows a decrease from N1 treatment of 7 to N4 treatment of 1. The process of deterioration of fish quality can produce aromas that are less in demand by consumers. Odors can be caused by the activity of decaying microorganisms as well as chemical activities such as fat oxidation (Fatich *et al*., 2023; Wicaksono *et al.,* 2021).

The texture parameter can be seen in the graph above showing the reduction from N1 treatment of 7 to N4 treatment of 1. The texture of fresh fish is dense and elastic, if the texture of the fish decreases, it will become soft and easily crumble when pressed by hand. Texture is a characteristic description of the surface of the fish's body which can be an indicator of fish freshness that can be observed using the sense of touch (Fatich et al., 2023), so that from the data obtained through the premeter of the texture of the carp soaked in pineapple is unacceptable and not suitable for consumption (Wicaksono *et al.,* 2021).

CONCLUSSION

Soaking mackarel tuna fish with pineapple juice has an effect on controlling the total colony that grows in the fish. Each treatment had a significant effect with the highest total colony at N0 of $1030x10^4$ and the lowest at N4 of $36x10^3$. In the organoleptic test, there is no real effect on mackarel tuna fish, this is because each parameter (eyes, gills, meat, aroma, and texture) in N1, N2, N3, and N4 shows that the fish is not suitable for consumption because there is a decrease in quality in the eyes, gills, meat, aroma, and smell. In the N0 treatment, the fish is still in a fresh

condition and suitable for consumption because there is no pineapple soaking like other treatments.

REFERENCES

Adine, A. A., Wulandari, E., & Utama, D. T. (2023). Karakteristik Mikrobiologi (Total Bakteri, Total Yeast) dan pH Produk Susu Kurma Selama Penyimpanan Suhu Rendah (4-6°C). *Jurnal Teknologi Hasil Peternakan*, *4* (1), 31.

Anggraini, D., Rahmides, W. S., & Malik, M. (2012). Formulasi Sabun Cair dari Ekstrak Batang Nanas (*Ananas comosus*. L) untuk Mengatasi Jamur Candida albicans. *Jurnal Penelitian Farmasi Indonesia*, *1*(1), 30–33.

Fatich, M. F. N. Al, Setyastuti, A. I., Kresnasari, D., & Sarmin, S. (2023). Identifikasi Tingkat Kesegaran Ikan Tongkol (*Euthynnus* sp.) Di Pasar Bumiayu, Kabupaten Brebes. *Journal of Marine Research*, *12* (3), 511–518.

Fitri, Z. E., Sahenda, L. N., Holili, R. S. A., & Rukmi, D. L. (2023). Perhitungan Koloni Bakteri Susu Segar Pada Ruang Warna Ycbcr The Calculation Of Fresh Milk Bacteria Colony In Ycbcr Color Space. *Jurnal Ilmiah NERO*, *8*(2), 87–96.

Khuluq, M. H. N. H., Wardatun, S., & Wiendarlina, I. Y. (2015). Uji Toksisitas Sari Buah Dan Bonggol Nanas (*Ananas comosus* (L.) Merr) Terhadap Larva Udang (*Artemia salina leach*). *Jurnal Farmasi*, 1–9.

Lestari, D., Claudya, T., & Pramitasari, R. (2019). Stabilitas Mikrokapsul *Lactobacillus acidophilus* Atcc 314 Terhadap Pemanasan Dan Penyimpanan Dalam Selai Buah Nanas Rendah Gula. *Jurnal Teknologi Dan Industri Pangan*, *30* (2), 127–132.

Lokollo, E., & Mailoa, M. N. (2020). Teknik Penanganan Dan Cemaran Mikroba Pada Ikan Layang Segar Di Pasar Tradisional Kota Ambon. *JPHPI*, *23*, 103–111.

Maulidah, N., & Wahidah, F. F. (2021). Metode Perbanyakan Azotobacter sp. dengan Media Cair di Kantor Koordinator PTPH Bojonegoro. *Jurnal Matematika & Sains*, *1*(2), 75–80.

Mumpuni, F. S., & Hasibuan, S. (2018). Prevalensi Mikroba Pada Produk Pindang Tongkol Skala Ukm Di Pelabuhan Ratu, Sukabumi. *Jurnal Pengolahan Hasil Perikanan Indonesia*, *21*(3), 480–485.

Ngginak, J., Romode, M. E., Sampe, R., & Manalu, T. S. J. (2023). Identifikasi Nematoda pada Ikan Tongkol (*Euthynnus affinis*) di Pelabuhan Ikan Oeba. *Jurnal Pendidikan Biologi*, *11* (2), 185–191.

Nihe, A., Husain, R., Mile, L., Teknologi, J., Perikanan, H., Perikanan, F., & Kelautan, I. (2022). Lama Penyimpanan dan Kesegaran Ikan Nila dengan Pengawet Larutan Kulit Nanas. *Jurnal Ilmiah Perikanan Dan Kelautan*, *10*(3).

Purwaningsih, I. (2017). Potensi Enzim Bromelin Sari Buah Nanas (*Ananas comosus* l.) Dalam Meningkatkan Kadar Protein Pada Tahu. *Jurna Teknologi Laboratorium*, *6* (1), 39–46.

Rikawati, A. M., Dewi, Y., & Lestari, O. A. (2018). Kajian Formulasi Puree Daging Dan Puree Empulur Nanas (*Ananas comosus* (L) Merr) Dalam Pembuatan Cookies. *Jurnal UNTAN*, 1–11.

Riska, O. A., Prastiwi, R., Halin, H., & Hildayanti, S. K. (2023). Pelatihan Pengolahan Pangan Lokal Berbahan Baku Nanas Program MBKN KKN Tematik Indo Global Mandiri. *Jurnal Pengabdian Mandiri*, *2* (1), 291–300.

Setyastuti, A. I., Prasetyo, D. Y. B., Kresnasari, D., Ayu, N., & Andhikawati, A. (2021). Karakteristik Kualitas Ikan Tongkol (*Euthynnus affinis*) Asap Dengan Asap Cair Bonggol Jagung Selama Penyimpanan Beku. *Jurnal Akuatika Indonesia*, *6* (2).

Sulistijowati, R., Ladja, T. J., & Harmain, R. M. (2020). Perubahan Nilai pH dan Jumlah Bakteri Ikan Nila (*Oreochromis niloticus*) Hasil Pengawetan Larutan Daun Matoa (*Pometia pinnata*). *Media Teknologi Hasil Perikanan*, *8*(2).

Suprayitno, E. (2020). Kajian Kesegaran Ikan Dipasar Tradisional Dan Modern Kota Malang. *Jurnal Of Fisheries and Marine Seriech*, *4* (2), 289–295.

Vatria, B. (2020). *Penanganan Hasil Perikanan (Fishery Product Handling)*.

Wicaksono, A., Rostini, I., Rostika, R., & Pratama, R. I. (2021). The Effect of Additional Cayenne (*Ananas comosus* [L]. Merr) Solution on the Prefferencelevel Red Tilapia Shredded. *Asian Journal of Fisheries and Aquatic Research*, 1–8.

Zulaihah, L., Nur, I., & Marasabessy, A. (2018). Program Pendinginan Ikan pada Kelompok Pedagang Pasar Pelelangan Muara Baru Jakarta Utara. *Snppm*, 261–265.