

Effectiveness of the Composition of Banana Peel Vinegar and NaCL as Fish Preservative

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Submission date: 06-Mar-2023 11:07AM (UTC+0700)

Submission ID: 2029842712

File name: ARTIKEL_IJAHST.pdf (430.58K)

Word count: 4466

Character count: 22469

Manuscript received November 5, 2022; revised November 20, 2022; accepted November 20, 2022; date of publication December 20, 2022

Digital Object Identifier (DOI): <https://doi.org/10.35882/ijahst.v2i6.189>

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How to cite: Rifqi Athawiryra¹, Siti Mardiyah¹, Sudirman¹, Fitrotin Azizah¹, Aini Ahmad, "Effectiveness of the Composition of Banana Peel Vinegar And NaCl as Fish Preservative ", *International Journal of Advanced Health Science and Technology*, vol. 2, no. 6, pp. 426–430, December 2022.

Effectiveness of the Composition of Banana Peel Vinegar and NaCl as Fish Preservative

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ABSTRACT. Fish is a food that is in great demand by many people. Fish are also easily damaged. Therefore, some fishermen use formalin as a preservative for their caught fish. However, the use of formalin in food is prohibited and is considered dangerous because it can cause health problems. Hence, the use of natural preservatives is an alternative. The combination of banana peel vinegar and NaCl salt used banana peel vinegar can inhibit the growth of microbes in the fish body. Furthermore, if it is combined with the addition of NaCl, it can reduce the water content in the fish body so that microbes cannot grow and reproduce. The purpose of this study was to obtain an effective concentration of preservatives from the combination of banana peel vinegar and NaCl. This type of research is experimental with 4 treatments 9:1, 7:1, 4:1, and 3:1. Each treatment was repeated 6 times. 24 samples of fish that have been treated are left for 12 hours at room temperature which represents the time fishermen catch fish until they come to shore. The results of this study showed that the durability of fresh fish in 4:1 treatment got a value of 6.95, categorized as fresh fish. It means that the combination of banana peel vinegar and NaCl salt at a concentration of 4:1 is effectively used as a fish preservative. The results of the oneway ANOVA test showed that there was an effect of the combination of banana peel vinegar and NaCl salt on the freshness of the fish.

INDEX TERMS Fresh Fish, Banana Peel Vinegar, NaCl.

I. INTRODUCTION

Marine natural resources in Indonesia are very abundant, which stretches across more than 17,000 islands and 13,466 islands of which have been named and the coastline is thousands of kilometers away, so that the majority of the population make a living as fishermen [1]. Head of Research and Human Resources Agency for Marine and Fisheries of the Ministry of Maritime Affairs and Fisheries Sjarief Widjaja stated that Indonesian people are very fond of consuming marine fish and are relatively high. It is proven by the large number of fish demands and before adding to the need for processed products and exports, it has reached 13 million tons per year. The report from the Ministry of Maritime Affairs and Fisheries shows that the fish consumption rate in 2020 is 56.39 kg/capita. The number increased by 3.47% compared to 2019 which was around 54.5 kg/capita. During the last 10 years the percentage of national fish consumption tends to increase [2]. Dead fish meat will spoil faster than beef, fruit and vegetables [3]. This event occurs because all layers of fish flesh, especially the gills, skin and stomach contents, are suitable places for

microbial activity. The method used to prevent decay is one of them by salting or salting, salted fish is called salted fish [4][5]. But not everyone likes salted fish, fresh fish is bigger in consumption in the community, to maintain the freshness of fish, preservatives are needed. Food poisoning is being talked about a lot recently [6][7]. Food poisoning can occur because these foods contain formaldehyde and borax which are dangerous chemicals. Formalin can poison the body because formalin is not actually an additional food ingredient, therefore foods that are intentionally added to formalin can be harmful to the body [8][9]. The case of the raid on the salted fish manufacturing industry suspected of containing formaldehyde in the Lekok area, Pasuruan Regency, East Java. In March 2020, 2.5 tons of evidence were secured by the authorities [10][11].

Food ingredients are not allowed to use formalin. However, in reality many people use formalin as a food preservative. Formalin is a non-food preservative and is a mixture of Formaldehyde, Methanol and water with varying levels of formaldehyde between 20%-40% [12][13]. Formalin is widely used in foodstuffs because of its

affordable price and very easy to find in grocery stores and how to use it which is quite easy and can maintain the quality of salted fish, so formalin is in great demand as a food preservative by irresponsible food producers [14][15]. Foods containing formaldehyde can cause chronic and acute effects that can attack the digestive tract and respiration, causing dizziness, seizures, hypotension, unconsciousness, even coma and can cause damage to internal organs. Chronic effects that can occur in the form of inflammation in the respiratory tract organs [16][17].

Therefore, to reduce the use of formalin as a food preservative, formalin substitutes can be made from natural ingredients that are safer for health and easy to obtain. One example is banana peel [18][19]. Banana peel is a natural material that has semi-wet properties and is commonly found in household waste, most of which are not used thoroughly so that in the end it can cause various environmental pollution [20][21]. Banana peel has a variety of ingredients that are nutritious for the health of the body, precisely to maintain stamina and provide energy for the body. These contents consist of vitamins A, B1, B2, and C, water, carbohydrates, protein, minerals, sugar, fat and iron [22][23]. The content in banana peels can of course still be used for various things. One of the main ingredients is carbohydrates [24]. Carbohydrate levels in banana peels are quite high, which is around 18.5%. And in the manufacture of ethanol the main ingredient is carbohydrates, so it is very suitable if banana peels are used as the basis for making organic vinegar [25][26]. Natural preservatives that have been used for a long time are table salt. Salt cannot kill bacteria or decaying microbes but the added salt can reduce the water content in the fish body, so bacteria cannot grow and multiply at a certain point of preservation [27][28]

Sodium Chloride or table salt is a compound that has the chemical formula NaCl. In the food fermentation process, sodium chloride is used as an inhibitor for the growth of microbial organisms that cause spoilage and prevent the growth of some other organisms that cause spoilage [29]. One of the properties of salt is bactericidal and bacteriostatic, therefore salt is often used to extend the shelf life of a food product [30][31]. Salt solution has an osmotic action on foodstuffs because foodstuffs act as semipermeable membranes to reduce water content so that salt plays a role in inhibiting enzymatic and bacteriological processes [32][33]. Based on the explanation above, namely with the many cases of misuse of formalin as a food preservative, then researchers are interested in researching natural preservatives are needed that can reduce the use of formalin and are also not harmful to the body if consumed in the long term continuously and one of the natural preservatives that can be used is banana peel vinegar and combined with NaCl salt with a certain concentration so that researchers are interested in conducting research with the title Testing the Effectiveness of the Composition of Banana Peel Vinegar and NaCl salt as a preservative for marine fish.

II. METHODOLOGY

This type of research is experimental with a posttest only design which aims to determine the effectiveness of banana peel vinegar with a combination of several concentrations of NaCl on fish preservation.

TABLE 1
 TYPE OF RESEARCH

	Treatment	Posttest
R (Experimental Group)	X	O1
R (Control Group)		O2

The population of this study was all fish caught by fish fishermen in the Brondong area, Lamongan Regency. Meanwhile, in this study, the sample that was given the action was fresh fish. The number of samples used is as many as 24 samples which will be given 4 treatments. Repetition for each treatment is 6 times which is obtained from the formula according to [34] below R refer to Repetition, T refer to Treatment :

$$\begin{aligned} (R-1) (T-1) &> 15 \\ (R-1) (4-1) &> 15 \\ (R-1) (3) &> 15 \\ 3R - 3 &> 15 \\ 3R &> 15 + 3 \\ 3R &> 18 \\ R &> 6 \end{aligned}$$

The formulation of Banana Peel Vinegar and NaCl was carried out at the Chemical Laboratory of the University of Muhammadiyah Surabaya. The effectiveness test was carried out in Latek Village, Sekaran District, Lamongan Regency. The study was carried out from January 2022 to July, while the examination was carried out in May 2022. Data were collected by direct observation after the sample was incubated for 12 hours using the organoleptic test using the score sheet method on a scale of 1-9 conducted by 10 panelists.

A. PROCEDURE FOR MAKING BANANA PEEL VINEGAR

First filter the banana skin juice to separate it from the dirt and heat the banana skin juice. Put the sugar into the boiled banana peel juice, stir until dissolved. Then added ammonium sulfate and waiting for the temperatures of the banana peel juice to drop and adding baking yeast (*Saccharomyces cerevisiae*). Put the banana peel juice that has been bioiled into a container then close tightly. Then let the fermentation take place for 7 days and add 10% *Acetobacter aceti* and fermentation is allowed to continue for 10 days.

B. FISH SOAKING PROCEDURE

Choose fish based on the appropriate size then soaking the fish into the prepared solution and NaCl for 15 minutes

according to the treatment. The soaked fish is then placed on a serving plate and incubated for 12 hours.

C. FISH QUALITY ASSESSMENT PROCEDURES

Fish are served on serving plates that have been coded, then panelist give a score on the shore sheet that has been given with organoleptic observation.

D. DATA ANALYSIS TECHNIQUE

Data were analyzed using descriptive statistics to determine the degree of freshness of fish from each treatment. The degree of fish freshness obtained from the average score was then compared with the fish freshness requirements according to SNI 2729: 2013 with the following criteria:

If you get an average value of 7-9, it describes the condition of the fish in the fresh category

If you get an average value of 5-6, it describes the condition of the fish in the bad category

If you get an average value of 1-4, it shows that the condition of the fish is in the category of unfit for consumption

III. RESULT

From the organoleptic test that has been carried out with the title "Test the Effectiveness of the Composition of Table Salt (NaCl) and Banana Peel Vinegar as a Preservative of Marine Fish" the results of the organoleptic value data of fish on storage for 12 hours can be seen in the following table.

**TABLE 2
 FISH FRESHNESS**

No	Repeatin g	Fish Freshness Value			
		Na Vinegar 9:1	Na Vinegar 7:1	Na Vinegar 4:1	Na Vinegar 3:1
1.	A	7,0	6,5	7,1	6,4
2.	B	6,5	6,0	6,9	6,5
3.	C	6,7	6,2	7,0	6,3
4.	D	6,4	6,5	6,9	6,1
5.	E	6,5	6,2	6,9	6,1
6.	F	6,6	6,1	7,1	6,7
average		6,6	6,3	7,0	6,4
Standard Deviation (SD)		0,21	0,21	0,10	0,23

Based on the panelists' assessment above, it was found that the highest average organoleptic value was 6.95 in treatment 4 : 1 which was close to the value of 7.0 and the fish could be categorized as fresh fish.

The data obtained is then processed using the SPSS (Statistical Program Social Science) application. The first thing to do is to test the normality of the data using the Shapiro Wilk test because the data being tested is < 50, and the results are normally distributed data with p value > 0.05. Then the data was tested for homogeneity and the data was declared homogeneous with the result $197 > 0.05$. So the assumption of homogeneity in the One Way Anova test has been fulfilled. The results of the one way ANOVA test show a significant value (Sig.) of $0.00 < 0.050$ (attached to the

attachment). Based on the decision making on the one way ANOVA test, the average value obtained for each variation is significantly different. Reinforced by the output of "Homogenous Subsets" all the resulting averages are different. Thus, the variable composition of Banana Peel Vinegar and NaCl has a significant effect on the durability of the freshness of the fish.

**TABLE 3
 ANOVA Test**

ANOVA					
Organoleptic Test Values					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.713	3	.571	16.086	.000
Within Groups	.710	20	.036		
Total	2.424	23			

IV. DISCUSSION

Based on the results of the research "Test the Effectiveness of the Composition of Kitchen Salt (NaCl) and Banana Peel Vinegar as Preservative of Marine Fish" conducted in Latek Village, Lamongan Regency, it showed the effect of soaking fish using the composition of variations in the ratio of banana peel vinegar and NaCl table salt. It can be seen from the results of the organoleptic test of fish which showed that there were differences in values between the treatment groups. The sample used was fresh brass fish purchased from fishermen in the Brondong Beach area, Lamongan. Samples were given 4 treatments, namely treatment 9:1, 7:1, 4:1, 3:1. The sample is then left for 12 hours which represents the length of time fishermen are in the process of catching fish until they come to shore. The data that has been obtained is tested for normality of the data. This normality test is carried out to determine whether the data is parametric or non-parametric data. The method used in this normality test is the Shapiro-Wilk method, because the number of samples used in this study is 24 samples according to the normality test criteria that the sample is $9 < N < 50$ (N: Sample) then the valid method is Shapiro-Wilk. The results of the normality test of the data showed a significance value of > 0.05 so it could be concluded that the data obtained were normally distributed so that the One Way Anova parametric test could be continued. After the data normality requirements are met then the data will be tested for homogeneity, the homogeneity test can be carried out simultaneously with the One Way Anova test. The value obtained is a significance > 0.05 , so the data from the variance of the 4 treatment groups being compared are homogeneous, so the assumption of homogeneity in the One Way Anova test is fulfilled.

So descriptively the variation of composition 4:1 with the average value obtained is 6,958 which is the highest value from the other treatment groups, in other words the 4:1 treatment group can be the most effective. In the One Way

Anova test the results show a significance value of $0.000 < 0.05$ which indicates H_0 is rejected, meaning that there is a significant effect of the treatment given. Thus, variations in the composition of banana peel vinegar and NaCl that significantly affect the durability of fish freshness are variations in composition 4: 1. Banana Peel Vinegar Acid can be used as a preservative because it can decrease the pH of foodstuffs so that they can inhibit the growth of bacteria that cause spoilage and cause bacterial protein denaturation because there is sufficient acid content. This ability is combined with salt which also has the ability as a preservative. The way salt works to preserve is by absorbing fluid from the fish's body [35]. In the 3:1 treatment, the average organoleptic value got a relatively low value of 6.36. According to Pratomo, the use of a salt concentration that is too high can give a decreasing organoleptic assessment [36]. The good results were obtained at a ratio of 4:1 with a value of (7,0) in other words, it was an effective comparison to extend fish endurance. If the composition is too saturated, it is assumed that it will affect the taste of the fish itself

IV. CONCLUSION

The results of the formulation of several combinations of banana peel vinegar and NaCl salt with various concentrations of 9:1, 7:1, 4:1, 3:1. The freshness resistance of fish is known based on the treatment. With 4:1 treatment, the score was 6.95, close to 7.0, which could be categorized as fresh fish. The results of the most effective treatment were variations in the composition of 4:1 with an average value of 6,958 on statistical test data using SPSS. Suggestion for further researchers are first it is expected that organoleptic tests will be carried out by panelists who are experts in their fields. Second, expected to be able to test the microbiology after soaking with the formulation of banana peel vinegar and NaCl. Suggestion for the Community It is hoped that the results of this study can be used as an insight that the combination of Banana Peel Vinegar and NaCl salt in a ratio of 4: 1 can be used as an effective fish preservative.

REFERENCES

- [1] M. N. Mailoa, I. K. E. Savitri, E. Lokollo, and S. S. Kdise, "Mutu Organoleptik Ikan Layang (Detapterus sp.) Segar Selama Penjualan di Pasar Tradisional Kota Ambon," *Majalah BIAM*, vol. 16, no. 1, pp. 36–44, 2020.
- [2] A. S. Nurqaderanie, Metusalach, and Fahrul, "Tingkat Kesegaran Ikan Kembung Lelaki (Rastrelliger kanagurta) Yang Dijual Eceran Keliling Di Kota Makassar," *Ipteks Psp*, vol. 3, no. 6, pp. 528–543, 2016.
- [3] J. Wang, I. Potoroko, and L. Tsrulnichenko, "Wood vinegar and chitosan compound preservative affects on fish balls stability," *Food Biosci*, vol. 42, no. May, p. 101102, 2021, doi: 10.1016/j.fbio.2021.101102.
- [4] J. Thielmann, S. Kohnen, and C. Hauser, *Antimicrobial activity of Olea europaea Linné extracts and their applicability as natural food preservative agents*, vol. 251, no. 2016. Elsevier B.V, 2017. doi: 10.1016/j.ijfoodmicro.2017.03.019.
- [5] A. Masyita *et al.*, "Terpenes and terpenoids as main bioactive compounds of essential oils, their roles in human health and potential application as natural food preservatives," *Food Chem X*, vol. 13, no. January, p. 100217, 2022, doi: 10.1016/j.fochx.2022.100217.
- [6] N. Zabaoui *et al.*, "Biological properties of propolis extracts: Something new from an ancient product," *Chem Phys Lipids*, vol. 207, pp. 214–222, 2017, doi: 10.1016/j.chemphyslip.2017.04.005.
- [7] D. Barrett *et al.*, "The Journal of Nutrition Nutritional Epidemiology Past and Recent Salted Fish and Preserved Food Intakes Are Weakly Associated with Nasopharyngeal Carcinoma Risk in Adults in Southern China", doi: 10.1093/jn/nxz095.
- [8] Sunardi, J. Margolang, B. N. Pratama, A. Panjaitan, M. Sinambela, and L. T. Hutabarat, "Simple designed of charge controller based on microcontroller for caddy cars using solar panels," *IOP Conf Ser Mater Sci Eng*, vol. 725, no. 1, Jan. 2020, doi: 10.1088/1757-899X/725/1/012052.
- [9] C. M. Harris and S. K. Williams, "The antimicrobial properties of a vinegar-based ingredient on Salmonella Typhimurium and psychrotrophs inoculated in ground chicken breast meat and stored at $3\pm 1^\circ\text{C}$ for 7 days," *Journal of Applied Poultry Research*, vol. 28, no. 1, pp. 118–123, 2019, doi: 10.3382/japr/pfy048.
- [10] N. Ghaned, I. Samaha, and M. Nossair, "Incidence of Some Pathogenic Bacteria in Smoked and Salted Fish Products," *Alex J Vet Sci*, vol. 60, no. 0, p. 1, 2019, doi: 10.5455/ajvs.265362.
- [11] M. Loibner, L. Oberauer-Wappis, C. Viertler, D. Groelz, and K. Zatloukal, "Protocol for HER2 fish using a non-cross-linking, formalin-free tissue fixative to combine advantages of cryo-preservation and formalin fixation," *Journal of Visualized Experiments*, vol. 2017, no. 130, Dec. 2017, doi: 10.3791/55885.
- [12] J. F. Leal, M. G. P. M. S. Neves, E. B. H. Santos, and V. I. Esteves, "Use of formalin in intensive aquaculture: properties, application and effects on fish and water quality," *Rev Aquac*, vol. 10, no. 2, pp. 281–295, Jun. 2018, doi: 10.1111/RAQ.12160.
- [13] V. Tanamool, M. Chantarangsee, and W. Soemphol, "Simultaneous vinegar fermentation from a pineapple by-product using the co-inoculation of yeast and thermotolerant acetic acid bacteria and their physicochemical properties," *3 Biotech*, vol. 10, no. 3, 2020, doi: 10.1007/s13205-020-2119-4.
- [14] E. J. Kim, K. M. Cho, S. J. Kwon, S. H. Seo, S. E. Park, and H. S. Son, "Factors affecting vinegar metabolites during two-stage fermentation through metabolomics study," *Lwt*, vol. 135, no. July 2020, p. 110081, 2021, doi: 10.1016/j.lwt.2020.110081.
- [15] M. Jones, E. Amaud, P. Gouws, and L. C. Hoffman, "Effects of the addition of vinegar, weight loss and packaging method on the physicochemical properties and microbiological profile of biltong," *Meat Sci*, vol. 156, no. August 2018, pp. 214–221, 2019, doi: 10.1016/j.meatsci.2019.06.003.
- [16] G. Kiran V *et al.*, "Synthesis and Characterization of Banana Peel Starch-based Bioplastic for Intravenous Tubes Preparation," *Mater Today Commun*, vol. 33, p. 104464, Dec. 2022, doi: 10.1016/j.MTCOMM.2022.104464.
- [17] B. Y. Sheikh, M. M. R. Sarker, M. N. A. Kamarudin, and A. Ismail, "Prophetic medicine as potential functional food elements in the intervention of cancer: A review," *Biomedicine and Pharmacotherapy*, vol. 95, pp. 614–648, 2017, doi: 10.1016/j.biopha.2017.08.043.
- [18] E. da S. Ferreira *et al.*, "Synthesis and Characterization of Natural Polymeric Membranes Composed of Chitosan, Green Banana Peel Extract and Andiroba Oil," *Polymers (Basel)*, vol. 14, no. 6, 2022, doi: 10.3390/polym14061105.
- [19] X. Zhai *et al.*, "An efficient method using ultrasound to accelerate aging in crabapple (Malus asiatica) vinegar produced from fresh fruit and its influencing mechanism investigation," *Ultrason Sonochem*, vol. 72, p. 105464, 2021, doi: 10.1016/j.ulsonch.2021.105464.
- [20] B. O. Adetuyi *et al.*, "Banana Peel as a Source of Nutraceuticals," *Food and Agricultural Byproducts as Important Source of Valuable Nutraceuticals*, pp. 243–250, 2022, doi: 10.1007/978-3-030-98760-2_17.
- [21] A. E. Prisacaru, C. Ghinea, L. C. Apostol, S. Ropciuc, and V. F. Ursachi, "Physicochemical Characteristics of Vinegar from Banana Peels and Commercial Vinegars before and after In Vitro Digestion," *Processes 2021, Vol. 9, Page 1193*, vol. 9, no. 7, p. 1193, Jul. 2021, doi: 10.3390/PR9071193.
- [22] B. Iskandar, A. Lukman, S. Syaputra, U. N. H. Al-Abroni, M. D. C. Surboyo, and C. K. Lee, "Formulation, characteristics and antibacterial effects of Euphorbia hirta L. mouthwash," *J Taibah Univ Med Sci*, vol. 17, no. 2, pp. 271–282, 2022, doi: 10.1016/j.jtumed.2021.08.009.
- [23] P. M. Joyner, "Protein adducts and protein oxidation as molecular mechanisms of flavonoid bioactivity," *Molecules*, vol. 26, no. 16, 2021, doi: 10.3390/molecules26165102.

- [24] L. Wen, Y. Jiang, J. Yang, Y. Zhao, M. Tian, and B. Yang, "Structure, bioactivity, and synthesis of methylated flavonoids," *Ann N Y Acad Sci*, vol. 1398, no. 1, pp. 120–129, 2017, doi: 10.1111/nyas.13350.
- [25] D. Ousaaid *et al.*, "Fruits Vinegar: Quality Characteristics, Phytochemistry, and Functionality," pp. 1–16, 2022.
- [26] P. Xu, M. Marsafari, J. Zha, and M. Koffas, "Microbial Coculture for Flavonoid Synthesis," *Trends Biotechnol.*, vol. 38, no. 7, pp. 686–688, 2020, doi: 10.1016/j.tibtech.2020.01.008.
- [27] F. Zhu, "Polysaccharide based films and coatings for food packaging: Effect of added polyphenols," *Food Chem.*, vol. 359, no. April, p. 129871, 2021, doi: 10.1016/j.foodchem.2021.129871.
- [28] J. J. Wijnker, G. Koop, and L. J. A. Lipman, "Antimicrobial properties of salt (NaCl) used for the preservation of natural casings," *Food Microbiol.*, vol. 23, no. 7, pp. 657–662, Oct. 2006, doi: 10.1016/J.FM.2005.11.004.
- [29] S. K. Trumbo, M. E. Brown, and K. P. Hand, "Sodium chloride on the surface of Europa," *Sci Adv.*, vol. 5, no. 6, pp. 7123–7135, Jun. 2019, doi: 10.1126/SCIADV.AAW7123/SUPPL_FILE/AAW7123_SM.PDF.
- [30] B. S. M. Mahmoud, K. Yamazaki, K. Miyashita, I. Shin, and T. Suzuki, "A new technology for fish preservation by combined treatment with electrolyzed NaCl solutions and essential oil compounds," *Food Chem.*, vol. 99, no. 4, pp. 656–662, Jan. 2006, doi: 10.1016/J.FOODCHEM.2005.08.037.
- [31] J. O. Unuofin, G. A. Otunola, and A. J. Afolayan, "Phytochemical screening and in vitro evaluation of antioxidant and antimicrobial activities of *Kedrostis africana* (L.) Cogn," *Asian Pac J Trop Biomed.*, vol. 7, no. 10, pp. 901–908, 2017, doi: 10.1016/j.apjtb.2017.09.008.
- [32] A. Amalia, R. D. Dwiyanti, and H. Haitami, "Daya Hambat NaCl terhadap Pertumbuhan *Staphylococcus aureus*," *Medical Laboratory Technology Journal*, vol. 2, no. 2, p. 42, 2016, doi: 10.31964/mltj.v2i2.125.
- [33] T. Tsironi, D. Houhoula, and P. Taoukis, "Hurdle technology for fish preservation," *Aquac Fish.*, vol. 5, no. 2, pp. 65–71, Mar. 2020, doi: 10.1016/J.AAF.2020.02.001.
- [34] Nuryadi, T. D. Astuti, E. S. Utami, and M. Budiantara, *Buku ajar dasar-dasar statistik penelitian*. 2017.
- [35] D. Kresnasari, "Pengaruh Pengawetan dengan Metode Penggaraman dan Pembekuan terhadap Kualitas Ikan Bandeng (*Chanos chanos*)," *Scientific Timeline*, vol. 1, no. 1, pp. 1–8, 2021.
- [36] G. N. Pratomo, H. Nurcahyo, and N. R. Firdaus, "Profil Fermentasi Ikan Mujair (*Oreochromis mossambicus*) Dengan Penambahan NaCl," *Al-Kaunyah: Jurnal Biologi*, vol. 13, no. 2, pp. 158–166, 2020, doi: 10.15408/kaunyah.v13i2.12608.

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