University of Muhammadiyah Malang, Indonesia
e-ISSN 2622-4836 Vol 5 No 2, Agustus 2023. pp. 105-114
Indonesian Journal of Tropical Aquatic
Journal homepage: http://ejournal.umm.ac.id/index.php/ijota

Quality of traditional salt in the Tiberias Group, West Oesapa Village, Kelapa Lima District, Kupang City

Umbu Paru Lowu Dawa[1,a,*], Mada Maria Lakapu[1], Dewi Setyowati Gadi[1], Yunialdi H. Teffu[1], Donny M. Bessie[1], Santo P.A Naliama[1], Yanuarinda Seuk Seran[1], Dewanto Umbu S. Anakaka[1]

[1]Fishery Products Technology, Fisheries, and Marine Science Faculty, Artha Wacana Christian Christian University, Kupang, Indonesia.
[a]umbupaki@gmail.com
[*]Corresponding author

ARTICLE INFO

Keywords:
NaCl content
Organoleptic
Total plate number
Water control

ABSTRACT

This study aimed to analyze the quality of traditional salt through organoleptic tests (color and aroma), water content, NaCl content, and total plate number (TPN). This research used quality and quantity methods. The data analysis method was a comparative descriptive method. The results showed that the quality of the salt produced traditionally through organoleptic tests had a color and aroma that were acceptable NSI 4435-2017, the water control met NSI 3556-2016 and NSI 4435-2017, while the NaCl content did not meet NSI 3556-2016, but it complied with NSI. 4435-2017 and the Total Plate Number (TPN) in coarse salt 2.7×10^2– 3.6×10^2 colony/g, well water 1.3×10^3– 1.8×10^3 colonies/mL, filtering solution 1.9×10^3– 2.3×10^3 colonies/mL, filtered solution 1.6×10^3– 1.8×10^3colonies/mL. Meanwhile, the cooked salt was $<2.5 \times 10^1$colony/g (<25 colonies).

How to cite:

Dawa UPL, Lakapu MM, Gadi DS, Teffu YH, Bessie DM, Naliama SPA, Seran YS, Anakaka DWS. 2022. Quality of traditional salt in The Tiberias Group, West Oesapa Village, Kelapa Lima District, Kupang City. *IJOTA,* 5(2), 105-114.
DOI: https://doi.org/10.22219/ijota.v5i2.22775

1. Introduction

Indonesia is the world's second-largest maritime country, with a seawater area of about 5.8 million km². However, Indonesia imports salt valued at more than 1 trillion 1DR (~100,000,000 USD) yearly. Therefore, the Indonesian government attempts to reduce this number of imports and should even be able to export. This is because the raw material for salt production is seawater, which is abundant in Indonesia (Susanto et al. 2015). As a significant product in food, salt is an essential raw material for the domestic industry. The presence of salt is necessary for every household and industry. According to Prastio (2019), salt is a strategic food commodity whose needs and functions continue to increase yearly for both industrial and consumption needs.

Salt farmers are an activity of making salt carried out by people, most of whom make salt, and it has even become an annual routine and a livelihood that supports daily life. Salt production is the primary source of livelihood during the dry season. Salt production benefits the people's economy (Apriliana, 2013). Tiberias salt business in West Oesapa village is in Kelapa Lima District, Kupang City, East Nusa Tenggara Province. It generally produces salt by cooking and using firewood as fuel. Making salt consists of 18 kg of coarse salt is put into a filtering container and added 100 L of fresh water, then drained in a shelter. The filtering site is first given gravel, sand, and plastic sacks that filter salt. The filtered water is boiled until it becomes salt.

According to Rismana (2016), solvent water, salt raw materials, and 30-35% salt raw material solutions that have not been filtered still contain quite a lot of microbial contamination, namely hundreds of colonies/mL. This is understood because the raw material of salt used is coarse salt of 1 (one) quality which still contains water-insoluble impurities such as soil and other contaminants at the bottom during the production process in the salting field. The levels of water-insoluble pollutants are generally still above 5%, and the NaCl content ranges from 88-94%. This insoluble impurity is an ideal medium for microbes to harbor and must be removed.

A previous study by Diwa (2018) stated that the quality of salt produced in the Tiberias group, Oesapa West Village, was classified in the "medium" quality category with a NaCl content of 87.58% and a water content of 10.19%. This study aimed to analyze the quality of traditional salt through organoleptic tests (color and aroma), water control, NaCl content, and total plate number (TPN).

2. Material and methods

2.1 Material

The tools used to manufacture salt were a cooking salt container (drum), a container for storing the filtered solution, a filtering container, a bucket, a plastic bag, and a scale. The main ingredients used in making traditional cooking salt in West Oesapa village, Kelapa Lima District, Kupang City, were coarse salt, fresh water, wood as fuel, plastic sacks, gravel, and sand. Materials for testing are samples of coarse salt, fresh water, salt solution before being filtered, filtered salt solution, and salt cooked as the main ingredients. Chemicals used for analysis were: distilled water, potassium chromate/K_2CrO_4, $AgNO_3$, sulfuric acid/H_2SO_4, sodium hydroxide/NaOH, phenolphthalein indicator, 70% alcohol, Plate Count Agar (PCA), Buffered Pepton Water (BPW).

2.2 Method

In the Tiberias group, this research was conducted in May–September 2021 at Oesapa West village, Kelapa Lima District, Kupang City. The organoleptic and total plate number (TPN) testing was conducted at the Artha Wacana Christian University Kupang laboratory. In contrast, the water content and NaCl content tests were carried out at the Kupang State Politany Agricultural Laboratory.

The procedure for making traditional salt in the Tiberias group in West Oesapa village, Kupang City, was to prepare raw materials for coarse salt, namely 18 kg of salt and 100 L of fresh water. Fresh water and coarse salt are put into a plastic bowl that has been given a hole at the bottom. The plastic bowl was stored in a plastic bag, then covered with gravel and sand, then a plastic bag on the bottom again. The filtered water was accommodated in a container made of used tires, and then the filtering process was carried out for ± 1 hour. Then, the filtered water with a salinity of 20 ppt was put into a cooking drum and then cooked for ± 6-7 hours.

2.3 Analysis Data

The method analysis used was a comparative descriptive method, which was a method used to compare research data obtained with existing facts (NSI 3556-2016 and NSI 4435-2017) and explain the relationship between one factor and another factor (Sugiyono, 2008).

3. Results and Discussion

3.1. Salt color

The color parameters of salt produced using traditional cooking utensils in the Tiberias group, West Oesapa Village, Kupang City, can be seen in Figure 1.

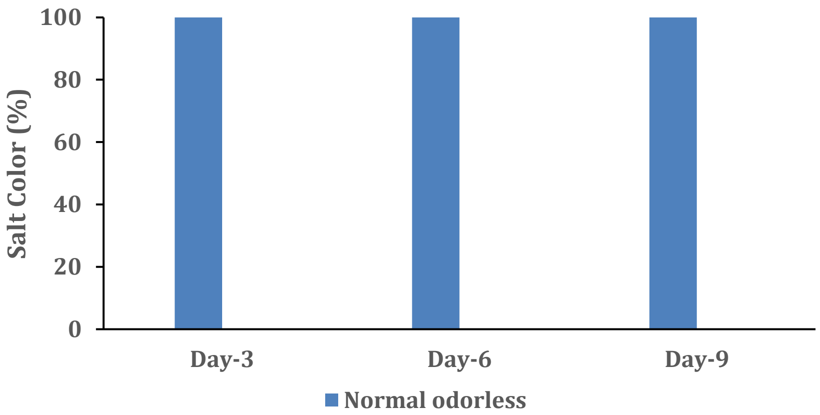

Figure 1. Panelist assessment profile of salt color parameters produced using traditional cooking tools in the Tiberias Group, West Oesapa, Kupang City.

Figure 1 shows that the panelists' assessment of the color parameters of salt produced using traditional cooking utensils in the Tiberias group, West Oesapa village, Kupang City makes salt with a color that meets the raw material salt quality requirements for iodized consumption salt (NSI 4435-2017) are classified as Q1 salt (good quality salt) with an assessment of the color parameters of the salt produced in the Tiberias group is suspected to be due to the washing process using fresh water or well water and followed by a filtering process so that the filtered solution is slightly clear when cooked and produces a clean white color. Meanwhile, the resulting salt was brown if the filtered solution was cloudy. The color of coarse and cooking salt can be seen in Figure 2.

(A) (B)

Figure 2. Tradisional salt produced by the Teberias Group in West Oesapa village, Kupang city: A. Coarse salt (Brown color); B. cooked salt (White color)

Compared to earlier studies by Loda (2021), who researched the analysis of the quantity and quality of people's salt using traditional cooking utensils in the Tiberias group in Oesapa West Village, Kupang City, the results were similar to the results of the current study.

Abdullah and Susandini (2018) explain that the color of the less white salt is influenced by the cloudiness of the water used in the salt production process. This can be overcome by precipitating the water used before the crystallization process is carried out. This process is a treatment carried out in manufacturing traditional salt in general. Pakaya et al. (2015) explained that the color of the salt is related to the resulting salt crystals. Large salt crystals are complicated to clean. Not only that, if the surface of the salt crystals is uneven, dirt will still stick.

3.2. Odor of salt

The profile of panelists' assessment of the odor parameters of salt produced using traditional cooking utensils in the Tiberias group, Oesapa West Village, Kupang City, can be seen in Figure 3.

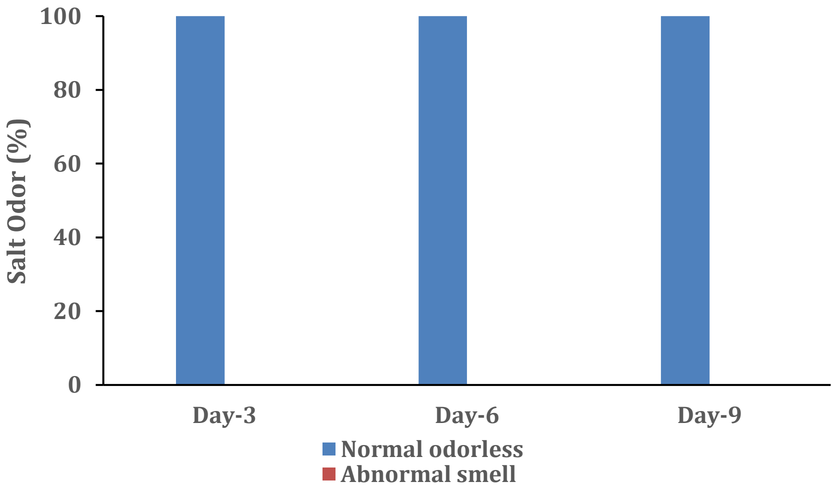

Figure 3. Panelist assessment result on parameters of salt aroma produced using tradisional cooking tools in the Tiberias Group, West Oesapa village, Kupang city

Figure 3 shows that the panelists' assessment of the parameters of salt aroma produced using traditional cooking utensils in the Tiberias group, West Oesapa Village, Kupang City produces salt with an aroma that meets the quality requirements of salt as raw material for iodized consumption salt (NSI 4435-2017) are classified as K1 salt (good quality salt) with normal criteria for odorless. The high assessment of the panelists on the parameters of the salt aroma produced in the Tiberias group was thought to be because the sludge which usually causes odor has been reduced by washing and filtering before the cooking process. When compared with previous research conducted by Loda (2021), who researched the analysis of the quantity and quality of the salt farmer people using traditional cooking utensils in the Tiberias group in West Oesapa village, Kupang City, the results were similar to the current study.

Purwati et al. (2020) stated that the smell or aroma of salt is generally normal and odorless, while the aroma that arises from salt is influenced by the salt container, the pollutants contained in seawater, and the treatment in storage and storage time of salt.

3.3. Water content

The graph of the results of testing the average water content of coarse salt and traditional cooking salt in the Tiberias group, Oesapa West Village, Kupang City, and quality standards can be seen in Figure 4.

The results of testing the water content of coarse salt and traditional cooking salt in the Tiberias group, West Oesapa village, Kupang City, showed that the highest average value of water content in coarse salt was in the sample code coarse salt 3 (3rd day of cooking salt). The lowest was in the sample code coarse salt 9 (9th day of cooking salt). Meanwhile, the highest water content for traditional cooking salt was in the sample cook salt 3 (3rd day of cooking salt), and the lowest was cook salt 9's coded sample (9th day of cooking salt). The test results of the average water content of traditional cooking salt produced in the Tiberias group, West Oesapa village, Kupang city are in the quality requirements of iodized consumption salt (NSI 3556-2016) and the quality requirements of raw material salt for iodized consumption salt (NSI 4435-2017) with a maximum water content of 7%.

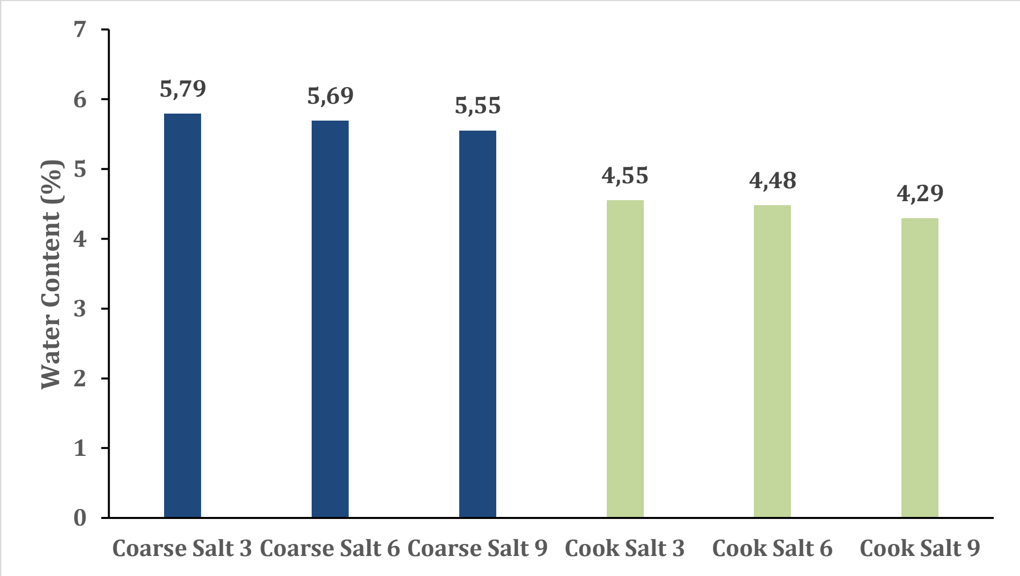

Figure 4. The result of average water content of coarse salt and traditional salt in the Tiberias Group, West Oesapa village, Kupang city

The results of testing the water content of coarse salt and traditional cooking salt in the Tiberias group, West Oesapa village, Kupang City, showed that the highest average value of water content in coarse salt was in the sample code coarse salt 3 (3rd day of cooking salt). The lowest was in the sample code coarse salt 9 (9th day of cooking salt). Meanwhile, the highest water content for traditional cooking salt was in the sample cook salt 3 (3rd day of cooking salt), and the lowest was cook salt 9's coded sample (9th day of cooking salt). The test results of the average water content of traditional cooking salt produced in the Tiberias group, West Oesapa village, Kupang city are in the quality requirements of iodized consumption salt (NSI 3556-2016) and the quality requirements of raw material salt for iodized consumption salt (NSI 4435-2017) with a maximum water content of 7%.

In comparison to earlier research by Fallo (2021) on the analysis of salt quality using traditional cooking utensils in the Teberias Group, West Oesapa village, Kupang City, has average of water conventional cooking content salt on the 9th day was 4.60%. According to the current study, the moderate water content on the 9th day was 4.295%. This indicates that the average water content value in traditional salt in Tiberias Group, West Oesapa village, Kupang city has a value that is not very different. Saksono (2002) explained the effect of magnesium levels on water content: the increasing magnesium content in salt, the greater the ability to attract water vapor from the air, thereby increasing the water content in salt. The nature of magnesium sulfate is very hygroscopic. Therefore, magnesium sulfate compounds are commonly found in hydrates with a monoclinic crystal structure. Subiyantoro (2001) in Herman and Joetra (2015) explains that salt has hygroscopic characteristics; it is easy to absorb water from the air.

The low water content of traditional cooking salt produced in the Tiberias group, West Oesapa village, Kupang city was thought to be due to the influence of low bittern water salinity, which was 20 ppt. Arwiyah et al. (2015) explained that the higher the salinity of seawater, the higher the water content contained in the salt produced. Rusiyanto et al. (2013) demonstrated that high water content affects the shape of salt crystals. If the water content in the salt is high, the physical properties of the salt will be in the form of coarse grains because the salt crystals stick together. Sarlam (1986) in Arwiyah et al. (2015) explained that water content is critical in handling salt because salt is hygroscopic. Temperature and humidity affect the stored water content.

3.4. *Content of NaCl*

The graph of the results of testing the NaCl content of salt in the Tiberias group, West Oesapa village, Kupang City, and quality standards can be seen in Figure 5.

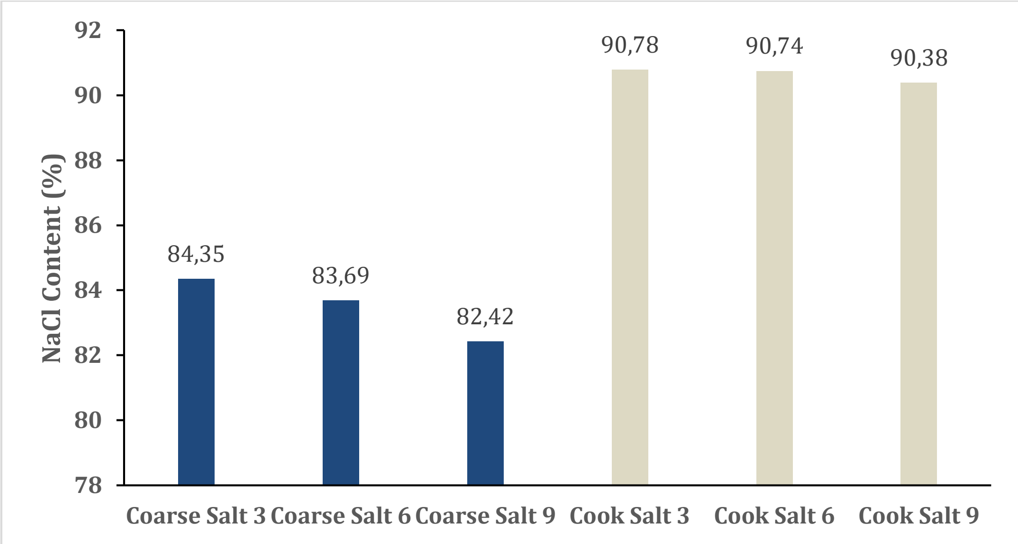

Figure 5. Average value of NaCl content of Coarse Salt and Traditional Cooking Salt in the Tiberias Group, West Oesapa, Kupang City.

Figure 5 shows the results of testing the average NaCl content of coarse and cooking salt in the Tiberias group, West Oesapa village, Kupang City.) while the highest NaCl content in cooking salt was found in the sample code coarse salt 3 (3rd day of cooking salt), and the lowest was in the coarse salt 9 sample code (9th-day cooking salt). The results of the analysis of the average value of NaCl content from traditional cooking salt produced by the Tiberias group, West Oesapa village, Kupang City, have not met the quality standards for iodized consumption salt (NSI 3556-2016) with a minimum NaCl content of 94%. However, it has been fulfilled based on the quality standards of raw material salt for iodized consumption salt (NSI 4435-2017) because it is classified as K2 salt (medium quality) with a minimum NaCl content of 90%.

The high content of NaCl produced in the traditional cooking salt test in the Tiberias group, West Oesapa village, Kupang City, was suspected because there was still dirt in the form of silt even though it had gone through a washing and filtering process. In addition, in cooking, salt evaporation occurs due to heat. This is what causes the higher the salt content, the higher the NaCl level. In comparison to earlier research by Fallo (2021) regarding the analysis of the quality of salt in the Tiberias group using traditional cooking utensils in West Oesapa village, Kupang City, the average value of the NaCl content of the Tiberias group cooking salt was 91.02%. The value of the content is greater than the results of research obtained at this time.

Setyopratomo et al. (2003) stated that NaCl generally contains impurities in magnesium chloride, magnesium sulfate, calcium chloride, calcium sulfate, and water. These impurities are present on the surface of the crystal or trapped in the crystal lattice. Based on definition of salt according to Sulistyaningsih et al. (2010), it is stated that salt is a collection of chemical compounds with the largest constituent being sodium chloride (NaCl) and impurities, namely calcium sulfate (CaSO4), magnesium sulfate (MgSO4) and magnesium chloride (MgCl2).

Adi et al. (2007) stated that the excellent salinity of seawater used as raw material for making salt ranges from 25-35 ppt. The low content of NaCl is also caused by the salinity of seawater, high impurities, and the process of making salt. Hidayat (2011) *in* Arwiyah et al. (2015) stated that salt is not solely determined by raw water's salinity and NaCl content but is also influenced by several factors, including seawater quality, impurities, and manufacturing processes.

Pusriswilnon (2006) explained that NaCl generally contains impurities in magnesium chloride, magnesium sulfate, calcium chloride, calcium sulfate, and water. The magnesium content in salt can cause the quality of the salt to be low. The magnesium mineral content composition in salt grains is one element that can reduce NaCl levels from salt. Deglas and Yosefa (2020) explained that the main determinant of saltiness in salt is the concentration of NaCl contained in salt grains. NaCl is the main element in salt, with a composition of Sodium (40%) and Chloride (60%). Some other minerals are also in salt, such as magnesium, calcium, phosphorus, cobalt, phosphorus, zinc, sulfur, chlorine, manganese, copper, fluorine, and iodine. Each mineral has its role and function in the body's metabolic processes (Sasongkowati, 2014). Herawati and Romadhon (2020) explained that the many mineral content present influenced low NaCl levels in the salt, so the lower the NaCl content, the higher the mineral content and the reverse. Zainuri et al. (2016) explained the relationship between NaCl content and magnesium: the higher the NaCl content of the salt produced, the tendency for the magnesium content to decrease. So the relationship between the two elements produces a negative relationship. As explained, NaCl's presence determines the presence of magnesium in the salt. Efforts to increase the level of NaCl as an indicator of the quality of good consumption salt means reducing the level of impurities, one of which is magnesium.

Purbani (2006) classifies salt based on NaCl content as the main element in 3 categories, namely "Excellent Category" containing >95% NaCl, "Good Category" containing 90-95% NaCl, "Medium Category" containing NaCl between 80-90%. Anonymous (2001) *in* Sudarto (2011), the raw material of seawater used for making salt affects the quality of the salt produced because the quality of seawater in each region is different. Differences in seawater quality are influenced by climate and weather. Seawater raw materials contain several main elements, namely chlorine, sodium, magnesium, sulfur/sulfur, calcium, potassium, and bromine.

3.5. Total Plate Number

The Total Plate Number (ALT) test was conducted to determine whether microbes grew at each stage in the cooking salt production process in the Tiberias group, Oesapa West Village, Kelapa Lima District, Kupang City. The Total Plate Number (ALT) test was carried out at the Exact Laboratory of the Christian University of Artha Wacana Kupang, and the results of testing the Total Plate Number (ALT) value for each sample can be seen in Table 1.

Table 1. Results of Testing the Total Plate Number (ALT) Produced Using Traditional Cooking Tools in the Tiberias Group, West Oesapa Village, Kupang City

No	Code Sample	Petri dish	Dilution						Total ALT colonies/g & colonies/mL
			101	102	103	104	105	106	
1.	GK3	1	37	9	3	0	0	0	3.6×10^2
		2	35	10	2	0	0	0	
	GK6	1	28	14	3	0	0	0	2.7×10^2
		2	26	12	1	0	0	0	
	GK9	1	33	8	3	0	0	0	3.2×10^2
		2	31	7	2	0	0	0	
2.	AS3	1	107	69	28	4	0	0	1.8×10^3
		2	104	65	26	6	0	0	
	AS6	1	98	59	13	7	0	0	1.3×10^3
		2	87	57	12	6	0	0	
	AS9	1	105	53	28	15	7	0	1.6×10^3
		2	102	51	26	13	5	0	
3.	LP3	1	129	89	42	15	3	0	2.3×10^3
		2	127	86	39	12	2	0	
	LP6	1	109	96	41	9	0	0	2.1×10^3
		2	112	94	32	11	0	0	
	LP9	1	121	65	36	14	5	0	1.9×10^3
		2	118	62	28	12	0	0	
4.	AHP3	1	112	51	29	5	0	0	1.6×10^3
		2	102	49	27	3	0	0	

No	Code Sample	Petri dish	Dilution						Total ALT colonies/g & colonies/mL
			101	102	103	10 4	105	106	
	AHP6	1	118	57	29	8	0	0	1.8 × 10^3
		2	116	54	27	5	0	0	
	AHP9	1	114	47	26	3	0	0	1.7 × 10^3
		2	112	52	27	6	0	0	
5.	GM3	1	8	3	0	0	0	0	<2.5 × 10^1
		2	7	2	0	0	0	0	
	GM6	1	6	3	0	0	0	0	<2.5 × 10^1
		2	6	1	0	0	0	0	
	GM9	1	5	3	0	0	0	0	<2.5 × 10^1
		2	7	2	0	0	0	0	

Information :
GK: Salt Coarse on day 3, day 6, and day 9,
AS : Well water on day 3, day 6, and day 9,
LP : Filtration solution on day 3, day 6, and day 9,
AHP : Filtered water on day 3, day 6, and day 9,
GM : Cooking salt on day 3, day 6, and day 9.

Table 1 above presents the value of Total Plate Number (ALT) for Coarse Salt (GK), Well Water (AS), Filter Solution (LP), Filtered Water (AHP), and Cooked Salt (GM) produced by the Tiberias group, West Oesapa village. West, Kupang City. The range of Total Plate Number (ALT) in the whole sample from the lowest to the highest value is < 2.5 × 10 - 2.3 × 10^3colony/g. The value of the Total Plate Number (ALT) in coarse salt ranges from 2.7 × 102 – 3.6 × 102 colonies/g, and the well water used for the process of dissolving the coarse salt, which will then be continued in the filtering process has a value of Total Plate Number (ALT) ranged from 1.3 × 103 – 1.8 × 103 colonies/ml, and in the filtration solution, the Total Plate Number (ALT) value ranged from 1.9 × 103 – 2.3 × 103 colonies/ml, as well as in aqueous solutions the results of filtering the value of the Total Plate Number (ALT) ranged from 1.6 × 103 – 1.8 × 103 colonies/mL. At the same time, the value of the Total Plate Number (ALT) was <2.5 × 101 colonies in cooked salt. /g (less than 25 colonies).

The total Plate Number (ALT) value in coarse salt ranges from 2.7 × 10^2– 3.6 × 102 colonies/g. This indicates the presence of microbes that can live because impurities are suspected to be quite high. Where coarse salt as the basic ingredient used by the Tiberias group, West Oesapa village, Kupang City, was initially processed traditionally, and the storage conditions were quite open and grounded to be one of the factors that could cause high impurities in coarse salt so that it becomes a medium for microbial growth (Rismana, 2016). Salt raw materials and 30-35% salt raw material solutions that have not been filtered still contain quite a lot of microbial contamination, namely hundreds of colonies/ml. Bacteria can also cause high contamination that can grow and adapt well to high salt levels, namely bacteria that are classified as extreme halophiles (Rini et al. 2017).

The Total Plate Number (TPN) value in healthy water used as a solvent for coarse salt was relatively high, which is between 1.3 × 10^3– 1.8 × 103 colonies/ml. The presence of these microbes was thought to be due to the water used not being clean or polluted so that there are microbes that thrive or live. The filtering solution has a higher Total Plate Number (ALT) than well water, which was 1.9 × 103 – 2.3 × 103 colonies/ml. The Total Plate Number (TPN) is thought to be due to the presence of a lot of dirt in the filtering solution; where during the implementation in the field, it was seen that the filtering solution was filthy, which as a result of the process of dissolving coarse salt in a condition that was still dirty with clean water that was also not clean or had been polluted so that there were microbes that grew. While in the filtered solution, the value of the Total Plate Number (ALT) decreases or is less, which ranges from 1.6 × 10^3– 1.8 × 103 colonies/ml, this result is thought to be due to a filtering process that uses plastic sacks as coatings and materials such as gravel and sand so that the Total Plate Number (ALT) value is not as much as the filtering solution. Still, the presence of microbes is thought to be due to In the process of carrying out the screening, and contamination occurs both from tools, environmental conditions, and also from people as implementers in the screening process. According to Rismana (2016), these contaminants can be generated from raw materials, purification materials, and air contamination at production stages.

Food safe for consumption is free (below the maximum tolerance required) from harmful contaminants such as biological, chemical, and foreign substances that can interfere, harm, and endanger human health. Therefore, to know the level of food contamination, especially biological contamination, it is necessary to do a qualitative and quantitative test (Winarno and Betty, 1982). If grown on food, bacteria can cause various growths in the food's appearance, chemical composition, and taste (Fardiaz, 1992). Food contains toxic, harmful, or hazardous materials that can harm or endanger human life. Food that contains dirty, rotten, rancid, decomposed material or plant or animal material that is diseased or comes from carrion makes the food unfit for human consumption (BPOM, 2012). Microbes grow well in moist and warm foods and contain good nutrients such as food in a dirty environment. Therefore, food is easily attacked by microbes if it is in a dirty environment. Contamination of pathogenic microbes and these poison-producing microbes is a biological hazard in food (Rahayu, 2008).

4. Conclusion

From the results of the research above, it can be concluded that the results of organoleptic testing of standard white salt color, odorless typical salt odor, water content meets NSI 3556-2016, and NSI 4435-2017, and NaCl content does not meet NSI 3556-2016 but meets NSI 4435- 2017 which is classified as K2 salt (good quality salt) and the lowest Total Plate Number (ALT) value to the highest value is < 2.5 × 101 - 2.3 × 103 colonies/g.

5. Acknowledgment

1. Artha Wacana Christian University for the recommendation and support funding through the University Research Scheme.
2. Faculty of Animal Husbandry, Maritime and Fisheries Nusa Cendana University as the executor of activities.

References

Abdullah, Z., A., Susandini, A. (2018). Production media (geomembrane) can improve the quality and selling price of salt (case study: people's salt fields in the Madura Region). *Eco-Entrepreneurship*, 3(2), 21-36.

Adi, T. R., Supangat, A., Sulistiyo, B., Muljo, B., Amarullah, H., Prihadi, T, H., Soentjahjo, E., Rustam, A. (2007). Guidebook for integrated salt and artemia business development. Research center for marine areas and non-biological resources, Marine and Fisheries Research Agency, Ministry of Marine Affairs and Fisheries. Jakarta. 36 p.

Anonymous. (2016). Consumption of iodized salt. NSI 3556:2016. National Standardization Agency (BSN), Jakarta. 17 p.

Anonymous. (2017). Raw material salt for iodized consumption salt. NSI 4435:2017. National Standardization Agency (BSN), Jakarta. 17 p.

Apriliana. (2013). The impact of the people's salt business empowerment program on the welfare of salt farmers' households in Karawang Regency. Thesis of the Department of Environmental and Resource Economics, Faculty of Economics and Management. Bogor Agricultural University, Pages 5-6.

Arwiyah, Zainuri, M., Efendy, M. (2015). Study of NaCl content in raw water and produced salt and salt land productivity using different table salt media. *Marine Journal*, 8(1), 3-14.

BPOM. (2012). Regulation of the head of the food and drug supervisory agency of the republic of indonesia on good food production methods for home industries.

Deglas, W., Yosefa, F. (2020). Testing of Iodine, NaCl and water content in two brands of consumable salt. *Journal of Agriculture and Food*, 2(1), 2656-7709.

Diwa, HM. (2018). Study of quality and quantity of traditional cooked salt in Oesapa West Village, Kelapa Lima District, Kupang City. Thesis of the Faculty of Fisheries and Marine Sciences, Artha Wacana Christian University. 49 p.

Fallo, R, D, B. (2021). Analysis of salt quality in the tiberias group using traditional cooking tools in Oesapa West Village, Kupang City. Thesis. Fishery Products Technology. Faculty of Fisheries and Marine Science. Artha Wacana Christian University. Kupang. 69 p.

Fardiaz, S. (1992). Food Microbiology I. Jakarta. Main Library Gramedia

Herawati, D., Romadhon, A. (2020). Analysis of Mg, Ca and Fe levels of rich mineral salts in Lamongan Prism Salt Ponds. *Juvenile Journal*, 1(3), 2723-7583.

Herman, Joetra, W. (2015). The effect of kitchen salt (NaCl) on the shrinkage of clay soil field. *Momentum Journal*, 17(1), 13-25.

Loda, E. U. G. (2021). Analysis of the quantity and quality of people's salt using traditional cooking tools in the Tiberias Group in Oesapa West Village, Kupang City. Thesis. Fishery Products Technology. Faculty of Fisheries and Marine Science. Artha Wacana Christian University. Kupang. 65 p.

Pakaya, KN Rieny, S., Faiza, D. A. (2015). Analysis of salt quality in Siduwonge Village, Randangan District, Pohuwato Regency, Gorontalo Province. *Scientific Journal of Fisheries and Marine Affairs*, 3, 1-10.

Prastio, LO. (2019). Strategi program pemberdayaan usaha garam rakyat di Desa Muara Baru Kecamatan Cilamaya Wetan Kabupaten Karawang. *The Indonesian Journal of Politics and Policy (Ijpp)*, 1(1), 62–73.

Purbani, D. (2006). Salt crystal formation process. Research Center for Marine and Non-Biological Areas. Marine and Fisheries Research Agency, Ministry of Marine Affairs and Fisheries. 215 p.

Purwati, M., I., Gustomi, A., Supratman, O. (2020). Analysis of the quality of NaCl and the state of salt produced from South Bangka Waters. *Journal of Tropical Marine Science,* 3(2), 53-64.

Pusriswilnon. (2006). Guidebook for Integrated salt and artemia business development. Research Center for Marine Areas and Non-Biological Resources. Marine and Fisheries Research Agency, Ministry of Marine Affairs and Fisheries. Jakarta. 256 p.

Rahayu (2008). Festive strategy of excellence in education services industry (a study of strategic management. Bandung: Alfabeta Publishers. 54 p.

Saksono, N. (2002). Analysis of iodates in kitchen spices using iodometry and x-ray flourescense methods. *Makara Technology*, 6(3), 89-94.

Setyopratomo, P., Siswanto., Wahyudi., Ilham., Heru, S. (2003). Experimental study of purification of nacl salt by recrystallization method. *Tamansiswa University. Palembang. Thing*, 11(2), 17-28.

Sudarto. (2011). Salting technology process in Indonesia. *TRITON Journal*, 7(1), 13-25.

Sugiyono. (2008). Qualitative quantitative research methods and R&D. Bandung : Alphabeta. 146 Pg.

Sulistyaningsih., Sugiyono., Sedyawati. (2010). Purification of kitchen salt through old water crystallization method with impurity binding materials $Na_2C_2O_4$-$NaHCO_3$ and $Na_2C_2O_4$-Na_2CO_3. *Jurnal Kimia*, 1(8), 26-36.

Susanto, H, H Rokhati, GW. Santosa. (2015). Development of traditional salt production process for improving product quantity and quality in Jepara District, Central Java, Indonesia. *Procedia Environmental Sciences,* 23(Ictcred 2014), 175–178.

Winarno, F, G., Betty S. L. J. (1982). Food damage and prevention methods. Center for Food Technology Research and Development.

Zainuri, M., Khoirul, A., Aliffia, P, S. (2016). Relationship of sodium chloride (NaCl) and magnesium (Mg) content of people's salt on Madura Island. Proceedings of the National Marine Seminar.