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Analysis Of Krosok Salt Compound Content From The Results Of The Salt Farmers Group In Kersik Village, Kutai Kartanegara Regency

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Abstract. Salt is a source of electrolytes and iodine which are very important for the human body. East Kalimantan Province has the potential for diverse coastal and marine resources with high economic value, so it has great potential for optimal, effective, efficient and sustainable management. This research aims to determine the compound content of krosok salt that will be distributed to the public with NSI. This research method is based on NSI 3556:2016 and Atomic Absorption Spectrophotometry (AAS) method, including: (1) Water content analysis; (2) Analysis of the part that is not soluble in water; (3) NaCl content; (4) KIO3 levels; (5) Analysis of metal contamination. This research was conducted on krosok salt in Kersik Village, Kutai Kartanegara Regency. The NaCl salt content does not meet the minimum NSI requirements, namely 94%. Meanwhile, Pb, Cd, metal contamination meets the requirements with values below 10 mg/kg and 0.5 mg/kg.

Keywords: Metal Contamination, Nacl Content, Krosok Salt

INTRODUCTION

Salt is a chemical substance that is often consumed by humans and is the main spice that gives a salty taste that is used in food to add flavor to the food. Salt is also useful for maintaining fluid balance in the body. In general, salt is composed of compounds, one of which is Sodium Chloride (NaCl). Apart from NaCl, salt also contains impurities, including magnesium sulfate (MgSO4), magnesium chloride (MgCl2), calcium sulfate (CaSO4) and so on. The method used to remove these impurities is generally carried out through a recrystallization process so that the quality of the salt increases.

Salt also contains several minerals including Zinc (Zn), Sulfur (S), Copper (Cu), Iodine (I), Cobalt (Co), Manganese (Mn), Flour (F), Phosphorus (P), Magnesium (Mg), Calcium (K), and Chlorine (Cl) These mineral contents greatly influence the body's metabolic processes. Apart from that, salt also contains several types of metals which are very dangerous for body health, including cadmium (Cd), lead (Pb), arsenic (As). The presence of these metals is very detrimental to the lives of living creatures, especially human health. These metals can enter the food chain if they are contaminated in the environment. It is very important to check heavy metal levels in order to maintain the survival of living creatures if consumed exceeds the maximum level limit.

Indonesia is the world's second-largest maritime country, with a seawater area of about 5.8 million km². In addition to being said to be an agricultural country (Prakoso & Prajanti, 2021), Indonesia also gets the title of a maritime country because it has large

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territorial waters. This is indicated by data on Indonesia's coastline length, namely, the area of the seas (sea) 108.000 km 6,400,000 km^2 (Ministry of Marine Affairs and Fisheries, 2019), while the total size of Indonesia's territorial province reaches 290,000 km^2. The main potential of marine resources in Indonesia is salt which is produced in various regions of Indonesia (kurniawan et al, 2021). This potential will boost Indonesia's economy in the marine sector. With geographical conditions of 3/4 part of the territorial waters, Indonesia may become a solid and independent maritime country in the world (maritime axis), coupled with the population in Indonesia, which is currently projected to reach 271,066,400 people (Statistics Indonesia, 2019).

East Kalimantan Province has the potential for diverse coastal and marine resources with high economic value, so it has great potential for optimal, effective, efficient and sustainable management. East Kalimantan Province has also been designated as a regional center for a university-based maritime partnership program, sponsored by the Department of Maritime Affairs and Fisheries and facilitated by the United States Agency for International Development (USAID) Coastal Resources Management Project. Marine management based on Article 1 of Law of the Republic of Indonesia Number: 32 of 2014 concerning Maritime Affairs is the implementation of activities, provision, exploitation and utilization of marine resources (fisheries; energy and mineral resources; coastal and small island resources; natural resources non-conventional) and marine conservation.

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.

MATERIALS

The materials used in this research include krosok salt, distilled water, AgNO3 0.1000 N, NaCl 0.1000 N, K2CrO4 5%, H2SO4 1 N, NaOH 4 N, phenolphthalein, concentrated HNO3, KI 10%, KIO3 0.005 N, Na2S2O3.5H2O 0.005 N, starch indicator, Pb 1000 ppm standard solution, and 1000 ppm Cd standard solution.

METHODS

The method that can be used to determine heavy metal levels in krosok salt is using the Atomic Absorption Spectrophotometry (AAS) method. This method is generally chosen because it is relatively simple, selective and sensitive. This method is also the most commonly used method for analyzing heavy metal content in various types of samples. In addition, this method is capable of detecting very small metal levels. This method has a working principle with atomic absorption and atomic emission spectra. Atomic emissions can occur because light radiation can cause these metals to experience excitation so that the energy can be lose.

1. **Water content testing based on NSI 3556:2016**

   The weighing bottles were first conditioned in the oven at 110˚C for 1 hour. Meanwhile, the salt is placed in a desiccator because this sample is quite sensitive. After the weighing bottle is oven, leave it for 15 minutes in a desiccator. Empty weighing bottles are weighed and the weight recorded. Next, 20 grams of salt sample was added, then baked in the oven for 2 hours at a temperature of 110˚C. Leave it for 15 minutes in a desiccator and weigh it. Then put in the oven again for 1 hour at 110˚C. Leave for 15 minutes and weigh. If the weight is not constant, oven it again until it gets a constant weight. Each sample was carried out in duplicate.

2. **Testing for water insoluble parts based on NSI 3556:2016.**

   The cup and filter paper were first conditioned at 110˚C for 1 hour. Then let it sit for 15 minutes, weigh the cup and filter paper, and record the weight. On the other hand, sample preparation was carried out by weighing 100 grams of salt in a 500 mL beaker and then adding 350 mL of distilled water. The solution is heated until boiling while stirring. After everything has dissolved, cool and filter using pre-conditioned filter paper. The precipitate was then placed in an oven at 110˚C for 1 hour. Cooled in a desiccator for 15 minutes then weighed as weight after drying. Each sample was carried out in duplicate. NaCl content analysis was based on NSI 3556:2016. Analysis of NaCl levels was carried out by weighing 50 grams of salt then dissolving it in 200 mL of distilled water, stirring and then filtering. The filtrate was collected in a 500 mL flask and adjusted to the mark. Next, 2 mL of the filtrate was taken and poured into a 250 mL Erlenmeyer. The solution was acidified using 1 N H_2SO_4, then neutralized with $NaOH_4N$. The mixture was then diluted with distilled water to 100 mL and 1 mL of K_2CrO_4 was added. Titrate with 0.1 N $AgNO_3$ until the end point of the titration is brick red. Each sample was carried out in duplicate.

3. **Testing for metal contamination (Pb, Cd and As) based on NSI 3556:2016.** Metal contamination analysis was carried out by weighing 10 grams of salt dissolved in 80 mL of distilled water. Acidified with concentrated HNO3 until pH < 2. The sample was placed in a 100 mL volumetric flask and adjusted to the mark. Blank solutions were prepared using the same procedure. Finally, transfer the sample and blank into a sample bottle. Then an analysis of Pb, As and Cd metal contamination was carried out using Flame Atomic Absorption Spectroscopy (FAAS). The injection of each solution was carried out according to the instructions in the Flame Atomic Absorption Spectroscopy (FAAS) program. Each change of solution will be injected first with aquabides. Next, create a calibration curve between absorbance on the vertical axis (y) and metal concentration (μg/mL) on the horizontal axis (x).

RESULT AND DISCUSSION

Table 1. The Results of Salt Krosok in Kersik Village, Kutai Kartanegara Regency

No.	Parameters	Per Unit	Test Result
1.	Nacl adbk content	%	88.60
2.	Water content	%	3.63
3.	The part that does not dissolve in water adbk	%	0.00923
4.	Leadl (Pb)	mg/kg	2.10
5.	Cadmium (Cd)	mg/kg	<0.113
6.	Mercury (Hg)	mg/kg	0.083
7.	Arsenic (As)	mg/kg	<0.083

Source : Krosok Salt Test Result

Based on the calculation results, the water content in the krosok salt of Kersik Village is 3.63%. Meanwhile, according to the Indonesian National Standard (NSI) 3556:2016 regarding iodized consumption salt, the maximum water content is 7%. If the water content exceeds the standard, the product will easily be damaged due to the growth of microorganisms (Hayati & Hafiludin, 2023). The high water content supports yeast, mold and bacteria to easily reproduce, causing changes in food ingredients.

Water content is the decrease in sample weight after drying using a certain method. Water content analysis can be carried out using the gravimetric method. The principle is to evaporate the water in the sample using an oven, then weigh it until the weight is constant. The method used for this test uses low temperatures with a temperature of 110 ± 2˚C (Deglas et al., 2020).

Then, the part that is not soluble in water in the salt sample is the impurities that remain after the dissolution process, such as sand, rubbish, plastic, etc. The principle of this analysis is that the sample to be tested is dissolved in distilled water and then filtered using a

glass filter. Impurities in the sample will remain during the filtering process. After drying in the oven, the impurities will be weighed and the results are considered to be the part that is not soluble in water. The purity and quality of salt will be compromised due to impurities or impurities (Shaputra & Apriani, 2022).

Based on the results of calculating the part that is not soluble in water, the average value of the krosok salt sample was 0.00923%. This shows that the part that does not dissolve in water is less, and meets the standard for iodized salt consumption based on NSI 3556:2016, namely a maximum of 0.5%. One of the causes of insoluble parts of salt is the manufacturing process. Salt is made in a simple way by collecting sea water in ponds and then drying it in the heat of the sun until it crystallizes. This method allows the salt crystals formed to mix with impurities or other minerals dissolved in seawater.

The use of drying and washing processes in small and medium industries is not enough to produce high quality salt so that the appearance of the salt is dirty (Rauhailah, 2019). Most salt farmers in Indonesia do not know how to purify salt to remove impurities, so the quality of the salt does not meet standards. Therefore, salt farmers must know how to improve the physical appearance of salt (clean and dry), remove hygroscopic impurities, mud, and reducing substances in salt. The addition of coagulants is one solution to accelerate the deposition of impurities in salt. Removal of impurities can use biopolymer coagulants to accelerate the rate of salt crystal formation. Biopolymer coagulants are used because they include substances that accelerate particle agglomeration and separate particles from the solution medium (Putri et al., 2020).

The results of the krosok salt analysis are lower than the minimum requirement for NaCl content, namely 88.60%, compared to the standard contained in NSI 3556:2016, namely a minimum of 94%. This low NaCl level can be influenced by the raw material and salt content. Sea water is the main ingredient in making salt, so it is likely that the salt produced will have a different salt content. This is caused by the different salinity of sea water. There are many things that influence it, including temperature, rainfall, humidity, sunlight intensity, etc. (Suhana, 2018). Apart from the raw material salt, the salt content also affects the NaCl levels. NaCl has impurities in the form of water, $MgCl_2$, $MgSO_4$, $CaCl_2$, and $CaSO_4$. The presence of magnesium can reduce the NaCl content in salt, so that the salt is considered to be of lower quality (Deglas et al., 2020).

Because its effect is very important for health, attention must be paid to the process of making salt so that the NaCl content in the salt meets standard quality. To produce higher levels of NaCl and in accordance with NSI 3556:2016, salt farmers can improve the quality of salt using

various methods such as recrystallization, washing and using High Density Polyethylene (HDPE) plastic. To make salt with a NaCl content above 95%, washing can be done. However, the washing method only washes the salt with a clean salt solution so that the impurities on the surface of the salt can be separated. Therefore, washing is not enough because salt impurities are present in the salt crystal lattice, so purification by crystallization is required (Umam, 2019).

Analysis of metal contamination using Flame Atomic Absorption Spectroscopy (FAAS). Based on NSI 3556:2016, the principle of this analysis is that the test sample is dissolved in distilled water and analyzed using Flame Atomic Absorption Spectroscopy with a maximum wavelength of cadmium (Cd) 228.8 nm and lead (Pb) 283.3 nm. The presence of heavy metals in salt is very dangerous for body health. Pb metal can have a toxic effect on the function of body organs. Pb poisoning in humans is acute, characterized by 3Ps, namely pain, paralysis and pallor (Khaira, 2017).

In children, Pb poisoning is characterized by reduced intelligence, stomach ache, difficulty speaking, reduced appetite, impaired brain growth, and coma. Cadmium content in the body can also have negative effects on health such as breast cancer, respiratory problems, kidney failure, and even death (Istarani et al., 2014). In the human body, cadmium most often causes damage to the kidneys, liver, gonads, lungs and bones (Wamaulana et al., 2022).

CONCLUSION

From the results of the research above, it can be concluded that the results of krosok salt water content, cadmium, arsen, and others compound meets NSI 3556-2016, and NSI 4435-2017, but NaCl content does not meet NSI 3556-2016 and NSI 4435- 2017.

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