Ad-Dawaa JOURNAL OF PHARMACY

V0l. 03 No.01 Page 14-20 DOI : 10.52221/dwj.v1i1.868

Determination of Salt Content in Salted Fish in Pangandaran Area Using Argentometric Titration Method

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ABSTRACT

Salted fish is a traditional processed food widely consumed in Indonesia due to its affordability, availability, distinctive flavor, and long shelf life. However, despite its popularity, excessive salt used in preservation can lead to serious health issues such as hypertension, kidney problems, and cardiovascular diseases. Therefore, monitoring the salt content in these foods is essential for public health and food safety. This study aims to determine the sodium chloride (NaCl) levels in three commonly consumed salted fish types: jambal roti (Arius thalassinus), layang (Decapterus sp.), and layur (Trichiurus sp.), sold in traditional markets and local traders (UMKM) in Pangandaran. It also evaluates whether these products meet the Indonesian National Standard (SNI 8273:2016), which requires salt levels to be between 12% and 20%. The analysis used the Mohr argentometric titration method, with silver nitrate ($AgNO_3$) as the titrant and potassium chromate (K_2CrO_4) as the indicator. Samples were prepared by grinding, hot water extraction, and titration to measure salt content. Results showed salt levels ranged from 0.514% to 2.17%, with the highest in jambal roti from UMKM I and the lowest in jambal roti from UMKM II. All samples had salt levels well below the minimum standard of the SNI. These findings suggest that while the products are safe regarding sodium chloride levels, the low salt content may imply inadequate preservation, which could affect product stability and shelf life without other preservation methods. Further research is recommended to assess microbial safety and storage quality of these products.

Keywords : Salted fish, Argentometric Titration, Sodium chloride, Mohr method.

INTRODUCTION

Salted fish is a preserved product made from various types of fish through a salting process. This method is widely used in many countries, including Indonesia, as an effective traditional preservation technique (Santoso 2022). During salting, salt is applied as a preservative either in crystalline or solution form (Ir Rabiatul Adawyah 2023). Salting extends the shelf life of fish because salt helps inhibit or stop autolysis and kills bacteria within the fish (Saleha 2017).

The salt content in salted fish is a critical parameter in ensuring product quality and safety (Ariyani 2022). Excessive sodium chloride (NaCl) levels may pose health risks such as hypertension, while low salt levels may be insufficient to prevent spoilage due to microbial activity (Prasetyo dan Fadilla 2023). According to the Indonesian National Standard (SNI 8273:2016), the acceptable salt content in dried salted fish ranges from 12% to 20% by weight to ensure both safety and shelf stability (Bija et al. 2024).

The sodium ions in table salt (NaCl) can cause blood concentration and blood pressure to increase (Jacoeb dan Abdullah 2020). Sodium intake affects hypertension and is a risk factor for coronary heart disease, stroke, obesity, high cholesterol, and high fat. (Nadiah, Riyanta, dan Barlian 2021)

In practice, salting can be done dry (using salt directly), wet (soaking in salt solution), or a combination of both (Asiah, David, dan Djaeni 2020). In addition to functioning as a preservative, salt also plays a role in forming the distinctive taste and texture of salted fish. (Putalan et al. 2022)

But in reality, the salt content in salted fish products can vary depending on the processing technique, type of fish, soaking time, and concentration of salt solution used (Suprayitno 2022). Salt content that is too high can be detrimental to health because excessive sodium intake can cause hypertension, coronary heart disease, stroke, and high cholesterol. (Ir Rabiatul Adawyah 2023).

The Mohr argentometric titration method was chosen in this study because it is able to effectively measure the levels of chloride ions (Cl^-) in sodium chloride (NaCl), which is the main compound found in table salt (Mawarni dan Aulia 2022). The principle of this method is based on the reaction between chloride ions and silver ions (Ag^+) to form a silver chloride (AgCl) precipitate,

with the end point of titration marked by the formation of a brick red color from the silver chromate precipitate (Nasution et al. 2025).

TOOLS AND MATERIALS

The equipment used in this study were beakers, measuring flasks, measuring cylinders, analytical balances, 250 mL Erlenmeyer flasks, droppers, volumetric pipettes, and mortar

The materials used in this study were salted jambal roti fish, salted mackerel, distilled water (aquades), 5% potassium chromate solution, and silver nitrate solution (AgNO3).

METHODS

This study used a laboratory experimental design to determine the levels of sodium chloride (NaCl) in three types of salted fish, namely jambal roti, layang, and layur, all of which were obtained from different traders at Pangandaran Fish Market. The materials used in this study included distilled water, 0.1 N silver nitrate (AgNO3), and 5% potassium chromate (K2CrO3) as indicators. The tools used were beakers, measuring flasks, pipettes, Erlenmeyer flasks, and analytical scales.

In this procedure, 20 grams of fish meat was ground and extracted using 100 mL of hot distilled water at a temperature of 100°C. The mixture was left for 15 minutes and then filtered to obtain a clear filtrate. A 10 mL sample of the filtrate was put into an Erlenmeyer flask, and 2–3 drops of potassium chromate indicator were added. The solution was then titrated with standardized 0.1 N $AgNO_3$ until a brick red color appeared indicating the end point of the titration.

RESULTS

Table 1. Table of Salt Content in Salted Fish

No	Jenis Ikan asin	UMKM I (%)	UMKM II (%)	UMKM III (%)
1.	Jambal Roti	2.17	0.514	1.125
2.	Layang	0.668	0.878	0.886
3.	Layur	2.09	0.963	1.123

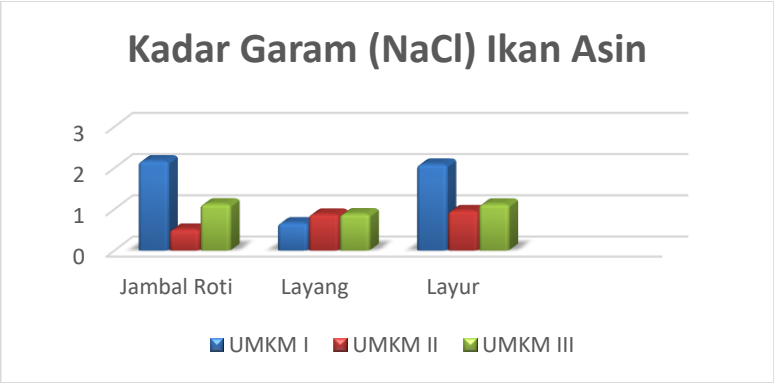

Figure 1. Graph Percentage of Salt Content (NaCl) of Salted Fish

DISCUSSION

This research was conducted on March 4-30, 2024, at the Chemistry Laboratory of the Muhammadiyah Ciamis Health Sciences College. This study aims to determine the salt content (NaCl) in three types of salted fish, namely jambal roti, layang, and layur, obtained from three MSME actors at the Pangandaran Fish Market. The process of determining the salt content was carried out using the argentometric titration method using a standard solution of $AgNO_3$ 0.1 N and a potassium chromate indicator (K_2CrO_4) 5%, in accordance with the principles of the Mohr method. This method is used because it is effective in determining chloride ions (Cl^-), which are part of the NaCl compound in a neutral atmosphere.

The results showed that the salt content in all samples ranged from 0.514% to 2.17%. The highest concentration was found in jambal roti UMKM I (2.17%), while the lowest was also found in jambal roti UMKM II (0.514%). This value is far below the Indonesian National Standard (SNI 8273:2016), which requires dried salted fish to contain 12–20% salt by weight.

Jambal roti, which is known for its thick flesh, is generally expected to absorb more salt. However, data shows that salt levels vary greatly between producers for the same type of fish. For example, jambal roti from UMKM I has a much higher salt content than jambal roti from UMKM II, indicating inconsistencies in processing methods, not just differences in fish types.

Low salt content indicates a less-than-optimal salting process. Several factors can influence this, including the concentration of the brine solution, soaking time, type of salting method (dry or wet), and environmental conditions during processing. In addition, differences in fish types and meat thickness can affect salt absorption, although in this study, processing techniques appeared to be the dominant factor.

From a food safety perspective, insufficient salt levels can lead to microbial contamination, as salt functions to reduce water activity and inhibit microbial growth. Salted fish with levels far below the standard tend to spoil more quickly and potentially pose a health risk due to bacterial growth. Therefore, the effectiveness of salting as a preservation method is highly dependent on achieving the appropriate salt concentration. On the other hand, salt levels that are too high are also undesirable, because they can cause health problems such as hypertension and cardiovascular disease. Although the samples in this study had relatively low salt levels, thus reducing the risk of excessive sodium intake, the main concern lies in the lack of preservation efficiency and impaired shelf life.

The Mohr method used in this study has the advantages of being fast, simple, and can be applied with basic laboratory equipment. The titration endpoint is easily recognized by the formation of a brick red precipitate (silver chromate), indicating that all chloride ions in the sample have reacted with silver ions. However, this method requires careful pH control because it is only effective in neutral conditions if it is too acidic or basic, the indicator will not work optimally. In addition, standardization of the $AgNO_3$ solution before use is very important to ensure the accuracy of the results, because the titrant concentration can change due to the influence of light or evaporation during storage. Despite its limitations, this method remains one of the main choices in the analysis of chloride in food because it is efficient and the results are easy to interpret.

This study highlights the need for better quality control in salted fish production, especially among small-scale producers. Training and education for MSME operators are essential to improve their understanding of proper salting techniques that ensure product safety and compliance with food standards.

CONCLUSION

Research shows that the salt content in all salted fish samples is below the SNI standard, which is between 0.514% to 2.17%. This low content indicates a less-than-optimal salting process that needs improvement so that the product is safe and suitable for consumption.

ACKNOWLEDGEMENTS

The author would like to thank the supervising lecturer and all parties at the Muhammadiyah Ciamis Health College Laboratory who have provided guidance, facilities, and support during the research process.

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