BioLink : Jurnal Biologi Lingkungan, Industri dan Kesehatan, Vol.10 (2) February (2024)
ISSN: 2356- 458X (print) ISSN: 2597-5269 (online)
DOI: 10.31289/biolink.v10i2.10933

BioLink
Jurnal Biologi Lingkungan, Industri, Kesehatan

Available online http://ojs.uma.ac.id/index.php/biolink

ANALYSIS OF MINERAL CONTENT IN ZAM-ZAM WATER CIRCULATION IN PADANGSIDIMPUAN CITY

Fatma Suryani Harahap*[1] , Heni Mulyani Pohan[2] , Rabiyatul Adawiyah Siregar[3], Elisa[4] , Jalilah Azizah Lubis[5] & Nur Latifah[6]

[1,2,3]Chemistry Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Tapanuli Selatan, Indonesia
[4]Physics Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Tapanuli Selatan, Indonesia
[5]Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Tapanuli Selatan, Indonesia
[6]Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Tangerang, Indonesia

Submitted: 07-12-2024; Reviewed: 09-01-2024; Accepted: 12-02-2024

**Corresponding author*: fatma.suryani@um_tapsel.ac.id

Abstract

This research was motivated by the existence of Zam-zam water trade in Padangsidimpuan City, while the Saudi Arabian government prohibited the export of Zam-zam water. This causes people to suspect that the quality of Zam-zam water circulating in the market is not the same as the Zam-zam water found in Mecca. Therefore, research needs to be carried out to answer these concerns. This research aims to analyze the mineral content of labeled packaged Zam-zam water circulating in Padangsidimpuan City compared with Zam-zam water brought from Mecca City. The mineral concentrations tested were sodium and chloride. This research uses laboratory experimental methods, including quantitative analysis. According to the type of research, the data analysis technique used is to compare the concentration of each mineral in the water labeled Zam-zam with the mineral concentration in the Zam-zam water used as a control. The research results showed that Zam-zam water obtained from Mecca City contained 42.4 mg/L chloride, 2.06 mg/L sodium, while the labeled Zam-zam water circulating in Padangsidimpuan, namely sample 1, contained 160.7 mg/L chloride. sodium 2.06 mg/L in sample 2 contains 50.5 mg/L chloride, sodium 2.17 mg/L. The three Zam-Zam samples circulating in Padangsidimpuan that have been tested show that the quality of Zam-Zam water is suitable for consumption based on determining a good water quality test, namely at the suitability threshold.

Keywords: *Atomic Absorption Spectrophotometer; Mineral; Zam Zam water*

How to Cite: *Harahap, F.S. Pohan, H.M. & Putri, D.A. Elisa, Lubis, J.A. & Latifah, N. (2024). Analysis Of Mineral Content In Zam-Zam Water Circulation In Padangsidimpuan City. BioLink: Jurnal Biologi Lingkungan, Industri dan Kesehatan, Vol. 10 (2): 168-176*

INTRODUCTION

Humans and living creatures cannot live without water. What the body needs is not only H2O, but also minerals found in water such as calcium, sodium, magnesium, etc. (Pebriani, 2021). Therefore, more and more bottled mineral water is circulating on the market with its own advantages, such as one mineral water product sourced from mountain springs which contains natural minerals such as calcium, magnesium, potassium, iron and sodium. Other products add flour as an anti-bacterial to their products (Hernawan, 2018). Among the water in this world, there is the most noble water, namely Zam-Zam water (Ramadhan, et al., 2021) . Zam-zam water is holy water and the best water on the surface of the earth. Zamzam water contains many elements, namely positive ions and negative ions (Oktaviani, 2021) . The multi-element and hydrochemical composition of Zam-Zam water contains 34 elements including Calcium (Ca), Magnesium (Mg), Sodium (Na) and Chloride (Cl) with the highest concentrations (Donia, 2021). The elements Antimony (Sb), Beryllium (Be), Bismuth (Bi), Bromine (Br), Cobalt (Co), Iodine (I), and Molybdenum (Mo) are less than 0.01 ppm. Chromium (Cr), Manganese (Mn), and Titanium (Ti) were also detected in Zam-Zam water. (Yazid, 2017). The healing ability of Zam-zam water is not just a miracle or even mere suggestion, but can be scientifically proven. (Nonci, and Tahir, 2018) . Many scientific studies have been carried out to determine the unique properties of Zam-Zam water, where the results state that the mineral content in Zam-Zam water is much higher than well water and bottled mineral water. Because of the features that Zam-zam water has, it is not surprising that many people want to consume it, including people outside Saudi Arabia, including Indonesia. However, each pilgrim returning to Indonesia is only allowed to bring 5 liters of Zamzam water. However, many pilgrims felt that the volume provided was insufficient, so they tried to carry Zamzam water secretly (Halim, 2016).

The Saudi Arabian government has carried out strict supervision over the distribution of Zam-zam water by prohibiting the free export of Zam-zam water abroad. The ban emerged after a study in Europe stated that Zam Zam water was polluted (Huda, 2016). The move by the Kingdom of Saudi Arabia to prohibit bringing Zam-zam other than those packaged by Maktab Zamazimah is an effort to anticipate western steps in damaging the good name of Zam-zam in

the eyes of Muslims and the world. Several cargo companies in both Jeddah and Makkah also gave up when pilgrims tried to send Zam-zam via cargo. There are quite a few pilgrims who don't want to bother secretly bringing Zam-Zam water beyond the limit, because now Zam-Zam water is easily available on the market (Aziz, 2014) .

However, people prefer Zam-zam water imported directly from Mecca compared to that sold in the market. Because people are worried about the quality of Zamzam water. Public concerns about the quality of water labeled Zam-Zam that is sold on the market is normal considering the existence of Saudi Arabian government regulations that prohibit the export of Zam-Zam water. People feel suspicious because the water labeled Zam-zam that is traded does not have the same quality as Zam-zam water imported directly from Mecca (Moni, et al., 2022) . Another fact regarding water labeled Zam-zam circulating on the market is the raid on fake Zam-zam water factories in Semarang and Batang, Central Java on January 15 2014. The fake Zam-zam water was even circulating not only in the city where the water was circulating. the factory is located, but has been sent to other cities such as Jakarta, Solo and Yogyakarta. Fake Zam-Zam water is made by mixing 10 liters of real Zam-Zam water with 13 gallons of regular refill water. The results of Nur's research (2024) showed that two samples of labeled bottled Zamzam water circulating in Semarang City contained chloride levels that exceeded the threshold, namely 1665.88 ppm and 2407.61 ppm, while the threshold was in accordance with Minister of Health Regulation Number 416 of 1990 states that the lower limit for chloride in drinking water is 250 ppm. Similar research has never been carried out in Padangsidimpuan City. Therefore, it is necessary to test the mineral content of bottled Zam-Zam water circulating in Padangsidimpuan City. The aim of this research is to determine the quality of Zam-zam water circulating in Padangsidimpuan City by analyzing the mineral content and then comparing it with the mineral content of Zam-zam water brought directly from Mecca Al Mukarromah as a control based on Minister of Health Regulation Number 416 of 1990 concerning Requirements and Supervision Water. This research uses the Atomic Absorption Spectrophotometry (SSA) method to analyze the sodium and chloride content in Zam-Zam water.

RESEARCH METHODS

The research was carried out in two places, namely the Chemistry Laboratory of the Muhammadiyah University of South Tapanuli and the Medan Industrial Standardization and Services Center. The research was conducted from January to March 2023.

The materials used in this research were Zam-Zam water imported directly from the city of Mecca and 2 types of Zam-Zam water with different brands circulating in Padangsidimpuan city, standard solutions of Na and Cl. The equipment used is an Atomic Absorption Spectrophotometer and glassware.

Population and Sample

The population of this research is water labeled Zam-Zam which is traded in the Padangsidimpuan City market. Meanwhile, the sample which is part of the population studied in this research is bottled drinking water labeled Zam-zam which is traded in three different shops with different brands. Meanwhile, as a controller, Zam-Zam water from the city of Makkah is used which will be taken by Hajj pilgrims in 2022. The place to collect it is at the Zam-Zam water tap located at the Grand Mosque.

Sampling Method

The sampling method was carried out in two ways, because the sources of the samples studied were different, namely water labeled Zam-zam circulating in Padangsidimpuan City and Zamzam water obtained from Makkah City as a control.

Water labeled Zam-zam circulates in Padangsidimpuan City

The water labeled Zam-zam was obtained from three different shops and it was confirmed that the brands were different. Two samples adequately represent the population studied, because they meet the minimum number of sampling points. Water labeled Zam-zam includes bottled drinking water, so the sampling method is quite simple, namely taking a sample and keeping it away from direct sunlight. Furthermore, the sample can be directly analyzed without the need for preservation.

Zam-zam is obtained from the city of Makkah

Zamzam in the city of Mecca is groundwater and can be taken from wells. However, because the Zamzam well has been closed, Zamzam water cannot be taken directly from the well but through the tap that flows it. Therefore, sampling was carried out following the

groundwater sampling procedure at the water tap. The Zam-Zam water sample originating from the city of Mecca is a momentary sample, meaning the sample was taken at one point and one time only. This was done with the assumption that the composition of Zam-zam water will not change wherever and whenever it is taken, also because this research aims to determine instantaneous quality, not to monitor the quality of Zam-zam water.

Quantitative analysis

The main goal of quantitative analysis is to determine the quantity of each component that makes up the analyte. Quantitative analysis produces numerical data that has certain units. Data resulting from quantitative analysis are generally expressed in volume units, weight units and concentration units using certain analytical methods. Quantitative analysis was carried out to determine the mineral content in the sample (Nur Ba'diani Aziz, 2014).

Chloride Testing (Cl^-)

The chloride test follows the rules of SNI 3554:2015 Point 3.12, namely taking 100 ml of sample that has a pH value of 7-10, if the sample is not within that pH range then add H_2SO_4 or NaOH 1 N to pH 7-10, add 1 mL of K_2CrO_4 indicator ; with a standard solution of silver nitrate ($AgNO_3$) until a reddish yellow color appears; Blank titration is carried out by measuring 100 mL of distilled water carefully and then doing it in the same way as the sample treatment; duplo work done; then calculate the chloride content (Cl^-) in the sample.

Sodium Testing (Na^+)

Determination of the sodium content in the sample was carried out using the Atomic Absorption Spectrophotometry method which was added to the sample and measured at a wavelength of 588.52 nm, then adsorption measurements were carried out.

Data analysis

The data obtained is in the form of concentrations of each mineral tested, including chloride and sodium from both samples and controls. The data analysis technique used is to compare the concentration of each mineral in water labeled Zam-zam with the concentration of minerals in Zam-zam water which is used as a control based on Minister of Health Regulation Number 416 of 1990

concerning Water Requirements and Supervision quality.

RESULTS AND DISCUSSION

In presenting the results, code is used to refer to the sample. Samples are coded based on the Zam-Zam water source used. The code explanation is in the table below:

Table 1. Description of Zamzam Water Code

Code	Zamzam Water Source
Example 1	Shop A
Example 2	Store B
Example 3	City of Mecca

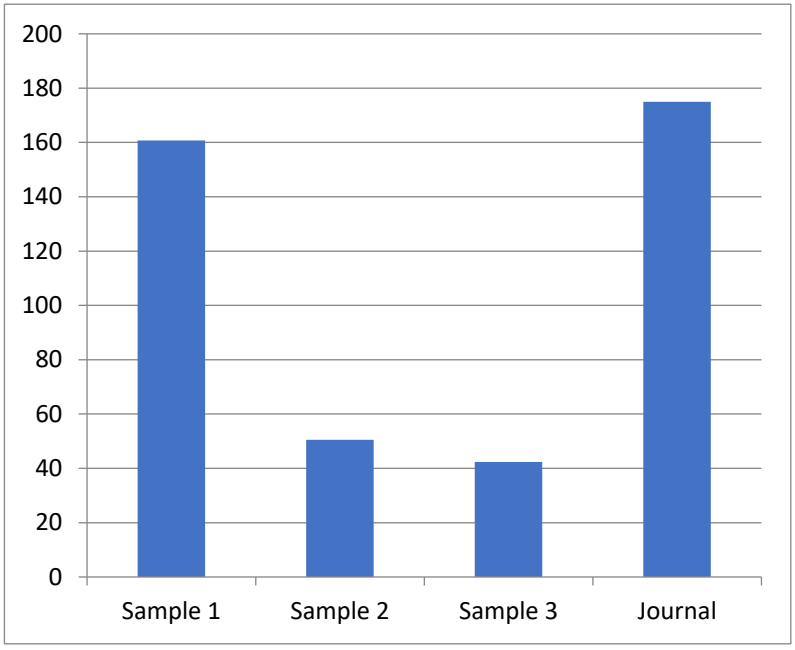

Figure 1 . Comparison of chloride concentrations

In this study, an analysis of the chloride (Cl) and sodium (Na) content of bottled Zam-Zam water samples 1, 2 and 3 circulating in Padangsidimpuan City was carried out. From the graph above, it is clear that the chloride concentration in sample 1, namely the sample purchased at shop A, contains concentration levels above the concentration of Zam-zam water taken from Mecca as a control. The chloride contrast value in sample 1 was 160.7 mg/L, while the chloride concentration value in sample 3 as a control was 42.4 mg/L and the concentration value in sample 2 was 50.5 mg/L. The results of Nur's research (2014) show that the chloride content in Zam-zam water taken from Mecca is 174.99 ppm. Chloride is not toxic, and even plays a role in regulating cell osmotic

pressure. In general, the more it contains, the better, but its presence in drinking water has limits (Mostafa, et al., 2020) . Minister of Health Regulation Number 416 of 1990 concerning requirements and supervision of water quality states that the limit for chloride content in drinking water is 250 mg/L. Of the three samples tested, none exceeded the threshold set by the government, although in sample 1 the chloride concentration was far from the concentration value in the control sample, likewise in sample 2 there was still a slight difference in the chloride contrast value. So it can be concluded that the concentration of chloride ions in samples labeled Zam-zam varies when compared with control Zamzam water.

Next, sodium metal analysis was carried out on the sample. Analysis of sodium metal in the samples obtained data for sample 1 of 2.06 mg/L, sample 2 of 2.17 mg/L and sample 3 (control) of 2.06 mg/L. Meanwhile, research data from Nur (2014) shows that Zam-zam water taken from Mecca contains 38.28 ppm of sodium. For more details, the comparison of sodium metal concentrations can be seen in Figure 2.

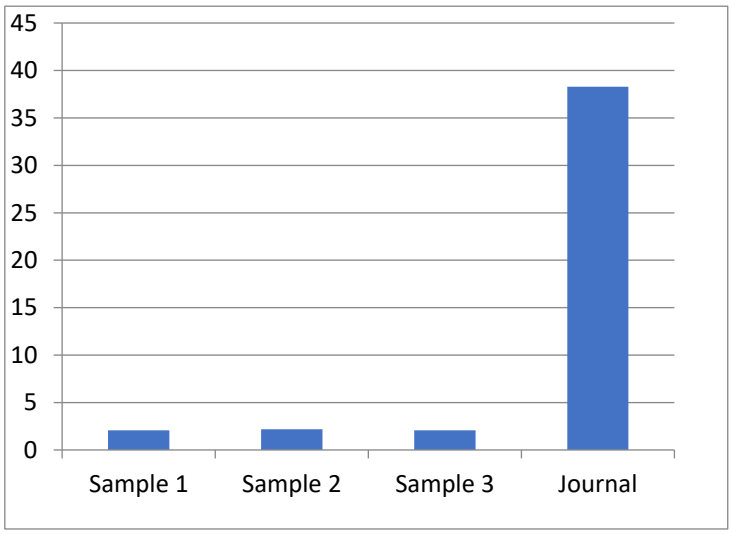

Figure 2 . Comparison of sodium concentrations

From the graph above, it can be seen that the sodium concentration in samples 1 and 2 is very different from sample 3 as a control. However, Sample 3 with previous research data has significant differences, even though according to theory Zam-zam water will not change its composition. There are several possibilities, namely due to differences in research, instruments used or frequency of methods used during research. (Murfat, and Gayatri, 2023) have also researched

Zam-zam water. The results of the research obtained a sodium level of 2.95 mg/L, not much different from that obtained in this study. The benefits of sodium for the body include maintaining blood volume, regulating water in cells, and maintaining nerve function (Khalid, 2014) . Therefore, the more sodium content the sample contains, the better, as long as it does not exceed the limit (Nonci & Tahir, 2018) . The maximum limit for sodium content in drinking water according to Minister of Health Regulation Number 416 of 1990 concerning Requirements and Control of Water Quality is 200 mg/L. Of the samples tested, all were still below the limit so they were safe for consumption. However, the sodium concentration in sample 2 was less when compared to the control. There are several possibilities, namely due to differences in research, instruments used or frequency of methods used during research. (Murfat, and Gayatri, 2023) Even though the comparison is small, there is still a difference between the sodium content in control Zam-zam water and labeled Zam-zam water. (Damayanti, and Taufiq, 2023)

CONCLUSION

Based on the research conducted, it can be concluded that Zam-Zam water obtained from Mecca City contains 42.4 mg/L chloride and 2.06 mg/L sodium. Meanwhile, the mineral content contained in Zam-zam water labeled Zam-zam circulating in Padangsidimpuan City is that sample 1 contains 160.7 m/L chloride, 2.06 mg/L sodium, sample 2 contains 50.5 m/L chloride, sodium 2.17 mg/L. If you look at the mineral content, the Zam-zam water circulating in Padangsidimpuan City is different from the Zam-zam water obtained from Mecca City. The three labeled Zam-zam samples circulating in Padangsidimpuan that have been tested show that the quality of Zam-zam water is suitable for consumption based on determining a good water quality test, namely at the suitability threshold.

ACKNOWLEDGEMENTS

Thanks to the Council for Higher Education Research and Development of the Central Leadership of Muhammadiyah. This research is supported by the Muhammadiyah Research Grant Batch V of 2021 by the research contract Number : 1687/PD/359/I.3/D/2022.

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