IBJ
Indonesian Biodiversity Journal
http://ejurnal.unima.ac.id/index.php/ibj

indonesian.biodivers.j
Vol. 5, No.1. April 2024
ISSN : 2722-2659

ANALYSIS OF CLEAN WATER QUALITY IN KOLONGAN VILLAGE, TALAWAAN DISTRICT

Irama Rauli Tarigan[1], Mercy M. F Rampengan[2], Nova L.I.M Ogi[3]

[1,2,3]Biology Departement, Faculty of Matehematics and Natural Science, Universitas Negeri Manado, Indonesia.

Corresponding author: iramataringan@gmail.com

Received: October 16, 2023 *Accepted: April 12, 2024*

Abstract

Kolongan Village is one of the villages in Talawaan district of North Minahasa, North Sulawesi. In the village of Kolongan, some springs are potentially a clean water source for the people of the village. This research aims to analyze the quality of the springs in the village of Kolongan Talawaan, Prefectures as a water source. This type of research is quantitative, and the method used in this research is the Indonesian National Standard (SNI) according to the water quality parameters that have been established with the direct observation plan of the physical properties of water and with the laboratory testing plan for the observation of water chemical and biological properties with indicators of iron, sensitivity, manganese, *E.coli*, taste, and smell. The research was conducted from July 24, 2021, to September 20, 2021. The water quality measurement results in the spring in one village of Kolongan showed iron <0.0086 mg/L, iron 69-93 mg/ L, manganese 0.03-0.07 mg / L, *E. coli*, 11 CFU, not sensitive and odorless. Water source 2 showed iron <0.086 mg / l, density 75-85 mg/ l, manganese 0.02-0.03 mg/l, and *E. coli*, 3.6-9.2 CFU, is not sensible and odorless. The pollution index calculation indicates that the springs in Kolongan Village belong well. However, because they still contain biological reservoirs, it is necessary to have an advanced process for them to be consumed by the community.

Keywords: quality analysis of springs, biological parameters, chemical parameters, physical parameter, pollution Index

INTRODUCTION

Water is a natural resource that is a basic necessity for life on Earth. Water is an important component in the living environment that will influence and be influenced by other components. Meanwhile, water, as one of the primary necessities to sustain human life, has a risk of water-borne disease or contamination due to community activities. (Rosyida, M. 2016). The individual needs for pure water are very complex, i.e., for clean water, feeding food, worship, cleaning all laundry, etc. According to WHO estimates, in the developing world, each individual needs between 60 and 120 liters of clean water per day. (Destiquama *et al*., 2019). Water is one of the disease carriers for the human body if water is consumed without going through the process of maturing first. So that the water that enters the body of

indonesian.biodivers.j
Vol. 5, No.1. April 2024
ISSN : 2722-2659

every human does not cause disease, water management begins from the origin of the distribution network. The full distribution is also necessary to avoid the problem of direct contact with the initial waste of the problem with clean water consumed by the community (Indrawan, 2016). Water is essential for the survival of humans, animals, and plants. Most humans need water as a circulatory process for the body, as well as for washing, bathing, and other purposes. (Putri, 2018).

Water pollution describes a decline in water quality, where water pollution can be caused by continuous population growth, resulting in densely populated settlements producing household waste that crumbles into the groundwater layer. (Sulistyorini *et al*., 2017). According to the regulation of the Ministry of Health of the Republic of Indonesia No. 492/MENKES/PER/1V/2010 on the quality requirements of clean water, it is defined as water that can be drunk directly without processing. (Depkes RI,2010). The decrease in water quality may be due to an increase in the level of the measured physical parameters, such as the increase in color parameters in the water. Ifsuppose the color of a water becomes bluish to green. In that case, the change in color in that water may likely be caused by the presence of chemical substances such as iron metals, manganese, and cyanide, allegedly from the disposal of plant waste. If the water has an unpleasant smell, it can be caused by the presence of contamination of the water by the bacteria *E.coli* feces. These bacteria are suspected of causing typhoid disease and diarrhoea. (Zikra, W. *et al*., 2018).

Kolongan Village is one of the villages located in the Talawaan district of North Minahasa district, North Sulawesi. In this village, there are several springs. The spring of the village of Kolongan is a spring of spring that springs from the ground. People use the water as clean water for cooking and washing. Water sources that are near residential areas and plantations can cause pollution due to community activities, such as using the springs as a wash cake bath (MCC) simultaneously. The contamination from the stool can trigger the appearance of *E. Coli*. in the water, which causes water consumption to cause diarrhoea. Therefore, the researchers wanted to know the quality of the springs in the village of the canyon of the marshes.

Based on the above assumptions, to exploit the potential of the springs in the village of Kolongan with the direct observation plan (in situ) of the physical properties of the water and with the examination plan of the laboratory test for the observation of the biological and chemical properties of the water. The purpose of this research is to first analyze the quality status of the springs used by the people who live around the spring's location. The second is to see the pollution index at the three springs in the village of Kolongan.

RESEARCH METHODS

The type of research is quantitative, with a direct observation plan (in situ) of the physical properties of water and a laboratory test plan for the observation of the biological and chemical properties. The study was scheduled for August 24, 2022.

indonesian.biodivers.j
Vol. 5, No.1. April 2024
ISSN : 2722-2659

Tools and Materials

Tools for testing sterile glass bottles, polyethylene bottles, atomic absorption spectrometers (SSA), loose cathode lamps, cup glass, volumetric pipette, measuring pepper, Erlenmeyer, glass cylinders, clock glass, electric heaters, vacuum casing devices, membrane filters, analytical scales, spraying butter, burets, butter measuring glass, volume pipets, measured glass, cups, clove spoons, pH meters, mixers, electric heaters, analytic scales, mortar and starnfer, spray bottles For *E.coli* testing, the following tools are used: oxy needles, sample bottles, autoclave, hot plate, Colony counter, pipette, Petri cup, reaction tube, gauge glass, pipette, spatula, analytical scales, bunsen, plastic wrap, aluminium foil, pH paper, microscope, object glass, cover glass, vortex, hot plate, micropipette, beaker glass, Erlenmeyer, cotton, and label paper. The materials used in the iron test are mineral-free water, nitric acid (HNO3), iron metal standard solution (Fe), acetylene gas (C2H2), HNO3 dilution solution, HNO3-washer solution, calcium solution, and air pressure.

The materials for the test complexity are murexide indicator, eriochrome black T indicator (EBT), sodium hydroxide solution (NaOH), pH refresher solution, compounding material, standard calcium carbonate solution (CaCO3), raw sodium dinatrium diethyleneamine tetra acetate hydrated, NaEDTA solution, sianide sodium powder (NaCN), water purification. The materials used for manganese precipitation are mineral-free water, manganese metal (Mn), HNO3 detergent solution, calcium solution, and compressed air. The *E.coli* test material used the following tools: nutrient agar (NA), eosin methylene blue agar (EMBA), sterile alcohol and Aquades, and not forgetting water samples.

Water quality analysis covers water's chemical, biological, and physical parameters

In this study, we are testing chemical parameters in water using iron, thickness, and manganese, iron, and iron test methods carried out under SNI 06-6989. 4-2009, this method uses spectrophotometry, i.e. with concentrated nitric acid (HN0) material, standard liquid iron metal, acetylene gas (C2H2), and a minimum pressure of 100 psi and dilution liquid.

Sensitivity, sensitivity test methods performed with SNI method 06-6989.12-2004, materials used: murexide indicator, EBT indicators, sodium hydroxide liquid, retention fluid, standard solution of calcium carbonate, raw solution of ethylene dinatrium, while the tools used are: titration equipment, 255 sizes labuan, 100ml size glass, polumean pipette, Erlenmeyer Labuan, glass melting, spray bottle, and 10ml size pipette.

The manganese test method is carried out in accordance with SNI 06-6989. 5-2009, i.e. with the ingredients: nitric acid, manganese metal, acetylent gas, HNO 30.05M dilution liquid, and calcium liquid. And the instruments used: the atomic (SSA) absorption spectrophotometer is

indonesian.biodivers.j
Vol. 5, No.1. April 2024
ISSN : 2722-2659

lit, the cathode lamp with holow cathodee lamp (HCL), the glass cups are 100mL and 250mL, the volumetric taps are 10,0mL as well as 50,0ml, the measurement tubes are 50.0mL; 100,1 and 1L; the Erlenmeyer is 100 mL, its glass piston, its watch glass, its listric heater, a set of vacuum filter equipment, its membrane piston measurements are 0.45µm, its analytic weights are investigated 0,0001gram; and the spray piston.

Biological testing was performed with the Total Plate Count (TPC) test of *Escherichia coli* bacteria using an EMB medium. 1 ml of the sample is mixed with 9 ml of aquades. The biological test is performed by mixing 1 ml with the 9 ml of aquades, which suspense 101 is then occulated into the EMB media and then incubated for two days, followed by the total plate count method (T PC), then counted with a device called the colony counter.

Physical testing: the physical testing of water is done using direct observation to see the color of the water, the sense of smell to know the scent of water, the sense of taste to know whether the water has a taste, and to measure the amount of temperature and pH of the water using an ORP meter.

Water quality analysis is a method used to determine water quality from water springs in Kolongan Village. Measurement of the rate or concentration of water quality parameters in the water springs in Kolongan Village will be carried out in the laboratory. Then, the test results of these parameters will be compared with the quality standards established in the Clean Water Quality Requirements set out in Permenkes No. 492 of 2010 on the clean water quality requirements.

Pollution Index Analysis (IP)

The pollution index method is one of the methods for measuring water quality. This calculation is relative to the results of observations based on applicable quality standards. (Nurrohman *et al*., 2019). To measure the water pollution index, it is taken from three research stations and will be watered to water quality standards. Analysis of water quality data used using the method of the water quality index (IP) according to (Kep-MENLH N0.115, 2003) on the determination of the quality status of water to determine the level of contamination of rivers by using the determined value of the contamination index (IP) result value and the ratio of the average value of the concentration of each parameter to the raw quality value, class of value there is 4, i.e. 0-1,1 quality of water classified well, 1,1-5,0 lightly polluted, 5,0-10,0 moderate, and already more than 10,0 quality water has been heavily contaminated.

The formula used is as follows:

$$IPj = \sqrt{\frac{(\mathrm{Ci/Lij})2\mathrm{M}+(\mathrm{Ci/Lij})2\mathrm{R}}{2}}$$

indonesian.biodivers.j
Vol. 5, No.1. April 2024
ISSN : 2722-2659

Description:
Ipj : Pollution index for allocation j
Ci : Water Quality Parameter Concentration i
Lij : Water quality parameter concentration I listed in the water surface standard j
M : Maximum
R : Average – flat

RESULTS AND DISCUSSION

After conducting research at 3 sampling sites, the following results were obtained:

Table 1. Water Quality Test Results

No	Parameter	Unit	Baku Mutu	Test Results		
				Mata Air 1	Mata Air 2	Mata Air 3
1	Besi	mg/L	0,3	0,0086	0,0086	0,02
2	Kesadahan	mg/L	500	82	80	71
3	Mangan	mg/L	0,4	0,05	0,02	0,03
4	*E.coli*	CFU	0	3,67	5,7	7,3
5	pH		6,5-8,5	6,85	6,94	7,1
6	Temperature	°C	Suhu Udara±3	24	25	25

Table 1 shows the measurement of clean water quality in Kolongan Village. The iron content of 3 water springs and each test indicates the lowest value is <0.0086 mg/L and the highest is 0.02mg/L, which is classified as safe if consumed by the public because it does not exceed the prescribed quality standard (PP No. 82 Year 2001) of 0.3 mg / L. While the content of the waterprints is 500 mg/ L, the test results show in 3 points that the minimum water content at ST3B station is 65 mg / l and the maximum content is 93 at ST1C. Table 4.2 also shows the contents of the Mangan results of the test. The contents tend to be between 0.02 mg/l and 0.05 mg/ l at the ST1B station. The content of foodprints tested has not yet exceeded the standard quality specified by ST. Number 82 Year 2001 which is 0.4mg / L, which means that water from the eye content is still consumed based on manganese. Unlike the *E. coli* content that appears to be still found in some stations. the standard quality of *E.coli* based on PP No. 82, of 2001, is 0 CFU/100ml, but it turns out there are still many stations that contain *E. Coli* ranged from 3.67 at spring 1, 5.7 at spring 2, and 7.3 at spring 3.

Discussion

Pollution index (PI) analysis results and discussion

Soil water is water that flows itself from the ground to the surface of the ground. Water springs are water sources that come from the most basic soil and are, hardly affected by the season or quantity or quality, the same as the state of inland water. (Sutrisno, 2019). The water to be consumed must be clear, without color, without smell, without flavor, and without any pathogenic germs contained in it. Basically, this requirement was made to protect humans from waterborne disease. (Renngiwur *et al.*, 2016). Water quality status is the level of water quality condition that can indicate whether the condition of water can be

indonesian.biodivers.j
Vol. 5, No.1. April 2024
ISSN : 2722-2659

classified against the state of pollution or the good condition of a water source that has been tested on the basis of parameters and methods that have been determined. In the calculation of the water quality status in this study is based on the parameters that have been determined in Permenkes No. 492 of 2010 on the Quality Requirements of Clean Water, and Permenks No. 32 of 2017 on the Standard of Water Quality for Environmental Health and Water Health Requirement for Sanitary Hygiene Purposes and (PP No. 82 of 2001) on Water Quality Treatment and Water Pollution Control, then the results of the calculations of the pollution index accordingly (Kep-MENLH No. 115 of 2003 on the Guidelines for the Determination of Water quality status.

Tabel 2. Pollution Index

		Kelas I	
No	**Titik**	**IP**	**Status Mutu Air**
1	ST1	0,109472864	Good
2	ST2	0,022732864	Good
3	ST3	0,037071331	Good

Based on the above pollution index indicates that the quality of water in the water springs located in the Kolongan village of Talawaan district of North Minahasa is Good which means that the water quality is categorized as Good. However, based on (PP No. 82 of 2001), this is also supported by a physical test on each sample of water spring where all the water on the three springs is odorless and not felt. It can be said that the quality of the springs in Kolongan village can be used as raw, clean water but must go through an advanced process to be consumed safely by the community.

The clean water supply system of which the supplier is the unity of physical technical, and non-physical systems of the water supply and good clean waters has the following purposes: preparing clear, quality water that is also conducive to its containers; preparing high-quality water; and preparing easy and economically valuable water (Faisal & Atmaja, 2019). If the water has a temperature higher or lower than the temperature of the air, it is a sign that the water contains special elements that emit or absorb energy. (Afrianti Rahayu & Muhammad Hidayat Gumilar, 2017).

CONCLUSION

The results of measurements of water quality in the village of Kolongan Talawaan showed that the results of iron, sensitivity, and manganese from all points of water springs do not exceed Baku Mutu Parameter requirements that have been established in Permenkes No. 492 Year 2010 and PP No. 82 Year 2001, it was also found that the water in each spring does not smell and feel.

REFERENCE

Destiquama, D., Hasriyanti, H., & Amal, A. (2019). Studi Kelayakan Air Tanah Untuk Kebutuhan Air Minum Di Kelurahan Romang Polong Kecamatan Somba Opu Kabupaten Gowa. *Jurnal Environmental Science*, *2*(1). https://doi.org/10.35580/jes.v2i1.12025

Faisal, M., & Atmaja, D. M. (2019). Kualitas Air Pada Sumber Mata Air Di Pura Taman Desa Sanggalangit

Sebagai Sumber Air Minum Berbasis Metode Storet. *Jurnal Pendidikan Geografi Undiksha*, *7*(2), 74–84. https://doi.org/10.23887/jjpg.v7i2.20691
Indrawan, T. (2016). Kajian Pemanfaatan Dan Kelayakan Kualitas Airtanah Untuk Kebutuhan Domestik Dan Industri Kecil-Menengah Di Kecamatan Laweyan Kota Surakarta Jawa Tengah. *Majalah Geografi Indonesia*, *26*(1), 46–59. https://doi.org/10.22146/mgi.13404
Peraturan Menteri Kesehatan Republik Indonesia Nomor 492/MENKES/PER/1V/2010 tentang persyaratan kualitas air minum
Permenkes No 492 Tahun 2010 Tentang Persyaratan Kualitas Air Minum, dan Permenkes No 32 Tahun 2017 tentang Standar Baku Mutu Kesehatan Lingkungan dan Persyaratan Kesehatan Air Untuk Keperluan Hih\giene Sanitas.
Putri, T. S. (2018). Analisis Kualitas Mata Air Motonuno Kecamatan Lohia Kabupaten Muna. *Jurnal STABILITA*, *6*(2), 4–7.
Renngiwur, J., Lasaiba Dan, I., Mahulauw, A., Pengajar, S., Pendidikan, J., Fitk, B., & Ambon, I. (2016). Analisis Kualitas Air Yang Di Konsumsi Warga Desa Batu Merah Kota Ambon. *Jurnal Biology Science & Education*, *5*(2), 101.
Rosyida, M. (2016). Analisis Sifat Fisis Kualitas air di Mata Air Sumber Asem Dusun Kalijeruk, Desa Siwuran, Kecamatan Garung, Kabupaten Wonosobo. *Skripsi*. Semarang: UNNES.
Rahayu, S. A., & Gumilar, M. M. H. (2017). Uji cemaran air minum masyarakat sekitar Margahayu Raya Bandung dengan identifikasi bakteri Escherichia coli. *Indonesian journal of pharmaceutical science and technology*, 4(2), 50-56.
Sulistyorini, I. S., Edwin, M., & Arung, A. S. (2017). Analisis Kualitas Air Pada Sumber Mata Air Di Kecamatan Karangan Dan Kaliorang Kabupaten Kutai Timur. *Jurnal Hutan Tropis*, *4*(1), 64. https://doi.org/10.20527/jht.v4i1.2883
Sutrisno, C. Totok, 2002. *Tenologi Penyediaan Air Bersih.* Jakarta: Rineka Cipta.
Zikra, W., Amir, A., & Putra, A. E. (2018). Identifikasi bakteri escherichia coli (e. coli) pada air minum di rumah makan dan cafe di Kelurahan Jati serta Jati Baru Kota Padang. *Jurnal Kesehatan Andalas,* 7(2), 212-216.