J. Pijar MIPA, Vol. 17 No. 6, November 2022: 813-819 ISSN 1907-1744 (Cetak)
DOI: 10.29303/jpm.v17i6.4289 ISSN 2460-1500 (Online)

ANALYSIS OF WELL WATER FEASIBILITY AS WATER CONSUMPTION IN BOARDING HOUSE AREA, JEMBER DISTRICT INDONESIA

Wanda Febrianty* and Sudarti
Physics Education Study Program, Faculty of Teaching and Training Education, Universitas Jember, East Java, Indonesia
*Email: wandafebrianti4@gmail.com

Received: October 31, 2022. Accepted: November 25, 2022. Published: November 30, 2022

Abstract: Currently, as many as 45% of Indonesian people use well water to meet their daily needs. However, problems with the use of well water occur due to increasing population growth, resulting in increased water pollution. Waste generated by human activities can seep into the ground and contaminate well water. This research was conducted to determine the feasibility of well water as consumption water in the Kos area of Jember Regency. The method used in this research is a descriptive observation method. The study used seven samples of well water originating from the Kos area of Jember Regency and 1 sample of mineral water as a comparison. Samples of well mineral water were tested using physical, chemical, and biological tests. Physical tests were carried out on color, odor, temperature, and total dissolved solids (TDS). The chemical test was carried out in the form of a pH test. Biological tests were carried out by observing changes in color and odor due to bacteria after the samples were left for ten days. The results showed that three water samples did not meet the physics test, namely sample 4, sample 6, and sample 8. One well water sample did not meet the chemical test, namely sample 4. Five water samples did not meet the biological test: sample 2, sample 4, sample 6, sample 7, and sample 8.

Keywords: *Well Water, PDAM Water, pH, Color, TDS.*

INTRODUCTION

The primary source of life on earth is water. Every living thing on earth needs water to survive. Water is one of the renewable energies on earth through the water cycle. There are various water sources, such as seawater, river water, rainwater, and groundwater. Groundwater is infiltration water that comes from rainwater that seeps into the ground through the soil surface, rainwater that seeps into the ground first through the soil layers. It results in the mixing of substances in the soil into the rainwater. Some substances that can get mixed into rainwater through the soil layers are heavy metals, magnesium, and calcium [1].

Well water is one of the community's primary sources of clean water. Approximately 45% of the total population in Indonesia uses well water as the main source of water to meet their daily needs [2]. Dug wells are a well water source with a depth of 7-10 meters. Dug wells are the community's most widely used type of well [3]. Dug wells must have good construction, such as walls that must be cemented to prevent harmful substances from entering the well water [4]. Several human activities utilize dug well water, such as washing, bathing, cooking, and drinking. The use of well water for human life must pay attention to the quality of the well water. The quality of well water used for community activities can affect community health. The quality of well water can be interpreted as a quality standard of a water source used for a specific purpose in terms of the substances contained in the water. To review the feasibility of clean water, the government, through the Ministry of Health, issued a Regulation of the Minister of Health or PERMENKES, namely No. 416/Menkes/per/IX/1990, regarding requirements and monitoring of water quality. In this regulation, water quality is viewed from three indicators: chemical, physical and biological [5]. The characteristics of clean water that are harmless and suitable for consumption are clean water that does not contain bacteria and minerals that can harm the health of the body [6].

Water quality indicates the feasibility of water being used for certain purposes. In measuring water quality, it will be expressed in numbers according to the measurement indicators. Then these numbers will be compared or tested based on existing water quality standards. Physical, chemical, and biological tests usually carry out water quality testing. Physical tests on water consist of tests for color, odor, temperature, and the number of dissolved solids.

Meanwhile, the chemical test consists of a pH test. Biological tests were carried out by letting the water stand for ten days and observing changes in color and odor due to bacteria [7]. One of the most important components in supporting an environment's good or bad condition is the availability of clean water and proper sanitation [8]. Therefore, the quality of water suitable for consumption is one of the important things to note. The low quality of water consumed by the community can harm public health [9].

The increasing population today increases the amount of clean water the community needs. The water problem is both in terms of water quality and water quantity. The amount of available water on earth does not change over time because of the water

cycle. Thus, population growth causes an increase in the need for water [10]. Based on data cited from the World Health Organization (WHO), in developing countries like Indonesia, each individual needs 30-60 liters of clean water for daily needs [11]. Based on data from the Central Bureau of Statistics for Jember Regency, data was obtained showing that Jember Regency was the district with the largest population, ranking 3rd in East Java Province. From 2014 to 2016, there was a rapid increase in the population, from 2.3 million to 2.41 million people. The increase in population has resulted in a decrease in environmental quality, which has an impact on decreasing water quality. Most people of Jember Regency fulfill their water consumption needs with well water and PAM water [12].

In Jember Regency, there are densely populated areas, Jalan Jawa, Jalan Sumatra, Jalan Kalimantan, and Jalan Nias, Sumbersari District Jember Regency. In that area, there are residential areas used as student boarding houses in Jember Regency. The distance between boarding places in the area is very narrow or not even far from one another. Residents of boarding homes on Jalan Jawa, Jalan Sumatra, Jalan Kalimantan, and Jalan Nias, in Sumbersari District, Jember Regency, mostly use well water to meet their daily needs for cooking, washing, and bathing. Given these circumstances, a study was conducted to determine the feasibility of well water for consumption.

RESEARCH METHOD

The type of research used is descriptive observational research located in the boarding house area of Jember Regency. The water samples tested in this study consisted of 7 wells in the Kos area of Jember Regency and one mineral water sample as a comparison. The eight water samples were taken on Friday, October 14, 2022. The samples obtained were tested using physical, chemical, and biological tests. Physical tests were carried out on color, odor, temperature, and *total dissolved solids* (TDS). The chemical test was carried out in the form of a pH test. Biological tests were carried out by observing changes in water color and odor due to bacteria after all water samples were left in bottles for ten days. Color and smell tests are carried out by direct observation using the senses of sight and smell. The temperature test is carried out using a thermometer. The *total dissolved solids* (TDS) test was carried out using a *total dissolved solids* (TDS) meter. The pH test was carried out using a pH meter. In addition to testing water samples, this research was also conducted by distributing questionnaires to boarding house residents whose well water was used as the research sample. Questionnaires were distributed to determine the number of well water users for consumption. The research data obtained are presented using tables and then described and compared with the literature on the feasibility of water quality as consumption water. The research results obtained will be compared with the literature, namely the Republic of Indonesia Minister of Health Regulation (Permenkes) No. 416/MEN.KES/PER/IX/1990, No. 492/MenKes/Per/IV/2010, and No. 32 of 2017.

RESULTS AND DISCUSSION

Color

The Color test in this study was carried out by direct observation. Based on the Regulation of the Minister of Health (Permenkes) RI No. 416/MEN.KES/PER/IX/1990, it is stated that the condition for water that is suitable for consumption is water that is not colored. Colored water can be an indicator of unfit consumption. It is because colored water indicates the presence of substances contained in water, such as metals, organic substances, and other substances [13]. Colorless (clear) well water can be used as the first indicator of assessing the quality of the water [14]. Table 1 shows the results of the color test.

Table 1. Color Test Results for Color

Description	Sample	Sample
1 (Mineral Water)	Colorless	Suitable
Sample 2 (Jalan Sumatra No. 9)	Colorless	Suitable for
Sample 3 (Java 6 Street No. 4C)	Colorless	Suitable for
Sample 4 (Jalan Kalimantan 1 No. 88)	Mas trip	Colorless
69) Colorless, suitable for	No.	sample
6A)	No.	Colorless
sample 7 (Jalan Nias 01)	Colorless	suitable
sample 8 (Road Kalimantan 1)	colorless	Feasible

Based on the research that has been done, the results showed that the mineral water samples were colorless, and the seven well water samples tested also showed colorless results. It can be the first indicator that the well water is of good quality. Thus, seven samples of well water that have been tested using a color test have met the requirements for the color of water suitable for consumption as written in the Regulation of the Minister of Health (Permenkes) RI No. 416/MEN.KES/PER/IX/1990.

Odor Test Odor

The direct smell carried out a test in this study. Based on the Regulation of the Minister of Health (Permenkes) RI No. 492/Menkes/Per/IV/2010, it is stated that the requirement for water that is suitable for consumption is water that does not smell. Smelly water indicates the presence of substances dissolved in the water. These substances can cause odors in water, such as decaying organic matter, chemicals such as phenols, and the presence of macroscopic organisms [15]. Table 2 shows the results of the odor test.

Table 2. Odor Test Results Odor

Description	Sample	Sample
1 (Mineral Water)	Normal	Eligible
Sample 2 (Jalan Sumatra No. 9)	Normal	Eligible
Sample 3 (Java 6 Street No. 4C)	Normal	Eligible
Sample 4 (Road Kalimantan 1 No. 88)	Abnormal	Not Eligible
Sample 5 (Mastrip Street No. 69)	Normal	Eligible
Sample 6 (Jalan Nias 1 No. 6A)	Abnormal	Not Eligible
Sample 7 (Jalan Nias 01)	Normal	Eligible
Sample 8 (Road Kalimantan 1)	Abnormal	Inadequate

Image 1. Color and Odor Test

Based on the research that has been done, the results show that there are water samples that have a normal odor, namely sample 1 (Mineral Water), sample 2 (Jalan Sumatra No. 9), sample 3 (Java 6 Street No. 4C), sample 5 (Jalan Mastrip No. 69), and sample 7 (Jalan Nias 01). Meanwhile, the water samples that had an abnormal odor were sample 4 (Jalan Kalimantan 1 No. 88), 6 (Jalan Nias 1 No. 6A), and sample 8 (Jalan Kalimantan 1). Water with an abnormal (bad) odor indicates that the water contains substances that are not good for the body if consumed. Thus, based on RI Minister of Health Regulation (Permenkes) No. 492/Menkes/Per/IV/2010, samples of well water that met the requirements for the smell of water fit for consumption were sample 2 (Jalan Sumatra No. 9), sample 3 (Jalan Jawa 6 No. 4C), sample 5 (Jalan Mastrip No. 69), and sample 7 (Jalan Nias 01). Meanwhile, samples of well water that did not meet the requirements were sample 4 (Jalan Kalimantan 1 No. 88), 6 (Jalan Nias 1 No. 6A), and sample 8 (Jalan Kalimantan 1).

Temperature

Well water temperature test is carried out using a thermometer. Based on the Regulation of the Minister of Health (Permenkes) RI No. 32 of 2017, concerning water temperature quality standards that are suitable for consumption, it is stated that water that is suitable for consumption must have a temperature in the range of ± 3˚C from the air temperature around the water source. Water temperature too high or more than 3˚C from air temperature makes the water unfit for consumption. It is because high water temperatures can signify the presence of harmful substances if consumed. Hazardous substances that can cause high water temperatures are sulfur or phenol [16]. Apart from indicating the presence of hazardous substances, water temperatures are too high in odor water due to decreased O2 levels [17]. Table 3 shows the results of the temperature test.

Based on the research that has been done, the results show that the mineral water sample has a temperature of 29.0 ºC. The well water tested contained a sample of well water with the lowest temperature, namely sample 5 (Jalan Mastrip No. 69), with a temperature of 28.3ºC, and a sample of well water with the highest temperature, namely sample 6 (Jalan Nias 1 No. 6A) with a temperature of 29 .5ºC. This research was carried out at an air temperature of 29.6ºC. Thus, the lowest and highest well water temperature is still within the allowable interval of ± 3ºC from the air temperature. Therefore, based on RI Minister of Health Regulation (Permenkes) No. 32 of 2017, seven well water samples tested in this study were declared to meet the water temperature requirements for consumption.

Table 3. Temperature Test Results

Sample	Temperature (°C)	Description
Sample 1 (Mineral Water)	29.0	Eligible
Sample 2 (Jalan Sumatra No. 9)	28.7	Eligible
Sample 3 (Java 6 Street No. 4C)	28.4	Eligible
Sample 4 (Kalimantan 1 Street No. 88)	28.5	Eligible
Sample 5 (Mastrip Street No. 69)	28.3	Eligible
Sample 6 (Nias 1 Street No. 6A)	29.5	Eligible
Sample 7 (Nias 01 Street)	29, 1	Eligible
Sample 8 (Jalan Kalimantan 1)	28.4	Eligible

Remarks: Air temperature 29.6°C

Test *Total Dissolved Solid* (TDS)

Test *total dissolved solid*s in this study was carried out using a *total dissolved solid*s (TDS) meter. Based on the Regulation of the Minister of Health (Permenkes) RI No. 492/Menkes/Per/IV/2010, regarding the quality standards for dissolved solids in water suitable for consumption, it is stated that the amount of solids dissolved in water has a maximum value of 500 ppm. If dissolved solids are in the water with a TDS value of more than 500 ppm, then the water is unfit for consumption [18]. The TDS value can affect the taste of the water that will be consumed. TDS values that are too high or exceed 500 ppm can change the taste of water. In addition, the large number of dissolved solids in water can also cause water to become toxic and unfit for consumption [19]. Table 4 shows the results of the TDS test.

Table 4 The results of the TDS test.

Sample	TDS (ppm)	Information
Sample 1 (Mineral Water)	127	Eligible
Sample 2 (Jalan Sumatra No. 9)	177	Eligible
Sample 3 (Java 6 Street No. 4C)	188	Eligible
Sample 4 (Jalan Kalimantan 1 No. 88)	150	Eligible
Sample 5 (Mastrip Street No. 69)	178	Eligible
Sample 6 (Jalan Nias 1 No. 6A)	306	Eligible
Sample 7 (Jalan Nias 01)	215	Eligible
Sample 8 (Road Kalimantan 1)	262	Eligible

Figure 2. Test Temperature and TDS

Based on the research that has been done, the results show that the mineral water sample has a TDS value of 127 ppm. Furthermore, of the seven well water samples tested, there was a well water

sample with the lowest TDS value, namely sample 4 (Jalan Kalimantan 1 No. 88) with a TDS value of 150 ppm, as well as a well water sample with the highest TDS value, namely, sample 6 (Jalan Nias 1 No. .6A) with a TDS value of 306 ppm. From these data, it can be seen that of the seven well water samples tested, the TDS value is still within the permissible interval, which is less than 500 ppm. Therefore, based on RI Minister of Health Regulation (Permenkes) No. 492/Menkes/Per/IV/2010, seven samples of well water tested in this study were declared to fulfill the requirements for the TDS value of water suitable for consumption.

pH

The pH test or acidity level of well water uses a pH meter. The pH test determines the degree of acid or base in well water. Based on the Regulation of the Minister of Health (Permenkes) RI No. 416/MENKES/IX/1990, regarding the quality standard for pH degrees in water suitable for consumption, it is stated that water suitable for consumption has a pH degree requirement of between 6.5 to 9. Water with an acidity degree below 6, 5, or above 9 indicates that the water is unfit for consumption. Consuming water that is not in accordance with the appropriate pH degree can decrease health due to the presence of toxic chemicals in the human body [20]. Table 5 shows the results of the pH test.

Table 5. the results of the pH test

Sample	pH	Description
Sample 1 (Mineral Water)	7.9	Eligible
Sample 2 (Jalan Sumatra No. 9)	6.6	Eligible
Sample 3 (Java 6 Street No. 4C)	6.6	Eligible
Sample 4 (Road Kalimantan 1 No. 88)	6.4	Not Eligible
Sample 5 (Mastrip Road No. 69)	6.5	Eligible
Sample 6 (Jalan Nias 1 No. 6A)	6.9	Eligible
Sample 7 (Jalan Nias 01)	7.4	Eligible
Sample 8 (Kalimantan Road 1)	6.8	Feasible

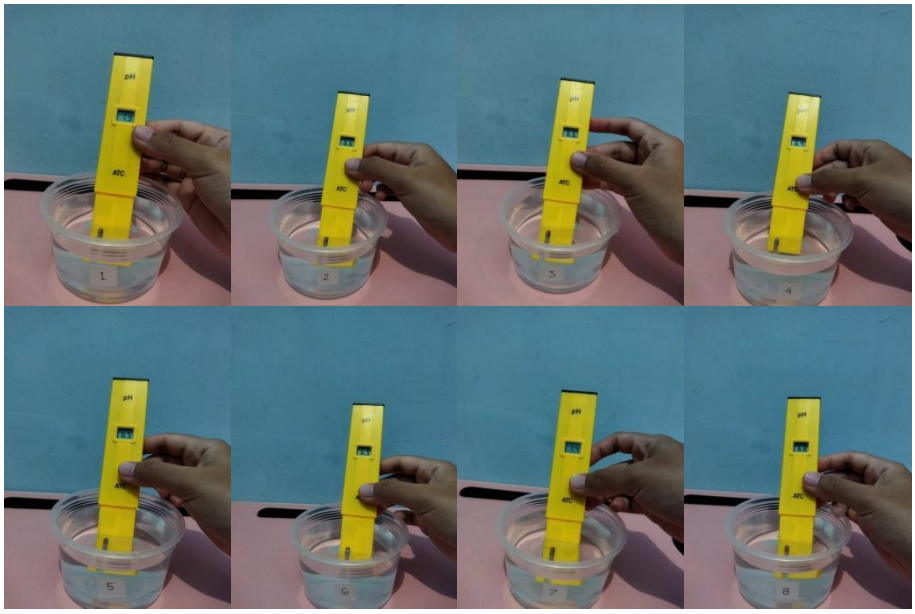

Figure 3. pH test

Based on the research that has been done, the results show that there are water samples that have a proper pH value based on RI Minister of Health Regulation (Permenkes) No. 416/MENKES/IX/1990 namely sample 1 (Mineral Water), sample 2 (Jalan Sumatra No. 9), sample 3 (Java 6 Street No. 4C), sample 4 (Jalan Kalimantan 1 No. 88), sample 5 (Mastrip Street No. 69), sample 6 (Jalan Nias 1 No. 6A), sample 7 (Jalan Nias 01), sample 8 (Road Kalimantan 1). Meanwhile, the water sample with an inappropriate pH value was sample 4 (Jalan Kalimantan 1 No. 88), with a pH of 6.4.

Biological

Biological tests in this study were carried out by immersing all water samples for ten days in

closed bottles. Then, observations are made of changes in the color of the water and the smell of the water. Water that smells and changes color can indicate the presence of bacteria in the water. Based on the Regulation of the Minister of Health (Permenkes) RI No. 492/MEN KES/PER/IV/2010, regarding standards for water content suitable for consumption, it is stated that water suitable for consumption is water that does not contain harmful bacteria. Water-containing bacteria, when consumed, can cause health problems [21]. Table 6 shows the results of the biological test.

Table 6. Biological Test Results for

Sample	Color Change	Odor	Description
Sample 1 (Mineral Water)	Not Changed	Normal	Eligible
Sample 2 (Jalan Sumatera No. 9)	Not Changed	Abnormal	Not Eligible
Sample 3 (Jalan Jawa 6 No. 4C)	Unchanged	Normal	Viable
Sample 4 (Jalan Kalimantan 1 No. 88)	Not Changed	Abnormal	Not Eligible
Sample 5 (Jalan Mastrip No. 69)	Not Changed	Normal	Eligible
Sample 6 (Jalan Nias 1 No. 6A)	Unchanged	Abnormal	Not Eligible
Sample 7 (Jalan Nias 01)	Unchanged	Abnormal	Not Eligible
Sample 8 (Road Kalimantan 1)	Unchanged	Abnormal	Not Feasible

Based on the research that has been conducted, the results show that there are samples of well water that do not meet the biological test requirements based on the Regulation of the Minister of Health (Permenkes) RI No. 492/MENKES/PER/IV/2010, samples that are not feasible, namely sample 2 (Jalan Sumatra No. 9), sample 4 (Jalan Kalimantan 1 No. 88), sample 6 (Jalan Nias 1 No. 6A), sample 7 (Jalan Nias 01), and sample 8 (Jalan Kalimantan 1). The well water sample was unsuitable for biological testing because it had an abnormal (unpleasant) odor after being left in the bottle for ten days. Meanwhile, samples eligible for the biological test were sample 3 (Jalan Jawa 6 No. 4C) and sample 5 (Jalan Mastrip No. 69). The sample was declared feasible in the biological test because it did not change color and had a normal odor.

Results of Questionnaire Distribution of Using Well Water for Consumption

The results of distributing questionnaires showed that 68.8% of boarding houses used well water for cooking, and 18.8% of boarding houses used well water for drinking. These results indicate that many boarding houses in Jember Regency still use well water as drinking water, especially for cooking activities.

CONCLUSION

Based on the results, it can be concluded that in the physics test there is well water that is suitable for consumption, namely well water in sample 2 (Jalan Sumatera No. 9), sample 3 (Jalan Jawa 6) No. 4C), sample 5 (Jalan Mastrip No. 69), and sample 7 (Jalan Nias 01). Based on physical tests, there is also well water that is not suitable for use as consumption water, namely well water in sample 4 (Jalan Kalimantan 1 No. 88), sample 6 (Jalan Nias 1 No. 6A), and sample 8 (Jalan Kalimantan 1). Furthermore, based on chemical tests with pH indicators, it was concluded that there was one water sample that was not suitable for consumption, namely sample 4 (Jalan Kalimantan 1 No. 88), while the other six samples were declared to have fulfilled the pH test. Then, in the biological test, there was well water suitable for consumption, namely well water in sample 3 (Jalan Jawa 6 No. 4C) and sample 5 (Jalan Mastrip No. 69). In addition, there was also well water that was unfit for consumption based on biological tests, namely well water in sample 2 (Jalan Sumatra No. 9), sample 4 (Jalan Kalimantan 1 No. 88), sample 6 (Jalan Nias 1 No. 6A), sample 7 (Jalan Nias 01), and sample 8 (Jalan Kalimantan 1).

REFERENCES

[1] Nazir, R., Khan, M., Masab, M., Rehman, H. U., Rauf, N. U., Shahab, S., ... & Shaheen, Z. (2015). Accumulation of heavy metals (Ni, Cu, Cd, Cr, Pb, Zn, Fe) in the soil, water and plants and analysis of physico-chemical parameters of soil and water collected from Tanda Dam Kohat. *Journal of pharmaceutical sciences and research*, *7*(3), 89.

[2] Yoga, I. G., Astuti, N. P., & Sanjaya, N. N. (2020). Analisis Hubungan Kondisi Fisik dengan Kualitas Air Pada Sumur Gali Plus di Wilayah Kerja Puskesmas II Denpasar Selatan. *Jurnal HIGIENE*, 6(2), 52-63.

[3] Rahmawati, Jasman, & Jabbar, A. (2018). Studi Kualitas Air Sumur Masyarakat Kecamatan Soreng Kota Parepare. *Seminar Nasional Sinergitas Multidisiplin Ilmu Pengetahuan dan Teknologi*, 1, 104-110.

[4] Qadriyah, L., Moelyaningrum, A. D., & Ningrum, P. T. (2019). Kadar Kadmium Pada Air Sumur Gali Disekitar Tempat Pemrosesan Akhir Sampah (Studi Di Tempat Pemrosesan Akhir Sampah X Kabupaten Jember, Indonesia). *Jurnal Biologi Lingkungan, Industri, Kesehatan*, 6(1), 41-49.

[5] Souisa, G. V., & Janwarin, L. M. (2018). Kualitas Sumur Gali di Dusun Wahakaim. *Higeia Journal Of Public Health Research And Development*, 2(4), 612-621.
[6] Patil, P. N., Sawant, D. V., & Deshmukh, R. N. (2012). Physico-chemical parameters for testing of water-a review. *International journal of environmental sciences*, *3*(3), 1194.
[7] Afdaliah, N., & Pristianto, H. (2019). Pemetaan Kualitas Air Sumur Bor Warga Kota Sorong. *Jurnal Teknik Sipil: Rancang Bangun*, 5(1), 13-19.
[8] Rahim, Z. M., & Muchlisoh, S. (2019). Faktor Yang Mempengaruhi Penggunaan Sumber Air Minum Layak Konsumsi Di Bengkulu Tahun 2018. *Jurnal Seminar Nasional Official Statistics*, 1138-1146.
[9] Meiliyadi, L. A., & Syuzita, A. (2022). Sosialisasi Tingkat Pencemaran Air Sumur Berdasarkan Parameter Fisika Di Desa Telagawaru. *Jurnal Warta Desa (JWD)*, 4(1), 27-33.
[10] Muchlis, P. D., Rakhman, A. N., & Antoni, T. B. (2021). Persebaran Salinitas Air Tanah Di Kecamatan Dukuhseti Kabupaten Pati. *Jurnal Teknologi*, 14(1), 83-90.
[11] Singkam, A. R., Lestari, I. L., Agustin, F., Miftahussalimah, P. L., Maharani, A. Y., & Lingga R. (2021). Perbandingan Kualitas Air Sumur Galian Dan Bor Berdasarkan Parameter Kimia Dan Parameter Fisika. *Jurnal Pendidikan Biologi dan Sains*, 4(2), 155-165.
[12] Yulivarta, A. P., Waluyo, J., & Iqbal, M. (2019). Hubungan Kualitas Biologi, Kimia, Fisika Air Sumur Dengan Kepadatan Penduduk Di Kabupaten Jember. *Jurnal Saintifika*, 21(2), 35-47.
[13] Honma, T., Ohba, H., Kaneko-Kadokura, A., Makino, T., Nakamura, K., & Katou, H. (2016). Optimal soil Eh, pH, and water management for simultaneously minimizing arsenic and cadmium concentrations in rice grains. *Environmental Science & Technology*, *50*(8), 4178-4185.
[14] Widyastuti, R., M., E. T., Purwaningsih, N. V., Saputro, T. A., & Kartikorini, N. (2022). Edukasi Pengaruh Konsumsi Air Sumur Terhadap Fungsi Ginjal Di Jember. *Jurnal Humanism*, 3(2), 175-183.
[15] Sari, M., Alhamda, S., & Herawati, N. (2021). Analisis Kualitas Fisik Dan Bakteriologi (E-Coli) Air Sumur Gali Di Jorong Koto Kaciak Kanagrian Magek Kecamatan Magek. *Jurnal Sehat Mandiri*, 16(2), 68-78.
[16] Earnestly, F. (2018). Analisa Suhu, pH, dan Kandungan Logam Besi Pada Sumber Air Tanah Di Kampus Universitas Muhammadiyah Sumatera Barat (Umsb) Padang. *Jurnal Menara Ilmu*, 12(1), 201-205.
[17] Subhi, M., & Sumijanti, E. (2021). Analisa Kualitas Air Sumur Bahan Pembuatan Keramik Dengan Parameter Fisik (Suhu) Dan Kimia (Klorida) Di Pt. Sumber Keramik Indah Kota Probolinggo. *Jurnal Seminar Nasional Hasil* Riset, 585-588.
[18] Manurunga, M., Ivansyah, O., & Nurhasanah. (2017). Analisis Kualitas Air Sumur Bor di Pontianak Setelah Proses Penjernihan Dengan Metode Aerasi, Sedimentasi dan Filtrasi. *Jurnal Prisma Fisika*, 7(1), 45-50.
[19] Chuzaini, F., & Dzulkiflih. (2022). IoT Monitoring Kualitas Air Dengan Menggunakan Sensor Suhu, pH, dan Total Dissolved Solids (TDS). *Jurnal Inovasi Fisika Indonesia (IFI)*, 11(3), 46-56.
[20] Putra, A. Y., & Yulis, P. A. (2019). Kajian Kualitas Air Tanah Ditinjau dari Parameter pH, Nilai COD dan BOD pada Desa Teluk Nilap Kecamatan Kubu Babussalam Rokan Hilir Provinsi Riau. *Jurnal Riset Kimia*, 10(2), 103-109.
[21] Yulivarta, A. P., Waluyo, J., & Iqbal, M. (2019). Hubungan Kualitas Biologi, Kimia, Fisika Air Sumur Dengan Kepadatan Penduduk Di Kabupaten Jember. *Jurnal Saintifika*, 21(2), 35-47.