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by Syarifa Wahidah

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Syarifa Wahidah Al Idrus, Rahma Rahmawati and Sri Nursakinah

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Syarifa Wahidah, Rahmawati, Sri Nursakinah,

Program Studi pendidikan kimia FKIP Universitas Mataram

Email: idahsya76@gmail.com

ABSTRACT

This study aims to analyze the water quality of the Ancar and Babakan rivers, and to formulate strategies for their control. The analyzed water quality is pH, DO (Dissolved oxygen), BOD (Biologycal Oxygen Demand), color, odor, and temperature. Samples were taken at 3 points in each river. The results of the analysis show that the Babakan and Ancar rivers are not suitable for use because they are turbid brown and turbid yellow. The smell of water is like the smell of dirt mixed with soil and the smell of mud. The results of Ancar river acidity measurements show that the pH value of water in normal conditions with an average of 6 (still within the limits of class II water quality standards) and in the Babakan river the average pH value is 8, still within the class II river water quality standards. This means that river water can still be used as a means of recreation, a place for raising freshwater fish, livestock, and agriculture. The measurement results of DO values in the Babakan river were obtained 15 mg/l and in the Ancar river 32 mg/l. A large DO value indicates that the water has good quality. Measurement of BOD value in the Babakan river obtained 16 mg / l and in the Ancar river 3 mg / l. The water quality of the Ancar and Babakan rivers is physically polluted. Chemically, the quality of the Ancar river is categorized as mildly polluted and the river Babakan is categorized as moderately polluted, so that the control strategy can be carried out by reaeriasi.

Keywords: River water quality, pollution control strategy

INTRODUCTION

Water is a natural resource that is needed by living things in all their activities. Water resources must be conserved so that they can be used for a long time. Saving and conserving water resources to maintain water quality. Water quality is a measure of the condition of water in terms of its physical, chemical and biological characteristics. Water quality also indicates the size of water conditions relative to the needs of water and human biota. Drinking water has different quality from water quality for fisheries, irrigation / irrigation, industry, recreation and so on. Clear water is not necessarily good for fish life because clear water is not the only quality requirement for fish, because many fish are found living and developing well in dirty water according to

humans. The quality of water can be determined by measuring physical parameters, chemical parameters and conducting several tests. Tests that are usually done are chemical, physical, biological, or appearance (odor and color) tests (Syukur, 2002: 51). According to Masduqi (2009), water quality can be stated with water quality parameters. These parameters include physical, chemical, and microbiological parameters.

Water suitable for daily use must meet physical, chemical and microbiological requirements. Physically, healthy water is clear, odorless, and tasteless. Chemically, healthy water is a neutral pH level and contains certain minerals and meets its quality requirements. Microbiologically, healthy water does not contain disease-causing microbes, such as E. coli, which can cause diarrhea and salmonella.

Laboratory testing is carried out for the analysis of chemical parameters of water quality. Chemical parameters of water quality that need to be measured are pH, DO, BOD and COD. Every waters needs to be tested periodically for physical and chemical parameters such as rivers. this is because rivers are waters that have quite a lot of functions. Ancar and Babakan rivers are rivers that need to be analyzed regularly, because of the position in the middle of the city of Mataram. in addition, the two rivers have quite a number of functions, including: fisheries, irrigation and disposal of domestic and industrial waste.

Mataram is a city that has developed quite rapidly, with a land area of 61.30 Km2. The city of Mataram has a population of 459314 people in 2016 and 2017 amounting to 468509 people. Over the past 2 years, the city of Mataram has experienced a significant increase in population, resulting in an increase in the need for clean water and increasing community consumption. While the land area will not increase and cause pressure on the environment heavier. Waste originating from human activities such as waste from agriculture, industry and household activities contributes to the decline in river water quality (Suriawiria, 2003).

According to Priyambada et al. (2008) river water quality is strongly influenced by increased domestic, agricultural and industrial activities due to changes in land use and domestic activities that affect BOD concentrations. Based on the description above, it is necessary to analyze the water quality of the Ancar and Babakan rivers, which are the major rivers in the city of Mataram, and formulate water pollution control strategies. The purpose of this study was to

analyze the water quality of the Ancar and Babakan rivers and formulate priority strategies for controlling river water pollution.

Some water quality observed were physical analysis (odor color and temperature), pH, DO (Dissolved oxygen), BOD (Biologycal Oxygen Demand). The quality of the water being tested can determine how the water is and its designation. Babakan River is a river in the center of Mataram City and passes through several industries such as the iron handicraft industry and the provincial hospital in the city of Mataram. Ancar River where the sample is taken is passing through the area of tofu and tempe home industries and dense residential settlements.

RESEARCH METHODS

The physical condition of the water (color, odor and temperature) and the pH test (degree of acidity) were analyzed at the water sampling location. DO and BOD analysis is done in the laboratory. Analysis of the physical condition of water is done by observing directly the color, odor and temperature. The color of water can be observed visually (directly) or measured using the platinum cobalt scale (expressed in units (PtCo)), by comparing the color of the water sample and the standard color (Effendi, 2003). The odor which is one of the physical parameters can be observed by direct organoleptic analysis method. Odor observation is done by comparing the odors of each sample, the odor indicator is used as a rating limit. The indicator commonly used is pure water. Temperature test is carried out directly on location using a thermometer. PH test (degree of acidity) using universal pH paper or pH meter. DO test is done using iodometric titration. DO test in addition to titration can also be done directly measured with a DO meter. The BOD test is carried out with the same treatment as the DO test, after which the water sample is stored for 5 days and the DO test is on the fifth day. Difference in DO values for days 5 and 0 is the BOD value.

$$DO_0 = \frac{Volume\ titran\ x\ N\ Na2S2O3\ X\ 8\ X\ 1000}{100}$$

$$DO_5 = \frac{volume\ titran\ x\ N\ Na2S2O3\ X\ 8\ X\ 1000}{100}$$

$$\textbf{BOD} = DO_5 - DO_0$$

DISCUSSION

This study aims to determine the water quality of the Babakan and Ancar rivers. Babakan river is one of the rivers in the city of Mataram. This river is often used by residents for daily needs such as bathing, washing, fishing and growing water plants such as water spinach and waste water disposal. Ancar River is also a river that has the same uses as the Babakan river. The use of water from both rivers for all day-to-day activities does not seem to be in accordance with water quality standards. From the results of the analysis at three points of river water sampling obtained the following data:

Table 1. Results of Babakan river water quality analysis

No	Location	Babakan river	Ancar river
1.	color	Dark chocolate	Turbid yellow
2.	odor	Dirt mixed with soil	Smelled of mud
3.	temperature	28°C	27 °C
4.	pH	8	6
5.	DO	15 mg/l	32 mg/l
6.	BOD	16 mg/l	3 mg/l

Color and smell

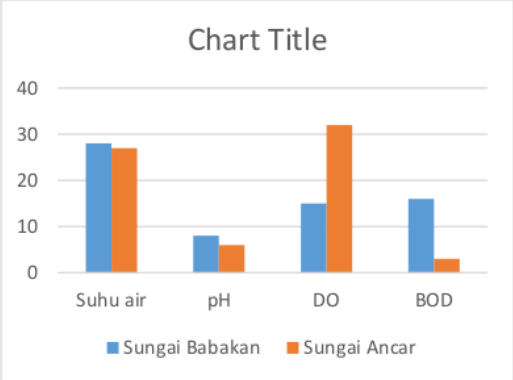
Based on color observation, Babakan river water is murky brown. so that the river water is not suitable for daily needs. Healthy water is clear water. Meanwhile, Ancar river water has a murky yellow color. Water color changes can be caused due to the presence of organic materials. Examples of organic matter in waters are plankton and humus. and In addition, changes in the color of the waters caused by the content of inorganic materials. Examples of inorganic materials are oxides on iron causing reddish colors in waters, and manganese oxides causing brownish /

blackish colors in waters. In addition, the change in green color in the waters can be caused by calcium carbonate from calcareous areas. According to (Effendi, 2003) the brownish color of water is caused by the presence of organic materials, such as tannins, lignin, and humus derived from the weathering process of dead plants.

Changes in the color of the waters caused by algal blasting. The color of the waters can indicate the presence of different substances that dissolve in water and affect water quality. The color of water can be observed directly or observed in the laboratory. observations in the laboratory use the cobalt platinum scale, by comparing the color of the water sample and the standard color (Effendi, 2003). changes in the color of the water in the Babakan and Ancar rivers are probably caused by the disposal of community waste. Waste disposed of in the form of water in the form of medical waste, household waste and industrial waste. Domestic and industrial waste contains organic waste. organic waste causes changes in the color of river water.

Besides color, odor is an indicator of water quality. Babakan river water samples emit odor of dirt mixed with soil. Similarly, the Ancar River smells mud. Because water samples are not suitable for daily needs. Smelling water will disturb the smell of the surrounding community and not aesthetically pleasing. In addition to color, the smell of water can be an indication of water conditions, for example the fishy odor can be caused by the presence of algae in the water. Based on the Decree of the Minister of Health of the Republic of Indonesia Number 907 / MENKES / SK / VII / 2002, it is known that drinking water that can be consumed by humans is odorless. Some of the main sources of odor in river water are hydrogen sulfide and anaerobic decomposition organic compounds. Anaerobic decomposition results in the appearance of odors. The odor is one of the signs of poison gas. And odors indicate anaerobic conditions that have adverse effects on health or environmental impact (Vanatta, 2000).

In the Babakan river, the appearance of odor is caused by the decomposition of anaerobes from waste disposal in the river. Similarly, the Ancar river. Waste disposed of in the waters of the Ancar and Babakan rivers is dominated by Organic Waste. Organic waste comes from tofu-making home industry.



Graph 1. Results of Ancar and Babakan river water quality analyzes

Temperature and pH

Temperature and pH are other physical factors that are directly observed. Temperature is an important factor in regulating life processes and absorption in organisms. Normal water temperature is the temperature of water that allows living things to metabolize and multiply (Day & Underwood, 2002). Therefore, temperature is a very important physical factor in water. From the graph, it can be seen that the differences are quite clear from the analysis of the Ancar and Babakan rivers. Babakan river water temperature is higher than the Ancar river because the entry of more waste. Besides that the Babakan river is more open and exposed to direct sunlight.

The measurement results of the acidity (pH) level of Ancar river water are 6 in the range of class II water quality standards. And the Babakan river has an average pH of 8, including the criteria for class II river water quality. So that river water can still be used for recreational facilities, freshwater fish farming, animal husbandry and agriculture. The degree of acidity (pH) of water affects the level of water fertility. Low pH waters will become less productive waters. Conversely waters with high pH (bases) are suitable for fish farming. At low pH (acid) the dissolved oxygen content will decrease. The opposite happened in an alkaline atmosphere. So, the degree of acidity (pH) greatly affects water quality.

Dissolved Oxygen / DO

Dissolved Oxygen / DO is the amount of dissolved oxygen in a waters. DO is needed by all living bodies for breathing and metabolic processes in water. Besides DO is used to exchange

substances and produce energy for growth and breeding. Oxygen is also needed for the oxidation of organic and inorganic materials in the aerobic process. The main source of oxygen in waters is the result of photosynthesis of aquatic organisms and the process of exchange from the air (Salmin, 2000). In the river Babakan obtained DO value of 15 mg / l. And the Ancar river obtained DO value of 32 mg / l. The greater DO value in water, indicating that the water has good quality. Conversely, if the DO value is low, it can be seen that the water has been polluted. In this study DO measurements were carried out by titration. The titrant used for titration is 0.025 N. Na2S2O3 solution. From the DO analysis, the Ancar river has a higher DO than the Babakan river. So that the Ancar river has better water quality than the Babakan river.

The amount of dissolved oxygen in the liquid is affected by the amount of waste entering and the process of water body variation. A good reairation process will maintain the value of dissolved oxygen / DO remains good. The more open condition of the Ancar river causes direct sunlight to enter. The process of photosynthesis and air exchange works well in the Ancar river. High levels of organic material waste in water bodies causes low DO values. Because organic matter in water will be destroyed by bacteria using dissolved oxygen (DO).

Biological Oxygen Demand / BOD

BOD is the amount of oxygen needed by organisms in the waters. Aquatic organisms need oxygen when breaking down organic matter. The breakdown of organic matter means that the organism uses organic material as food and its energy is obtained from the oxidation process (Pescod, 1973). Based on observations obtained BOD values in the Babakan river 16 mg / l. Then the BOD value in the Ancar river is 3 mg / l. Based on the results of BOD in the Babakan river is at the level of moderate pollution and the Ancar river at a low level of pollution. This condition is caused by the Babakan river passing through hospitals and industries such as the iron craftsman industry and the tempeh tofu industry. Babakan River has a higher level of pollution than Ancar River.

BOD parameters are used to determine the level of waste water pollution. BOD determination is a trace of pollution flow from upstream to estuary level. During the BOD examination, the samples examined were attempted to be free from outside air to prevent contamination of oxygen in the free air. BOD examination is considered as an oxidation procedure.

Where living organisms act as a medium to break down organic matter into CO2 and H2O. The oxidation reaction during BOD examination is strongly influenced by the population and temperature. Therefore, the BOD examination is conditioned at room temperature which is a common temperature in nature. Theoretically, the oxidation process must be perfect so that organic matter breaks down into unlimited CO2 and H2O. In the laboratory, the time used is 5 days. Assuming that for 5 days, the percentage of reaction is quite large from the total BOD. The 5 day BOD value is part of the total BOD. And the 5-day BOD value is 70 - 80% of the total BOD value (Sawyer & Mc Carty, in Pipin, et al. 2015). Determination of incubation time of 5 days, to reduce the yield of ammonia (NH3) oxidation is quite high . Because ammonia as a by-product can be oxidized to nitrite and nitrate. can then influence the results of BOD determination.

Table 2. Water pollution levels based on DO and BOD values

Pollution level	parameter	
	DO (ppm)	BOD(ppm)
Low	>5	0-10
Sedang	0 – 5	10-20
High	0	25

Source : Wirosarjono (1974)

Water Pollution Control Strategies

Water pollution control strategies are efforts that can be done to prevent and tackle water pollution. Then the recovery of water quality occurs according to its natural conditions. So that the river water quality is maintained.

Based on survey results and community interviews around the waters. Some efforts to control water pollution are as follows:

a. The biggest contributor to waste to water is the community, especially communities around the watershed (DAS).

b. Resource management and control of water pollution have received less attention from the relevant agencies.

c. Community sanitation around the watershed is still so low that it needs government attention.

d. Control of waste water disposal needs to be considered. Such as household and industrial waste so that the waters still meet quality standards.

e. Increase the rate of river reaeration with simple or high technology. Increasing ripples or currents in river flow is one of the simple technologies using the help of river rocks. River rocks are placed in the waters thereby increasing water turbulence. Increased turbulence will make the reaeration rate higher. High reaeration rate can increase dissolved oxygen (DO) in a waters (Marganingrum, D, et al. 2018).

Conclusion

1. The physical water quality conditions of the Ancar and Babakan rivers (color and odor) indicate the quality of polluted river water.

2. Ancar River shows the pH of water under normal conditions with an average of 6 in the range of class II water quality standards. In the Babakan river, pH around 8 is still within the threshold of class II river water quality criteria. Class II waters can be used for recreation, freshwater fish farming, animal husbandry and agriculture.

3. Chemically, the Ancar river is mildly polluted and the Babakan river is moderately polluted.

4. Water pollution control strategies need to be carried out to prevent greater pollution.

References

Dyah marganingrum, Muhammad rahman djuwansah and asep mulyono. 2018. Assessment of the jangkok river and Ancar river on organic pollutants. Journal of environmental technology vol. (1) January 2018.

Effendi, Hefni. 2003. Water Quality Study (For Water Resources and Environmental Management). Yogyakarta Kanisius.

Fardiaz, Srikandi. 1992. Water and Air Pollution. Yogyakarta: Canisius.

Mahyudin, Soemarno, Tri Budi Prayogo.2015. Analysis of Water Quality and Metro River Water Pollution Control Strategies in Kepanjen City, Malang Regency. J-PAL, Vol. 6, No. 2, 2015.ISSN: 2087-3522.E-ISSN: 2338-1671,

Regulation of the Minister of Health of the Republic of Indonesia Number 492 / MENKES/PER/IV/2010 Regarding Drinking Water Quality Requirements. Jakarta.Mapurna.id/files/SK_ permenkes _492 _ 2010 . pdf. Accessed May 20 2017

Priyambada, I, B, Oktiawan, W, Suprapto, R, P, E, 2008, Analysis of the Effect of Different Land Use Functions on River BOD Contamination Load (Case Study of the Serayu River in Central Java), Precipitation Journal, Vol. 5, No. 2, pp. 55-62, accessed November 7, 2011, http://isjd.pdii.lipi.go.id/admin/ journal / 52085562.pdf

Pipin Supenah, Endang Widyastuti and Rawuh Edy Priyono. Study of Condong River Water Quality affected by Trusmi Batik Industrial Waste Liquid Waste. Biosfera 32 (2) May 2015 (swaayer)

Rahayu, Tuti. 2010. The Characteristics of Shallow Well Water in the Kartasura Region and Its Purification Efforts. Journal of Science and Technology Research, no 5 Hal: 104-124.

Suriawiria, Unus. 2003. Water in a Healthy Life and Environment. Alumni Publisher. Bandung

Salmin 2005. "Dissolved Oxygen (DO) and Biological Oxygen Needs (BOD) as One Indicator for Determining Aquatic Quality ". Journal of Oseana, 30. 21-26

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