EFFECTIVENESS OF PHYTOREMEDIATION METHODS WITH VARIATION OF AMOUNT OF HEACH HONEY PLANTS (EICHHORNIA CRASSIPES) TO REDUCE COD EFFLUENT IPAL PARAMETERS IN KAWEDAN PUBLIC HEALTH CENTER, KABUPATEN MAGETAN

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Abstract. Biological treatment processes can use microorganisms and phytoremediation of aquatic plants which are now widely used to reduce various levels of toxic metals or organic substances. This aquatic plant is considered quite easy to obtain and effective in absorbing various toxic metals and organic substances into plant tissues. To determine effectiveness of the phytoremediation method with variations in the number of water hyacinth plants (Eichhornia crassipes) to reduce the COD Effluent parameters of IPAL at the Kawedanan Health Center, Magetan Regency. This type of research is a quassi experimental research study, namely research that refers to the treatment of reducing COD levels in puskesmas waste water before and after being treated. This type of research is an experiment or trial using the phytoremediation method, namely (Eichhornia crassipes). This descriptive analysis is used to compare the reduction in COD parameters before treatment and after treatment using the water hyacinth phytoremediation method and then compared which is presented in the form of descriptive analysis and discussion. The object of this research is community health center wastewater and COD examination samples with 3 replications without treatment at 0 days and 7 days and treatment every 7 days. Based on pre-research that I conducted within 7 days, the effectiveness of COD levels could decrease to a smaller level. The overall average reduction in COD levels during treatment was 62 mg/l. The overall effectiveness of water hyacinth utilization in reducing COD levels in the IPAL effluent at the puskesmas is 79%.

Keywords: Public Health Center Waste, IPAL, Phytoremediation, Water Hyacinth, COD

1 INTRODUCTION

Community Health Center service activities certainly produce organic waste, chemical waste, so that each Health Center also adjusts the IPAL requirements used according to the waste that is most produced. The Kawedanan Health Center produces a lot of chemical waste which causes high parameters of wastewater, but the performance of the IPAL in the Kawedanan Health Center is still not optimal because one of the parameters measured for the quality of wastewater treatment is still high (Public Health, 2015).

The Kawedanan Health Center provides health services including Inpatient, Outpatient, 24-hour Emergency Unit (ER), Examination Room, Mother and Child Services, Pharmacy, Sanitation Clinic. In addition, there are other supporting facilities which include warehouses, ambulances, kitchens, fire extinguishers, clean water supply and wastewater treatment plants (Mustofa et al., 2023). The Wastewater Treatment Plant (IPAL) must be properly maintained so that it can work optimally so that the effluent produced can comply with established quality standards and not interfere with the health of the surrounding community (Syaid, 1999) (Khanal, L. N el al., 2021).

Wastewater that is discharged into river bodies must comply with predetermined quality standards and not contain harmful bacteria, viruses, chemicals so that it does not contaminate the river body and does not cause the surrounding community to contract disease (Santosa et al, 2023). In order for IPAL to operate properly, several empowerment and management tools are needed such as an IPAL management institution, good human resources, and supported by financing (Susilo.H, et al.,2021) With the support of good costs from the company, it can help the performance of IPAL to be more optimal and good (Asmadi and Suharno, 2012) (Pandey, V. C, 2022).

Of the many parameters measured to determine the quality of wastewater treatment, one of them is the BOD and COD parameters in wastewater. Waste water containing high levels of COD indicates that the water contains large amounts of organic pollutants. In addition, wastewater containing high COD levels contains many microorganisms or pathogens (Ridho, W. O et al., 2019). These pathogenic microorganisms themselves can cause various diseases in humans. Most diseases that arise due to exposure to COD are digestive tract diseases such as cholera, dysentery, typhus and other (Siregar, 2008) (Wulan, D. R et al., 2022).

The results of an examination at the Ponorogo Regional Health Laboratory on January 18 2023 regarding the IPAL effluent of the Kawedanan Health Center stated that the COD level at the outlet was 297 mg/l. Meanwhile, the quality standard for COD content according to East Java Governor Regulation Number 72 of 2013 is 80 mg/l. So that the COD level of the Kawedanan Health Center does not meet the requirements because it exceeds the existing quality standard, which is 73% of the requirements, so waste treatment must be carried out (Fuad Zakiyah, 2017) (Widiyanto, A., & Otok, B, 2023).

The results of the pre-research conducted on Monday, 13 February 2023 and samples were taken on Monday, 20 February 2023 showed that there was a decrease in COD levels in the waste of the Kawedanan Health Center. Based on the background above, the authors are interested in conducting research on reducing COD levels in the wastewater of the Kawedanan Health Center entitled Effectiveness of the Phytoremediation Method with Variations in the Number of Water Hyacinth Plants (Eichhornia crassipes) to Reduce COD Parameters of IPAL Effluent at the Kawedanan Health Center, District Magetan.

2 RESEARCH METHODS

This type of research is a quassi experimental research study, namely research that refers to the treatment of reducing COD levels in puskesmas waste water before and after being treated. This type of research is experimental or trial using the phytoremediation method namely water hyacinth (Eichhornia crassipes). The sample used in this study was IPAL effluent which had been treated with 15 water hyacinth plants and 20 water hyacinth plants. In this study, the variables that were affected were the effluent wastewater from the IPAL at the Kawedanan Health Center, Magetan Regency, and the variables that affected the parameters of the cod content of the wastewater. To obtain the data, a laboratory examination was carried out on samples of IPAL effluent water that had been treated with water hyacinth. Samples were taken every 7 days for 4 times. All data were analyzed descriptively compared to East Java Governor Regulation Number 72 of 2013 Quality Standard 80 mg/l, then described in narrative form, and then conclusions were made.

3 RESULT

Table 1. Results of Analysis of Decreased COD Levels on Day 7.1

Pool	Result	Quality standars	Information
Control	89 mg/l	80 mg/l	Exceeds the quality standars
Pool 1	73 mg/l	80 mg/l	Below the quality standard
Pool 2	69 mg/l	80 mg/l	Below the quality standard

Based on table 1, the results of a decrease in COD levels on day 7.1 in pond 1 and pond 2 decreased, but in the control pool the cod levels still exceeded the quality standard.

Table 2. Results of Analysis of Decreased COD Levels on Day 7.2

Pool	Result	Quality standars	Informa-tion
Pool 1	69 mg/l	80 mg/l	Below the quality standard
Pool 2	62 mg/l	80 mg/l	Below the quality standard

Based on table 2, the results of a decrease in COD levels on day 7.2 in pond 1 and pond 2 decreased.

Table 3. Results of Analysis of Decreased COD Levels on Day 7.3

Pool	Result	Quality standars	Informa-tion
Pool 1	62 mg/l	80 mg/l	Below the quality standard
Pool 2	54 mg/l	80 mg/l	Below the quality standard

Based on table 3, it shows that the results of a decrease in COD levels on day 7.3 in pool 1 and pool 2 decreased.

Table 4. Results of Analysis of Decreased COD Levels on Day 7.4

Pool	Result	Quality standars	Informa-tion
Pool 1	58 mg/l	80 mg/l	Below the quality standard
Pool 2	49 mg/l	80 mg/l	Below the quality standard

Based on table 4 it is known that pool 1 and pool 2 showed a decrease in cod levels. It can be said that it exceeds/does not exceed the quality standard because the number of milli per gram refers to East Java Governor Regulation Number 72 of 2013. The maximum limit for cod content in wastewater is 80 mg/l.

Information :

0: First day before treatment
7.1: First seven days after treatment
7.2: Second seven days after treatment
7.3: Seven third days after treatment
7.4: Seven fourth days after treatment
Pool 1 : The treatment pond contained 15 water hyacinths
Pool 2 : The treatment pond contained 20 water hyacinths

4 DISCUSSION

The research test method used for COD analysis samples is taken every 7 days with 4 samplings. Sampling was carried out directly in the tarpaulin pool and at that time the samples were sent directly to the laboratory. After being examined in the laboratory, it was shown that the COD content in the IPAL effluent before treatment was very high and exceeded the quality standard. Meanwhile, after the treatment with water hyacinth, the COD content in the IPAL effluent decreased (Semvimol, N et al., 2014) (Zakiah, , ey al.,2017). The COD effluent parameters of IPAL after being treated with water hyacinth as many as 15 plants experienced a significant decrease with a total percentage decrease of 78.05%.

The COD effluent parameter of IPAL after being treated with water hyacinth as many as 20 plants experienced a significant decrease with a total percentage of 81.8%. Based on laboratory results and the average reduction in COD effluent parameter, the most optimal IPAL is in pond 2 with 20 water hyacinth plants. Overall, the reduction in COD effluent levels of the IPAL after treatment was 62 mg/l with an efficiency of 79%.

Compared with previous research journals, the effectiveness of water hyacinth in reducing cod levels in community health center ipal effluent was more effective by using 20 water hyacinth plants.

5 CONCLUSION AND RECOMMENDATION

Based on the research results above, it can be concluded, The IPAL effluent liquid waste taken at the Kawedanan Health Center before being treated using water hyacinth plants has a quality that exceeds the quality standard set by the Governor of East Java Regulation Number 72 of 2013, namely the quality standard of 80 mg/l. The water hyacinth plant (Eichhornia crassipes) affects the process of improving the quality of IPAL effluent based on a decrease in COD levels, but on the 15th day the water hyacinth plant must be replaced with a new one because the life span of a good water hyacinth plant lasts only 14 days. The average reduction in COD levels during treatment was 62 mg/l. The overall effectiveness of the use of water hyacinth in reducing COD levels in the IPAL effluent at the puskesmas is 79%.

Based on the results of the research above, it can be recommended : There needs to be a process of cleaning the Wastewater Treatment Plant (IPAL) once every two weeks on a regular and periodic basis. It is necessary to have a control tub at the Wastewater Treatment Plant (IPAL) at the Kawedanan Health Center and check it once a week. After the 15th day the water hyacinth plants need to be replaced with new water hyacinth plants because the most effective life span of water hyacinth plants is only 14 days. Researchers need to consider the research location, temperature and weather so that research can run optimally. Suggestions for future researchers, it is expected to develop research with variations in the number of water hyacinth plants and variations in research time.

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