Indonesian Journal of Nutritional Epidemiology and Reproductive
ISSN: 2620-8261 (Online)
Vol. 6 No.1 January 2023, pp.36-42

Utilization of water hyacinth In Reducing Levels of Chemical Oxygen Demand And Acidity of Tofu Industry Liquid Waste

Muhammad Ali Sodik*, Haslinda Janis Kusuma
Institut Ilmu Kesehatan STRADA Indonesia
*Corresponding Author : alisodik20212@gmail.com

ABSTRACT

One of the causes of the environmental problems is the tofu industry. Disposal of liquid waste in the river causes water pollution. To find out how far the burden of pollution in wastewater is by measuring COD and pH. In this case aquatic plants such as water hyacinth are an alternative way to overcome the waste pollution. Aim from this study the use of water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) and acidity (pH) tofu industry liquid waste in Tawang Village, Wates District, Kediri Regency. Based on the type of this research istrue experimental. This research design uses True post test only design with the focus of his research directed to be analyzed the use of water hyacinth in reducing levels of COD and pH of tofu industry wastewater with 3 types of water hyacinth variations in treatment namely 5, 7 and 9 applied with 5L of tofu wastewater is then tested by a laboratory. Analysis of the data used is One Way Anova. The findings found the average levels of COD and pH after the administration of water hyacinth with plant variation 9 is 865.80 mg / l and 7.7220 mg / l, plant variation 7 is 4617.80 mg / l and 7.7180 mg / l , plant variation 5 is 6422.00 mg / l and 7.7180mg / l. Based on statistical tests using One Way Anova get a value of 0,000 <0.05 so it is concluded that the averageCOD level of liquid waste of tofu industry which are given water hyacinth significantly different. Based on statistical tests using One Way Anova get a value of 0.001 <0.05 so it can be concluded that the averagepH of tofu industry liquid waste which are given water hyacinth significantly different. The results of this study can be a community solution to problems in the use of water hyacinth to reduce levels of COD and pH so that the quality of water contaminated by industrial waste can be overcome.

Keywords: Tofu liquid waste, COD levels and pH

Received November 12, 2022; Accepted December 20, 2022

INTRODUCTION

The current environmental problems are increasing one of the causes, namely the growth of small and medium enterprises (SMEs) which is getting bigger. Tofu industry is widely available in Indonesia. The greater the growth of small and medium industries, the resulting waste will increase, the resulting waste is discharged into the environment without prior treatment, as a result the surrounding community environment becomes damaged.(Hartati, 2013)

Tofu raw materials are soybean, vinegar, and water. The protein content in soybeans and vinegar added to the tofu making process will cause tofu liquid waste to produce unwanted odors. The stench in the tofu liquid waste is caused by the breakdown of high sulfur-containing proteins by natural microbes. So there is a need for waste treatment before being discharged into the environment (Nurtiyani 2011).

One way to find out how far the pollution load is in wastewater is to measure COD (Chemical Oxygen Demand), BOD (Biological Oxygen Demand) is the amount of oxygen needed by microorganisms to oxidize organic compounds in waste. (Didik Sugeng Purwanto, 2018).

According to Nuriswanto (2014) in his research that tofu industry wastewater has a COD (Chemical Oxygen Demand) number between 1940-4800 mg / L, BOD (Biological Oxygen Demand) between 1070-2600 mg / L, insoluble solids between 2100-3800 mg / L and pH between 4.5-5.7. This condition is very far from East Java governor regulation No 72 of 2013 which states that the quality standard of tofu wastewater that can be discharged into water bodies is BOD 150 mg / L, COD 300 mg / L, .TSS 100 mg / L, Ph 6 - 9

According to Ratnani (2013) in examining the ability of water hyacinth to treat tofu wastewater, it can be concluded that water hyacinth can be used to treat tofu liquid waste. In the study water hyacinth can also increase the growth of water hyacinth. Besides being detrimental because it quickly covers the surface of the water, water hyacinth is apparently also beneficial because it is able to absorb organic, inorganic and other heavy metals which are pollutants.

In 1 day the tofu home industry needs soybeans to produce ± 80 kg of tofu. Tofu waste produced there are two types, namely liquid and solid waste, for liquid waste is discharged directly to the pond and then to the river flow, so that the river becomes turbid and creates a pungent odor. As for solid waste in the form of pulp that is used for making tempe gembos and the rest is for chicken farmers for animal feed mixtures. Lack of knowledge of home industry tofu owners to manage tofu wastewater before environmental discharges are issues that need to be addressed.

The simplest way to overcome the case is by utilizing water plants, water hyacinth which functions to absorb chemicals that can be applied to environmental pollution, one of which is pollution from tofu industry waste. Considering that the tofu industry is a small scale industry, it requires a waste treatment plant with simple tools, low operational costs, economic value and environmentally friendly.

Based on the background and description above, this research will be carried out utilizing water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) and Acidity Level (pH) of tofu industry wastewater in Tawang Village, Wates District, Kediri Regency.

MATERIALS AND METHODS

In the research used is this research is true experimental, This research design uses True post test only design. True experimental design post test only design isexperimental research using a control group and the sample chosen is not random (random), with the type of test control design.

RESULTS

1. Kadar COD (Chemical Oxygen Demand) liquid waste of tofu industry

Table 2. Levels of COD (Chemical Oxygen Demand) liquid waste of tofu industry in Kediri Regency.

Deuteronomy	COD analysis		
	Treatment 1	Treatment 2	Treatment 3
Repetition 1	861	4600	6425
Repetition 2	875	4653	6419
Repetition 3	859	4612	6416
Repetition 4	863	4608	6427
Repetition 5	871	4616	6423
COD average	865.80	4617.80	6422.00

Based on table 2, the results show that at 5 repetition levels COD (Chemical Oxygen Demand) liquid waste of tofu industry in Kediri Regency each treatment obtained different results where the value of 865.80 mg / l in treatment 1, treatment 2 was 4617.80 mg / l while treatment 3 was 6422.00 mg / l.

2. Kadar The degree of acidity (pH) of the liquid waste of tofu industry

Table 3. Content The acidity (pH) of the tofu industry's liquid waste in Kediri Regency

Deuteronomy	PH analysis		
	Treatment 1	Treatment2	Treatment 3
Repetition 1	7.71	7.72	7.72
Repetition 2	7.73	7.71	7.73
Repetition 3	7.72	7.73	7.71
Repetition 4	7.72	7.71	7.72
Repetition 5	7.73	7.72	7.71
Average Ph	7.7220	7.7180	7.7180

Based on table 3, the results show that at 5 repetition levels The acidity (pH) of the tofu industry's liquid waste in Kediri Regency each treatment obtained different results where the value of 7.7220 mg / l in treatment 1, treatment 2 amounted to 7.7180 mg / l while treatment 3 amounted to 7.7180 mg / l.

A. Statistical Test Results

1. Gift water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) tofu industry wastewater.

a. **Normality test**

Table 4. Use normality test water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) tofu industrial wastewater

Tests of Normality				
COD_ treatment		Kolmogorov-Smirnova		
		Statistics	Df	Sig.
COD	Treatment 1	258	5	.200 *
	Treatment 2	.335	5	.069
	Treatment 3	.188	5	.200 *
* This is a lower bound of true significance.				
a. Lilliefors Significance Correction				

Based on the normality test, it is obtained the significance value> 0.05 so that it can be concluded that the data contribute normally.

b. **Homogeneity Test**

Table 5. Homogeneity Test of the use of water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) tofu industrial wastewater

Levene Statistics	df1	df2	Sig.
1,984	2	12	.180

Based on the homogeneity test, the significance value is 0.180> 0.05 so that it can be concluded that the data is homogeneous.

c. **Anova Test**

Table 6. Anova usage test water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) tofu industrial wastewater

ANOVA				
	Df	Mean Square	F	Sig.
Between Groups	2	40170000,067	246240,295	.000
Within Groups	12	163,133		
Total	14			

Based on statistical tests using One Way Anova get a value of 0,000 <0.05 so it can be concluded that the average COD (Chemical Oxygen Demand) levels of liquid waste from tofu industry which are given water hyacinth (Eichhornia Crassipes) significantly different.

2. Gift water hyacinth (Eichhornia Crassipes) in reducing the acidity (pH) of the liquid waste of tofu industry

a. **Normality test**

Table 7. Normality test for use water hyacinth (Eichhornia Crassipes) in reducing the acidity (pH) of the liquid waste of tofu industry

Tests of Normality				
Treatment_pH		Kolmogorov-Smirnova		
		Statistics	Df	Sig.
pH	Treatment 1	.231	5	.200 *
	Treatment 2	.231	5	.200 *
	Treatment 3	.231	5	.200 *
* This is a lower bound of true significance.				
a. Lilliefors Significance Correction				

Based on the normality test, it is obtained the significance value> 0.05 so that it can be concluded that the data contribute normally.

b. **Homogeneity Test**

Table 8. Homogeneity Test of the use of water hyacinth (Eichhornia Crassipes) in reducing the acidity (pH) of the liquid waste of tofu industry

Levene Statistics	df1	df2	Sig.
.000	2	12	1,000

Based on the homogeneity test, it is obtained the significance value of 1,000> 0.05 so that it can be concluded that the data are homogeneous.

c. **Anova Test**

Table 9. Test of ANOVA usage water hyacinth (Eichhornia Crassipes) in reducing the acidity (pH) of the liquid waste of tofu industry

ANOVA				
	Df	Mean Square	F	Sig.
Between Groups	2	.000	.381	.001
Within Groups	12	.000		
Total	14			

Based on statistical tests using One Way Anova get a value of 0.001 <0.05 so it can be concluded that the average acidity (pH) of tofu industry liquid waste which are given water hyacinth (Eichhornia Crassipes) significantly different.

DISCUSSION

COD (Chemical Oxygen Demand) Level of Liquid Waste of Tofu Industry

Based on the results of the study found that the levels of COD tofu industrial liquid waste in the fifth repetition of experiments using 3 treatments the average results obtained in the first treatment using a variation of water hyacinth plant 9 that is 865.80 mg / l, the second treatment using a variation of water hyacinth plant 7 that is 4617.80 mg / l and the third treatment using the variation of water hyacinth plant 5 is 6422.00 mg / l, according to which East Java governor's regulation number 72 of 2013 concerning the standard quality of wastewater for industry and / or other business activities COD 300 mg / l.

Water from industry carries a number of solids and particles both dissolved and precipitated. This material is coarse and fine. Water is often turbid colored and the temperature is high. Water that contains toxic and dangerous chemical compounds has its own characteristics. Polluted wastewater provides characteristics that can be identified visually or through laboratory examinations. Visual identification can be known through turbidity, water color, taste, odor that arises, and other indications. Meanwhile, laboratory identification (laboratory examination) is marked by a change in the chemical nature of water which contains toxic and dangerous chemicals in concentrations that exceed the recommended limits (Dr. Budiman Chandra, 2017).

Tofu is obtained through the process of coagulation (deposition) of soy milk protein, the ingredients used are tofu stone (CaSO4), Vinegar Acid (CH3COOH) and MgSO4. In general the process of making tofu includes soaking, grinding, cooking, filtering, coagulating, molding / hardening and cutting. the purpose of adding vinegar to the process of making tofu is to develop starch, make tofu more dense, and unify starch. (Kafadi, 2016)

Tofu industry is an industry that uses a lot of water in its production process both as a washing material, a cooler and a raw material for its production. The water used in the production process is ± 25 L per 1 kg of soybean raw materials. Considering soy as a raw material for tofu that contains protein (34.9%), carbohydrates (34.8%), fat (18.1%) and other nutritional ingredients. As a result, the resulting liquid waste can contain high organic matter.(Nuriswanto 2014).

From the substances contained in the tofu waste shows pollutants are classified as organic substances. So the organic substance is what causes the COD content(Chemical Oxygen Demand) does not meet the requirements if it is discharged to the shipping company.

Acid Content (pH) of Liquid Waste of Tofu Industry.

Based on the results of the study found that the levels of COD tofu industrial liquid waste the fifth repetition of experiments using 3 treatments obtained the average results in the first treatment by using a variation of water hyacinth plant 9 that is 7.7220 mg / l, in the second treatment using a variation of water hyacinth plant 7 that is 7.7180 mg / l, whereas in the treatment thirdly using a variation of water hyacinth plant 5 ie 7.7180 mg / l, according to which East Java Governor Regulation Number 72 of 2013 concerning the standard quality of wastewater for industry and / or other business activities Ph 6.0 - 9.0 mg / l.

One parameter that influences the quality of tofu liquid waste is pH. In the process of making tofu, vinegar was added. Industrial wastewater knows its nature tends to be acidic, in this acidic state volatile substances will be released. This results in tofu industry's liquid waste emitting a foul odor. pH is very influential in the process of waste treatment. Stipulated quality standards 6-9. The effect that occurs when the pH is always low is a decrease in dissolved oxygen (Effendi, 2013).

The pH value is a controlling factor that determines the biological ability of microalgae to utilize nutrients. A pH value that is too high for example, will reduce the photosynthetic activity of microalgae. Algae photosynthesis is the process of taking CO2 dissolved in water, and results in a decrease in CO2 dissolved in water. CO2 reduction will increase pH (Herlambang, 2015).

Provision of Water Hyacinth (Eichhornia Crassipes) in Lowering COD (Chemical Oxygen Demand) Tofu Industry Liquid Waste.

Based on the normality test, it is obtained the significance value> 0.05 so that it can be concluded that the data contribute normally. Based on the homogeneity test, the significance value is 0.180> 0.05 so that it can be concluded that the data is homogeneous. Based on statistical tests using One Way Anova get a value of 0,000 <0.05 so it can be concluded that the averageCOD (Chemical Oxygen Demand) levels of liquid waste from tofu industry which are given water hyacinth (Eichhornia Crassipes) significantly different.

Water hyacinth can utilize organic substances contained in tofu liquid waste by absorbing organic substances contained in tofu liquid waste for food. The COD concentration may decrease due to the absorption of water hyacinth. Oils and fats that pollute water are often put into groups of solids. Namely solids that float above the surface of the water. The oil contained in water can come from various sources, including tofu industry liquid waste. Oil does not dissolve in water, therefore if water is polluted by oil, the oil will remain afloat unless it is stranded on the ground around the tub or around the tub.

There are two expectations from the research, namely reducing pollution caused by the growth of high water hyacinth and reducing the COD content of tofu wastewater by water hyacinth. So in one activity will solve two problems at once. In this observation, a thought arose to reduce the amount of oil that existed before being treated with water hyacinth. Because oil is solid and floats on the surface of the water if too much will prevent the water hyacinth from touching the water. So that the water hyacinth root can not get enough water. Water pollution caused by oil is very detrimental because it can cause the following things: Causing reduced beam penetration into water,

Provision of Water Hyacinth (Eichhornia Crassipes) in Reducing the Degree of Acidity (pH) of Tofu Industry Liquid Waste.

Based on the normality test, it is obtained the significance value> 0.05 so that it can be concluded that the data contribute normally. Based on the homogeneity test, it is obtained the significance value of 1,000> 0.05 so that it can be concluded that the data are homogeneous. Based on statistical tests using One Way Anova get a value of 0.001 <0.05 so it can be concluded that the averageacidity (pH) of tofu industry liquid waste which are given water hyacinth (Eichhornia Crassipes) significantly different.

Basically, acidity (acidity) is not the same as pH. Acidity involves two components, namely the amount of acid, both strong and weak acids (for example carbonic acid and acetic acid), hydrogen ion concentration. pH also affects the toxicity of a chemical compound. Ammonium compounds that can be ionized are found in waters that have a low pH. Ammonium is non-toxic, but in alkalis (high pH) more ionized and toxic ammonia is found. (Tebbut, 2016 in Effendi, 2015).

Most biota are sensitive to changes in pH and like pH values around 7-8.5. Abnormal pH will disturb the metabolism of plants which results in the water plants die. pH of wastewater. Before processing is acidic and affects the aquatic plants which will inhibit the

decomposition of organic matter. The pH value greatly affects the biochemical processes of the waters, for example the nitrification process will end if the pH is low. pH <4 most water plants die because they cannot tolerate low pH. Tofu processing uses vinegar so that the pH of the tofu liquid waste is very low, which is less than 4. So that this study will also use water hyacinth to process the tofu waste. (Sriyana, 2017 in Hariyanti, 2016).

Utilization of water hyacinth with three variations of plants with the same observation time was found that there was a difference in the decrease in COD and pH. The more plant variations given to tofu wastewater, the higher yields can be obtained. So that it can be concluded that there are significant differences in each variation of water hyacinth plants (Eichhornia Crassipes) which are applied to tofu liquid waste.

CONCLUSION

1. The average amount of COD and pH after the administration of water hyacinth with plant variation 9 is 865.80 mg / l and 7.7220 mg / l.
2. The average amount of COD and pH after administration of water hyacinth with plant variation 7 is 4617.80 mg / l and 7.7180 mg / l.
3. The average amount of COD and pH after administration of water hyacinth with plant variation 5 is 6422.00 mg / l and 7.7180mg / l.
4. Based on statistical tests using One Way Anova get a value of 0,000 <0.05 so it can be concluded that the average COD (Chemical Oxygen Demand) levels of liquid waste from tofu industry which are given water hyacinth (Eichhornia Crassipes) significantly different.
5. Based on statistical tests using One Way Anova get a value of 0.001 <0.05 so it can be concluded that the average acidity (pH) of tofu industry liquid waste which are given water hyacinth (Eichhornia Crassipes) significantly different.

SUGGESTION

1. For the Community
   It is hoped that the results of this study will enable the community to utilize water hyacinth as a solution to overcome the problem of water pollution caused by waste.
2. For Future Researchers
   It is hoped that further researchers will need to deepen and add more research on the effects of giving water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) and the Degree of Acidity (pH) of liquid waste of tofu industry.
3. For Educational Institutions
   It is expected that educational institutions can use the results of this study as learning input the use of water hyacinth (Eichhornia Crassipes) in reducing levels of COD (Chemical Oxygen Demand) and Acidity Level (pH) of liquid waste of tofu industry and can be developed further for further research to be more useful for readers and researchers.

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