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Tofu Wastewater Treatment Using Biocoagulant Moringa Seed Powder (Moringa Oleifera L)

Fitrisia Nora [1,2], Marhadi[1] , Endi Adriansyah[1]*, Asih Suzana[1], M. Sidik Pramono[1] , Rifqi Sufra[3] & M. Syaiful [4]

[1]Departement of Enviromental Engineering, Faculty of Engineering, University Batanghari, Indonesia.

[2]Development Planning Agency Jambi Province Regional, Indonesia.

[3]Departement of Chemical Engineering, Institut Teknologi Sumatera, Indonesia.

[4]Maintenance Plan of Mining Equipment Department, Akademi Komunitas Industri Pertambangan Bukit Asam, Indonesia.

Email address

endiadriansyah.25@gmail.com

*Corresponding author

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Abstract:

Indonesia has various types of vegetation which are used as natural coagulants or biocoagulants. Coagulants can be divided into chemical coagulants and natural coagulants (biocoagulants). Biocoagulants are more environmentally friendly and can be obtained from natural ingredients, both animals and plants, one of which is Moringa seeds. Moringa seeds or with the Latin name Moringa oleifera are a type of plant from the Moringaceae family. From several previous studies, Moringa seeds were used as a more economical and environmentally friendly wastewater treatment method. Moringa seed biocoagulant in powder form is made from ripe and old moringa seeds and contains less than 10% water. Moringa seed biocoagulant contains 4αL-rhamnosyloxy-benzylisothiocyanate and is a determinant of coagulation effectiveness. This active substance is able to absorb pollutants in waste water. This research aims to treat tofu waste with moringa seed biocoagulant in reducing pollutant parameters, namely TSS (Total Suspended Solid) and COD (Chemical Oxygen Demand). Results of the removal of pollutants from moringa seed powder biocoagulant in tofu waste water the efficiency value obtained for each TSS parameter, and the COD for the TSS parameter is 54.4%. and for the COD parameter of 14.6%, it can be concluded that the efficiency value for each parameter still does not meet the effectiveness value.

Keywords: Tofu Wastewater Treatment, Biocoagulan, Moringa seed powder, COD, TSS

1. Introduction

Indonesia has various types of vegetation which are used as natural coagulants or biocoagulants. Coagulants can be divided into chemical coagulants and natural coagulants (biocoagulants) [1]. Chemical coagulants are coagulants that are less environmentally friendly and can trigger diseases that attack the nerves of the human brain. Meanwhile,

biocoagulants are more environmentally friendly and can be obtained from natural ingredients, both animals and plants, one of which is Moringa seeds. Moringa seeds or with the Latin name Moringa oleifera are a type of plant from the Moringaceae family. From several previous studies, Moringa seeds were used as a more economical and environmentally friendly wastewater treatment method. Moringa seed biocoagulant in powder form is made from mature and old Moringa seeds and contains less than 10% water [2]. Moringa seed biocoagulant contains 4αL-rhamnosyloxy-benzylisothiocyanate and is a determinant of coagulation effectiveness [3]. Moringa plants in Jambi Province are very easy to find in various places. Many industrial business players do not know the benefits of old and mature Moringa seeds as a biocoagulant for waste water treatment.

Tofu wastewater treatment is carried out using coagulation, flocculation, sedimentation and filtration processes. Coagulation is the process of destabilizing colloids in waste water by adding coagulants to the waste water so that sediment occurs at the bottom of the settling tank [4]. Meanwhile, flocculation is a continuation of the coagulation process, where the microflocs resulting from coagulation begin to agglomerate colloidal particles into larger flocs that can be settled and this process is assisted by slow stirring. TSS (Total Suspended Solid) is generally removed by flocculation and filtration [5].

The purpose of this study was to determine the effectiveness of moringa seed powder as a biocoagulant in reducing pollutant parameters, namely the concentration of TSS (Total Suspended Solid) and COD (Chemical Oxygen Demand) in tofu wastewater and to determine the effectiveness of using moringa seed powder dois for tofu wastewater treatment as a biocogulant. to reduce these pollutant parameters. [6]

2 MATERIAL AND METHOD

2.1 Material

Type of research uses quantitative research. This study was to determine the TSS and COD content of tofu wastewater before and after treatment with biocoagulan moringa seed powder

2.2 Method

2.2.1. Sampling and Sample Preparation

Sampling of tofu wastewater is carried out at the tofu factory located at the Sulphur dike in Jambi City. The sampling is explained as follows:

1. Tofu waste water samples are taken using a tool in the form of a sample bottle made of plastic. Tofu waste water samples are taken and closed carefully.

2. The sample that has been put into a bottle is then preserved at a temperature of 4 °C and placed in the refrigerator.

3. Samples are tested in the laboratory for TSS and COD concentrations.

2.2.2. Preparation of Moringa Seed Powder

Preparation of Moringa seed powder biocoagulant is explained as follows.

1.Peel the seeds from the old Moringa fruit on the tree and then clean the epidermis (brown) to obtain white Moringa seeds.

2.Then dried in an oven at 50 °C for 6 hours, Carry out the extraction process by soaking Moringa seed powder using 200 mL of N-Hexane in a chamber while stirring, then filter it to get the residue, then dry the residue using a water bath at 70°C to ensure there is no N-Hexane present. left behind

3. The residue that has been dried, weighed 5 grams and extracted in 100 mL of distilled water. The mixture was stirred with a hot plate stirrer for 30 minutes.

4. Then do the filtering. The resulting filtrate is used as a biocoagulant.

2.3. Data Analysis

1. Sample of Aquadest Extract Solution Moringa seed powder

A total of 5 grams of Moringa seed powder was weighed and dissolved in distilled water, then stirred and then filtered. The filtrate was diluted to 100 mL and left for 15 minutes. The absorbance was then measured at the optimum wavelength. A sample of Moringa seed powder water extract solution was pipetted in 1 mL and diluted to 100 mL. and left for 15 minutes. The absorbance is then measured at the optimum wavelength

2. Then put it on the hot plate stirrer. Stirring was carried out using a hot plate stirrer at a speed of 100 rpm for 2 minutes as a quick stir. The stirring speed was then reduced to 40 rpm

for 30 minutes as slow stirring

3. After that, the sedimentation process was carried out for 60 minutes, then the filtrate above was taken and TSS and COD analysis was carried out on the sample

3. RESULT AND DISCUSSION

3.1. Preliminary Test Results of Tofu Waste Water Physically and Chemically

The initial characteristics (inlet) of tofu waste are known by measuring the chemical parameters of the tofu waste. Tofu waste was obtained directly from the collection location, Pematang Sulur Village, Jambi City. Tofu waste samples come from the process of filtering soybean juice into lumps of tofu. The chemical parameters contained in tofu wastewater from the inlet before processing are TSS of 1166.67 mg/L and COD of 11313.17 mg/L.

3.2. Biocoagulant Preparation of Moringa Seed Powder

The Moringa seeds used in this research came from the Muaro Jambi area, Sembubuk Village, Jaluko District, Jambi Province. Moringa seeds are picked directly from old brown fruit trees, then the fruit is peeled from the skin of the fruit, then the seeds inside the skin of the fruit are taken with a sickle to carry out waste water treatment experiments using the biocoagulant method in turbidity. 105 NTU Moringa seeds without skin can remove turbidity by A coagulant dose of 1 ml/L of unpeeled Moringa seeds requires a 10-fold higher dose, namely a coagulant dose of 10 mg/L. stated that the protein concentration of the unhulled Moringa seeds showed the highest value. Furthermore, the biocoagulant preparation of Moringa seed powder is explained as follows. The biocoagulant preparation process for Moringa seed powder is divided into 9, which can be seen in table 4.2.

3.3. Use of Biocoagulants in Tofu Wastewater Treatment Using Coagulation, Flocculation, Sedimentation and Filtration Methods in Tofu Wastewater

Coagulation flocculation is a process required in processing tofu wastewater to remove flocs in tofu wastewater. This process uses a hot plate stirrer at a speed of 100 rpm for 2 minutes as a quick stir. The stirring speed was then reduced to 40 rpm for 30 minutes as slow stirring. After that, the sedimentation process was carried out for 60 minutes, TSS and COD analysis was carried out on the tofu wastewater samples. The effectiveness of using Moringa seed powder solution was determined based on experiments using biocoagulants [7], [8].

3.4. The Effectiveness of Moringa Seed Powder Biocoagulant Solution Against Parameter Pollution in Tofu Wastewater

3.4.1. Parameters TSS (Total Suspended Solids)

Based on the laboratory test results in Figure 1, it is clear that the initial and final concentration of TSS parameter pollutants in tofu wastewater, the initial concentration was dose-0 1166.67, the final dose of Moringa seed powder was added, dose-1 was 570.00, dose-2 was 578.00, dose -3 604.00, dose-5 568.00, dose-10 532.00, dose-15 542.00, dose-20 536.00, dose-25 568.00 and dose-30 606.00, as for the picture The pollutant concentration of the waste parameters is illustrated in Figure 1 Decline TSS as follows.

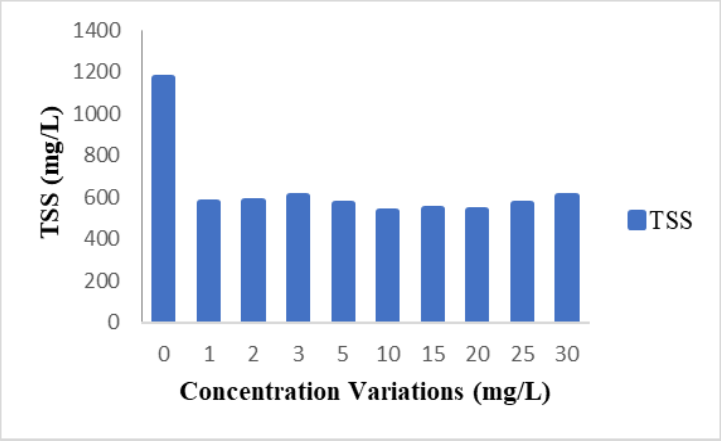

Figure 1 Graph TSS

The decrease in the TSS value of 54.4% can be seen in the Figure 2

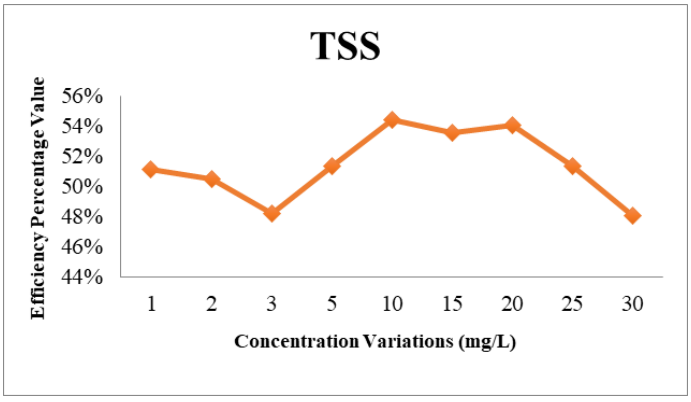

Figure 2 Graph Efficiency TSS

Figure 2 It can be seen that the initial concentration of TSS at dose-0 increased by 1166.67 mg/L, then after processing with the addition of Moringa seed powder, TSS decreased at a dose of 10 mg/L amounting to 532.00 mg/L,

the final result was that the TSS parameter removal efficiency was 54,4%, the TSS parameter concentration did not test the concentration of pollutants, from the results of the TSS parameter test the value of Moringa seed powder biocoagulant Furthermore, the calculation of the efficiency [9], [10], [11] of removal of tofu waste water pollutant parameters is described in table 4.9.

Based on the calculation results of the TSS parameter removal efficiency, the final result value for the TSS parameter was 54,4%. This result shows that the additional dose of Moringa seed powder is effective for the TSS parameter. Furthermore [12], the graphical image of the TSS parameter allowance is illustrated in Figure 4.5.

Based on figure 4.5. explained that the initial concentration of the TSS parameter was 1166.67 mg/L for the dose value for adding Moringa seed solution of 532 mg/L so that the efficiency percentage value obtained was 48% effective.

4.4.2. COD Parameters (Chemical Oxygen Demand)

Based on the laboratory test results in Figure 3, it is clear that the initial and final concentration of COD pollutant parameters for tofu wastewater [13], the initial concentration was dose-0 11313.17, the final dose of Moringa seed powder was added, dose-1 was 11080.44, dose-2 was 11038.12, dose -3 10911.18, dose-5 10592.82, dose-10 10488.03, dose-15 10276.46, dose-20 9662.90, dose-25 9959.10 and dose-30 10086.04, as for the pictures The pollutant concentration of the waste parameters [14]is illustrated in Figure 3 as follows.

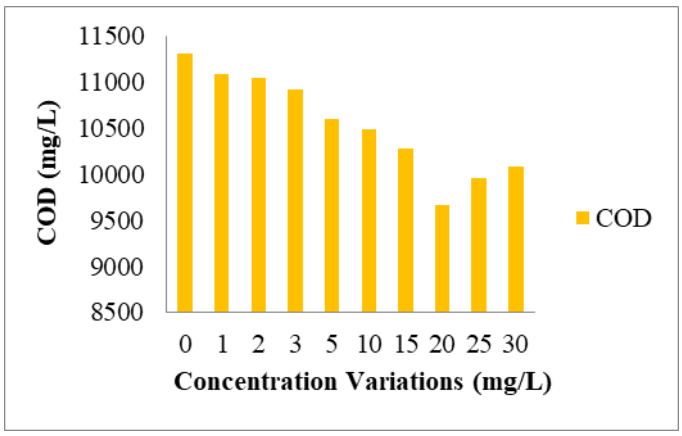

Figure 3 Graph COD

figure 4. It can be seen that the initial concentration of COD at dose-0 increased by 11313.17 mg/L, then after being processed with the addition of Moringa seed powder, COD decreased at a dose of 20 mg/L by 9662.9 mg/L. The final result for the COD parameter removal efficiency was 14. 6%,. [15] for the concentration of the COD parameter it did not test the pollutant concentration, from the results of the COD parameter test the value of the biocoagulant processing of Moringa seed powder still did not meet environmental quality standards. This result shows that the additional dose of efficiency moringa seed powder is very effective for the COD parameter. Furthermore, the graphic image of the COD parameter allowance is illustrated in figure 4.

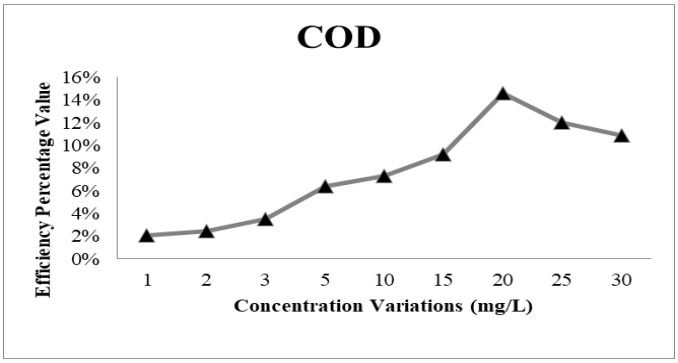

Figure 2 Graph Efficiency COD

Based on figure 4.9. explained that the initial concentration of the COD parameter was 11313.17 mg/L for the dose value of the addition of Moringa seed solution of 9662.9 mg/L so that the efficiency percentage value obtained was 14.6% ineffective. This is in accordance with the research of [16] that the dose affects the value of COD levels, the better the dose, the better the COD value.

4. Conclusion

Concentration TSS value has decreased by 54,4 % where the TSS dose of 10 mg/L, and the COD value has decreased by 14,6% dose of 20 mg/L. Addition of further processing to get a better COD value.

References

[1] Husin, S. P. (2005). Pengaruh Massa dan Ukuran Biji Kelor pada Proses Penjernihan Air. *Jurnal Teknologi Proses*, Vol 4 (2), 26-33.

[2] Coniwanti,P, Mertha, I.D. (2013).Pengaruh Beberapa Jenis Koagulan Terhadap Pengolahan Limbah Cair Industri Tahu Dalam Tinjauannya Terhadap Turbidity.

Jurnal Teknik Kimia Vol 19 No 3

[3] Irmayana, Eko Prabowo Hadisantoso, dan Soeharti Isnaini. (2017).Pemanfaatan Biji Kelor (Moringa Oleifera) Sebagai Koagulan Alternatif Dalam Proses Penjernihan Limbah Cair Industri Tekstil Kulit. *Jurnal ISTEK* Edisi Juni 2017 Volume X No. 2. ISSN 1979-8911

[4] Novita, Elida I. d. (2014). Optimasi Penggunaan Koagulan Alami Biji Kelor (Moringa Oleifera) Pada Pengolahan Limbah Cair Mocaf. *Jurnal Agroteknologi*, Vol 08 (02),171-178

[5] Prihatinningtyas, E. (2013). Aplikasi Koagulan Alami Dari Tepung Jagung Dalam Pengolahan Air Bersih. *Jurnal Teknosains*, Vol. 2(2): 71-158

[6] Putra, R., Lebu, B., Munthe, D., dan Rambe, A.M. (2013). Pemanfaatan Biji Kelor Sebagai Koagulan Pada Proses Koagulasi Limbah Cair Industri Tahu Dengan Menggunakan Jar Test. *Jurnal Teknik Kimia USU*. Vol 2, nomor 2 : 28-31

[7] Adriansyah, E., Agustina, T. E., & Arita, S. (2019). Leachate Treatment of TPA Talang Gulo, Jambi City by Fenton method and adsorption. *Indonesian Journal of Fundamental and Applied Chemistry*, *4*(1), 20–24. https://doi.org/10.24845/ijfac.v4.i1.20

[8] Adriansyah, E., Kasman, M., Prabasari, I.G., dan Permana, E (2019). "Korelasi Parameter Pencemar Fisika dan Mikrobiologi Dalam Leachate Dengan Response Surface Methodology. *Jurnal Teknik Kimia*, 25(3). 86-89. https://doi.org/10.36706/jtk.v25i3.132

[9] Amuda, O.S. (2006). Removal of COD and Color from Sanitary Landfill Leachate by Using Coagulation – Fenton's Process. *Journal Application Science Environmental Management*. Vol. 10 (2) 49 – 53.

[10] Parsons, S. (2004). *Advanced Oxidation Processes For Water and Wastewater treatment, IWA Publishing, London, UK*

[11] Gowda, S.T. and Yashaswini, (2018). Optimization of Fenton Process. *International Journal of Advances In science Engineering and Technology, Bengaluru*. 6, pp. 46-48.

[12] Agustina, T.E. (2016). Teknologi Pengolahan Limbah Cair Dengan Metode Oksidasi Lanjutan, *Unsri Press*, Palembang.

[13] Gottschalk, C., Libra, J.A., and Saupe, A., (2010). Ozonation Of Water and Waste Water, 2nd Ed, Wiley-VCH, Verlag GmbH & Co, Weinheim.

[14] Marhadi, Adriansyah, E., Herawati, P., Suzana, A., & Pratama, A. I. Decreasing pH, COD and TSS of Domestic Liquid Waste Using Photocatalysis TiO2 (Titanium Dioxide). *International Journal of Research in Vocational Studies (IJRVOCAS), 3*(2), 11–15. https://doi.org/10.53893/ijrvocas.v3i2.201.

[15] Sufra, R., Latifah, L., Susilo, N. A., Adriansyah, E., Wati, L. A., Yulia, A., Syaiful, M., Viareco, H., Marhadi, M., Ghony, M. A., & Herawati, P. (2023). Pemanfaatan Sisa Kulit Kayu sebagai Karbon Aktif dalam Pengolahan Air Lindi Industri Pulp and Paper. *Jurnal Civronlit Unbari*, *8*(1), 17. https://doi.org/10.33087/civronlit.v8i1.106

[16] Viareco, H., Adriansyah, E., & Sufra, R. (2023). Potential Sequencing Batch Reactor in Leachate Treatment for Organic and Nitrogen Removal Efficiency. *JURNAL KESEHATAN LINGKUNGAN*, *15*(2), 143–151. https://doi.org/10.20473/jkl.v15i2.2023.143-151