UNIVERSITAS UNIVERSAL

Terbit Online Pada Halaman Jurnal: https://journal.uvers.ac.id/index.php/greeners

Journal of Green Engineering for Sustainability

ISSN (Online) 3025-6895

Integrated Waste Treatment System

Comparative Perfomance and Kinetics of Phytoremediation and Bioremediation Systems for Tofu Wastewater

Roselyn Indah Kurniati[a], Yosef Adicita[b], Arini Wulan Dari[c], Nesa Zafira[a], Silda Adi Rahayu[a], Ferdy Ashari Syawal[a], Vayolla Syakirah Karil[a]*

[a]*Teknik Lingkungan Universitas Riau, Kampus Bina Widya KM 12,5 Kelurahan Simpang Baru Kecamatan Binawidya, Pekanbaru 28293, Indonesia*

[b]*Teknologi Rekayasa Pengelasan dan Fabrikasi Politeknik Negeri Batam, Jl. Ahmad Yani Teluk Tering, Kecamatan Batam Kota, Kota Batam Kepulauan Riau 29461, Indonesia*

[c]*Teknik Lingkungan Universitas Universal, Kawasan Pasir Putih Kelurahan Sadai Kecamatan Bengkong, Kota Batam Kepulauan Riau 29432, Indonesia*

ARTICLE INFORMATION

Received 26 September 2026
Received in revised form 19 October 2026
Available Online 20 October 2026

KEYWORDS

eco enzyme,
water hyacinth,
phytoremediation,
tofu wastewater,
bioremediation

CORRESPONDENCE

Telp:
E-mail:
roselyn.indahkurniati@lecturer.unri.ac.id

A B S T R A C T

Tofu industrial wastewater contains high levels of organic matter and suspended solids and is acidic, posing a significant water pollution risk if discharged untreated. This study aims to compare the effectiveness of phytoremediation using water hyacinth (*Eichhornia crassipes*) and eco-enzyme in reducing chemical oxygen demand (COD), total suspended solids (TSS), and pH of home-scale tofu wastewater. An experimental study was conducted over six days with three treatments: five water hyacinth plants (P1), a combination of water hyacinth and 10% eco-enzyme (P2), and 10% eco-enzyme alone (P3), with testing performed on days 0, 3, and 6. The initial wastewater characteristics showed a COD of 163.75 mg/L, TSS of 440 mg/L, and pH of 4.55. Treatment P1 yielded a COD reduction of approximately 41% and a TSS reduction of about 45% by day 6, along with an increase in pH to 4.82. Treatment P2 reduced COD by about 20.6% and TSS by about 36.3%, whereas P3 reduced COD by approximately 27.7% and TSS by 25%; both treatments decreased the pH to 3.82–4.34. One-way ANOVA tests revealed that exposure duration (3 and 6 days) had no significant effect on COD ($p = 0{,}091$), TSS ($p = 0{,}628$), or pH ($p = 0{,}669$). These findings indicate that water hyacinth without eco-enzyme supplementation is more effective and simpler to apply under the conditions of this study.

1. INTRODUCTION

Tofu is a popular food in Asia and is typically processed through grinding, boiling, filtration, protein coagulation, preservation, and packaging [1]. The tofu-making process leaves behind approximately 30% of the soybean mass as waste [2]. The absence of treatment facilities in the majority of small- and medium-scale tofu industries leads to the direct discharge of wastewater into the environment, thereby exacerbating water pollution levels. Tofu wastewater contains high concentrations of organic matter due to soybean residues and other by-products. This results in a significant increase in chemical oxygen demand (COD) and total suspended solids (TSS), thus necessitating specialized treatment [3]. According to the Minister of Environment Regulation No. 5 of 2014 concerning Wastewater Quality Standards, wastewater from soybean processing activities, including tofu production, must not exceed COD 300 mg/L, TSS 200 mg/L, and a pH range of 6-9. The initial tofu wastewater used in this study had a COD of 163.75 mg/L, TSS of 440 mg/L, and pH of 4.55. Although the COD remained below the quality standard of 300 mg/L, the TSS exceeded the standard limit of 200 mg/L by approximately 2.2 times, and the pH was more acidic than the permissible range of 6-9. Furthermore, the high protein and amino acid content in tofu wastewater promotes

microbial growth and causes a depletion of dissolved oxygen levels in water bodies.

Various wastewater treatment methods have been extensively developed, such as coagulation, ultrafiltration membranes, and oxidation [3]. Although achieving relatively high removal efficiencies, these methods involve high operational costs. Such approaches are difficult to implement because the tofu industry is predominantly small- to medium-scale in Indonesia. To address this issue, eco-friendly, effective, and economical wastewater treatment technologies are required. The combination of phytoremediation and eco-enzyme supplementation serves as a relatively low-cost, minimal-chemical-residue alternative that is easy to operate and maintain [4].

Water hyacinth (*Eichhornia crassipes*) is widely utilized in phytoremediation processes due to its capacity to absorb and degrade organic matter and metals. Previous studies have shown that water hyacinth (*Eichhornia crassipes*) effectively reduces chemical oxygen demand (COD) by 93.8%, total suspended solids (TSS) by 90.2%, NH_3 95%, and color by 45.4% in coffee processing wastewater [5]. Furthermore, this plant can remove TDS, BOD, COD, TKN, and phosphorus by more than 70% in paper mill wastewater [6]. Eco-enzyme is a biocatalytic solution rich in organic acids, bioactive compounds, and functional enzymes produced through the natural fermentation of fruit and vegetable scraps mixed with sugar and water.

Eco-enzyme is a biocatalytic solution rich in organic acids, bioactive compounds, and functional enzymes produced through the natural fermentation of fruit and vegetable scraps mixed with sugar and water [7]. The enzymes and organic acids generated during the fermentation process possess high oxidation and degradation capabilities, thereby enabling them to break down organic matter, neutralize contaminants, and even enhance microbial activity within wastewater treatment systems. In previous studies, complex organic pollutants were degraded more rapidly by this biological catalyst, converting them into simpler and less hazardous substances [8]. Compared with conventional treatments such as coagulation, membrane filtration, and chemical oxidation, eco-enzyme is produced from inexpensive fruit and vegetable waste, requires no complex equipment or high energy input, leaves minimal chemical residues, and can be prepared independently by small-scale producers. The combination of water hyacinth phytoremediation and eco-enzyme supplementation is expected to complement each other and improve the removal efficiency of pollutant parameters in tofu wastewater. Both methods align with sustainable waste management principles (green technology) as they utilize natural materials, involve low costs, require minimal energy, and can be directly applied by small-scale tofu producers without complex technology. Based on this background, this study was conducted to examine the effectiveness of combining water hyacinth phytoremediation and eco-enzyme techniques in reducing pollutant parameters in tofu industrial wastewater, specifically COD, TSS, and pH. This approach aims to provide an applicable, low-cost, and environmentally friendly wastewater treatment solution.

2. LITERATURE REVIEW

2.1. *Tofu Wastewater*

The tofu industry involves a series of activities centered on processing raw soybeans to produce tofu. This series of processes consists of washing, soaking, sedimentation, coagulation, and molding. During the sedimentation process, not all materials successfully settle; consequently, the remaining residues and other substances are discharged into the wastewater. Most of the waste generated by the tofu industry is liquid waste, which can cause pollution due to its high organic content and its potential to affect phosphorus, nitrogen, and sulfur concentrations in water bodies [9].

2.1.1. Total Suspended Solid (TSS)

Total Suspended Solid (TSS) refer to the solid matter present in wastewater. These insoluble materials typically affect the turbidity level of the water. When turbidity is high, light penetration into the water body is hindered. This indicates that TSS closely affects the photosynthetic processes of phytoplankton and other aquatic plants. Furthermore, TSS is closely related to the dissolved oxygen demand in aquatic environments. Low levels of dissolved oxygen cause water bodies to become anaerobic, leading to the mortality of aerobic organisms [10]

2.1.2. pH

Derajat keasaman digunakan untuk menyatakan tingkat keasaman atau kebasahan dari suatu larutan. Derajat keasaman dapat menunjukkan konsentrasi ion hidrogen (H+) di dalam air. Pada dasarnya pH limbah cair tahu cenderung bersifat asam, hal ini mengakibatkan limbah yang dihasilkan mengeluarkan bau yang tidak sedap [11].

2.1.3. Phytoremediation

Phytoremediation is a simple alternative technology that can be utilized to treat wastewater. This technique has the advantages of effectively addressing pollution problems and being applicable directly at the site of contamination. Aquatic plants are commonly used in phytoremediation practices. The application of water hyacinth and wood charcoal has been shown to reduce pollutant loads such as TSS, pH, and COD [12] .

2.1.4. Eco Enzyme

Eco-enzyme is a complex organic solution produced through the fermentation process of organic waste residues, brown sugar, and water. The eco-enzyme used in this study originated from the fermentation of kitchen organic waste. This eco-enzyme liquid is dark brown in color and possesses a strong sour-fresh aroma. With its characteristics, this liquid can be utilized as an all-purpose cleaner, plant fertilizer, pest repellent, and an environmental protector capable of neutralizing various environmental pollutants [13].

3. METHODOLOGY

The wastewater to be used is home-scale tofu industrial wastewater. The sampling technique refers to (SNI-6989-59, 2008), namely the grab sampling method. The plant used in this study was water hyacinth (*Eichhornia crassipes*), selected for its green leaves and unwithered stems. Five plants were used per reactor. Prior to the experiment, the plants were cleaned of soil and debris attached to the roots, then acclimatized in clean water in plastic containers for seven days to allow adaptation before being used as phytoremediators.

An experimental method was conducted to determine the effectiveness of water hyacinth and eco-enzyme in reducing pollutant parameters such as COD, TSS, and pH in tofu wastewater. The observational factors in this study were treatment (P) and exposure duration (H). The experiment was conducted for six days. COD, TSS, and pH testing were performed on day 0 (inlet), day 3, and day 6. The experimental design combination can be seen in Table 1.

Table 1. Combination of Treatments and Exposure Durations

Treatment (P)	Exposure Duration: Day 3 (H3)	Exposure Duration: Day 6 (H6)
1	P1-H3	P1-H6
2	P2-H3	P2-H6
3	P3-H3	P3-H6

Notes :
Treatment 1 (P1): Tofu wastewater + 5 water hyacinth plants
Treatment 2 (P2): Tofu wastewater + 5 water hyacinth plants + 10% eco-enzyme
Treatment 3 (P3): Tofu wastewater + 10% eco-enzyme

TSS, COD, and pH testing refer to the Standard Methods for the Examination of Water and Wastewater (2017). The percentage removal efficiency of COD, TSS, and pH for each treatment is determined by comparing the initial concentration of the sample prior to treatment with the concentration obtained from the treated samples at different time intervals. The removal efficiency of each parameter is calculated using the following formula:

$$Removal\ Efficiency = \frac{C_0 - C_t}{C_0} x100\%$$

The measurement results of COD, TSS, and pH were analyzed using a one-way ANOVA test to determine the effect of different treatments on the reduction of pollutant concentrations.

4. RESULTS AND DISCUSSION

4.1. *Characteristics of Tofu Wastewater*

The wastewater used in this study originated from the final discharge channel of a home-scale tofu industry. The characteristics of the tofu wastewater prior to treatment are presented in the following table:

Table 2. Initial Characteristics of Tofu Wastewater

Parameter	Initial Concentration	Quality Standard	Status
COD	163.75 mg/L	300 mg/L	Complies/ Below standard
TSS	440 mg/L	200 mg/L	Exceeds standard
pH	4.55	6-9	Acidic

The initial examination of the tofu wastewater characteristics showed a COD concentration of 163.75 mg/L, which complies with the quality standard established by the Regulation of the Minister of Environment No. 5 of 2014 concerning wastewater quality standards for soybean processing (tofu). Meanwhile, the TSS concentration exceeded the quality standard at 440 mg/L, and the pH was 4.55, indicating acidic conditions. The high TSS concentration in this tofu wastewater originated from the processes taking place during production. The processes of washing, soaking, boiling, filtration, and soybean pressing contribute to high turbidity [14]. Meanwhile, the acidic pH results from the addition of vinegar during the tofu coagulation and soaking processes [11].

4.2. *Concentration of Tofu Wastewater after Treatment 1 (P1)*

The initial COD concentration of the tofu wastewater sample prior to treatment was 163.75 mg/L, which was below the quality standard limit. After 3 and 6 days of exposure using five water hyacinth plants, the COD concentration decreased to 163 mg/L and 96.98 mg/L, respectively. Unlike COD, the initial TSS concentration exceeded the quality standard, recording 440 mg/L. After 3 and 6 days of exposure, the TSS concentration decreased to 261 mg/L and 240 mg/L, respectively. Meanwhile, the pH value increased from an initial value of 4.55 to 4.74 on day 3 and 4.82 on day 6.

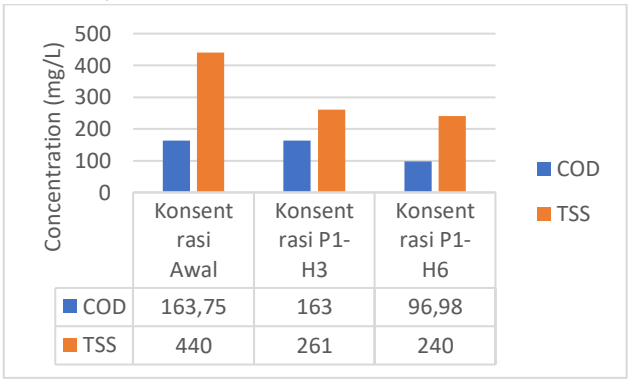


Figure 1. COD and TSS concentrations after Treatment 1 (P1)

The COD reduction on day 6 reached 40.70%, while the TSS reduction reached 45.40%. The capability of water hyacinth in remediating TSS is attributed to the role of the plant roots in absorbing fine particles present in the tofu wastewater [15]. The pH value under Treatment 1 (five water hyacinth plants) showed an increase from 4.55 to 4.74 on day 3 and 4.82 on day 6. This demonstrates that the treatment using five water hyacinth plants can increase the pH of tofu wastewater toward neutral conditions. The increase in pH occurs due to the photosynthetic process of water hyacinth. The consumption of H^+ ions during photosynthesis results in a reduction of H+ ions within the tofu wastewater, thereby shifting the pH value closer to neutrality.

Compared with the quality standard in the Regulation of the Minister of Environment No. 5 of 2014, Treatment 1 (P1) was only partially compliant. COD remained below the 300 mg/L limit (96.98 mg/L on day 6), but TSS (240 mg/L) still exceeded the 200 mg/L limit, and pH (4.82) remained below the permissible range of 6-9. Thus, five water hyacinth plants alone were not sufficient to meet the standard, indicating that further optimization is needed.

4.3. *Concentration of Tofu Wastewater after Treatment 2 (P2)*

The treatment of tofu wastewater was carried out using water hyacinth combined with the addition of eco-enzyme as a remediation agent. The initial COD concentration of the tofu wastewater before treatment was recorded at 163.75 mg/L, which remained below the quality standard. After 3 and 6 days of exposure with five water hyacinth plants and the addition of 10% eco-enzyme, the COD concentration decreased to 132 mg/L and 130.19 mg/L, respectively. This represents an 18% reduction compared to Treatment 1. The TSS concentration decreased to 293 mg/L and 280 mg/L on days 3 and 6, respectively. However, in contrast to COD and TSS, the pH shifted toward more acidic conditions, changing from 4.55 to 3.88 and 4.34.

Table 3. Concentration of COD, TSS, and pH in Treatment 2 (P2)

time	Treatment P2					
	COD		TSS		pH	
	Initial COD 163.75 mg/L		Initial TSS 440 mg/L		Initial pH 4,55	
	COD	% Removal	TSS	% Removal	pH	% Removal
3 Days	132 mg/L	19,4%	293 mg/L	33,4%	3,88	-
6 Days	130,19 mg/L	20,4%	280 mg/L	36,3%	4,34	-

Water hyacinth supplemented with 10% eco-enzyme successfully reduced TSS parameters by up to 36.30%. This capability is supported by the fact that the roots of water hyacinth can absorb small particles present in the tofu wastewater resulting from ongoing processes [15]. The relatively small difference in removal efficiency between Day 3 and Day 6 is suspected to be influenced by the addition of eco-enzyme. Eco-enzyme solutions contain hydrolytic enzymes, which possess a higher citric acid content compared to other enzymes, thereby exhibiting the potential to break down more complex organic molecules in the wastewater. According to Arun and Sivashanmugam [7], eco-enzyme can reduce TSS content in wastewater due to the presence of hydrolytic enzymes such as cellulase, protease, and lipase. These enzymes break down polymers into smaller monomers that dissolve in the wastewater, resulting in a decrease in TSS concentration.

Compared with the quality standard in the Regulation of the Minister of Environment No. 5 of 2014, COD remained below the 300 mg/L limit (130.19 mg/L on day 6), but TSS (280 mg/L) still exceeded the 200 mg/L limit by approximately 1.4 times, and pH (4.34) remained below the permissible range of 6-9.

4.4. *Concentration of Tofu Wastewater after Treatment 3 (P3)*

The treatment of tofu wastewater using 10% eco-enzyme alone (P3) was conducted to reduce COD, TSS, and pH parameters. Prior to treatment, the initial COD concentration was recorded at 163.75 mg/L (which remained below the quality standard), whereas TSS exceeded the quality standard at 440 mg/L. After 3 and 6 days of exposure, the COD concentration decreased to 140 mg/L and 118.35 mg/L, respectively, while TSS decreased to 356 mg/L and 330 mg/L, respectively. The pH value also decreased from 4.55 to 3.78 on day 3 and 3.82 on day 6. When compared to Treatment 2 (P2), Treatment 3 (P3) achieved only a 12.5% reduction in COD. This indicates that Treatment 3, which relied solely on eco-enzyme addition, had a limited effect on reducing COD and TSS. The decrease in pH is presumed to be caused by the acidic content of the eco-enzyme. The acidic nature of the eco-enzyme can break down organic molecules from complex forms into simpler forms [16].

Table 4. Concentration of COD, TSS, and pH in Treatment 3 (P3)

Time	Treatment P3					
	COD		TSS		pH	
	Initial COD 163,75 mg/L		Initial TSS 440 mg/L		Initial pH 4,55	
	COD	% Removal	TSS	% Removal	pH	% Removal
3 Days	140 mg/L	14,50%	356 mg/L	19,09%	3,78	-
6 Days	118,35 mg/L	27,70%	330 mg/L	25%	3,82	-

4.5. *ANOVA Test*

The results of data calculations across different time intervals for the treatment of tofu wastewater against the test parameters using a one-way ANOVA test indicated a significance value of 0.091 for COD, 0.628 for TSS, and 0,669 for pH. When compared with the critical threshold value of 0.05, the significance value for COD is greater than 0,05, indicating that there is no significant difference between the 3-day and 6-day exposure durations regarding the reduction of COD concentration. Furthermore, for TSS, the significance value of 0,628 > 0,05, meaning that varying the exposure duration between 3 and 6 days had no significant effect on TSS concentration reduction. Similarly, the pH significance value of 0,669 > 0,05 showing no significant difference between the 3-day and 6-day exposure durations on pH values. Overall, the one-way ANOVA test results revealed that the exposure duration did not significantly affect the test parameters. This is presumably due to the absence of dilution in the tofu wastewater prior to treatment. Diluting the wastewater with water can reduce the concentration of individual pollutants and help neutralize the pH of tofu wastewater [17].

5. CONCLUSION

This study demonstrates that phytoremediation using five water hyacinth plants (P1) is the most effective treatment for

reducing pollutants in tofu industrial wastewater. After 6 days, COD decreased from 163.75 mg/L to 96.98 mg/L (approximately 41%), TSS decreased from 440 mg/L to 240 mg/L (approximately 45%), and pH increased from 4.55 to 4.82. The addition of 10% eco-enzyme to water hyacinth (P2) did not enhance removal efficiency (COD reduction of ~20%, TSS reduction of ~36%); thus, the hypothesis that both methods would complement each other was not supported under the conditions of this study. Treatment using eco-enzyme alone (P3) reduced COD by approximately 28% and TSS by 25%, but decreased the pH down to 3.82, making the wastewater more acidic. Despite the reductions achieved, the TSS concentrations across all treatments (240, 280, and 330 mg/L) remained above the quality standard of 200 mg/L, and the pH values for all treatments remained below the neutral range of 6–9. Furthermore, the one-way ANOVA test indicated that the exposure durations of 3 and 6 days had no significant effect ($p > 0,05$), which is presumed to be related to the lack of preliminary wastewater dilution. Future research is recommended to incorporate wastewater dilution or pH neutralization, vary the eco-enzyme concentration and plant density, extend the observation period, and include treatment replications to allow for a more robust analysis of pollutant removal effectiveness and kinetics.

REFERENCE

[1] N. Hardyanti, H. Susanto, and M. A. Budihardjo, "Removal of organic matter from tofu wastewater using a combination of adsorption, Fenton oxidation, and ultrafiltration membranes," *Desalination Water Treat.*, vol. 318, Apr. 2024, doi: 10.1016/j.dwt.2024.100255.

[2] M. S. Kim, D. Y. Lee, and D. H. Kim, "Continuous hydrogen production from tofu processing waste using anaerobic mixed microflora under thermophilic conditions," in *International Journal of Hydrogen Energy*, Jul. 2011, pp. 8712–8718. doi: 10.1016/j.ijhydene.2010.06.040.

[3] N. Hardyanti, H. Susanto, and M. A. Budihardjo, "Removal of organic matter from tofu wastewater using a combination of adsorption, Fenton oxidation, and ultrafiltration membranes," *Desalination Water Treat.*, vol. 318, Apr. 2024, doi: 10.1016/j.dwt.2024.100255.

[4] S. B. Kurniawan *et al.*, "Phytotreatment of tofu effluent using water lettuce (Pistia stratiotes) and potential of biogas production from resultant biomass," *Journal of Water Process Engineering*, vol. 69, Jan. 2025, doi: 10.1016/j.jwpe.2024.106672.

[5] H. Munaem Ahmed, S. Rozaimah Sheikh Abdullah, H. Abu Hasan, A. Razi Othman, I. Ismail, and S. Budi Kurniawan, "Environmental Engineering and Management," 2021. [Online]. Available: http://www.eemj.icpm.tuiasi.ro/;http://www.eemj.eu

[6] V. Kumar, J. Singh, and A. K. Chopra, "Assessment of phytokinetic removal of pollutants of paper mill effluent using water hyacinth (Eichhornia crassipes [Mart.] Solms)," *Environmental Technology (United Kingdom)*, vol. 39, no. 21, pp. 2781–2791, Nov. 2018, doi: 10.1080/09593330.2017.1365944.

[7] C. Arun and P. Sivashanmugam, "Investigation of biocatalytic potential of garbage enzyme and its influence on stabilization of industrial waste activated sludge," *Process Safety and Environmental Protection*, vol. 94, no. C, pp. 471–478, 2015, doi: 10.1016/j.psep.2014.10.008.

[8] Z. Ashkan, R. Hemmati, A. Homaei, A. Dinari, M. Jamlidoost, and A. Tashakor, "Immobilization of enzymes on nanoinorganic support materials: An update," Jan. 31, 2021, *Elsevier B.V.* doi: 10.1016/j.ijbiomac.2020.11.127.

[9] E. Marian *et al.*, "PEMANFAATAN LIMBAH CAIR TAHU SEBAGAI PUPUK ORGANIK CAIR Utilization of Tofu Liquid Waste to Growth and Yield of Chicory (Brasica pekinensi)." [Online]. Available: http://jurnal.unmuhjember.ac.id/in

[10] D. Hidayat, R. Suprianto, and P. Sari Dewi, "PENENTUAN KANDUNGAN ZAT PADAT (TOTAL DISSOLVE SOLID DAN TOTAL SUSPENDED SOLID)DI PERAIRAN TELUK LAMPUNG," 2016.

[11] F. Sayow, B. V. J. Poli, W. Tilaar, and K. D. Augutine, "gkapantow2,+2+replace+-eprm-adw-Febrian+Sayow-Format+jurnal+5," *Agri-SosioEkonomi*, May 2020.

[12] A. Damayanti and D. K. Binawati, "Fitoremediasi Limbah Cair Tahu Menggunakan Tumbuhan Eceng Gondok (Eichhornia crassipes) dan Arang Kayu," *Bioscientist : Jurnal Ilmiah Biologi*, vol. 11, no. 2, p. 1376, Dec. 2023, doi: 10.33394/bioscientist.v11i2.9283.

[13] N. Rochyani, R. L. Utpalasari, and I. Dahliana, "Julii-Desember2020 Neny Rohyani, Rih Laksmi Utpalasari."

[14] Afridon and A. Irfan, "Number 2 (2023) Copyright. CC-BY-SA," *Media Ilmu*, vol. 2, 2023.

[15] H. Ahmad, R. Adiningsih, J. K. Lingkungan, and K. Mamuju, "EFEKTIVITAS METODE FITOREMEDIASI MENGGUNAKAN TANAMAN ECENG GONDOK DAN KANGKUNG AIR DALAM MENURUNKAN KADAR BOD DAN TSS PADA LIMBAH CAIR INDUSTRI TAHU."

[16] M. Samiksha and S. Kerkar, "Application of Eco-Enzyme for Domestic Waste Water Treatment," *International Journal for Research in Engineering Application & Management (IJREAM)*, vol. 05, no. 11, pp. 2454–9150, 2020, doi: 10.35291/2454-9150.2020.0075.

[17] D. Savitri Vidyawati *et al.*, "Pengaruh Fitoremediasi Eceng Gondok (Eichornia crassipes) melalui Pengenceran terhadap Kualitas Limbah Cair Industri Tahu." [Online]. Available: http://ejournal.unesa.ac.id/index.php/lenterabio

NOMENCLATURE

P1 : Treatment with water hyacinth
P2 : Combination treatment of water hyacinth and eco-enzyme
P3 : Eco-enzyme treatment
C_0 : Initial concentration
C_t : Concentration after treatment