



Utilization of domestic wastewater for the growth of microalgae *Chlorella* sp.

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ABSTRACT

This study investigates the potential of using domestic wastewater as a growth medium for *Chlorella* sp. and examines how it affects water quality over a period of 24 days. The experiment was conducted using a Completely Randomized Design (CRD) with a single factor: four levels of domestic wastewater concentration—0%, 25%, 50%, and 75%—each tested in three replicates. The results showed that the highest biomass production occurred on day 8, reaching 0.337 mg/L in the 75% wastewater treatment (TR3), while the lowest was observed in the control group (C) at 0.210 mg/L. Statistical analysis using ANOVA followed by the Tukey test confirmed that the differences between treatments were significant ($p < 0.05$). Correlation analysis showed a strong positive correlation between biomass and dissolved oxygen (DO, 0.949) and temperature (0.626), indicating that optimal light intensity and nutrient availability promote photosynthesis and biomass growth. In contrast, phosphate was negatively correlated with temperature (-0.738), suggesting that higher temperatures accelerate phosphate uptake by *Chlorella* sp. The study concludes that cultivating *Chlorella* sp. using domestic wastewater presents a sustainable solution for both biomass production and wastewater treatment. The microalgae help remove excess nutrients like nitrogen and phosphorus, enhancing water quality. However, as the algae decompose, they can also contribute to higher biological oxygen demand (BOD). This dual role underscores the promising potential of microalgae in promoting ecological wastewater management while supporting sustainable biomass production.

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Introduction

Access to safe water, sanitation, and hygiene (WASH) remains a critical challenge in developing countries, contributing to thousands of deaths each year worldwide (Uddin *et al.*, 2015). Around 36% of the world's population still lacks proper sanitation services, and nearly one billion people do not have access to safe drinking water for their daily needs (WHO, 2006; Simha *et al.*, 2017). In developing countries, more than 90% of domestic wastewater is released or stored untreated into rivers, lakes, or coastal areas, causing serious ecological problems, including water quality deterioration and loss of biodiversity (Caspersen *et al.*, 2018). Domestic

wastewater can also harbor a range of pathogens, which may lead to waterborne diseases like cholera, dysentery, and typhoid (Taseli and Kilkis, 2016), which increase the global health burden (Moe and Rheingans, 2006).

In many developing countries, conventional sanitation systems still depend on “drop and store” or “flush and discharge” methods to handle wastewater and tackle sanitation challenges (Ganesapillai *et al.*, 2015). These systems demand extensive infrastructure, such as wide-reaching piping networks and major excavation, and they consume substantial amounts of energy and resources—yet they still leave a significant environmental footprint (Batstone *et al.*, 2015). As a

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result, traditional sanitation systems that rely on flush toilets and mixed wastewater collection—using vast amounts of drinking water to transport waste—are neither environmentally sustainable nor economically practical (Langergraber and Muellegger, 2005). Therefore, it is important to develop sustainable sanitation alternatives that make use of the valuable components contained in domestic wastewater. One promising approach is phytoremediation technology using microalgae, particularly *Chlorella* sp.

Domestic wastewater is composed of feces, urine, toilet water, and household waste, along with residual discharges from institutions and communal facilities (Larsen et al., 2015; Iqhrammullah et al., 2024). Domestic wastewater typically contains high levels of organic matter and nutrients, particularly phosphorus and nitrogen. Human urine alone contributes around 90% of the total nitrogen, 55% of the total phosphorus, and a portion of the potassium. Meanwhile, black water carries the majority of both nitrogen and phosphorus (Hu et al., 2016). Detergents and cleaning products also contribute to the phosphorus load in wastewater. Larsen and Maurer (Larsen and Maurer, 2011) noted that the combined composition of domestic wastewater with a volume of 130 L/cap/day includes 120, 14, and 2 g/cap/day of COD, nitrogen, and phosphorus, respectively. Municipal wastewater generally contains between 31.8–202.4 mg/L of nitrogen, 4.9–106.2 mg/L of phosphorus, and 299–4294 mg/L of COD. If left untreated, domestic wastewater can contribute up to 75% of the phosphorus released into water bodies, which in turn triggers eutrophication (Karunanithi et al., 2015).

The nutrients contained in domestic wastewater can serve as a resource for *Chlorella* sp., thereby reducing the need for trace metals usually supplied in standard culture solutions. This microalga is well adapted to polluted waters, supported by its production of phytohormones and polyamines, which allow it to thrive even in contaminated environments (Yolanda et al., 2016). Therefore, studying the use of domestic wastewater as a medium for cultivating *Chlorella* sp. is essential, particularly as its cultivation continues to expand for various purposes, including fish feed and human nutritional supplements. *Chlorella* sp. itself is highly valued for its rich composition, containing about 45% protein, 20% fat, 20% carbohydrates, 5% fiber, and 10% minerals and vitamins (Rachmaniahm et al., 2010). Given this context, exploring the use of domestic wastewater for *Chlorella* sp. cultivation emerges as a

practical and efficient approach for managing household wastewater.

Materials and Methods

Location, Time Research and Research Design

This research took place between June and July 2024 at the Food and Agroindustry Laboratory of Universitas Teknologi Sumbawa. To support the analysis, measurements of nitrate, phosphate, and biological oxygen demand (BOD) were conducted at the FMIPA Laboratory, University of Mataram. In line with the requirements of the culture process, certain environmental adjustments—such as aeration and extended lighting—were applied. The materials used in this study consisted of a *Chlorella* sp. starter culture ($2,492 \times 10^3$ cells/mL), 36 liters of domestic wastewater, commercially available bottled drinking water, 96% alcohol, and a Whatman Glass Microfiber Filter GF/C (47 mm). The cultivation was carried out over 24 days, with each reactor containing 100 mL of *Chlorella* sp. inoculum combined with 36 liters of domestic wastewater. To support the process, various equipment was used, including an oven set at 100 °C, a DO meter, a digital pH meter, an aerator with 30 meters of tubing, aerator hole taps, 12 aeration stones (5 cm), a syringe holder for 47 mm membrane filters, 100 mL HDPE sample bottles, a gas stove, and a digital scale.

This study was conducted as an experimental investigation using a quantitative descriptive approach and a Completely Randomized Design (CRD). It involved a single factor with four treatment levels, each replicated three times. The variables examined in this research include:

1. Independent variables:

- Control (C) = 0% (without domestic wastewater)
- Treatment1 (T1) = 25% domestic wastewater
- Treatment2 (T2) = 50% domestic wastewater
- Treatment3 (T3) = 75% domestic wastewater

2. Dependent variables: BOD, nitrate, phosphate, TDS, temperature, pH, and dissolved oxygen (DO).

Research Steps

The study began with the collection of domestic wastewater samples from drainage channels in the densely populated areas of Kelurahan Seketeng, Kecamatan Sumbawa. This approach was chosen to ensure the samples accurately reflected the conditions of wastewater as it flows directly from its source.

The next step involved filtering the wastewater to remove large particles and minimize the risk of

contamination during the culture process. For this purpose, a 60-liter plastic drum with a jar-like design was used as the filter. The filtration system consisted of layered materials—gravel, sand, charcoal, and fibers—each layer measuring 9 cm in thickness (Figure 1).

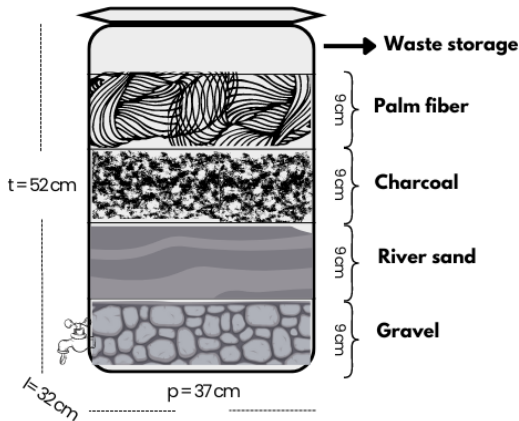


Figure 1. Liquid waste screening instrument

The filtered wastewater was sterilized by heating it for 15 minutes at 100 °C, then allowed to cool in a sterilized container. All equipment used in the culture process was first washed with soap, rinsed with clean water, and then sprayed with 96% alcohol before being left to air-dry. Ensuring the equipment is completely dry before use is crucial, since any remaining alcohol can harm *Chlorella* sp. cells

The photobioreactor was set up on a light steel rack measuring 4 cm × 6 cm × 150 cm, designed to hold 12 PET gallon reactors, each with a capacity of 12 liters. Each reactor featured a hole in the lid to accommodate electrical cables and an aerator. Illumination was provided by a 5-watt LED light, securely attached to the reactor lid with small screws. This setup was designed to create optimal conditions for *Chlorella* sp. growth, ensuring both efficient lighting and convenient access for sample collection.

Biomass Analysis

The biomass of *Chlorella* sp. was monitored every four days throughout the 24-day cultivation period. For harvesting, a 100 mL sample of the microalgae was collected and filtered using Whatman filter paper. The filter paper was then dried in an oven at 100 °C for 60 minutes before being weighed. The dry weight of the biomass was subsequently calculated using the following formula:

$$PB = (B_x - B_0) \dots\dots\dots (1)$$

PB: Biomass production (g/L/day)

Bx: Final weight after drying (g)

B0: Initial weight of the filter paper (g)

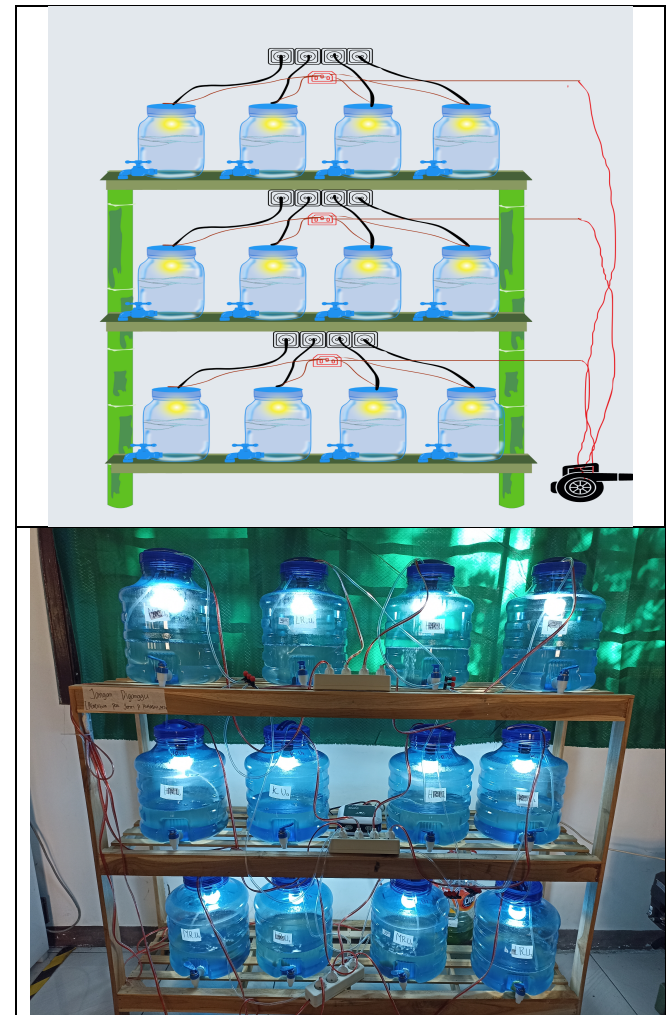


Figure 2. Photobioreactor

Data Analysis

SPSS 25 was used to analyze the secondary data presented in tables. Statistical significance was assessed using a one-way ANOVA, followed by the Tukey test at a 0.05 significance level. In addition, the mean and standard deviation were calculated for each parameter to summarize the results.

The researchers used the Pearson Product-Moment correlation method to examine the relationships between each pair of variables. An R-value of 1 indicates a perfect positive correlation, while an R-value of -1 reflects a perfect negative correlation. In this context, a positive correlation among water parameters suggests that they tend to increase or decrease together, whereas a negative correlation indicates that the parameters move in opposite directions. The decision basis for determining the relationship between measured water parameters is based on the significance level and correlation coefficient (R), as shown in Table 1 below.

Table 1. Correlation coefficient interval (Guilford, 1956)

Correlation coefficient interval	Relationship Level
0.00 – 0.199	Very low
0.20 – 0.399	Low
0.40 – 0.599	Keep
0.60 – 0.799	Strong
0.80 – 1.00	Very powerful

Results

Over the 24-day experiment, the biomass production of *Chlorella* sp. peaked on day 8 in the TR3 treatment, reaching a maximum value of 0.30 g/L. This is presented in the following Table 2.

Table 2. Biomass Production of *Chlorella* sp. and Tukey Test Results

Treatment	Replications			Average
	1	2	3	
	mg/L			
C	0.22	0.18	0.23	0.210±0.02645 ^a
TR1	0.29	0.24	0.30	0.277±0.03214 ^{a,b}
TR2	0.33	0.26	0.34	0.310±0.04358 ^{a,b}
TR3	0.37	0.27	0.37	0.337±0.05773 ^b

Notes:
Different letters (a, b) indicate significant differences between treatments ($p < 0.05$), while the same letters (ab) indicate no significant differences.

Table 3. ANOVA Test Results for *Chlorella* sp. Biomass Production

	df	F _{Calculated}	F _{Table}	Sig.
Factor	3	5.155	4.07	0.028*
Error	8			
Total	11			

Notes:
* = Significantly different at the 95% confidence level ($\alpha = 0.05$).

Table 4. Results of Domestic Wastewater Parameters

Parameters		Treatment			
		C	TR1	TR2	TR3
TDS (mg/L)	Initial	30.3	108.0	169.3	228.0
	1	0	0	0	0
	Final	39.3	110.7	171.0	231.0
pH	1	0	0	0	0
	Initial	6.40	6.40	6.50	6.50
	Final	6.20	6.50	6.70	6.90
Temperature (°C)	1	28.1	27.90	28.10	28.20
	0	0	0	0	0
	Final	28.7	28.40	28.50	28.70
DO (mg/L)	1	6.50	5.30	6.00	6.20
	Initial	5.90	5.90	6.20	6.20
	Final	5.90	5.90	6.20	6.20
Nitrate (mg/L)	1	0.60	0.38	0.54	0.51
	Initial	0.02	0.01	0.03	0.09
	Final	0.02	0.01	0.03	0.09
Phosphate (mg/L)	1	1.22	0.97	1.01	1.55
	Initial	0.03	0.01	0.03	0.08
	Final	0.03	0.01	0.03	0.08
BOD (mg/L)	1	0.95	1.35	1.45	1.75
	Initial	1.43	2.63	2.98	2.75
	Final	1.43	2.63	2.98	2.75

Notes: Initial values represent the measurements taken at the start of the experiment (Day 0), and Final values represent the measurements taken at the end of the experiment (Day 24).

Table 5. Correlation Analysis of *Chlorella* sp. Biomass and Domestic Wastewater Quality

	Biomass	TDS	pH	Temperature	DO	Nitrate	Phosphate	BOD
Biomass	1							
TDS	0.115	1						
pH	-0.411	0.695*	1					
Temperature	0.626*	0.035	-0.262	1				
DO	0.949**	0.058	-0.426	0.693*	1			
Nitrate	0.124	0.037	-0.218	-0.417	0.166	1		
Phosphate	-0.394	0.082	0.037	-0.738**	-0.363	0.817**	1	
BOD	0.016	0.569	0.687*	0.253	-0.029	-0.688*	-0.569	1

Discussion

Growth of *Chlorella* sp. Microalgae

Based on observations of *Chlorella* sp. biomass (Table 2) over a 24-day period, the highest biomass growth occurred on day 8 (Figure 3a), with the lowest result being 0.210 mg/L in the control group (K) and the highest biomass of 0.337 mg/L in the 75%

concentration group (TR3). This is in line with findings from Mousa & Mohsin (2025), who showed that *Chlorella* sp. cultivated with domestic wastewater also achieved enhanced biomass production due to efficient nutrient assimilation. The study by Mousa and Mohsin reported a substantial hydrogen yield of 862.64 mL-H₂/g, along with efficient removal of

wastewater pollutants including BOD₅, NH₄⁺-N, NO₂⁻-N, and NO₃⁻-N—patterns that resemble the nutrient dynamics observed in the present experiment. These findings underscore the potential of domestic wastewater as an effective growth medium for *Chlorella* sp., supporting both biomass production and the removal of pollutants.

Nitrate is a vital nutrient for the growth of *Chlorella* sp.. In this context, palm oil biogas wastewater contains a higher nitrate concentration compared to domestic wastewater, providing a more favorable environment for microalgal growth, likely contributed to the higher biomass production observed by Yolanda et al., (2016). In contrast, this study found that the limited nitrate in domestic wastewater restricted the growth of microalgae, even though phosphate was more abundant. This highlights the crucial role that nutrient availability plays in determining both the growth and composition of microalgal cultures (Esteves et al., 2024).

Higher light intensity in the photobioreactor increases the biomass concentration (Levasseur et al., 2023). As a result, the biomass of *Chlorella* sp. reached its peak earlier, on day 8, rather than following the typical exponential growth phase, which usually occurs around day 14 (Ho, Q.N. et al. 2022). The combination of optimal light and available nutrients, including nitrate and phosphate, promoted rapid biomass growth. However, after day 8, the limited nutrients in the domestic wastewater caused the growth rate to slow, leading to a subsequent decline in biomass

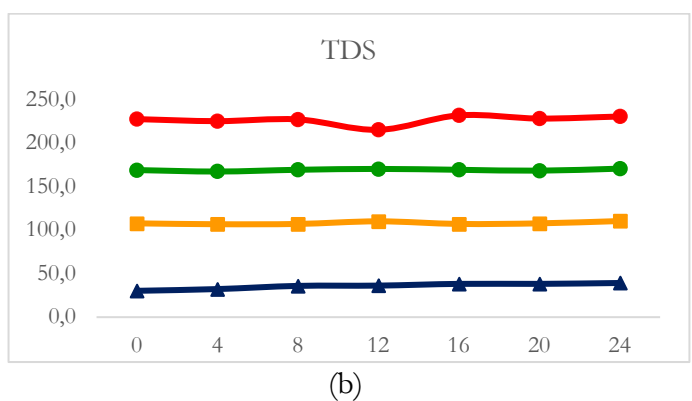
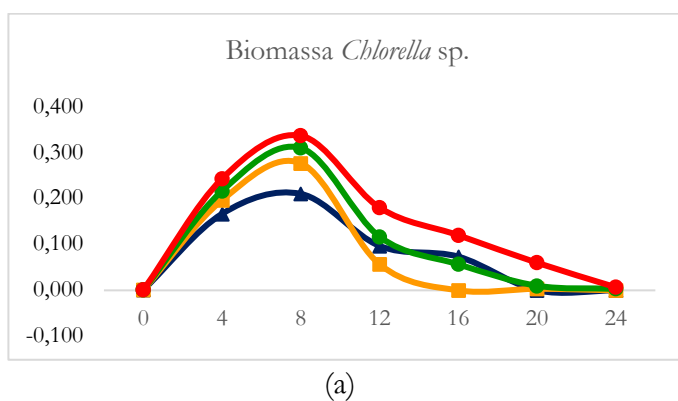
As shown in Table 3, the ANOVA results indicated that the concentration of domestic wastewater had a significant impact on *Chlorella* sp. biomass growth, with an F value of 5.155 and a significance level of 0.028. This confirms that there were meaningful differences between the treatments at the 5% significance level ($\alpha = 0.05$). A Tukey test was then carried out to determine which treatment groups differed from each other

The letters a, b, and ab in the mean columns of Table 2 show the results of the Tukey test. Different letters indicate statistically significant differences between treatments, while the same letters indicate no significant differences. In this experiment, the 75% wastewater concentration treatment (TR3) produced significantly more biomass than the control (K), while the 50% (TR2) and 25% (TR1) treatments showed only modest differences

Therefore, the different treatment levels influenced the growth of *Chlorella* sp., with the TR3 treatment producing the highest biomass, significantly surpassing the control. These results support the hypothesis that higher wastewater concentrations can enhance microalgal biomass production

Domestic Wastewater Quality

Using domestic wastewater to cultivate *Chlorella* sp. affects not only the microalgal biomass but also the quality of the wastewater itself. Over the 24-day observation period, changes were observed in parameters such as TDS, temperature, pH, DO, nitrate, phosphate, and BOD (Figure 3).



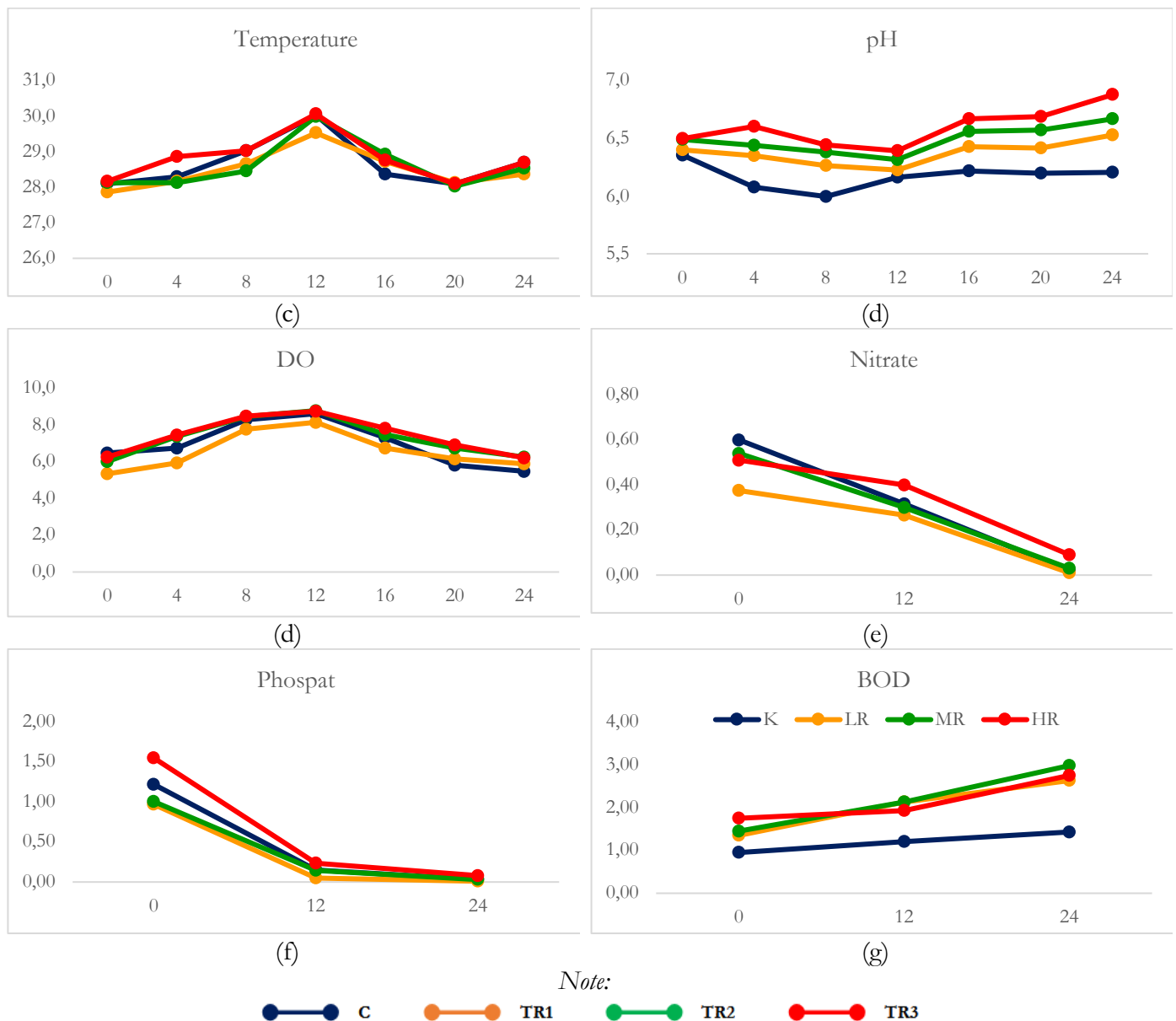


Figure 3. Graph of Biomass Concentration and Domestic Wastewater over 24 Days of Observation

a. Total Dissolved Solids (TDS)

According to Table 4, the highest TDS concentration was recorded in the TR3 treatment at 228 mg/L, while the control (C) had the lowest at 30.30 mg/L. The elevated TDS in TR3 likely reflects the accumulation of dissolved solids during *Chlorella* sp. growth, possibly resulting from metabolic byproducts or excretions from the microalgae. The elevated nutrient content in the domestic wastewater used as the growth medium also contributed to the higher TDS levels. In contrast, the lower TDS observed in the control group reflects the initial water conditions, which contained fewer dissolved nutrients.

A significant rise in TDS can impact water quality and the continued growth of microalgae. Excessive dissolved solids can disturb the osmotic balance between the inside and outside of the cells, forcing

them to use more energy to regulate the movement of ions and water across their membranes. This osmotic stress may, in turn, limit growth, reduce photosynthetic efficiency, and hinder nutrient uptake (Li et al., 2019; Kumar et al., 2020). This significant change in TDS may also indicate increased mineralization and the decomposition of organic matter during the bioremediation process by the microalgae (Converti et al., 2009).

b. pH

At the start of the experiment, the pH in the TR2 and TR3 treatments was slightly higher (6.50) than in the control and TR1 treatments (6.40). Over the course of the study, the pH increased across all treatments, with the most notable rise in TR3, reaching a final pH of 6.90. This increase is likely linked to the photosynthetic activity of *Chlorella* sp.,

where the absorption of carbon dioxide (CO₂) reduces water acidity and raises the pH (Otondo et al., 2018; Fogg et al., 1987). An increase of 10 to 40 points in pH in some treatments indicates that the culture medium became more alkaline over time. This is a common phenomenon in microalgae cultures, where active photosynthesis raises dissolved oxygen levels and reduces the concentration of CO₂, which acts as a weak acid in water

c. Temperature

Table 4 indicates that the initial temperature ranged from 27.90 °C in TR1 to 28.20 °C in TR3. By day 24, temperatures had risen slightly to 28.40 °C in TR1 and 28.70 °C in TR3. These changes remained within the optimal range for *Chlorella* sp. growth, as microalgae generally thrive at temperatures between 25 and 30 °C (Ranglová et al., 2019). Maintaining stable temperatures is essential, as extreme heat or cold can impact the photosynthesis and metabolism of microalgae. The slight temperature increase observed toward the end of the study may have resulted from microalgal metabolic activity or external environmental factors, but it was not sufficient to cause thermal stress in the culture

d. Dissolved Oxygen (DO)

These findings highlight how microalgae, either on their own or working alongside bacteria, play a vital role in effectively reducing nitrate levels in wastewater while simultaneously supporting their own growth and sustaining nutrient cycling.

After reaching its peak, DO levels gradually declined until the end of the observation period on day 24. This decrease parallels the reduction in *Chlorella* sp. biomass, likely resulting from lower photosynthetic activity or increased oxygen consumption by the microalgae and other microorganisms in the culture medium. Such patterns are common in closed culture systems, where oxygen demand for respiration rises during the later growth phase, while oxygen production from photosynthesis diminishes

e. Nitrate

At the start of the observation, the control treatment (K) had the highest nitrate concentration at 0.60 mg/L, whereas the lowest concentration was observed in TR1 at 0.38 mg/L. The graph illustrates a marked decrease in nitrate concentration across all treatments by day 24. The control treatment (K) experienced the fastest decline, reaching a final nitrate concentration of 0.02 mg/L, whereas TR3

retained the highest nitrate level at 0.09 mg/L by the end of the observation period

The significant reduction in nitrate concentration observed in this study is consistent with previous findings. Yang et al., (2023) demonstrated that *Chlorella pyrenoidosa* cultivated in high-nitrate synthetic wastewater could achieve a high nitrate consumption rate of 5.15 g L⁻¹ d⁻¹, efficiently converting nitrate into protein and chlorophylls, thereby supporting biomass accumulation and bioremediation potential. Similarly, Yu et al., (2024) reported that co-cultivation of *Chlorella vulgaris* with *Pseudomonas* sp. not only enhanced carbon fixation but also improved nitrate removal through synergistic nutrient exchange and metabolic regulation, achieving nitrate removal rates up to 135.4 mg L⁻¹ d⁻¹. These findings emphasize the key role of microalgae, whether alone or in combination with bacteria, in efficiently lowering nitrate levels in wastewater while also promoting growth and maintaining nutrient cycling

f. Phosphate

In contrast to nitrate, phosphate showed a different pattern at the start of the experiment, with the highest initial concentration of 1.55 mg/L in TR3 and the lowest of 0.97 mg/L in TR1. Figure 3g shows a significant decrease in phosphate concentration across all treatments by day 24, with TR3 recording a final phosphate concentration of 0.08 mg/L.

The observed reduction in phosphate is likely due to *Chlorella* sp. absorbing it as an essential nutrient for growth, especially for synthesizing DNA, RNA, and cell membranes. Phosphate plays a crucial role in the formation of nucleic acids, proteins, sugar phosphates, and various other metabolites (Solovchenko et al., 2019; Su, 2021; Blank, 2012; Lin et al., 2016). Phosphate also plays a crucial role in the formation of phospholipids, which are essential components of cellular membranes, providing both structure and protection to the cells. In microalgae, phospholipids constitute a significant portion of cellular phosphorus, with estimates suggesting that 10–50% of the lipids are made up of these molecules (Geider & La Roche, 2002; Manisali et al., 2019). As the microalgae use phosphate for photosynthesis and cellular growth, the phosphate levels in the medium decrease, which is clearly reflected in the observations.

g. Biological Oxygen Demand (BOD)

On day 0, the highest BOD was observed in TR3 at 1.75 mg/L, while the control treatment (K) had the lowest at 0.95 mg/L. Over the course of the experiment, BOD increased in all treatments, as

illustrated in Figure Xh. By day 24, the highest BOD levels were recorded in TR2 and TR3 at 2.98 mg/L each, followed by TR1 at 2.63 mg/L, with the control (K) remaining the lowest at 1.43 mg/L.

The rise in BOD reflects heightened biological activity within the culture system, mainly due to the growing number of microorganisms consuming oxygen to break down organic matter. At the start of the observation, the relatively low BOD values suggested that the available organic matter was limited and insufficient to support high microbial activity.

Correlation of *Chlorella* sp. Biomass and Domestic Wastewater Parameters

According to Table 5, the parameter with the strongest positive correlation was *Chlorella* sp. biomass and DO, with a value of 0.949. This indicates that as the biomass of *Chlorella* sp. increases, the dissolved oxygen levels in the water also rise.

The next strongest correlation was between nitrate and phosphate, with a value of 0.817. This suggests that as nitrate concentration increases, phosphate concentration also tends to increase in the aquatic environment created by domestic wastewater. These two compounds are the primary nutrients needed by microorganisms and aquatic plants, including *Chlorella* sp., meaning their presence often supports each other in aquatic environments.

Although nitrate and phosphate showed relatively low correlations with *Chlorella* sp. biomass, this suggests that other factors in the domestic wastewater—such as temperature, dissolved oxygen, or the overall nutrient balance—may play a more significant role in microalgal growth. Light intensity from the photobioreactor also has a major impact, as it warms the wastewater and supports algal development, which is reflected in the strong correlation between *Chlorella* sp. biomass and temperature ($r = 0.626$).

pH showed a strong positive correlation with both TDS (0.695) and BOD (0.687), indicating that higher pH levels are associated with increased TDS and BOD. In waters with active microalgal photosynthesis, such as those containing *Chlorella* sp., rising pH occurs as CO₂ is consumed during photosynthesis, which reduces acidity and elevates the pH. Under these conditions, organic compounds are more readily decomposed, releasing various ions into the water and thereby increasing TDS. This breakdown process also raises the oxygen demand

for decomposition, which is reflected in higher BOD values (Wang et al., 2023; Ras et al., 2013).

Another notable correlation was observed between dissolved oxygen and temperature ($r = 0.693$), suggesting that changes in one parameter can influence the other. Dissolved oxygen generally decreases as temperature rises, because warmer water holds less oxygen than cooler water. In the photobioreactor, the increase in temperature caused by the lighting likely contributed to the reduction in dissolved oxygen levels.

There was a strong negative relationship between phosphate levels and temperature, with a correlation of -0.738. In simpler terms, when the water is cooler, the microalgae's metabolic activity slows down, and they take up less phosphate. On the other hand, as the temperature rises, the microalgae become more active, absorbing phosphate more quickly and causing the phosphate concentration in the water to drop (Borlongan et al., 2020).

Another negative correlation was observed between BOD and nitrate, with a value of -0.688. This means that as nitrate levels rise in the water, BOD tends to drop. Nitrate is a key nutrient for microalgae, and higher concentrations promote their growth and enhance photosynthesis. As the algae produce more dissolved oxygen through photosynthesis, less oxygen is required to break down organic matter, which in turn lowers the BOD.

The growth of *Chlorella* sp. biomass has both positive and negative effects on the quality of domestic wastewater. On the positive side, this microalga helps improve water quality by absorbing excess nutrients like nitrate and phosphate, using them to fuel its own growth. This process helps prevent eutrophication and enhances overall water quality. However, there is a downside: as the biomass accumulates, its eventual decomposition consumes more oxygen, leading to an increase in parameters like BOD. Additionally, the growth of *Chlorella* sp. produces oxygen through photosynthesis, which can increase the dissolved oxygen (DO) content in the water, supporting the balance of aquatic ecosystems.

Conclusion

Using domestic wastewater to cultivate *Chlorella* sp. had a noticeable impact on biomass production. The wastewater provided nutrients like nitrate and phosphate, which the microalgae absorbed, helping to reduce excess nutrient levels and improve water quality. However, as the algae grew and biomass accumulated, the Biological Oxygen Demand (BOD) in the water also increased, which could influence the

overall oxygen availability. The close relationship between *Chlorella* sp. biomass, dissolved oxygen (DO), and temperature highlights how vital light and nutrient availability are for microalgal growth. This study emphasizes the promising role of *Chlorella* sp. not only in cleaning domestic wastewater in a sustainable way but also in producing valuable biomass that can be put to use.

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