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Effectiveness of Mendong (*Fimbristylis globulosa*) as A Phytoremediation Agent for Total Ammonia and Total Nitrogen Leachate

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Abstract

Landfills are one of the causes of environmental pollution resulting from the disposal of human activity waste without further treatment. In 2023, the total waste generation reached 1,270.00 tons per day, with 900 tons of waste being transported to the landfill each day. This waste accumulation produces leachate, a thick, dark-colored liquid that carries pollutants and materials from the waste, which has the potential to contaminate the surrounding environment, including the Kreo River. Therefore, phytoremediation using Mendong plants is proposed to reduce the pollutants in the leachate. This research employed an experimental method with a Completely Randomized Design (CRD), using Mendong plants (*Fimbristylis globulosa*) and three biomass variations: P0 (0 g), P1 (1000 g), and P2 (2000 g). Each treatment involved 10 liters of leachate and was replicated three times. The phytoremediation process proved effective in reducing total ammonia levels in the leachate, with a reduction of up to 63%, and the highest total nitrogen reduction reached 53%. This phytoremediation approach can assist in reducing excess total ammonia in water bodies by absorbing organic pollutants through plant roots, as Mendong exhibits hyperaccumulator and hypertolerant properties. Mendong (*Fimbristylis globulosa*) showed potential in reducing total ammonia and total nitrogen levels in landfill leachate, although the reductions were not statistically significant.

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INTRODUCTION

Every day, humans often produce waste that results in environmental problems (Rendana et al., 2024). Waste produced by human activities, such as organic and inorganic, can cause health problems if not addressed properly. So it is necessary to overcome the problem of environmental pollution caused by the waste of human activities (Hoya et al., 2023). Most of them are in the areas of big cities in Indonesia that experience environmental problems, namely waste disposal at Final Processing Sites (TPA). Landfills are one of the causes of environmental pollution caused by the disposal of waste from human activities without further treatment (Pramesti et al., 2023). The Final Processing Site (TPA) is a place to process and return waste to environmental media safely for humans and the environment (Pierrenia et al., 2021). However, in every area that has a landfill, it is still just an open garbage dump, also known as open dumping (Safitri et al., 2025). One of the landfills that still has open waste disposal activities or open dumping is the Jatibarang Semarang Landfill.

The Jatibarang Semarang Landfill is the center of the landfill in the city of Semarang, which is located in Kedungpane Village, Mijen District, Semarang City, Central Java. The pile of waste at the Jatibarang Landfill has increased from year to year, making Central Java the province that has the largest waste generation in Indonesia. In 2023, the total waste generation will reach 1,270.00 tons per day, with 900 tons of waste generation sent to landfills every day (Harjanti, 2020). This results in massive environmental pollution and impacts the environment. In addition, the total of waste generation, 60.34% is dominated by organic waste. So, the waste in the Jatibarang Landfill is used in several parts of the place for waste collection (Melinda et al., 2019). Most of the waste products produce liquids from the Jatibarang Landfill reservoir. The liquid will be accommodated in the leachate reservoir.

Leachate is water with a high concentration of organic content formed due to rainwater entering the interior landfill (Darnas et al., 2020). In general, leachate is a liquid that has a black color and an unpleasant odor. It is very pungent and contains toxic substances. According to Nuriadin et al (2024), leachate is a liquid that seeps through a pile of garbage by carrying compounds that contain solute or suspended matter. Leachate has content in the form of TSS, DO, nitrates, total nitrogen, total ammonia, iron, sulfate, COD, and BOD (Ade et al., 2024). One of the efforts to reduce the total Ammonia and total Nitrogen content of leachate wastewater is to phytoremediate. Phytoremediation commonly uses plants that have hydrophytic properties or can live in water. In addition, the nature of plants that can be used as phytoremediation plants is that they have remediatory properties, namely, they can grow and are tolerant of pollutants.

One of the aquatic plants that can act as a phytoremediation agent is Mendong (*Fimbristylis globulosa*) (Gunarsa, 2018). This plant has hyperaccumulator properties, as it is able to absorb higher amounts of pollutants and grow rapidly. In addition, the roots of phytoremediator plants play an important role by releasing rhizospheres that help transport pollutants into the planting medium (Hasanah et al., 2023). Previous studies have primarily focused on other macrophytes such as Eichhornia crassipes or Cyperus species for leachate treatment, while there is limited evidence regarding the application of Mendong in reducing nitrogenous pollutants in landfill leachate (Rosariastuti et al., 2020). This creates a research gap, particularly in evaluating its effectiveness in reducing total ammonia and total nitrogen concentrations. Therefore, this study aims to examine the potential of Mendong (*Fimbristylis globulosa*) as a phytoremediation agent for leachate treatment. The working hypothesis is that Mendong can reduce total ammonia and total nitrogen levels in the leachate of Jatibarang Semarang landfill.

METHOD

This research will be carried out in December 2024 at the Jatibarang Final Disposal Site (TPA), Semarang. Testing of total ammonia and total nitrogen levels in leachate was carried out at the Environmental Laboratory of the Semarang City Environmental Agency. This study is an experimental research using a true experiment design with a post-test only control group design. Leachate water samples were taken from leachate reservoirs at the Jatibarang Landfill, Semarang. The experiment was carried out under natural conditions without additional control of lighting, aeration, or temperature. However, key physicochemical parameters of the leachate, including temperature, dissolved oxygen (DO), and pH, were measured during the experiment to monitor the environmental conditions. The research design used was a Complete Random Design (RAL) with three levels of treatment and three repeats, so that there were a total of 9 experimental units.

Figure 1. Reactor setup of research mendong

The treatment provided in this study is as follows:
P0: 10 liters of leachate without mendong (control)
P1: 10 liters of leachate + 1000 grams of mendong
P2: 10 liters of leachate + 2000 grams of mendong

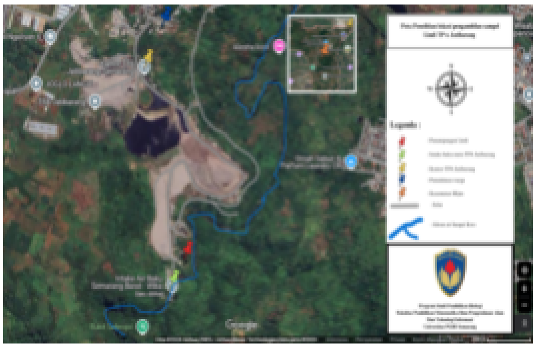

Figure 2. Location of research

Data collection techniques are carried out through experiments and observations. The data consists of primary data and secondary data obtained from laboratory test results with the help of measuring instruments. The total ammonia was tested using the Nessler Spectrophotometric method in accordance with the Indonesian National Standard (SNI) 06-6989.30-2005, while the total nitrogen was analyzed using the Kjeldahl method based on the Indonesian National Standard (SNI) 06-6989.1-2004. The observation data is then compared with the leachate quality standards stipulated in the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 06 of 2021 concerning leachate quality standards for Business Activities and/or Activities at Final Waste Processing Sites. Furthermore, the data from the research results were analyzed by a homogeneity test first before the One-Way ANOVA (Analysis of Variance) test was carried out. If the analysis of variance (ANOVA) shows significant differences among treatments, further tests will be conducted. The follow-up tests may include Duncan's test, LSD test, or HSD test, depending on the value of the coefficient of variation.

RESULT AND DISCUSSION

Mendong phytoremediation agent total ammonia leachate

In the study, it was found that the total ammonia content contained in leachate after phytoremediation using mendong plants was effective in reducing the total ammonia levels of leachate, but the treatment in this study did not have a significant effect. Although the total ammonia data showed a decrease in concentration in the treatment with mendong plants, statistically, the difference could not be distinguished from the natural variation between treatment iterations in the study. Here are the total ammonia data for day 3 in Table 1 and day 7 in Table 2.

Table 1. Total ammonia levels on day 3 of treatment

Treatment	Average initial rate	Repetition rate (mg/L)			Average final rate	Percentage decrease (%)	Information
		1	2	3			
P_0	2,25	2,46	2,46	2,46	2,46	-8	Rate Rise
P_1	2,25	2,07	1,99	2,72	2,25	0	Remain
P_2	2,25	1,97	1,5	0,66	1,37	63	Rate Drop

Based on the data in the table, it can be seen that mendong (*Fimbristylis globulosa*) effectively reduced the total ammonia level of leachate on day 3 of the study. However, there was no decrease in total ammonia levels of the leachate. The percentage of ammonia levels from the highest to the lowest in a row is P_2 an 63%, P_1 an 0%, P_0 an -8%.

Table 2. Total ammonia levels on day 7 of treatment

Treatment	Average initial rate	Repetition rate (mg/L)			Average final rate	Percentage decrease (%)	Information
		1	2	3			
P_0	2,25	15,5	15,5	15,5	15,54	-86	Rate Rise
P_1	2,25	15,2	16,2	15,7	15,70	-86	Rate Rise
P_2	2,25	15,9	15,3	15	15,42	-85	Rate Rise

Based on the data in Table 4.3, it was seen that mandong (*Fimbristylis globulosa*) was not effective in reducing the total ammonia level of leachate on day 7 of the study. The percentage of total ammonia levels from highest to lowest in succession is P_2-85%, and -86% respectively. P_1 and P_0. Furthermore, testing with the Anova Variety-Variety One Way Test for each treatment on day 3 of treatment and day 7 of treatment in Table 3 and 4.

Table 3. One-way test of the total ammonia level for 3 days

Sources of Diversity	Free degree (db)	Number of Squares (JK)	Middle Square (KT)	F_{Hitung}	F_{tabel}	
					5%	1%
Treatment	2	.2220	.1110	0.2133	5.14	10.92
Galat	6	3.1228	.5205			
Total	8	3.3448				

Based on this data, it can be known that F_{Hitung} (0.2133) < F_{tabel} (5.14) in treatment, meaning H_0 is accepted and H_1 is rejected, so that no follow-up test is needed. This shows that the biomass of mendong *(Fimbristylis globulosa*) has no effect on reducing the total ammonia level of leachate.

Table 4. One-way test of total ammonia level on day 7 of treatment

Sources of Diversity	Free degree (db)	Number of Squares (JK)	Middle Square (KT)	F_{Hitung}	F_{tabel}	
					5%	1%
Treatment	2	.4391	.2196	0.8189	5.14	10.92
Galat	6	1.60646	.26743			
Total	8	2.0437				

Based on this data, it can be known that F_{Hitung} (0.8189) < F_{tabel} (5.14) in the treatment, meaning H_0 is accepted and H_1 is rejected, so that no follow-up test is required. This shows that the biomass of mendong (*Fimbristylis globulosa*) has no effect on reducing the total ammonia level of leachate.

Data on the development of the percentage effectiveness of mendong (*Fimbristylis globulosa*) against the phytoremediation of total ammonia leachate in Jatibarang during the study can be seen in Figure 3.

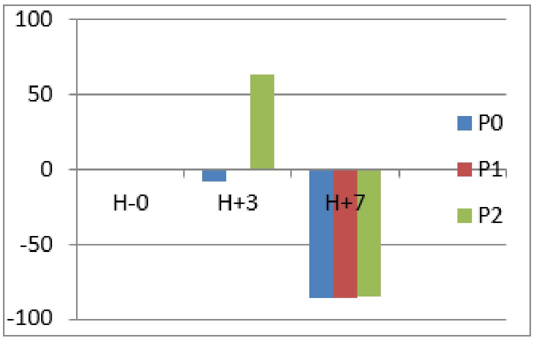

Figure 3. Graph of total ammonia levels of leachate

Insignificance in the data is suspected to be caused by Low Treatment Effect (small treatment effect), which is the ability of the mendong plant to absorb or degrade total ammonia, which is still limited in a certain time scale and concentration. According to Fitri et al (2023), in inferential statistics, especially in the ANOVA Variety, the significance of the differences between treatments was greatly influenced by the Treatment effect size compared to Within-group variance. In this study, treatment in the form of adding 1000 g (P_1) and 2000 g (P_2) of mendong biomass may result in biological changes, but these changes are not large enough to overcome the natural variability (error term) in the data. In the study, the treatment of the mendong biomass used was 1000 g (P_1) and 2000 g (P_2), respectively, which is theoretically expected to increase phytoremediation capacity through increasing the root surface area and rhizosphere exudate. However, such biomass accumulation may still be significantly below the threshold of the effectiveness of bioconversion of ammonia compounds on a limited experimental scale. The effectiveness of phytoremediation is not only influenced by the amount of biomass, but also by the speed of transport, the accumulation of pollutant compounds, and the biological activity of rhizospheric microorganisms that support the nitrification-denitrification process. The absence of a significant response can also be attributed to environmental dynamics such as pH, temperature, DO, and retention time that may not be optimal for the process of transforming ammonia into a non-toxic form of nitrogen. Although there is a decrease in total ammonia concentration, statistically, it cannot be categorized as a treatment effect that has a significant effect.

During the study, total ammonia levels always fluctuated (up and down), which did not differ much from each treatment. The ability of mendong plants to reduce the total ammonia level of leachate is due to their hyperaccumulator nature and hypertolerance to pollutants. In the results of this study using mendong as a phytoremediation of leachate, several biomasses contained in each treatment have different levels of effectiveness in reducing total ammonia. The biomass of the Mendong plant (*Fimbristylis globulosa*) used in this study was 0 g or without treatment (P_0), 1000 g of Mendong (P_1), and 2000 g of Mendong (P_2). From the three treatments, it can be seen that Mendong (*Fimbristylis globulosa*) was most optimal on day 3 of the study, which was 63% with a total ammonia level of 1.37 mg/L. However, any treatment on the third day other than the P_2 treatment was not effective in reducing total ammonia. Meanwhile, the treatment that had the worst reduction effectiveness occurred on day 7 of the study, which was -86% with a total ammonia level of 15.70 mg/L so that the biomass and time during the study were the most effective, namely the treatment compared to the control, on day 3, and all treatments on day 7.

Table 5. Government quality standard of leachate

Parameter	the highest concentration	
	Value	Unit
pH	6-9	-
BOD	50	mg/L
COD	100	mg/L
TSS	200	mg/L
TDS	2000	mg/L
Total Ammonia Nitrate	1	mg/L

From the literature: Permen LHK No.6 /2021

According to Panca et al. (2023), Hyperaccumulator plants are plants that have the ability to absorb pollutants or concentrate high levels of pollutants and then accumulate in the plant body biomass. Mendong plants are hyperaccumulators because they have fibrous roots that spread in various directions, so that they have high absorption of pollutants. In hyperaccumulator plants, pollutants will accumulate inside the roots due to the larger surface area of the root hairs compared to the stems and leaves in the absorption of pollutants. Mendong plants have a rhizosphere that functions to carry pollutants in the planting medium to the root cells, and then they will be degraded by enzymes found in the roots. The presence of the rhizosphere around the roots of mendong results in the presence of pollutant-degrading enzymes such as nitroreductase, lactase, dehalogenase, peroxidase, and nitrilase. Hyperaccumulator plants can accumulate metals with concentrations of more than 100 ppm, more than typical plants, where plants in general will experience poisoning and decreased production. Meanwhile, hypertolerant plants are plants that are able to adapt and survive and have high tolerance to environmental conditions that have been contaminated with pollutants. The hypertolerant nature of the mendong plant (*Fimbristylis globulosa*) is caused by the adaptation pattern that the mendong plant exhibits before phytoremediation. Mendong (*Fimbristylis globulosa*) does not directly absorb the organic matter contained in leachate, but will adapt first and provide conditions that can support the decomposition process of organic matter by microorganisms found in plant roots.

Plant conditions affect the decrease in total ammonia concentrations of leachate. On the seventh day of the study, the research treatment of leachate experienced an increase in concentration from the third day of the study. This is because the condition of the plants on the seventh day of treatment has begun to rot due to the high level of leachate toxicity. However, prolonged immersion in high pollutants causes plants to experience stress, such as nutrient limitations, exposure to waste, or changes in water quality, which can begin to show symptoms of senescence or decay, especially in the submerged roots and leaves. This necrotic plant tissue will become a new substrate for decomposer microorganisms. The process of decomposition of plant biomass by aerobic and facultative heterotrophic bacteria will produce inorganic nitrogen compounds, especially ammonium ions (NH_4^+), as the final result of the ammoniation process. Ammonification refers to the conversion of organic nitrogen derived from dead plant tissues into a water-soluble form of ammonia. The ammoniation process contributes directly to an increase in total ammonia levels in water-containing media, even when adequate dissolved oxygen (DO) is available. Several previous studies support these findings. According to Zhou et al. (2012), root rot of aquatic plants in phytoremediation systems can lead to ammonia accumulation in water due to nitrogen mineralization of complex organic compounds. A similar thing is conveyed by Xu et al. (2016), who state that after the initial phase of nitrogen absorption by plants, the next phase can be characterized by the release of nitrogen back into water due to the decomposition of plant tissues. In this system, although DO levels increase until day 7, nitrification activity may not be optimal or may not be able to compete with the ammonification rate of decaying plant biomass. The nitrification process requires the existence of a stable and thriving community of nitrifying bacteria, which generally requires a longer adaptation time. As a result, the production of NH_4^+ from plant tissues is faster than the system's ability to convert it into nitrites (NO_2^-) and nitrates (NO_3^-), resulting in an increase in total ammonia. In addition, decaying plants also release dissolved organic compounds such as amino acids, urea, and other low-molecular nitrogen compounds that are easily degraded by microbes into NH_4^+. This combination of decomposition and ammonification processes creates conditions that support an increase in total ammonia concentrations even when there is no significant change in pH or temperature.

Mendong phytoremediation against total nitrogen leachate

In this study, the phytoremediation agent, namely mendong (*Fimbristylis globulosa*), can reduce the total nitrogen level in leachate. The treatment used during the study by differentiating biomass in Mendong was 0 g (P0), 1000 g (P1), and 2000 g (P2). The purpose of the difference in biomass is to determine the comparative effectiveness of the biomass of the mendong plant in reducing the total nitrogen level in the leachate, as well as to determine the biomass that is effective in reducing the total nitrogen level. The data on total nitrogen reduction after phytoremediation treatment using mendong plants are shown in Tables 5 and 6.

Table 6. 3rd total nitrogen levels of treatment

Treatment	Average initial rate	Repetition rate (mg/L)			Average final rate	Percentage decrease (%)	Information
		1	2	3			
P_0	1244	1190	1187	1194	1190	5	Rate Drop
P_1	1244	1339	1434	1258	1343	-7	Rate Rise
P_2	1244	1068	1339	1244	1217	2	Rate Drop

Based on the data in Table 5, it can be seen that mendong (*Fimbristylis globulosa*) was treated and effectively reduced the total nitrogen level of leachate on day 3 of the study. However, in the treatment, there was no decrease in the total nitrogen content of the leachate. The percentage of total nitrogen content from highest to lowest in a row is the treatment of 5%, 2%, and -7% $P_0 P_1 P_1 P_0 P_2 P_1$.

Table 7. 3rd total nitrogen levels of treatment

Treatment	Average initial rate	Repetition rate (mg/L)			Average final rate	Percentage decrease (%)	Information
		1	2	3			
P_0	1244	811	811	811	811	53	Rate Drop
P_1	1244	1044	1174	1123	1113	12	Rate Drop
P_2	1244	1118	1109	1048	1091	14	Rate Drop

Based on the data in Table 6. It was seen that mendong (*Fimbristylis globulosa*) effectively reduced the total nitrogen levels of leachate on day 7 of the study. The percentage of total nitrogen content from highest to lowest in a row is 53%, 14%, 12% $P_0 P_1 P_2 P_0 P_2 P_1$.

Furthermore, testing with the ANOVA Variety, One-Way Test, for each treatment on day 3 of treatment and day 7 of treatment in Tables 7 and 8.

Table 8. Total nitrogen level, one-way test, day 3 of treatment

Sources of Diversity	Free degree (db)	Number of Squares (JK)	Middle Square (KT)	F_{Hitung}	F_{tabel}	
					5%	1%
Treatment	2	42,755.56	21,377.78	2.31	5.14	10.92
Galat	6	55,492.66	9,248.78			
Total	8	98,248,22				

Based on this data, it can be known that (2.31) < (5.14) in treatment, meaning accepted and rejected so that no follow-up test is needed. This shows that the biomass of mendong (*Fimbristylis globulosa*) has no effect on the decrease in total nitrogen levels of leachate.$F_{Hitung} F_{tabel} H_0 H_1$.

Table 9. Nitrogen level one-way test total day 7 of treatment

Sources of Diversity	Free degree (db)	Number of Squares (JK)	Middle Square (KT)	F_{Hitung}	F_{tabel}	
					5%	1%
Treatment	2	3,927.78	1.9363,89	0.0683	5.14	10.92
Galat	6	172.566	28,761			
Total	8	176,493.78				

Based on this data, it can be known that (0.0683) < (5.14) in treatment, meaning accepted and rejected, so that no follow-up test is needed. This shows that the biomass of mendong (*Fimbristylis globulosa*) has no effect on the decrease in total nitrogen levels of leachate$F_{Hitung} F_{tabel} H_0 H_1$.

Data on the development of the percentage effectiveness of mendong (*Fimbristylis globulosa*) against phytoremediation of total nitrogen leachate from Jatibarang landfill during the study can be seen in Figure 3.

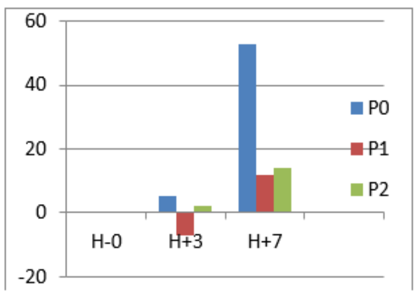

Figure 4. Total nitrogen drop graph image

In this study, the results showed that the total nitrogen level in leachate decreased after phytoremediation using the mendong plant (*Fimbristylis globulosa*), but the treatment did not show a statistically significant effect. Although the data on total nitrogen showed a decrease in total nitrogen concentration in the treatment with mendong plants, the differences between the treatments could not be significantly distinguished from the natural variation between the repetitions in each treatment group. This insignificance is suspected to be caused by the low treatment effect (small treatment effect), which is the limited ability of the mendong plants to absorb or degrade total nitrogen over a certain time scale and concentration. According to Fitri et al (2023), in inferential statistics, especially in the Variegated One-Way Analysis (ANOVA) test, the significance of differences between treatments is highly dependent on the comparison between the size of the treatment effect and the level of variability in the group (within-group variance). In this study, treatment in the form of adding mendong plant biomass of 1000 g (P_1) and 2000 g (P_2) can improve phytoremediation efficiency through root surface expansion and rhizosphere exudate secretion. However, such biomass accumulation is likely to still be below the threshold of effectiveness to induce significant total nitrogen biotransformation in the system in use. The absence of statistically significant differences can also be attributed to environmental dynamics such as pH, temperature, dissolved oxygen (DO) levels, and retention time, which may not be optimal for the process of transforming nitrogen into a more stable and non-toxic form (Novita et al., 2021). Despite the decrease in total nitrogen concentration, the findings could not be categorized as statistically significant treatment impacts.

In this study, there were fluctuations (ups and downs) in the total nitrogen levels in each test. These fluctuations occur as a result of the absorption of mendong plants and the nitrification process. A decrease in total nitrogen levels was seen in P_0, which is a treatment without the application of the plant, because P_0 was not given a cover.

As a result, the nitrogen nitrate (NO_3^-) compounds in the nitrogen process return to the atmosphere and convert the nitrates into nitrogen gas, which causes a decline, albeit in small amounts. This decline occurs not only in P_0, but also in P_1 and P_2. In the treatment of P_1 and P_2, most of the decline is due to the phytoremediation process carried out by the mendong plant, which is nitrogen assimilation through the formation of amino acids from inorganic nitrogen.

In the phytoremediation process, the activity between plants and microorganisms occurs at the roots that have a large surface area, so that they are able to absorb more and larger pollutants than the surface of the stems and leaves (Sukono et al., 2020). The results of the study conducted for seven days showed a decrease in total nitrogen levels in each treatment, both with and without mendong plants. However, the most significant decrease in total nitrogen occurred in the P0 treatment (without the plant) on day seven. This shows that there is a dominant natural process that occurs in the system, namely the denitrification process. Denitrification is a biological process carried out by anaerobic or facultative anaerobic heterotrophic microorganisms that convert nitrate compounds (NO_3^-) into nitrogen gas (N_2), through reduction stages involving several intermediate compounds such as nitrite (NO_2^-), nitric oxide (NO), and nitrous oxide (N_2O). The nitrogen gas formed will be released into the atmosphere, causing a decrease in the total nitrogen level in the water (Anggit et al., 2023). The denitrification process is greatly influenced by the dissolved oxygen (DO) conditions in the media. Denitrification generally takes place under anoxic conditions, i.e., when DO is low or limited. However, several studies, one of which is from Ilma (2021), suggest that partial denitrification can persist in microanoxic zones even if the environment in general has high DO, such as in plant root biofilms or microbial zones (Hafilda, 2021). In the treatment without plants (P0), uncovered water and exposure to the atmosphere allow free oxygen diffusion, increasing DO and facilitating nitrification. The nitrates that are formed can then undergo denitrification, mainly through the activity of microorganisms that form naturally in the leachate substrate. Although optimal denitrification occurs when DO is low, local

DO fluctuations, such as in mud aggregates or sediment layers, allow microanoxic zones to occur so that denitrification takes place (Pangemanan, 2024). Denitrifying microorganisms grow optimally under anaerobic conditions because they use nitrates as electron acceptors in respiration, replacing oxygen. This anaerobic condition is supported by the accumulation of organic matter from liquid waste (leachate), which undergoes microbial decomposition and consumes dissolved oxygen in the process. As the DO depletes, microbes begin to shift the use of electron acceptors from O_2 to NO_3^-, thus accelerating the denitrification reaction. Therefore, on the seventh day, when the microbiological process has progressed further and the DO has decreased more significantly, there is a higher denitrification rate compared to the third day. In contrast to the P1 and P2 treatments that use mendong plants, the process of nitrogen reduction also occurs, but more through phytoremediation mechanisms, such as assimilation by plants, the formation of organic compounds (amino acids and proteins), and microbial activity in the rhizosphere zone (Ari et al., 2022). Although denitrification also occurs, the presence of plant roots can supply oxygen through the aerenchyma tissue, which can increase local DO levels around the roots, thereby suppressing the denitrification process and further supporting nitrification and nitrogen assimilation.

Measurement of Dissolved Oxygen (DO) meter, pH, and Temperature at the research site at 10.00-10.30 WIB as secondary data that can support research under conditions that are not too hot. The decrease in total nitrogen content is supported by temperature and pH because the decomposition process takes place at a neutral and alkaline pH, which is optimal. In addition, it supports bacteria from the lag phase to the stationary phase in phytoremediation.

Research data shows that research suggests a decrease in the effectiveness of mendong in the absorption of pollutants in each treatment. In the results of this study using mendong as a leachate phytoremediation, several biomasses contained in each treatment have different levels of total nitrogen reduction effectiveness. The biomass of the Mendong plant (*Fimbristylis globulosa*) used in this study was 0 g or without treatment (P_0), 1000 g of Mendong (P_1), and 2000 g of Mendong (P_2). From the three treatments, it can be seen that Mendong (*Fimbristylis globulosa*) was the most effective in reducing the total nitrogen level by 5% on the third day of the study, which occurred at 5% with a total nitrogen level of 1190 mg/L, and by 2% with a total nitrogen level of 1217. However, on the third day of treatment, the treatment was not effective in lowering total nitrogen. Meanwhile, the treatment that had the most optimal level of effectiveness reduction on the seventh day of the study occurred in the ocean, which was 53% with a total nitrogen level of 817 mg/L. Furthermore, the treatment was 14% with a total nitrogen level of 1091 mg/L, and the treatment was 12% with a total nitrogen level of 1113 mg/L, so that the biomass and time during the study were the most effective, namely the treatment on the seventh day of the study, compared to the treatment, and the entire treatment on the third day.

CONCLUSION

Based on the results of the research that has been carried out, the following conclusions were drawn:

1. Mendong plant (*Fimbristylis globulosa*) is effective in reducing the total ammonia level of leachate. The most optimal effectiveness of reducing total ammonia levels occurred in the P3 treatment on day 3 of the study, which was 63%. Meanwhile, the lowest reduction in total ammonia levels occurred in the P0 treatment on day 7 of the study, which was -86%.
2. Mendong plant (*Fimbristylis globulosa*) is effective in reducing the total nitrogen level of leachate. The most optimal effectiveness of reducing total nitrogen levels occurred in the P0 treatment on day 7 of the study, which was 53%. Meanwhile, the lowest effectiveness of reducing total nitrogen levels occurred in the P0 treatment on

the third day of the study, which was -7%.

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