



The length of day and type of media in reducing pollutant on laundry wastewater

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ABSTRACT

Total Suspended Solid (TSS) and Total Dissolved Solids (TDS) can be used as the indicator of sediment in the media, which usually consists of silt, fine sand, and microorganisms. The high concentration of TSS in the water column can be used as the indication that the process of sedimentation in the reservoir is also high (Fauzi & Wicaksono, 2016). The purpose of this study was to determine the influence of day duration and type of media in reducing pollutants on laundry liquid waste. The method used in this study is a pure experiment for seven days; the total sample used was 15 liters of laundry wastewater. The independent T-test results on the TDS and TSS variables using two different types of treatments showed that there were significant differences between the two types of treatments with p values of TDS and TSS, respectively were 0,000 and 0.003 < 0.5. Meanwhile, the test of the effect of the types of treatments on the decrease in TDS and TSS has p-value 0,001 and 0.023 larger than 0.005, which means that there is an effect of types of treatments on the decrease in the value of TDS and TSS. Test the effect of the length of a day on the decrease in TDS and TSS have p values of 0.001 and 0.034 > 0.005, which means that there is an effect of the length of the day on decreasing the value of TDS and TSS.

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Lama hari dan jenis media dalam mengurangi polutan pada limbah laundry

ABSTRAK

Total Suspended Solid (TSS) dan Total Dissolved Solid (TDS) dapat digunakan sebagai indikator endapan di media, yang biasanya terdiri dari lumpur, pasir halus dan mikroorganisme. Tingginya konsentrasi TSS di kolom air dapat digunakan sebagai indikasi bahwa proses sedimentasi di reservoir juga tinggi. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh durasi hari dan jenis media dalam mengurangi polutan pada limbah cair laundry. Metode yang digunakan dalam penelitian ini adalah eksperimen murni selama 7 hari, total sampel yang digunakan adalah 15 liter air limbah laundry. Hasil uji independen T pada variabel TDS dan TSS dengan menggunakan dua jenis perlakuan yang berbeda menunjukkan bahwa terdapat perbedaan yang signifikan antara kedua jenis perlakuan dengan nilai p TDS dan TSS masing-masing sebesar 0,000 dan 0,003 < 0,5. Sementara itu uji pengaruh jenis perlakuan terhadap penurunan TDS dan TSS memiliki nilai p 0,000 dan 0,023 > 0,005 yang berarti bahwa ada pengaruh jenis perlakuan terhadap penurunan nilai TDS dan TSS. uji pengaruh durasi hari terhadap penurunan TDS dan TSS memiliki nilai p 0,001 dan 0,034 > 0,005 yang berarti bahwa ada pengaruh durasi hari terhadap penurunan nilai TDS dan TSS.

Kata kunci:

Total Dissolved Solid
Total Suspended Solid
Rapid sand filter
Phytoremediation
Water hyacinth

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Introduction

Increasing water pollution has reduced water quality throughout the world. Several people and diverse human activities cause water pollution. Pollution that causes a decrease in water quality can come from centralized waste (point sources), such as industrial waste, livestock business waste, hospitality, hospitals, and scattered waste. While non-point sources, such as agricultural, plantation, and domestic waste. In large companies/industries, the problem of handling wastewater can be overcome because they have more capital, but it will be different from industries whose scale is still small or medium-sized. They have not been able to overcome the problem of wastewater (Asmadi & Suharno, 2012). According to WHO (2008), nearly 2 billion total population in the world do not have access to water and sanitation facilities. Meanwhile, 90% of domestic household waste in developing countries is discharged directly to the surface without processing at all. As a result, water sources commonly consumed by humans are polluted. Whereas in Indonesia, report showed that 40.67% of households in Indonesia did not have septic tank facilities and the rest discharged waste into the environment (Nations & Unicef, 2013)

One crucial factor in determining the eligibility of water for consumption is the content of Total Dissolved Solids (TDS) and Total Suspended Solid (TSS) in water (Cahyani, Harmadi, & Wildian, 2016). TSS is one of the essential factors in declining water quality, causing changes in physics, chemistry, and biology (Rinawati, 2016). The effect of dissolved solids or solids on health depends on the chemical species causing the problem (Nicola, 2015).

Water is a basic need that can not be separated from human life, so an increase in the number of residents with various activities carried out by the people in Ternate also affects the increase in liquid waste, especially laundry. The problem that arises is the process of using and discharging water from their daily activities, then it becomes wastewater and is immediately discharged into the surrounding environment without prior treatment. The city of Ternate is now starting to feel very crowded along with stretching in various sectors, especially the economy, and accompanied by various kinds of infrastructure development and improvement of settlements or residents who come from outside the city of Ternate and begin to settle / domicile in the Ternate City Region. This can be seen from the comparison of land area and the level of population density. The rise of development activities in Ternate City certainly has an impact on the physical development and infrastructure of the city in addition to social, economic, and environmental impacts. One problem that arises at this time is the increased volume of Laundry wastewater as a result of the increase in development activities that are not environmentally friendly.

The more population, the more wastewater is also produced from wastes with various types of pollution in the environment from aesthetic disturbances or the imbalance of conditions in marine life if the liquid waste is not treated first before being discharged directly into the environment, the waste can also disrupt healthy humans if humans consume water that has been contaminated with

wastewater. An example of the most dominant problem occurring is in the Makassar Timur Sub-district, Ternate City.

The strategy that can be used as a solution in the management of domestic wastewater in the city of Ternate is to use water plants as a medium for absorption of TDS and TSS. Therefore, researchers are interested in conducting this research to determine the absorption ability of water hyacinth (*Eichhornia crassipes*) in reducing TSS levels and reducing TDS levels in Laundry wastewater

Method

The method used in sampling is by referring to (Badan Standardisasi Nasional, 2008) by taking a combined sample of time (morning, afternoon, and evening) and place (5 places) by taking a 1000 ml sample per taking.

Measurement of TDS and TSS uses a gravimetric method by measuring the weight of components in a pure condition where previously, the separation process was carried out. This analysis is certainly more focused on the transformation of radical elements into pure elements.

Calculation of TDS

$$\text{TDS} = 1000 \div V \times (F - B) \times 1000 \dots \text{mg/L}$$

Information:

B = weight of the Vaporizer Cup (g)

F = weight of the Vaporizer Cup + dissolved residue (g)

Calculation of TSS

$$\text{TSS} = \frac{1000}{V} \times (G \times (C + D)) \times 1000 \dots \text{mg/L}$$

Information

C = weight of the Vaporizer Cup (g)

D = Filter Paper weight (g)

G = weight of the vaporizer Cup + filter paper filter (g)

Samples were taken from this study by considering areas that have the highest level of pollution in the area around the city of Ternate this refers to (Usaid Kota Ternate, 2018). So that the east Makassar sub-district was chosen as a place to take of wastewater sample.

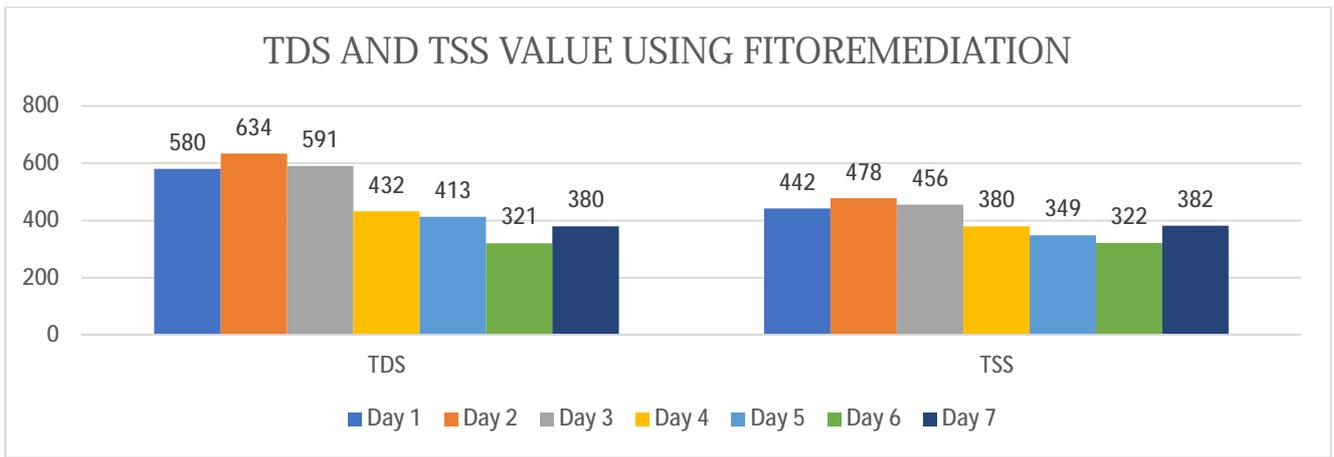
The number of samples taken is adjusted to the needs of research where the number of samples taken based on the place and the combined time can be accumulated as much as 15000 ml (Number of places X amount of time X liters per taking $5 \times 3 \times 1000 \text{ ml} = 15000 \text{ ml}$)

The research was carried out for seven days by looking at the effectiveness of the bioreactor made by conducting tests on the first day to the seventh day

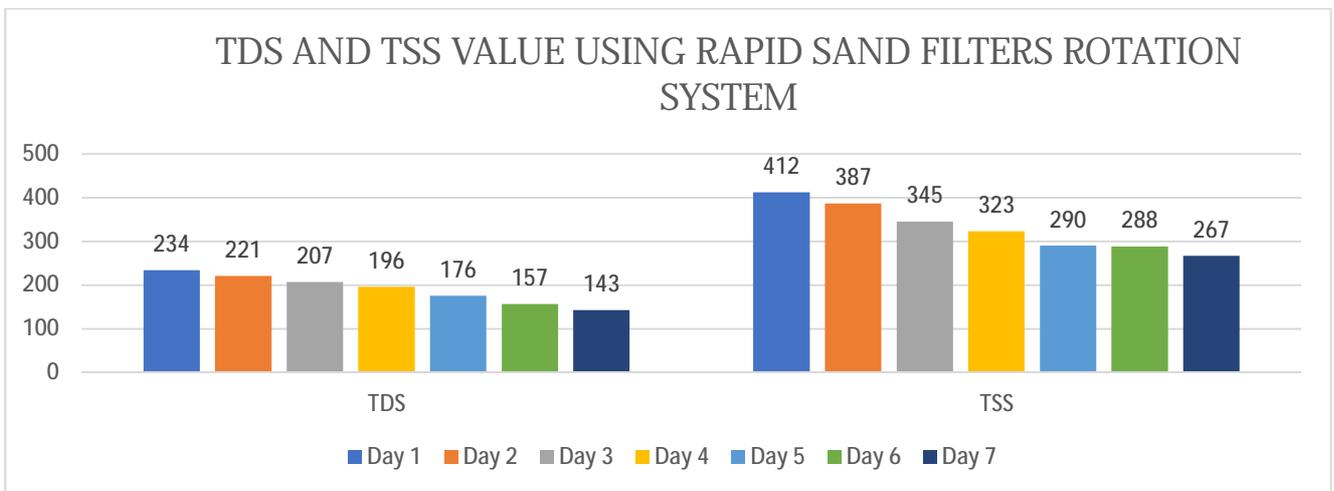
The difference test between the two sample groups uses the independent samples t-test, while the effect test uses multiple linear regression tests.

Results and Discussion

Based on the results of research conducted at the Environmental Chemistry Laboratory of the Department of Environmental Health, health polytechnic of ternate can be seen in the following results



Picture 1: TDS and TSS results from the first day to the seventh day using water hyacinth



Picture 2: TDS results from the first day to the seventh day using a rapid sand filter rotation system

Table 1
 Independent t-test

	Sig. Levene's Test for Equality of Variances	p-value
TDS against media types	0,001	0,000
TSS against media types	0,694	0,036

Based on an independent t-test that serves to determine the difference between TSS and TDS in processing using water hyacinth and rapid sand filter rotation. It is known that the value of sig. Levene Test for Equality TDS Variance $0.001 < 0.005$, it can be concluded that the TDS data is homogeneous; this is different from the sig value. Levene Test for Equality of TSS Variance with a value of $0.694 > 0.05$, it can be concluded that the data from the TSS value is not homogeneous. For the effect of decreasing TDS by using different types of media, the value of $P = 0.000 < 0.05$ can be concluded that H_0 is rejected with the meaning that there is a difference between TDS in the processing using water hyacinth and TDS using a rapid sand filter rotation. For the difference in decreasing the value of TSS by using different types of media, the value of $P = 0.003 < 0.05$ can be concluded that H_0 is rejected with the meaning that there is a difference between TSS in the treatment using water hyacinth and TSS by using rapid sand filter rotation system. The same thing was also said by (Selbig & Bannerman, 2011), who stated that the difference between TSS and SSC increased with larger particle sizes and higher sand content. The median correction factor for SSC ranges from 0.29 for particles larger

than 500 μ m to 0.85 for particles measuring 32 to 63 μ m. According to (Manyuci, 2013) said that membrane bioreactor could reduce TDS and TSS by more than 90% because it can degrade organic matter contained in wastewater.

Based on the multiple linear regression test, it was found that the correlation between days of decreasing TSS value by using rapid sand filter media and water hyacinth had a Pearson correlation value of -0.729 , which means that it had an inverse correlation where the longer treatment days, the TSS value is getting decrease. Correlation between days to decrease in TDS value either by using water hyacinth media or using a quicksand filter obtained Pearson correlation value $r = -0.395$, which means that the longer the treatment day the lower the TDS value. Based on table 2, it is known that the effect of the length of day on the decrease in TDS is 0.729 , with a coefficient of determination 0.532 , which means that the percentage of the effect of the length of the day on the decreasing in TDS values is 53.2%.

Based on table 2, it is known that the effect of the length of the day on decreasing the TSS value is 0.833 , with a coefficient of determination of 0.695 , which means that the percentage of the effect of the length of the day on

decreasing in TSS value is 69.5%. Based on the table above, it is known that the p-value for the length of day to TDS value is 0.001 while the p-value for the length of day to the TSS value is 0.034. So it can be concluded that the length of the day has an effect on the value of TDS p-value = 0.001 or > 0.005, and the length of the day also affects the value of the TSS with p-value = 0.034 or > 0.005. This is in line with research conducted by (Faisol Asip, Noffia Chintyani, 2019), which states that the results obtained indicate that the higher the adsorbent, the longer operating time, the lower

the flow rate, the higher the pH produced, the higher TDS decrease. This is because the larger and longer flow rate can cause significant and consistent pressure. it is supported by (Tan, Thishalini, Goh, & Edlic, 2017), research Who said that the increase of turbidity would increase temperature, the concentration of suspended solids, and speed, but decreased with time. This is also supported by the results of research conducted by (Ruhmawati et al., 2017). There is a significant effect between variations in a contact time of hydrilla water plants on decreasing TSS levels in tofu factory wastewater.

Table 2
 Multiple linear regression test (effect of day on TDS and TSS values using water hyacinth media and rapid sand filter rotation system)

	Coefficient of regression	Pearson Correlations	T value	Sig.	Annova
Constanta	12.466				
TDS	-0,043	-0,395	-4,403	0,001	
TSS	0,009	-0,729	2,420	0,034	
F value of TDS					13,637
F value of TSS					12,507
R Square of TDS		0.532			
R Square of TSS		0.695			
R of TDS		0.729			
R of TSS		0.833			

Table 3
 Multiple linear regression test (the type of media against TDS and TSS values)

	Coefficient of Regression	Pearson Correlations	T Value	Sig.	Annova
Constanta	2,376				
TDS	-0,004	-0,868	-6,230	0,000	
TSS	0,005	-0,563	2,636	0,023	
F of TDS					36,779
F of TSS					30,982
R Square of TDS		0,754			
R Square of TSS		0,849			
R of TDS		0,868			
R of TSS		0,922			

Based on the multiple linear regression test, it was found that the correlation between types of media on the decrease in TSS value had a Pearson correlation value -0.563, while the correlation between types of media on the decrease in TDS values has a Pearson correlation value = -0.868. Based on the table above, it is known that the effect of media types on the decrease in TDS value is 0.868 with a coefficient of determination 0.754, which means that the percentage of effect of media types on decreasing TDS is 75.4%. Based on the table above, it is known that the effect of media types on the decrease in TSS value is 0.922, with a coefficient of determination 0.849, which means that the percentage of the effect of media types on the decrease in TSS value is 84.9%. Based on table 3, it is known that the p-value for the length of the day to the TDS value is 0,000, while the p-value for the length of the day to the TSS value is 0.023. So it can be concluded that the length of the day affects the value of TDS with p-value = 0,000 or > 0.005, and the length of the day also affects the value of TSS with p-value = 0.023 or > 0.005. This study is in line with research conducted by (Kholif, Ma'fuddin, & Widyastuti, 2018), which states the assistance of coagulants, polypropylene sediments, and manganese greensand can reduce the TDS parameter by more than 60%. This is also in line with research conducted by (Samudro & Abadi Rulian E, 2011), which states that the reactor gravity

roughing filter (GRF) can reduce 79% of the TSS parameters. Research by (Wulan, Yogafanny, Yogafanny, & Kristiati, 2018) also stated that the bioreactor membrane was able to reduce TDS and TSS 91.85% and 76%. According to (Wulan et al., 2018) also, active sand has the characteristics as a binding element iron (Fe), manganese (mn), and sulfides in water. As water passes through active sand, solids, mycorrhizisms, and heavy metals can be separated. The use of active sand can also prevent fouling. The membrane functions as a selective barrier between two phases that allows the passage of specific components, but holds back other components. The membrane process works based on pressure differences as the thrust (David M. Warsinger et al., 2018). There are also some media which are known to be able to reduce TDS and TSS levels such as Moringa seed powder as a coagulant material which greatly influences changes in pH, Turbidity, TSS and TDS (Manurung, Dewi, & Lekatompessy, 2012). Supported also by research conducted by (Estydyah Nurroisah, Sofwan Indarjo, 2014) which states that there are significant differences in each treatment both using the aeration system stray treatment and filtration.

Conclusions and Recommendations

There is a significant difference between the two types of treatment with TDS and TSS values with p values 0,000 and 0.003 <0.5. Meanwhile, the test of the effect of types of treatment on decreasing the number of TDS and TSS values is a p-value of 0,000 and 0.023 > 0.005, which means that there is an effect of types of treatment on decreasing of TDS and TSS values. The test of the effect of the length of the day on

decreasing of TDS and TSS is a p-value of 0.001 and 0.034 > 0.005, which means that there is an effect of the length of the day on decreasing in the value of TDS and TSS.

It is recommended to the following researcher to research by using the other plant containing the substances that can reduce the water pollution level in terms of TDS and TSS.

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