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Effectiveness of Apu Wood Plant *(Pistia stratiotes L)* to Reduce the Bacterial in *Leachate* on Integrated Waste Treatment Plant of Toisapu, Ambon

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Abstract

The high population growth figures in the city of Ambon, contributed significantly impact on increasing production of waste and waste generated, both in large scale for industrial / factory, as well as domestic scale at the household level. Of the total waste and waste generated, estimated at nearly largely banished to the Final Disposal (TPA) in the Integrated Waste Treatment Plant (IWTP) Toisapu. One byproduct of the process is the accumulation of garbage leachate. Leachate contained in IWTP Toisapu already accommodated within a particular basin but there has been no effort or specific treatment for the reduction of pollutants contained therein. The use of water plants Wood Apu (Pistia stratiotes L) can be applied as a natural control, because these plants have the ability to reduce the amount of chemical contaminants. This study was done to see how effective the water plant lettuce wood as a natural control in reducing the number of bacterial contaminants in the leachate IPST Toisapu. The research design is quasi-experimental research (quasi experiment). Samples tested were leachate originating from IPST Toisapu. The parameters measured were the levels of the numbers of E. coli, and coliform before and after the Apu wood plants.

Keywords: Apu wood plants; bacterial; air pollution; waste treatment plant; leachate.

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1. Introduction

The more the speed of population growth figures in the city of Ambon, contributed significantly impact on increasing production of waste and waste generated, both in large scale for industrial / factory, as well as domestic scale household level [1]. Of the total waste and waste generated, expected mostly dumped into the Final Disposal Site in the Integrated Waste Treatment Plant (IWTP) Toisapu. This is where most of the waste is processed, mainly by using control landfill. This method is an easy way is applied mainly to the category of town was like Ambon. Waste management process would potentially cause environmental problems, especially the problem of water pollution leachate (leachate) [2].

Not Settlement of garbage and leachate contamination well, of course, in addition to polluting odor, also can be a breeding ground for a variety of insects as vectors of disease which will disrupt the lives of the people around. According to [3], leachate from a landfill contaminants that can affect people's health and pollute the environment, because in the leachate contained a variety of organic and inorganic chemical compound as well as a number of bacteria that can affect people's health. To overcome the problem of leachate from the landfill, efforts can be made, especially to reduce levels of pollutants to levels that do not exceed the Threshold Limit Value (TLV) that do not harm human health. One way is to use a coagulant.

IWTP Toisapu has been operating since 2007, has no installation leachate management as appropriate. Leachate is routed to reservoir tanks without giving specific treatment to combat contaminants contained therein. Apu Wood Plants (Pistia stratiotes L) is an aquatic plant that is proven to reduce the levels of waste water chemistry, especially the type of heavy metals such as Cadmium (Cd) and iron (Fe). The ability of these plants to bind metal contaminants in water, can be maximized to reduce levels of BOD, COD, TSS water and waste when used in the form of plants as a coagulant. This plant is in addition to easy to get, how to breeding also does not require much time and so it can be simple and applicable solutions especially for the IWTP Toisapu in controlling the content of the leachate contaminants before being released into nature [4]. This study aimed determine the effectiveness of plant leaves of Apu Wood as a natural control E. coli cells in the leachate at IWTP Toisapu. Investigate the E.coli levels of leachate before and after the leaves of Apu Wood plant, and investigate the Coliform levels before and after the leaves of Apu Wood plant.

2. Materials and methods

This type of research is quasi experiment (quasi-experiment). The population in this study is the leachate in IPST Toisapu. While the sample taken is 6 liters of leachate taken from the first container vessel which was then divided into four containers, each container containing 2 liters. Wood Apu leaves while the plant used is a plant from the plant aged 1 week and 1 month. Comparison of the composition of the leachate with Apu Wood plants are: the container I (plants 1 week old), 2 liters of leachate given plants as much as 5 clumps, in containers II (plants 1 week old), 2 liters of leachate by 10 family of plants, the III containers (plant age 1 month), 2 liters of leachate given as much as five clumps of plants, and on the container IV (plant age 1 month), 2 liters of leachate by 10 family of plants.

The data collection is done by observation (observation) of the physical quality of water and water quality laboratory testing, especially for the parameter numbers of E. coli and coliform. Data collected in the field will be processed manually and computer, while the presentation of data in a frequency distribution table and equipped with clarification tekstuler. The data were analyzed descriptively.

3. Results

Results of laboratory tests conducted at the Center for Environmental Health Engineering (BTKL) Ambon showed that a decline in the numbers bacteriologies (coliform). More can be seen in Table.

Table 1: The Analysis result of bacteriologies (coliform) on the leachate

Media	Number	Plant age	*coliform* (MPN)	
			Pre-test	*Post-test*
I	5	1 week	27×10^4	$\leq 1,8$
II	10	1 week	27×10^4	$\leq 1,8$
III	5	1 month	27×10^4	14
IV	10	1 month	27×10^4	$6,8 \times 10^4$

On examination it appears that Apu Wood plants able to reduce the number of bacteriological on leachate, this may happen because the plant contains many antibacterial compounds such as tannins, alkaloids, *saponins* and *flavonoids*. Apu Wood plants is also known to be a water plant that can adapt in an environment with high levels of metals such as leachate. The adaptation process is carried out by producing enzymes fitokelatin capable of binding heavy metals. Enzymes fitokelatin is a small peptide that is rich in cysteine amino acids containing sulfur (sulfur). Sulfur itself has the ability to kill bacteria.

Fitokelatin more abundant in the roots rather than the leaves. The younger the age of the plant the ability to produce fitokelatin will be many more. The decrease metabolism in Wood Apu planted in metal concentrations were always concentrated, resulting in a network of cells in the roots quickly broken this will have an impact on production fitokelatin [5]. This is consistent with research showing that the rate of decrease in the number of E. coli appear more pronounced in the young age of the plant. It is considering the young plants tend to have a lot of chlorophyll than older plants, so the process is faster metabolism and ability to produce fitokelatin more. Apu Wood plants as aquatic plant has the potential to reduce levels of water pollution by sewage. as bioremediation which is an innovative technology for waste treatment, which we can use as an alternative in dealing with pollution.

The plant is a fast-growing aquatic weeds and has adaptability to the new environment very big [6, 7]. Apu wood commonly used to purify water. These plants are generally very resistant to levels of nutrients is very low in the water, but his response to the high nutrient content is also very large [8,9]. So Apu Wood plants can be grown in the tank or pond into a fish because it can eliminate toxins or other substances that contaminate the

water [6.10].

4. Conclusions

Apu Wood plants able to reduce the number of bacteriology at the leachate in IPST Toisapu, and it is faster in plants young age.

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