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The effectiveness *Pistia stratiotes*, *Limnocharis flava*, and *Hydrilla verticellata* to increase the Quality of Polluted Water by Waste Detergents

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Abstract: *Pistia stratiotes, Limnocharis flava*, and *Hydrilla verticellata* have the ability to improve the quality of polluted water by waste detergents characterized to the decrease value temperature, pH, COD, BOD, and the increase in the value DO on the water after he received agent fitoremediator.
Keywords : Pistia stratiotes, Limnocharis flava, Hydrilla verticellata

1. Introduction

River arbes is one of a river that commonly used by the living in the vicinity of the river. Besides as a source of raw drinking water dikelolah by the government, river arbes are also used as an object tourism, wash, irrigation agricultural, and industry scale households until a large scale. The use of river arbes as a tourist attraction, wash, bathroom, and agriculture are more dominant take place on part hilir while in part the middle of a stream are more dominant used to wash, bathroom, and dump waste domestic households. Problems that arise due to their activities uncontrolled resulting in the entry of waste detergents into the river, and if water the river used by a community for the purpose of bathroom and drink, it would impact on the health problems, even against death. Pollution of detergents expected more found upon the hilir and the middle of a stream, this is caused by the activity of washing the community dominant in the body sections rivers and the stream river[1,2].

The use of the arbes uncontrolled cause a big problem for the environment and humans have to find a solution, either through counseling and using biological agents. There are several of water plants have the potential to improve the quality of contaminated water by waste, as *P. stratiotes, L. flava*, and *H. verticellata*. The research was conducted by Hermawati found that *L. flava* to reduce phospat levels in contaminated water by detergents[3,4].

2. Material and Methods

The kind of research this is descriptive with the approach experiment the laboratory aims to understand the effectiveness of *P. stratiotes, L. flava*, and *H. verticellata* to increase the quality of polluted water by waste detergents. This research lasts two monts, count of on 20 may - 22 july 2015. This research in do in three places different. The sample collection plants, water, measurement of the pH, and temperature carried across a river arbes precisely in Kahena Ambon. The measurement of BOD, COD, and DO done in the laboratory chemical Muhammadiyah University of Malang.

Conducting observations on the and updating beginning about the activity of the pollution caused on the water and plants (*P. stratiotes*, *L. flava*, and *H. verticellata*) on segments rivers appointed. Every segments of 300 meters and given plants on the riverside, with assessing the early on the river arbes which includes: temperature, pH, COD, BOD, and DO. Put every treatment of block observation and with assessing the water after 2 month.

3. Result and Discussion

Three types of herbs used in meremediasi waste in into the river arbes show different capabilities to increase the quality of water which includes temperature, pH, COD, BOD, and increase DO water. *P. stratiotes*, *L. flava*, and *H. verticellata* ability to increase the quality of contaminated water by waste detergents seen in table 1 following

Table 1. The ability *P. stratiotes, L. flava,* and *H. verticellata* down detergents waste

Parameter Measuring	Preliminary Data	Final data			The percentage decline or increase		
		P. stratiotes	***L. flava***	***H. verticellata***	***P. stratiotes***	***L. flava***	***H. verticellata***
pH	8	7	6	6	14,28%	14,28%	14,28%
Temperature	30	28	28	28	6,66%	6,66%	6,66%
BOD (ppm)	6,55	3,129	3,337	4,655	52,22%	49,05%	28,93%
DO (ppm)	6,75	14,982	13,226	13,148	54,95%	48,96%	48,66%
COD (ppm)	8	2,88	4,16	5,44	64%	48%	32%

Table shows an increase in the quality water characterized to the decrease pH from 8 to 6 after planting *P. stratiotes* with the decline 14,28 %. Temperature first before planting is 30 ^{0}C and after planting down to 28 ^{0}C with the decline 6,66 %. BOD first before planting is 6,55 ppm and after planting down into into 3,129 ppm with the decline 52,22 %. COD first before planting is 8 ppm and after planting fell to 2.88 ppm with the decline 64 %. DO first before planting is 6.75 ppm and after planting fell to 14,982 ppm with the increased 54,95 %. Table them shows an increase in the quality of water characterized by a fall in the pH from 8 to 6 after planting *L. flava* with decreases of 14,28 %. Early temperature before planting is 30 ^{0}C and after planting fell to 28 ^{0}C with decreases of 6,66 %. Early BOD before planting is 6,55 ppm and after planting down into into 3,337 ppm with decreases of 49,05 %. COD first before planting is 8 ppm and after planting fell to 4,16 ppm with decreases of 48 %. Early DO before planting is 6.75 ppm and after planting fell to 13,226 ppm with the percentage of the increase in 48,96 %. Table shows an increase in the quality water characterized to the decrease pH from 8 to 6 after planting *H. verticellata* with the decline 14,28 %. Temperature first before planting is 30 ^{0}C and after planting down to 28 ^{0}C with the decline 6,66 %. BOD first before planting is 6,55 ppm and after planting down into into 4.655 ppm with the decline 28,93 %. COD first before planting is 8 ppm and after planting fell to 5.44 ppm with the percentage the decline in 32 %. DO first before planting is 6.75 ppm and after planting fell to 13,148 ppm with the increased 48,66 %.

Pistia stratiotes, *Limnocharis flava*, and *Hydrilla verticellata* have the ability to reduce the water temperatures. The temperature increase in water because reaction eksogenik or reaction the release of heat when detergents mixed by water. The entry of waste detergents into the river has resulted in the high temperature water. Changes in temperature influences physical processes, chemical and biological which took place on the river[5,1]. The temperature increase water will result in: 1) the amount of oxygen dissolved in water to decline; 2) the speed a chemical reaction inflated; 3) life fish and biota other water disturbed; and 4) if the deadly temperatures exceeded, will cause of fish to die[6]. The increase of temperature led to an increase speed metabolism and respiration organisms water and so results in an increase of consumption oxygen.The increase of temperature also results in increased decomposing organic matter by microbes[2]. This water temperature before given herbs *P. stratiotes*, *L. flava*, and *H. verticellata* is 30 ^{0}C and after two months the growing season a decline in temperature to 28 ^{0}C or decreased by 2 ^{0}C. The three plants used as an agent fitoremediator have the ability in lowering water temperature waste detergents 6,66 % as much as. The drop in water temperature waste detergents caused by the closing of the canopy of plants capable of hinder ingress the light of the sun that

remains into the water. The drop in water temperature than 30 ^{0}C to 28 ^{0}C very good for the growth of phytoplankton who was a producer of waters in an ecosystem[5].

Besides parameter temperature, degrees acidity of is one of indicators to know the pollution on the water. Water were hit by detergents to increase pH so transformed become alkaline. The changes in its ph on the water caused organisms will experience disruption growth. Requirements a the life of the organism the water should have ph 6,5 – 7,5. Water will acidic or bases depends the amount pH. If a pH greater small than 6,5 so the water acidic, while water have a ph greater large 7,5 so is alkaline. Waste water, agricultural waste water, and materials emissions industry will change pH water that finally disrupting the life of organisms water that is sensitive to changes in its pH[7]. pH water prior to the that plants are 8 that is alkaline, and after 2 months the exposure, pH water turned into 7. According to the research shows that pH water after being plants (*P. stratiotes*, *L. flava*, and *H. verticellata*) can support the life of the organism water, that indicates that organisms the water lives well.

BOD is the number of the oxygen necessary for microorganisms to degrades organic matter that there is deep water[8]. BOD is the number of oxygen expressed in mg/l used by bacteria to oxidize organic matter in water[9]. Organic matter consisting of carbohydrates (cellulose, starch, sugar), protein, oil hydrocarbons and organic matter another enter into a body of water derived from resource and the sources of pollution. BOD natural resources in surface water derived from decay of plants and animal waste, while BOD source of human activities derived from feces, urine, detergents, oils and fats[10]. Many detergents wasted into the water will result in BOD increased levels. The use of *P. stratiotes*, *L. flava*, and *H. verticellata* as an agent fitoremediator results from different in lowering BOD water levels. *P. stratiotes* have the ability greater in sent down BOD water levels compared to *L. flava* and *H. verticellata*, this is because type rooting that are denser and there are many in absorbing organic matter dissolved in water used as a source of nutrients[11].

COD described the amount of oxygen needed to waste material in the water oxidized chemically. The waters of the cod high undesirable for the sake of agriculture and fisheries. The value of cod in the waters uncontaminated usually less than 20 mg/l[12]. The maximum permitted to cod water and to prop up the life of the organism aquatic and need for irrigation and fisheries around 10 - 100 mg/l (Government regulation No. 82/2001 on the management of water quality and water pollution control). The use of *P. stratiotes*, *L. flava*, and *H. verticellata* as an agent fitoremediator show that all three the plant have the ability in sent down cod water levels. This is because the three plants was able to absorb and storing components chemical waste in vacuoles, if the chemical components not needed by plants so will be released by a process of transpiration.

BOD levels and COD that rises will affect reduced levels do in water[13]. Oxygen dissolved in water very important for the sustenance of life organism water. Oxygen dissolved also important used to decipher or oxidize organic materials and inorganic to the process aerobic in water. The main source of oxygen in waters derived from air through the process diffusion and the results of photosynthesis of organisms in these waters[14]. Speed diffusion of oxygen from the air influenced several factors, such as cloudiness water, temperature, salinity, current, waves and ebb. Odum stated that levels of oxygen in sea water be added to the low temperature and reduced the higher salinity[15]. Oxygen have an important role as an indicator of the quality of waters, because oxygen dissolved participate in the process oxidation and reduction of organic matter and inorganic .In the condition of aerobic, oxygen had a role in oxidize of organic matter and inorganic with the final result in the form of nutrient that might boost fertility waters. In anaerobic condition, of oxygen resulting will reduce chemical those compounds into simpler ones in the form of the nutrient and gas.

The oxidizing process and reduction and the role of oxygen dissolved important to help reduce the burden of pollution in waters naturally and but aerobic to purify waste water industry and households[14]. Decomposition of organic matter and oxidation of inorganic can reduce levels of oxygen dissolved to get to zero (anaerobic). In the fresh waters, levels of oxygen dissolved at a temperature 0 ^{0}C range 15 mg/l and at a temperature 25 ^{0}C around 8 mg/l. According to Hach & Klein, the amount of oxygen dissolved in water at room temperature is 8 mg/l[9]. On condition frozen increased to 14,6 mg/l and at the boiling point solubility of oxygen 0 mg/l[9]. The use of *P. stratiotes*, *L. flava*, and *H. verticellata* as a fitoremediator shows that the three plants is able to improve do in water levels. This is because this plant feature especially photosynthetic and produce oxygen late into the water. The ability to improve *P. stratiotes* oxygen levels the larger compared to *L. flava*, and *H. verticellata*. This is because the leaves closer to water, so when despite oxygen during the photosynthesis directly into the water. Third treatment of this plant, the most effective improve the quality of water is *P.*

stratiotes with the decline in BOD levels 52,22 % and COD 64 %, then *L. flava* with the decline in BOD levels 40,05 % and COD 48 %, and *H. verticellata* with the decline in BOD levels 28,93 % and COD 32 %. *P. stratiotes* has type rooting fibers and a meeting of the so as to have power strain stronger compared to *L. flava* and *H. verticellata*[16,11].

4. Conclusions

According to the research and his discussion it can be summed up as follows-

1. *Pistia stratiotes*, *Limnocharis flava*, and *Hydrilla verticellata* effective will increase the quality of contaminated water by waste detergents characterized by temperature, pH, BOD, COD, and DO
2. Treatment third of this plant, the most effective improve the quality of water is *Pistia stratiotes* with a reduction in levels of 52,22 % BOD, COD 64 %, and increase levels of DO as much as 54,95 %

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