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File size:	246.77K
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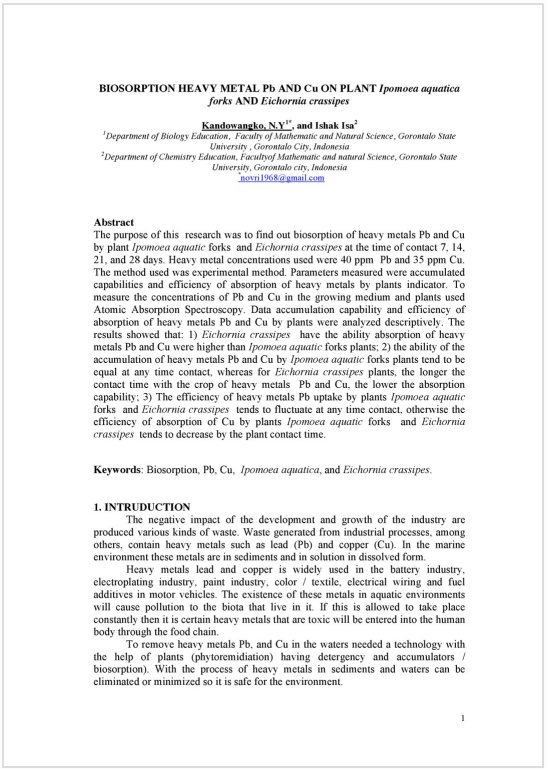
Submission date:	18-Aug-2019 05:25PM (UTC+0530)
Submission ID:	1161025820



BIOSORPTION HEAVY METAL Pb AND Cu ON PLANT *Ipomoea aquatica forks* AND *Eichornia crassipes*

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Abstract
The purpose of this research was to find out biosorption of heavy metals Pb and Cu by plant *Ipomoea aquatic* forks and *Eichornia crassipes* at the time of contact 7, 14, 21, and 28 days. Heavy metal concentrations used were 40 ppm Pb and 35 ppm Cu. The method used was experimental method. Parameters measured were accumulated capabilities and efficiency of absorption of heavy metals by plants indicator. To measure the concentrations of Pb and Cu in the growing medium and plants used Atomic Absorption Spectroscopy. Data accumulation capability and efficiency of absorption of heavy metals Pb and Cu by plants were analyzed descriptively. The results showed that: 1) *Eichornia crassipes* have the ability absorption of heavy metals Pb and Cu were higher than *Ipomoea aquatic* forks plants; 2) the ability of the accumulation of heavy metals Pb and Cu by *Ipomoea aquatic* forks plants tend to be equal at any time contact, whereas for *Eichornia crassipes* plants, the longer the contact time with the crop of heavy metals Pb and Cu, the lower the absorption capability; 3) The efficiency of heavy metals Pb uptake by plants *Ipomoea aquatic* forks and *Eichornia crassipes* tends to fluctuate at any time contact, otherwise the efficiency of absorption of Cu by plants *Ipomoea aquatic* forks and *Eichornia crassipes* tends to decrease by the plant contact time.

Keywords: Biosorption, Pb, Cu, *Ipomoea aquatica*, and *Eichornia crassipes*.

1. INTRUDUCTION

The negative impact of the development and growth of the industry are produced various kinds of waste. Waste generated from industrial processes, among others, contain heavy metals such as lead (Pb) and copper (Cu). In the marine environment these metals are in sediments and in solution in dissolved form.

Heavy metals lead and copper is widely used in the battery industry, electroplating industry, paint industry, color / textile, electrical wiring and fuel additives in motor vehicles. The existence of these metals in aquatic environments will cause pollution to the biota that live in it. If this is allowed to take place constantly then it is certain heavy metals that are toxic will be entered into the human body through the food chain.

To remove heavy metals Pb, and Cu in the waters needed a technology with the help of plants (phytoremidiation) having detergency and accumulators / biosorption). With the process of heavy metals in sediments and waters can be eliminated or minimized so it is safe for the environment.

1

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File name: 2017_Bioaborption_heavy_metals.pdf (246.77K)
Word count: 2001
Character count: 9655

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To remove heavy metals Pb, and Cu in the waters needed a technology with the help of plants (phytoremidiation) having detergency and accumulators / biosorption). With the process of heavy metals in sediments and waters can be eliminated or minimized so it is safe for the environment.

Cuprum (Cu) potentially toxic to plants and harmful to humans because it is carcinogenic (Notodarmojo, 2005). Cu metal content in plant tissue that normally grows about 5-20 mg / kg, while in critical condition in the media of 60-120 mg / kg and in the plant tissue of 5-60 mg / kg. In the critical condition of plant growth falters as a result of poisoning Cu (Alloway, 1995) and according Lasat (2003) concentration of more than 10 ppm can be toxic to plants. Similarly, the impact of Pb in plants. Research results Novita and Tarzan (2012), Pb at high concentrations can cause chlorosis on the leaves and inhibits growth rate *Elodea canadensis* so that growth becomes stunted.

The use of aquatic plants and semi-aquatic such as water hyacinth, water spinach to absorb the heavy metals lead (Pb), copper (Cu) of the contaminated solution is still being developed. Based on the research results and Saefudin Hidayati, 2003; Juhaeti et al., 2005 there are some plants that have high metal accumulation ability of the plant tissues, such as *Ipomoea* sp. which is able to absorb plumbum (Pb) to 44.00 ppm, cyanida (Cn) to 35.70 ppm and 1.4 ppm Cd, and Micania cordata is able to absorb up to 11.65 ppm and 3.66 ppm Pb Cn (Hidayati and saefudin, 2003; Juhaeti et al., 2005). *Azolla* is grown on waste water containing 94 ppm Pb; while genjer and hyacinth each containing 167 and 196 ppm (Juhaeti and Sharif, 2003)

If you pay attention to the ability of plants to clean heavy metal waste pollution, so it is necessary to study how the absorption of heavy metals Pb and Cu in plant water spinach (Ipomoea aquatic forks) and hyacinth (Eichornia crassipes).

The purpose of this study was to determine the absorption ability and efficiency of accumulation of heavy metals Pb and Cu by plant water spinach (Ipomoea aquatic forks) and hyacinth (Eichornia crassipes) at the time of contact 7, 14, 21, and 28 days.

2. Materials and Methods

This study was conducted in March-June 2015 in the Laboratory of Biology and Chemistry, State University of Gorontalo. Materials used in the form of plant materials include plant material that is water spinach and water hyacinth. Water spinach form buds stem cuttings measuring 30-35 cm were taken from the rice fields Gorontalo city, while the water hyacinth plant size 350-400 gram wet weight and have had 3 stolon, taken from Lake Limboto; chemicals used are Pb (NO3) 2 as the source of Pb, Cu (NO3) 2 as a source of Cu, HNO3. The tools used in the form of plastic pan with a diameter of 30 cm as maintenance of water spinach and water hyacinth, analytical balance, oven, hotplate, set of Atomic Absorption Spectroscopy (AAS) brand Simatzu AA 6300, and equipment beaker.

Experimental Design

This experiment was designed using the experimental method, with a completely randomized design.

Working procedure

After a week of the election of the plant, weighed and acclimatization for 2 weeks in the pan until the plant thrives then added heavy metals Pb and Cu with an initial concentration of 35 – 40 ppm and pH 5.5.

Water sampling and plant indicator done every week or every 7 days until day 28. Samples of water and the plants then analyzed for levels of Pb and Cu using Atomic Absorption Spectrophotometer (AAS) brand Shimadzu.
Data analysis capabilities biosorption of heavy metals by plants is done by using the formula: Heavy metals in plants/plant weight (mg/kg) and to determine the efficiency of metal accumulation by plants is determined by the following calculation: (Total Metal in plant / Metal in the media) x 100%

3. Result and Discussion

Water spinach ability and hyacinth plants accumulate metals in Pb and Cu at different contact time indicated on the chart 1. Based on the graph 1 it appears that plants have the ability to accumulate water hyacinth Pb and Cu were higher than in water spinach. The ability of plants water hyacinth to absorb Pb and Cu are influenced by the growth time. The greater growth of water hyacinth, the ability to accumulate Pb and Cu decreased. The reality is not found in plant water spinach. Ability to absorb Pb and Cu in water spinach plants are not affected by the time plant growth. The longer time growth of water spinach, the ability of accumulation have the same tendency is great.

Biosorption heavy metal Pb and Cu

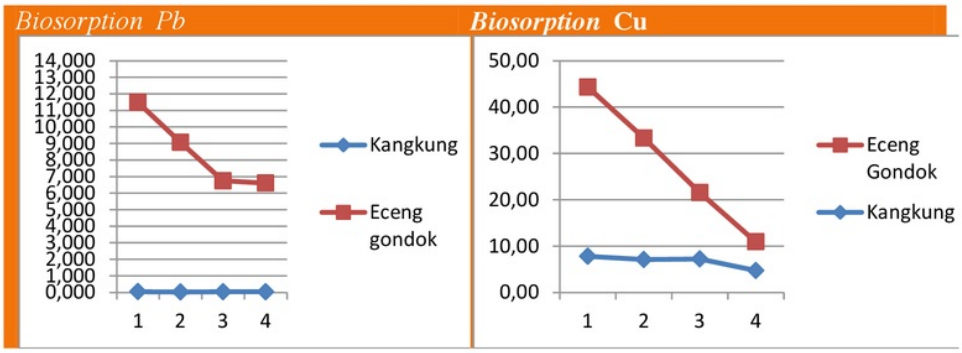

Figure 1. Accumulation of Pb and Cu in water spinach and Hyacinth at different contact time.

This is supported by the growth characteristics of plants as shown in Table 1. In water spinach plants in every segment of the nodus has the ability to produce new shoots and roots. So the impact on the addition of shoot and root dry weight at each time of observation This fact is expected to support the ability of plants to accumulate metals in an amount that is not much different. Instead the water hyacinth plants, the process of forming a new individual comes from stolons and roots growth of new stolons. Based on the data in Table 1. turns dry weight gain roots and canopy of water hyacinth plants were contaminated by Pb increased until the third week, further decreasing plant dry weight. However, the water hyacinth plants were contaminated by Cu, increased dry weight with age of the plant.

Table 1. Data Dry weight plant after application heavy metals Pb and Cu

		Dry weight Plant after application heavy metal Pb (gram plant^{-1})				Dry weight Plant after application heavy metal Cu (gram plant^{-1})			
		7	14	21	28	7	14	21	28
Water spinach	**Shoot**	26,040	46,280	64,140	63,370	3,066	3,474	3,304	4,702
	Root	0,850	0,670	8,760	9,730	0,300	0,511	0,348	0,484
	Total	26,890	46,950	72,900	73,100	3,366	3,985	3,653	5,186
Hyacinth	**Shoot**	0,533	0,632	0,964	0,870	0,316	0,348	0,468	0,762
	Root	0,226	0,240	0,430	0,419	0,182	0,231	0,251	0,324
	Total	0,759	0,872	1,394	1,289	0,498	0,579	0,718	1,086

Efficiency biosrption of Pb and Cu in plant water spinach and water hyacinth

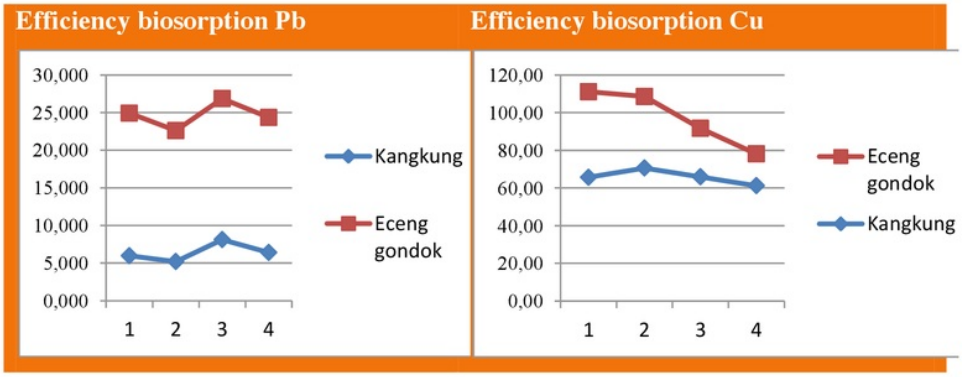

Figure 2. The efficiency of biosorption of Pb and Cu in water spinach and Hyacinth at different contact time

Furthermore, the efficiency of biosorption of Pb and Cu by water spinach and hyacinth shown in figure 2. The interesting thing turns on water spinach and hyacinth plants have an efficiency of absorption of Pb which fluctuates based on contact time with the metal Pb plants. Instead efficiency of absorption of Cu by water spinach and hyacinth has a tendency to decline.

4. Conclusion

The conclusions of this research are: 1) Water hyacinth plants have the ability biosorption of heavy metals Pb and Cu were higher than water spinach plants; 2) the ability of the accumulation of heavy metals Pb and Cu by water spinach plants tend to be equal at any time contact, whereas for Water hyacinth plants, the longer the contact time with the crop of heavy metals Pb and Cu, the lower the biosorption capability; 3) The efficiency of heavy metals Pb uptake by water spinach plants and Hyacinth tends to fluctuate at any time contact, otherwise the efficiency of biosorption of Cu by water spinach and Hyacinth tends to decrease by the plant contact time.

Acknowledgements

Thanks submitted to the Ministry of Research, Technology and Higher Education that has funded this research through grants fundamentals in 2015.

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