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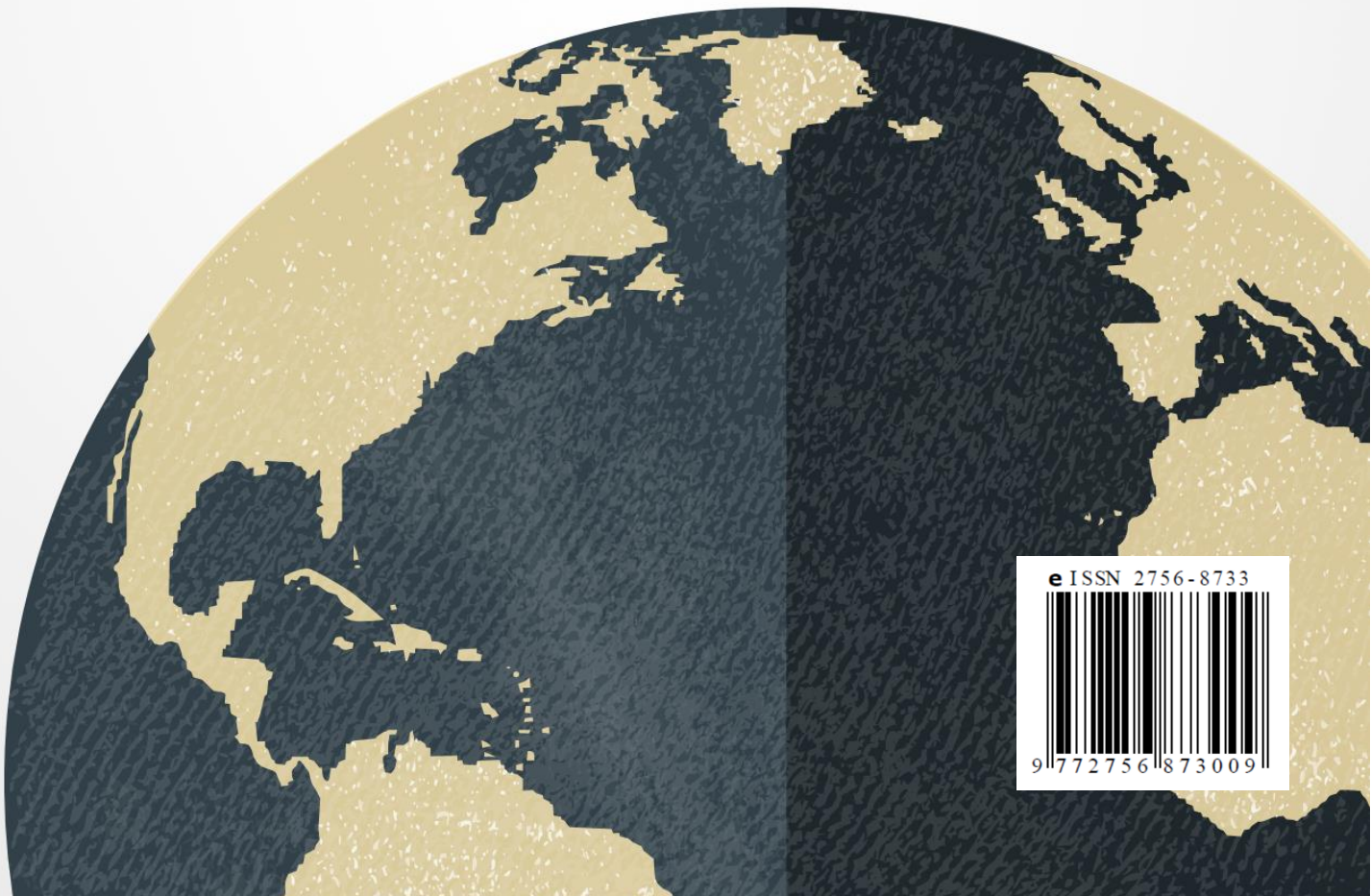

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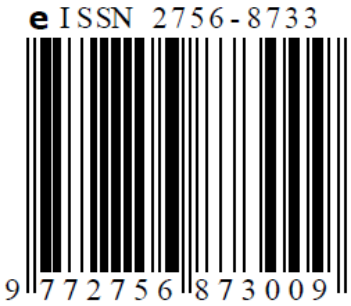

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DETERGENT WASTE PHYTOREMEDIATION USING MEXICAN-SWORD PLANT (*ECHINODORUS PALEAFOLIUS*) IN HOUSEHOLD APPLICATION

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ABSTRACT

Detergent waste is a leftover washing-process water that is difficult to decompose, which can pollute water and harm aquatic habitats. One way to lessen the toxicity of detergent waste is by using phytoremediation plants. The purpose of this study is to evaluate the possibility for Mexican-Sword plants to be used in domestic applications for phytoremediation. In this application, a reactor with a single plant type and a filter layer made of activated charcoal and zeolite sand is used. The wastewater is diluted and stored in the reactor for filtration, then the wastewater will be pumped into the environment through a water faucet. The reactor is designed to hold about 15 liters of water in a single hold which will take up to four days for the phytoremediation process, before it is discharged through the faucet directly to the drainage. It can be applied in households to produce greener environmental waste. The results of the research on Mexican-Sword plants have the potential for phytoremediation, which is indicated by the clear form of detergent wastewater and the growth of Mexican-Sword plants as the waste is absorbed by them. However, further research is still needed to increase the capacity as well as to reach the target as zero waste.

Keywords: Detergent Waste, Phytoremediation, Domestic Scale, Household

1. INTRODUCTION

Household waste (domestic waste) is one of the pollutants that can damage the water ecosystem because of the compound content of the waste that enters the water. According to Adistiara et al. (2019), 35 percents of detergent ingredients are contained in household waste. The presence of detergent waste needs to be addressed because detergent at a concentration of 0.5 mg/L is able to form foam, so that it can inhibit the diffusion of oxygen from the air to the surface of water bodies that can pollute aquatic ecosystems (Siswandari et al., 2016).

One way to overcome water pollution is to use phytoremediation method. Phytoremediation is an inexpensive, efficient and environmentally friendly method for decontaminating wastewater using aquatic plants. Mexican-Sword (Echinodorus paleafolius) can be used as an alternative method of liquid waste phytoremediation. Based on research, Mexican-Sword plant can be used as a plant for processing laundry liquid waste by phytoremediation because it reduces phosphate levels in laundry wastewater by 172.1748 ppm, lowers COD value by 446.890 mg/L, BOD by 38.748 mg.L, and the pH by 0.18 units (Padmaningrum et al., 2014).

2. METHODOLOGY

This is descriptive research in which it tests the phytoremediation effectiveness of Mexican-Sword (Echinodarus paleafolius) plant in detergent wastewater. The sample used in this study was a liquid waste from the washing process which was selected based on several criteria such as the waste produced must be fragrant, cloudy and discharged into rivers or waterways. Plants were acclimatized for 10 days using well water. This application used a reactor containing one type of plant with a filter layer using activated charcoal and zeolite sand. The wastewater was diluted and stored in the reactor first for filtration, then pumped into the environment through a water faucet. Detergent wastewater was measured for clarity before and after being filtered. The reactors were designed to hold about 15 liters of water at one time, which will take up to 4 days of phytoremediation. This is also applicable in households to achieve greener environment waste.

3. FINDINGS

The results on the second day showed that the Mexican-Sword plants looked wilted but the leaf margins dried and turned yellow. However, on the third day the plant stems looked fresh again and the water was getting a bit clear. The observation on the fourth day revealed that the plants experienced growth which was indicated by the addition of plant height, root elongation and leaf width which could be observed visually. This was because the detergent wastewater contained organic compounds that can be used for plant growth. In addition to the growth of the Mexican-Sword plants, the detergent wastewater looked clearer like ordinary water. It is believed that the plants have absorbed the wastewater's contents, which was why it gradually became clearer from the first day of waste placement until the fourth day.

Phosphate ions contained in detergent wastewater are a source of P for plants, which would be absorbed by Mexican-Sword plant roots as nutrients, so the longer the plants live in wastewater media, the lower the concentration of phosphate in the waste would be. However, in this study it is not certain how much phosphate content is absorbed by Mexican-Sword plants. Therefore, further research is needed to improve the analysis of waste phytoremediation using Mexican-Sword plants. Based on research, Mexican-Sword plants can reduce phosphate levels by 79.76 mg/l (95.15%) on the 7th day, 82.37 mg/l (98.27%) on the 11th day, and 82.9 mg/l (98.9%) on the 14th day (Sari et al., 2021). The longer the phytoremediation time, the greater the decrease in phosphate levels.

4. CONCLUSION

Based on the results of the research, Mexican-Sword plants have the potential as phytoremediation, which iwa characterized by the visualization of clear detergent wastewater and the growth of Mexican-Sword plants. However, further studies are needed to produce zero waste.

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