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REMOVAL OF HEAVY METALS (Cr, Cu, Pb) FROM BATIK TEXTILE INDUSTRY WASTEWATER USING MIXED AQUATIC PLANTS (*Hydrilla verticillata* AND *Salvinia molesta*) IN EAST JAVA

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Abstract

The batik textile industry in Indonesia has experienced rapid growth, contributing to economic development, especially at the home-industry scale. However, its production processes generate wastewater containing hazardous substances, particularly heavy metals such as chromium (Cr), copper (Cu), and lead (Pb), which threaten aquatic ecosystems and human health if untreated. This study investigated the effectiveness of phytoremediation using *Hydrilla verticillata* and *Salvinia molesta* in reducing heavy metal concentrations from batik wastewater in East Java. An experimental approach with a Completely Randomized Design (CRD) was applied, consisting of three treatments: 100% *H. verticillata*, 100% *S. molesta*, and a 50:50 mixture, each with three replications. Parameters observed included Cr, Cu, and Pb concentrations, pH, temperature, and plant biomass changes.

The results demonstrated that *H. verticillata* reduced Cr, Cu, and Pb by 31%, 33.6%, and 61%, respectively, while *S. molesta* achieved higher removal of Cr (91.9%) and Cu (60%), but Pb increased by 22% compared to initial values. The combined treatment showed synergistic effects, reducing Cr by 73%, Cu by 90.2%, and Pb by 36.6%. Biomass analysis indicated significant growth, with *S. molesta* showing the highest increase (89%).

These findings highlight the potential of aquatic plants as low-cost, eco-friendly phytoremediators for batik industry wastewater. While *S. molesta* was most effective for Cr, *H. verticillata* performed better for Pb, and mixed treatments enhanced Cu removal, emphasizing the importance of species selection and combinations in phytoremediation strategies.

Key words: batik wastewater, East Java, heavy metals, *Hydrilla verticillata*, phytoremediation, *Salvinia molesta*,

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