

RINGKASAN

Industri batik di Kota Jambi mengalami pertumbuhan pesat, namun peningkatan produksi berdampak pada meningkatnya volume limbah cair yang belum diolah secara memadai. Limbah tersebut, terutama dari proses pewarnaan, pembilasan, dan pelorodan, mengandung polutan organik tinggi seperti *Biochemical Oxygen Demand* (BOD), *Chemical Oxygen Demand* (COD), dan zat warna, yang berpotensi mencemari lingkungan. Rumah Batik Berkah, salah satu sentra produksi batik di Kota Jambi, menghasilkan limbah cair hingga 500 liter per-hari tanpa dilengkapi instalasi pengolahan, sehingga diperlukan solusi pengolahan yang efektif, sederhana, dan terjangkau.

Penelitian ini bertujuan untuk mengevaluasi efektivitas metode fitoremediasi menggunakan tanaman *Eichhornia crassipes* dalam sistem *constructed wetland* terhadap penurunan kadar BOD, COD, dan warna pada limbah cair batik. Metode yang digunakan adalah eksperimen dengan rancangan deskriptif kuantitatif menggunakan dua reaktor, yaitu reaktor dengan tanaman dan reaktor tanpa tanaman. Variasi waktu tinggal yang digunakan adalah 2, 4, 6, dan 8 hari, dengan media filter pasir, zeolit, dan arang aktif. Analisis laboratorium mengacu pada Standar Nasional Indonesia (SNI) dan uji statistik *paired sample t-test* digunakan untuk menilai signifikansi hasil.

Hasil penelitian menunjukkan bahwa pada reaktor dengan tanaman *Eichhornia crassipes* terjadi penurunan kadar BOD dari 17.959,72 mg/L menjadi 42,7 mg/L dengan efektivitas 99,76%, COD dari 45.607,50 mg/L menjadi 128,1 mg/L dengan efektivitas 99,72%, serta warna dari 16.073,75 Pt-Co menjadi 14,5 Pt-Co dengan efektivitas 99,91% pada hari ke-8. Berdasarkan uji statistik terdapat perbedaan antara reaktor dengan tanaman dan tanpa tanaman. Hasil penelitian telah membuktikan terdapat perbedaan yang signifikan antara perlakuan dengan dan tanpa *Eichhornia crassipes* dalam menurunkan konsentrasi BOD, COD, dan warna. Kesimpulannya, sistem *constructed wetland* dengan *Eichhornia crassipes* sangat efektif menurunkan kadar pencemar limbah cair batik, sehingga dapat dijadikan alternatif pengolahan limbah yang ekonomis, ramah lingkungan, dan sesuai untuk industri batik skala kecil hingga menengah.

SUMMARY

The batik industry in Jambi City is experiencing rapid growth, but increased production has resulted in an increase in the volume of liquid waste that has not been adequately treated. This waste, particularly from the dyeing, rinsing, and rolling processes, contains high levels of organic pollutants such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and dyes, which have the potential to pollute the environment. Rumah Batik Berkah, one of the batik production centers in Jambi City, produces up to 500 liters of liquid waste per day without a treatment facility, necessitating an effective, simple, and affordable treatment solution.

*This study aimed to evaluate the effectiveness of phytoremediation using *Eichhornia crassipes* (water hyacinth) in a constructed wetland system to reduce BOD, COD, and color levels in batik wastewater. The experimental research employed a quantitative descriptive design with two reactors: one with plants and one without plants. The treatment durations were set at 2, 4, 6, and 8 days, using filter media consisting of sand, zeolite, and activated carbon. Laboratory analyses followed the Indonesian National Standard (SNI), and a paired sample t-test was conducted to assess the statistical significance of the results.*

*The results showed that in the reactor with plants there was a decrease in BOD levels from 17,959.72 mg/L to 42.7 mg/L with an effectiveness of 99.76%, COD from 45,607.50 mg/L to 128.1 mg/L with an effectiveness of 99.72%, and color from 16,073.75 Pt-Co to 14.5 Pt-Co with an effectiveness of 99.91% on the 8th day. Based on statistical tests, there were differences between reactors with plants and without plants. The results of the study have proven that there are significant differences between treatments with and without *Eichhornia crassipes* in reducing the concentration of BOD, COD, and color. In conclusion, the constructed wetland system with *Eichhornia crassipes* is very effective in reducing the levels of batik liquid waste pollutants, so it can be used as an alternative waste treatment that is economical, environmentally friendly, and suitable for small to medium-scale batik industries..*