

RINGKASAN

Kemajuan industri batik Pekalongan sangat menguntungkan bagi perekonomian masyarakat dan berdampak negatif bagi lingkungan. Proses pewarnaan dalam membatik sangat banyak menyumbang zat-zat pencemar. Degradasi limbah dapat dilakukan oleh mikroorganisme berupa jamur. Jamur merupakan organisme penghasil beragam enzim hidrolitik dan oksidatif yang terlibat dalam pemecahan lignoselulosa. Salah satu jamur yang dapat mendegradasi limbah pewarna tekstil yaitu jamur *Aspergillus* sp. Aktivitas jamur dalam mendegradasi zat warna dipengaruhi oleh lama waktu kontak antara miselium jamur, zat warna, dan metode inokulasi. Degradasi limbah menggunakan jamur dapat menggunakan metode imobilisasi biomassa, seperti serat kering buah Gambas atau Oyong (*Luffa cylindrica*) karena memiliki kelebihan seperti struktur yang unik dengan bentuk tubular berserat, murah, ramah lingkungan, tidak berbahaya, mudah ditemukan, memiliki stabilitas yang tinggi, luas permukaan yang besar, dan kemampuan adsorpsi yang cepat. Penelitian ini bertujuan untuk mengetahui pengaruh *Aspergillus* sp.3 yang terimobilisasi *Luffa* dalam menurunkan kadar dekolorisasi limbah batik, serta mengetahui perlakuan waktu inkubasi terbaik dan inokulum terbaik dalam mendekolorisasi limbah batik Pekalongan.

Penelitian ini menggunakan metode eksperimental dengan rancangan percobaan Rancangan Acak Lengkap (RAL). Pengujian diawali dengan persiapan inokulum jamur yang akan digunakan untuk imobilisasi pada *Luffa*. Jamur yang sudah terimobilisasi *Luffa* kemudian digunakan untuk mendekolorisasi limbah pewarna naftol. Pengujian dilakukan dengan mengukur nilai persentase dekolorisasi, berat kering miselium, nilai pH, kadar DO, kadar TSS, kadar TDS, dan nilai suhu. Data hasil uji kemampuan biodegradasi dianalisis menggunakan *Analysis of Variance* (ANOVA) dengan tingkat kesalahan sebesar 5% kemudian dilanjutkan dengan uji Tukey.

Hasil penelitian menunjukkan bahwa perlakuan *Aspergillus* sp.3 terimobilisasi *Luffa* dapat mendekolorisasi limbah batik Pekalongan. Penggunaan inokulum spora dengan waktu inkubasi 72 jam dapat memberikan hasil yang paling tinggi dengan rata-rata persentase dekolorisasi sebesar 99,7%. Hasil tersebut didukung dengan pengukuran berat kering *Aspergillus* sp.3 terimobilisasi *Luffa* (2,294-4,416 g), nilai pH (5-7,14), kadar DO (12-16 mg/l), kadar TSS (70-148 mg/l), kadar TDS (2482,2-3761 mg/l) dan nilai suhu (29-31°C).

Kata Kunci: *Aspergillus* sp.3, dekolorisasi, imobilisasi, limbah batik, *Luffa cylindrica*

SUMMARY

The progress of the Pekalongan batik industry is very profitable for the people's economy and harms the environment. The coloring process in batik prints has a lot of contaminants. Waste degradation can be carried out by microorganisms in the form of fungi. Fungi are organisms that produce a variety of hydrolytic and oxidative enzymes involved in the breakdown of lignocellulose. One fungus that can degrade textile dye waste is the fungus *Aspergillus* sp. The activity of fungi in degrading dyes is influenced by the length of contact time between the fungal mycelium, the pigments, and the inoculation method. Waste degradation using fungi can use biomass immobilization methods, such as dry fiber of Gambas or Oyong (*Luffa cylindrica*) fruit because it has advantages such as a unique structure with a tubular fibrous shape, cheap, environmentally friendly, harmless, easy to find, has high stability, wide large surface area, and fast adsorption ability. This study aims to determine the effect of *Aspergillus* sp.3 immobilized by *Luffa* in reducing decolorization levels of batik waste, and determine the best incubation time treatment and the best inoculum in decolorizing Pekalongan batik waste.

The experimental method was used with a Completely Randomized Design (CRD). The treatments were incubation time variations and inoculum variations. Testing begins with the preparation of fungal inoculums that will be used for immobilization on *Luffa*. The immobilized *Luffa* fungus was then used to decolorize the naphthol dye waste. Tests were carried out by measuring the mycelium percentage value of decolorization, dry weight of mycelium, pH, DO, TSS, TDS, and temperature. Data from biodegradability test results were analyzed using Analysis of Variance (ANOVA) with an error rate of 5%, followed by Tukey analysis.

The results showed that the treatment of *Luffa* immobilized *Aspergillus* sp.3 could decolorize Pekalongan batik waste. The use of spore inoculums with an incubation time of 72 hours gave the highest yield with an average decolorization percentage of 99,7%. These results were supported by measurements of the dry weight of *Aspergillus* sp.3 immobilized *Luffa* (2,294-4,416 g), pH (5-7,14), levels of DO (12-16 mg/l), TSS (70-148 mg/l), TDS (2482.2-3761 mg/l), and temperature (29-31°C).

Keywords: *Aspergillus* sp.3, decolorization, immobilization, batik waste, *Luffa cylindrica*