

SELEKSI DAN KARAKTERISASI FUNGI PENDEGRADASI PEWARNA INDIGOSOL *GOLDEN YELLOW* DAN NAFTOL *BLUE BLACK* PADA LIMBAH INDUSTRI BATIK DI PEKALONGAN

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INTISARI

Pekalongan merupakan salah satu kota penghasil batik terbesar di Indonesia yang produksinya tersebar ke seluruh nusantara dan diekspor ke berbagai negara. Industri Batik di Pekalongan 501,900 batik/bulan dan membuang air limbah sebanyak 73.878 m³/bulan tanpa melalui pengolahan terlebih dahulu. Salah satu pencemaran yang ditimbulkan oleh industri batik adalah limbah zat warna. Zat warna yang sering digunakan yaitu pewarna sintetik naftol *blue black* dan indigosol *golden yellow* karena warnanya lebih kuat, praktis dan tidak mudah rusak. Limbah batik tersebut bersifat toksik, mutagenik dan karsinogenik. Oleh karena itu perlu dilakukan pengolahan terlebih dahulu salah satunya dengan memanfaatkan fungi untuk mendegradasi limbah batik tersebut. Penelitian ini bertujuan untuk mengisolasi fungi potensial dalam mendegradasi pewarna indigosol *golden yellow* dan naftol *blue black* dari lingkungan yang terkontaminasi limbah batik di Pekalongan dan diaplikasikan secara langsung pada limbah batik untuk mengetahui penurunan kadar BOD, COD, TDS, TSS, sulfida, minyak dan lemak. Hasil penelitian menunjukkan terdapat 127 isolat fungi yang diperoleh dari lingkungan yang terkontaminasi limbah batik. Seluruh isolat fungi yang ditemukan dilakukan skrining kualitatif produksi lakase menggunakan asam tanat didapatkan 23 isolat fungi yang menghasilkan zona coklat disekitar koloni. Sebanyak 23 isolat dilakukan skrining kuantitatif untuk mengetahui 10 isolat fungi yang menghasilkan aktivitas enzim lakase tertinggi yang dilanjutkan ketahap dekolorisasi terhadap pewarna indigosol *golden yellow* dan naftol *blue black* yang akan diambil satu isolat fungi unggul. Isolat fungi yang mampu mendekolorisasi pewarna indigosol *golden yellow* secara optimal yaitu isolat K By_{TI} dengan persentase dekolorisasi 96.3% pada konsentrasi 250 ppm dengan waktu inkubasi 168 jam. Sedangkan untuk pewarna naftol *blue black*, isolat 33 By_{LI} mampu mendekolorisasi secara optimal dengan efisiensi persentase dekolorisasi 79.38% pada konsentrasi 250 ppm dengan waktu inkubasi 168 jam. Kedua isolat tersebut diaplikasikan ke dalam limbah batik dan mampu dekolorisasi sebesar 43.9% pada isolat K By_{TI} dan 34.54% pada isolat 33 By_{LI}. Adanya proses degradasi terhadap pewarna yaitu proses biosorpsi fungi yang ditandai adanya perubahan miselium fungi. Sebelum perlakuan, permukaan miselium fungi berinding halus dan luas untuk interaksi dengan pewarna dan sesudah perlakuan miselium fungi menjadi kasar, tebal dan tampak adanya pewarna yang melekat pada permukaan miselium. Berdasarkan karakter morfologi dan molekuler isolat K By_{TI} diidentifikasi tergolong spesies *Trichoderma yunnanense* dengan kemiripan 99.66% dan isolat 33 By_{LI} diidentifikasi sebagai spesies *Talaromyces fuscoviridis* dengan kemiripan 98.46%. Pada perlakuan uji fisikokimia, kedua isolat mampu menurunkan sifat fisikokimia pada limbah batik (BOD, COD, TDS, sulfida, TSS, minyak dan lemak) dengan persentase 32.68% ; 23.74% ; 12.69% ; 56.63% ; 37.14% ; 13.03% ; 52.78% pada isolat *T. yunnanense*, sedangkan isolat *T. fuscoviridis* persentase dalam menurunkan sifat fisikokimia yaitu 13.51% ; 22.58% ; 15.33% ; 36.25% ; 18.29% ; 6.33% 41.79% pada BOD, COD, TDS, sulfida, TSS, minyak dan lemak.

Kata Kunci : indigosol *golden yellow*, naftol *blue black*, fungi, dekolorisasi

SELECTION AND CHARACTERIZATION OF INDIGOSOL GOLDEN YELLOW AND NAPHTOL BLUE BLACK DYE-DEGRADATING FUNGI IN BATIK INDUSTRY WASTE IN PEKALONGAN

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ABSTRACT

Pekalongan is one of the largest batik-producing cities in Indonesia, whose production is spread throughout the archipelago and exported to various countries. Batik industry in Pekalongan it produces 501,900 batik/month and disposes of waste water as much as 73,878 m³/month without prior treatment. One of the pollution caused by the batik industry is dye waste. The dyes that are often used synthetic dyes are naphthol blue black and indigosol golden yellow because the colors are stronger, practical and not easily damaged. The batik waste is toxic, mutagenic and carcinogenic. Therefore, it is necessary to process first by using fungi to degrade the batik waste. This research aims to isolate potential fungi in degrading indigosol golden yellow and naphthol blue black dyes from the environment contaminated batik waste in Pekalongan and applied directly to batik waste to determine the decrease in BOD, COD, TDS, TSS, sulfides, oils and fats levels. The results showed that there were 127 isolates of fungi obtained from an environment contaminated with batik waste. All fungal isolates were found to be subjected to qualitative screening of laccase production using tannic acid and 23 isolates of fungi produced a brown zone around the colony. A total of 23 isolates were quantitatively screened to find out 10 isolates of fungi that produced the highest laccase enzyme activity which would then proceed to the decolorization of indigosol golden yellow and naphthol blue black dyes which would take one fungal isolate. The fungal isolate that was able to optimally decolorize the indigosol golden yellow dye was isolate K ByT1 with a decolorization percentage of 96.3% at a concentration of 250 ppm with an incubation time of 168 hours. As for the naphthol blue black dye, isolate 33 ByL1 was able to decolorize optimally with an efficiency of 79.38% decolorization percentage at a concentration of 250 ppm with an incubation time of 168 hours. Both isolates were applied to batik waste and were able to decolorize 43.9% on K ByT1 isolate and 34.54% on 33 ByL1 isolate. The existence of a degradation process of the dye occurs in the biosorption process of fungi which is marked by a change in the mycelium of the fungus. Before treatment, the surface of the fungal mycelium was smooth and broad-walled for interaction with the dye and after treatment the fungal mycelium became rough, thick and it was visible that the dye was attached to the surface of the mycelium. Based on the morphological and molecular characteristics, isolate K ByT1 was identified as belonging to the *Trichoderma yunnanense* species with 99.66% similarity and 33 ByL1 isolates were identified as *Talaromyces fuscoviridis* species with 98.46% similarity. In the physicochemical test treatment, both isolates were able to reduce the physicochemical properties of batik waste BOD, COD, TDS, sulfide, TSS, oil and fat with a percentage of 32.68%; 23.74% ; 12.69% ; 56.63% ; 37.14% ; 13.03% ; 52.78% in *T. yunnanense* isolates, while the percentage of *T. fuscoviridis* isolates in reducing physicochemical properties was 13.51%; 22.58% ; 15.33% ; 36.25%; 18.29% ; 6.33% 41.79% in BOD, COD, TDS, sulfides, TSS, oils and fats.

Keywords: indigosol golden yellow, naftol blue black, fungi, decolorization