

## ABSTRAK

Limbah cair di Sentra Batik Sokaraja dibuang langsung ke lingkungan (Kali Wangan). Limbah cair batik tersebut mengandung bahan organik dan logam berat yang berpotensi mencemari Kali Wangan. Peruntukan Kali Wangan adalah untuk irigasi dan budidaya ikan, selain itu Kali Wangan masih dimanfaatkan untuk mandi dan cuci masyarakat sekitarnya. Tujuan penelitian adalah menurunkan senyawa pencemar dalam limbah cair batik dengan metode biosorpsi menggunakan biosorben *Sargassum cinereum* dan limbah *baglog Pleourotus ostreatus* dalam kantong teh celup, mendapatkan nilai toksisitas lethal dan gambaran toksisitas sublethal limbah hasil biosorpsi terhadap ikan nila (*Oreochromis niloticus*) dan mendapatkan kualitas air (permukaan dan tanah) serta persepsi masyarakat sekitar Sentra Batik Sokaraja. Metode penelitian yang digunakan adalah eksperimental dan survai. Metode eksperimental untuk mengkaji perbandingan dan ukuran partikel biosorben yang optimum menurunkan kadar krom pada limbah cair batik, nilai toksisitas lethal dan gambaran sublethal limbah cair batik hasil biosorpsi terhadap ikan nila serta efektifitas pengolahan limbah cair batik melalui metode biosorpsi. Survai dilakukan untuk mengetahui kualitas air permukaan dan air tanah sekitar Sentra Batik Sokaraja dan persepsi masyarakat terhadap pencemaran yang terjadi.

Hasil penelitian menunjukkan jumlah Cr(VI) teradsorpsi tertinggi terdapat pada perbandingan biosorben 3:1 ukuran partikel 250-425  $\mu\text{m}$  sebesar 0,0042 mg/g dengan efisiensi penurunan 68,31%. Jumlah Cr(total) teradsorpsi tertinggi pada perlakuan perbandingan biosorben 3:1 ukuran partikel 150-250  $\mu\text{m}$  sebesar 0,0392 mg/g dengan efisiensi penurunan hingga 62,69%. Gugus fungsi biosorben menunjukkan vibrasi -OH, -COOH, C-O, C-H (alkena). Topografi biosorben berupa serbuk tidak beraturan, proporsi relatif Cr 0,02 – 0,1 mol% yang tersebar di permukaan. Nilai  $LC_{50}$  96 jam limbah cair batik hasil biosorpsi celup terhadap ikan nila adalah 52.876 ppm. Gambaran perilaku ikan nila tampak pada gerakan operculum semakin cepat, aktivitas berenang semakin minim dan gerak refleks tetap baik. Gambaran enzimatik berupa peningkatan aktivitas enzim sitokrom P450 monooksigenase. Kerusakan insang pada hari ke-7 berupa terjadinya hiperplasia sel interlamela sedangkan kerusakan hepar berupa adanya edema pada sel hepatosit sehingga sel mengecil atau mengkerut dan sinusoid melebar..

Biosorpsi dengan biosorben dalam kantong teh celup efektif menurunkan kadar senyawa pencemar dalam limbah cair batik hingga 70%, meskipun BOD, COD dan TSS belum memenuhi baku mutu berdasarkan Perda Provinsi Jawa Tengah Nomor 5 tahun 2012. Metode pengolahan tersebut belum dapat diterima masyarakat karena dianggap sulit dan mahal dalam preparasinya. Kualitas air permukaan (Kali Wangan) dan air tanah sekitar Sentra Batik Sokaraja baik pada musim kemarau maupun penghujan masih memenuhi baku mutu PP 82 tahun 2001. Berdasarkan hasil survai, masyarakat di sekitar Sentra Batik Sokaraja menyatakan Kali Wangan tercemar limbah cair batik namun mereka merasa tidak terganggu dengan adanya pencemaran tersebut.

Kata Kunci : biosorpsi, kantong teh celup, limbah cair batik, persepsi, toksisitas

## ABSTRACT

Wastewater is released to the environment (Kali Wangan) directly at Sokaraja Batik Center. Batik wastewater contained organic matters and heavy metals which have potential to pollute Kali Wangan. Kali Wangan using is to irrigate and fish culture, others using as taking a bath and washing by people around it. The aim of research are to decrease pollutant matter in the batik wastewater by biosorption method using *Sargassum cinereum* and *baglog* residue of *Pleurotus ostreatus* in the tea bag as biosorbent, to obtain lethal toxicity value and sublethal toxicity description of batik wastewater biosorption result to the tilapia (*Oreochromis niloticus*) and to obtain water quality and people's perception around Sokaraja Batk Center. The method of research are experimental and survey. Experimental method is used to measure the optimum biosorbent ratio and particle size to decrease chrom concentration in the batik wastewater, to lethal toxicity value and sublethal description of the batik wastewater biosorption result to the tilapia and the effectiveness of treatment by biosorption method. Survey has been done to determine surface water quality and groundwater surrounding Sokaraja Batik Center and people perception about the water pollution.

The results of showed that the highest of amount Cr(VI) adsorbed at biosorbent with ratio 3 : 1 with particle size of 250-425  $\mu\text{m}$  was 0,0042 mg/g with decrease efficiency up to 68,31%. The highest of amount total chrome adsorbed biosorbent with ratio 3 : 1 with particle size of 150-250  $\mu\text{m}$  was 0,0392 with decrease efficiency up to 62,69%. Biosorbent functional group showed that hydroxyl vibration, alkene, carboxyl and carbonyl. Biosorbent topography is a powder with irregular form, relative proportion Cr 0,02 – 0,1 mol% that spread at biosorbent surface. 96-h  $\text{LC}_{50}$  value of the batik wastewater biosorption result with biosorbent that packed in the tea bag to tilapia is 52.876 ppm. Tilapia behavior description showed at operculum motion that tend to be rapid and swimming activity tend to slower, whereas reflex motion is stable. Enzymatic description is the increasing of cytochrome P450 monooxygenase enzyme activity. Branchia damage is be marked with the occurrence interlamella hyperplasia cell occurred edema of epithelium cell and seconder lamella begin fused, whereas liver damage showed with the emerged of edema in the hepatocyt so that hepatocyt cel come to shrink or wrinkle and the sinusoid come to widen, whereas

The result of this research also showed that biosorption by *S. cinereum* and *baglog* residue of *P. ostreatus* in the tea bag as biosorbent is effective to decrease pollutant matters at batik wastewater up to 70%, although BOD, COD and TSS are not meet to the threshold according to the regulation of Perda Provinsi Jawa Tengah No. 5 tahun 2012. Treatment method is does not accept yet by people around because it is still difficult and expensive in preparation. Surface water quality (Wangan River) and groundwater around Sokaraja Batik Center are still good both in the dry season and rainy season still meet the standard quality according to regulation of PP No. 82 tahun 2001. Based on the survey result, people around Sokaraja Batik Center stated that the Wangan River has been polluted by batik wastewater but they are not disturbed.

Keyword : batik waste water, biosorption, perception, tea bag package, toxicity