

Studi penghilangan warna air limbah dari pabrik pulp dan kertas menggunakan pleurotus ostreatus HHB1 = Study on the colour elimination of pulp and paper mill waste water by employing pleurotus ostreatus HHB1

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Abstrak

ABSTRAK

Saat ini di alam dikenal dua kelompok jamur yang mempunyai aktivitas pelapukan kayu. Pertama, jamur pelapuk putih (White rot fungi), yaitu jamur yang dapat merusak lignin dan selulosa kayu. Kedua, jamur pelapuk coklat (Brown rot fungi), yaitu jamur yang dapat merusak selulosa kayu. Beberapa jamur yang tergolong jamur pelapuk putih (*Scizophyllum commune*, *Tinctoporia borbonica*, *Phanerochaete chrysosporium*, *Tremetes versicolor*, *Aspergillus niger*, *Trichoderma* sp, *Coriolus versicolor*) dilaporkan mampu mendegradasi komponen sisa lignin yang terdapat pada air limbah pabrik pulp dan kertas. Dalam penelitian ini diuji kemampuan *Pleurotus ostreatus* HHB1 (yang juga tergolong 'White rot fungi') mendegradasi sisa lignin yang terdapat dalam air limbah pabrik pulp dan kertas.

Pada tahap awal penelitian dilakukan adaptasi yang bertujuan agar *Pleurotus ostreatus* HHB1 dapat menyesuaikan diri dengan air limbah yang akan didegradasi. Selanjutnya terhadap jamur yang sudah beradaptasi dilakukan evaluasi kurva pertumbuhannya dengan mengukur perubahan berat kering spora selama selang waktu 72 jam. Didapatkan bahwa fase lag atau fase adaptasi terjadi dalam selang waktu 16 jam pertama, sedangkan fase eksponensial terjadi pada selang waktu 32 jam berikutnya. Pengamatan selanjutnya selama 24 jam tidak menunjukkan terjadinya perubahan berat kering spora (fase stasioner). Pengamatan nilai BOD dan Unit warna ditentukan dalam selang waktu dari 0 sampai 72 cenderung turun dengan persentase penurunannya masing-masing sebesar 40,22 %, dan 67,01%. pH cenderung naik dari 6,4 hingga 7,5. Sedangkan COD cenderung tidak berubah. Evaluasi laju pengurangan Unit warna dalam selang waktu yang diamati menunjukkan bahwa reaksi penghilangan Unit warna secara umum berorde dua. Pada percobaan kondisi optimum (pengocokan 100 goyangan/menit, pada 260000 unit warna awal air limbah, 2 gll glukosa, $2,5 \times 10^9$ spora/mL inokulum, pH 6,0 dan 0,1 gll NH_4NO_3) penghilangan Unit warna dapat mencapai 93,08% dalam waktu 48 jam. Dari data yang diperoleh dapat disimpulkan bahwa jamur *Pleurotus ostreatus* HHB1 yang diteliti mempunyai kemampuan mendegradasi sisa lignin yang terdapat dalam limbah pabrik pulp dan kertas. Aktivitas jamur *Pleurotus ostreatus* HHB1 juga diamati pada terjadinya perubahan polikromatogram (GCMS) dari ekstrak dietil eter sebelum dan sesudah perlakuan.

ABSTRACT

There are two groups of fungi, which are known having an activity to decompose wood. Firstly, white rot fungi which is able to decompose lignin and cellulose. Secondly, brown rot fungi which is able to decompose cellulose. Many of white rot fungi groups (such as, *Scizophyllum commune*, *Tinctoporia borbonica*, *Phanerochaete chrysosporium*, *Tremetes versicolor*, *Aspergillus niger*, *Trichoderma* sp, *Coriolus versicolor*) were reported having an activity to degrade lignin residues in pulp and paper mill waste water. In this research an examination on activity of *Pleurotus ostreatus* HHB1 (white rot fungi group) to reduce unit

colour of waste water was carried out.

In the early stage of the research the *Pleurotus ostreatus* HHB1 was subjected to an adaptation experiment employing the waste water sample, in order to obtain suitable strain. Furthermore a growth curve was evaluated to adapt strain by measuring the dry weight of spore at certain interval time during 72 hours observation. The result indicates that the lag (adaptation stage), exponential and stationary stage were observed for the first 16, the next 32, and the last 24 hours respectively. When the similar strain (adapted strain) was applied to treat the pulp and paper mill waste water the following results were observed. Respected to initial value, as much as 98.08 % decreasing in colour unit (in Pt1Co unit) could be reached in 48 hours, while the BOD value was decreased as much as 40.22 % in 72 hours. The COD value, however, showed no significant change during observation time. During the treatment the pH was observed increasing from initial value. For the additional information, the change in chromatogram profile (measured with quadrupole GCMS) of the diethyl ether extract of treated and untreated waste water was observed. With the assumption that lignin is a main contribution of colour developing in a pulp and paper mill waste water and from the presented result it is concluded the *Pleurotus ostreatus* HHB1 has an activity to degrade lignin. Based on the simple kinetic evaluation the rate of colour reduction observed in this research generally has a second order.