

DEKOLORISASI LIMBAH PEWARNA SINTETIS REMAZOL BRILLIANT BLUE R OLEH ENZIM LAKASE DARI JAMUR PELAPUK PUTIH *Trametes hirsuta* EDN-082 TERIMOBILISASI PADA BEADS Ca-ALGINAT/SELULOSA

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INTISARI

Penelitian tentang dekolorisasi limbah pewarna sintetis Remazol Brilliant Blue R (RBBR) oleh enzim lakase dari *Trametes hirsuta* EDN-082 terimobilisasi pada Ca-alginat/selulosa (CAS) *beads* telah dilakukan. Penelitian ini bertujuan untuk mengimobilisasi enzim lakase dari *T. hirsuta* EDN-082 pada *beads* CAS dengan penaut silang kalsium klorida, mendekolorisasi pewarna sintetis RBBR dengan menggunakan *beads* CAS terimobilisasi enzim lakase, dan pengujian penggunaan berulang (*reusability*) *beads* CAS terimobilisasi enzim lakase.

Penelitian ini diawali dengan produksi enzim lakase dari jamur *T. hirsuta* EDN-082 kemudian diekstraksi dan dipresipitasi dengan amonium sulfat. Fabrikasi *beads* dilakukan melalui suspensi campuran alginat, selulosa, dan enzim yang diekstraksi pada larutan $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ 0,1 M. Dekolorisasi pewarna RBBR oleh *beads* Ca-alginat/selulosa/enzim (CAS-E) dilakukan dengan dua variasi yaitu variasi jumlah *enzyme loading* dan variasi berat. Pengujian *reusability* dilakukan dengan aktivasi glutaraldehid 0,6 % dan prosedur dekolorisasi dilakukan selama 5 siklus dengan masing-masing siklus memiliki rentang 4 jam.

Hasil penelitian menunjukkan bahwa imobilisasi enzim lakase (2 U/mL) dari *T. hirsuta* EDN-082 dengan metode *entrapment* pada matriks *beads* Ca-alginat/selulosa telah berhasil dilakukan dengan efisiensi imobilisasi sebesar 97,72 %. Persen dekolorisasi pewarna sintetis RBBR menggunakan *beads* CAS-E optimum adalah sebesar 95,37 % pada variasi aktivitas enzim 2 U/mL seberat 2 g *beads* per 20 mL pewarna dengan konsentrasi 100 ppm dalam waktu 4 jam. Pengujian *reusability* *beads* CAS-E teraktivasi glutaraldehid (CAS-E-GLU) mampu mempertahankan aktivitas dekolorisasi pada kisaran 80-70 % di seluruh siklus.

Kata kunci : alginat, dekolorisasi, enzim lakase, imobilisasi, selulosa

**DECOLORIZATION OF REMAZOL BRILLIANT BLUE R SYNTHETIC
DYES BY LACCASE ENZYME FROM WHITE ROT FUNGI *Trametes hirsuta*
EDN-082 IMMOBILIZED ON Ca-ALGINATE/CELLULOSE BEADS**

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ABSTRACT

Research on decolorization of synthetic dye Remazol Brilliant Blue R (RBBR) by laccase enzyme from *Trametes hirsuta* EDN-082 immobilized on Ca-alginate/cellulose (CAS) beads has been carried out. The objectives of this research were to immobilize the laccase enzyme from *T. hirsuta* EDN-082 on CAS beads with calcium chloride as crosslinker, decolorize the synthetic dye of RBBR using laccase enzyme immobilized on CAS beads, and reusability examination of laccase enzyme immobilized on CAS beads.

This research was initiated with the production of laccase enzyme from *T. hirsuta* EDN-082, then extraction and precipitation using ammonium sulfate. The fabrication of beads was carried out through a suspension mixture of alginate, cellulose, and enzymes, then extruded into 0.1 M CaCl₂.2H₂O solution. Decolorization of RBBR dye by Ca-alginate/cellulose/enzyme (CAS-E) beads was carried out by varying the amount of enzyme loading and the mass of beads. Reusability examination was carried out by activating 0.6 % glutaraldehyde and the decolorization procedure was carried out for 5 cycles with each cycle having a span of 4 hours.

The results showed that the immobilization of the laccase enzyme (2 U/mL) from *T. hirsuta* EDN-082 by entrapment method on the matrix of Ca-alginate/cellulose beads was successfully conducted with an immobilization efficiency of 97.72%. The effectiveness level of decolorization of synthetic RBBR dyes using CAS-E beads was 95.37% at a variation of enzyme activity of 2 U/mL with 2 g beads per 20 mL of dye with a concentration of 100 ppm within 4 hours. The reusability examination of activated glutaraldehyde-activated CAS-E beads (CAS-E-GLU) was able to maintain the decolorization activity in the 70-80% range throughout the cycle.

Keywords : alginate, cellulose, decolorization, entrapment, immobilization