RESPONSE SURFACE OPTIMIZATION OF CRYSTAL VIOLETDECOLORIZATION BY PELLETS OF *PYCNOPORUS SANGUINEUS*

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Name of Degree: Master of Biotechnology (coursework + dissertation)

Title of Dissertation ("this Work"): Response surface optimization of crystal violet decolorization by pellets of *Pycnoporus sanguineus*

Field of Study: Biotechnology

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ABSTRACT

Ligninolytic enzymes of white-rot fungi have broad specificities and have been implicated in transformation and mineralization of organo-pollutant with chemical structure similar to lignin e.g. synthetic dyes. This study was carried out to optimize selected parameters for decolorization of Crystal violet by *Pycnoporus sanguineus* in shake flasks. The parameters studied were initial dye concentration (ppm), agitation speed (rpm) and process time. They were optimized using response surface methodology (RSM). Subsequent to the optimization, the decolorization process was scaled up in stirred tank reactor (STR). Effect of different geometry of impellers on the decolorization process was studied. Curved blade and angled blade 60° impellers were used in the STR. Statistical analysis showed that initial dye concentration and decolorization time have significant effect exerted on the dye decolorization process ($p < 0.05$). Optimum condition for crystal violet decolorization was 40 ppm of initial dye concentration, two days process time and 160 rpm of agitation speed. In the STR, when curved blade impeller was used, increasing its rotational speed will increase the percentage of decolorization. On the contrary, when angled blade 60° impeller was used, the percentage of decolorization decreases with the increase in rotational speed of the impeller.

ABSTRAK

Enzim ligninolitik daripada kulat pereput putih mempunyai pengkhususan yang meluas dan mampu memberi impak di dalam penukaran dan mineralisasi pencemaran organik di mana ianya mempunyai struktur kimia yang serupa dengan lignin, contohnya; pewarna sintetik. Kajian ini dijalankan untuk mendapatkan parameter yang optimum bagi penyahwarnaan pewarna "crystal violet" oleh *Pycnoporus sanguineus*. Parameter yang terlibat termasuk kepekatan pewarna (ppm), kelajuan pengemparan (rpm) dan tempoh penyahwarnaan (h). Proses pengoptimuman dijalankan menggunakan "response surface methodology" (RSM). Selepas proses pengoptimuman dijalankan, Kajian deteruskan dengan skala yang lebih besar menggunakan tangki pengaduk. Kesan geometri pengaduk yang berbeza di dalam proses ini dikaji. Pengaduk yang digunakan di dalam tangki pengaduk adalah pengaduk mata melengkung dan pengaduk mata bersudut 60°. Analisis statistik menunjukkan kepekatan pewarna dan masa penyahwarnaan mempunyai pengaruh yang signifikan terhadap proses penyahwarnaan ($p < 0.05$). Keadaan optimum bagi proses penyahwarnaan "Crystal violet" adalah pada 40 ppm kepekatan awal pewarna, 2 hari tempoh pemprosesan dan 160 rpm kelajuan emparan. Bagi kajian berskala besar dengan menggunakan pengaduk mata melengkung, kenaikan laju pengaduk akan meningkatkan peratus penyahwarnaan. Sebaliknya, penggunaan pengaduk berpaksi ke bawah, peratus penyahwarnaan menurun dengan penambahan kelajuan pengaduk.

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TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

cm	centimeter
BBD	Box-Behnken design
LME	ligninolytic modifying enzyme
STR	stirred tank reactor
h	hour
ppm	parts per million
rpm	revolution per minute
RSM	response surface methodology