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Fungal decolourisation of textile dyes in liquid medium under alkaline conditions

Ottoni, Cristiane Angelica; Santos, Cledir; Lima, Nelson

Universidade do Minho, Portugal

E-mail: c.a.ottoni@hotmail.com

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Abstract

Dyes have been extensively used in a broad range of industries, especially in dyeing textiles which generate large amounts of alkaline effluents. In recent years there has been an increasing interest in white rot fungi (WRF) which were found to be able to degrade many xenobiotic compounds including such dyes. WRF produce all or some of the extracellular ligninolytic enzymes such as lignin peroxidase (LiP), manganese peroxidase (MnP) and laccase (Lcc) which are responsible for the degradation of pollutants.

The purpose of the present assay was to screen WRF for degradation of textile dyes in liquid medium under alkaline conditions.

Fourdifferent WRF strains, *Trametes versicolor* MUM94.04 MUM04.100 MUM 04.101 and *Phanerochaete chrysosporium* MUM94.15 obtained from the Micoteca da Universidade do Minho (MUM) culture collection were used. Decolourisations of Poly R-478 and Reactive Black 5 (RB5) at 0.1 gL^{-1} concentration were carried out in liquid medium containing Yeast Nitrogen Base supplemented with 5 gL^{-1} saccharose. The effect of pH in a range from 8 to 10 was studied. The samples were incubated at 30 ºC with shake (150 rpm) during 7 days. On days 1, 3, 5 and 7 the decolourisation, saccharose and enzymatic activities (LiP, MnP, Lcc, glioxal oxidase (GLOX) and proteases) were assessed using absorbance, HPLC and colorimetric methods, respectively. The fungal biomass was also evaluated by dry-weight method.

The four strains decolourised more efficiently RB5 than Poly R-478. Concerning RB5, MUM94.04, MUM04.100 and MUM94.15 yielded best results rising 75% of decolourisation at pH 9.5. Among the ligninolytic enzymes produced by MUM94.04 and MUM04.100 Lcc had the highest activity. Activities of LiP, MnP, GLOX and proteases were also quantified. For *P. chrysosporium* MUM 94.15 very low LiP, MnP,activities were detected at pH 8.5-10.0 in the samples although the decolourisation was similar to that observed in *T. versicolor* MUM94.04 and MUM04.100.

The results showed that increase alkaline conditions turn the fungal decolourisation more strictly. Mechanisms of dyes degradation for each strain are now under studied.