THERMOPHILIC BIOREMEDIATION OF EMERGING POLLUTANTS USING A RECOMBINANT THERMOPHILIC FUNGAL PEROXIDASE

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The ever-increasing accumulation of emerging pollutants in the environment is a major environmental and health concern as evidenced by a large number of recent reports showing their deleterious effects. Hence, efficient and novel approaches and strategies for the removal of such pollutants remain an active area of investigation. A potentially greener strategy by which these emerging pollutants (EPs) can be eliminated from the environment is through biological approaches such as microbial and enzyme-mediated bioremediation. An attractive feature of enzyme-based degradation is that this approach can be further enhanced via advanced protein engineering strategies. We have recently investigated the ability of different recombinant fungal dye decolorizing peroxidases (DyPs) to degrade a panel of different emerging pollutants, using a previously developed sensitive and robust (LCMSMS)-based approach. We show that a subset of the tested emerging pollutants were efficiently degraded by these peroxidases, whereas others were recalcitrant. Interestingly, exploiting the thermostable nature of a fungal peroxidase (rPsaDyP) by carrying out the remediation at an elevated temperature of 60 oC showed significantly better pollutant degradation (Figure 1). Additionally, including a redox mediator in the reaction had a synergistic effect as it enabled complete degradation of additional emerging pollutants. Our results highlight the potential of fungal DyPs (especially those that are thermophilic or can be evolved into thermophilic variants) to be used for the bioremediation of different classes of emerging pollutants.

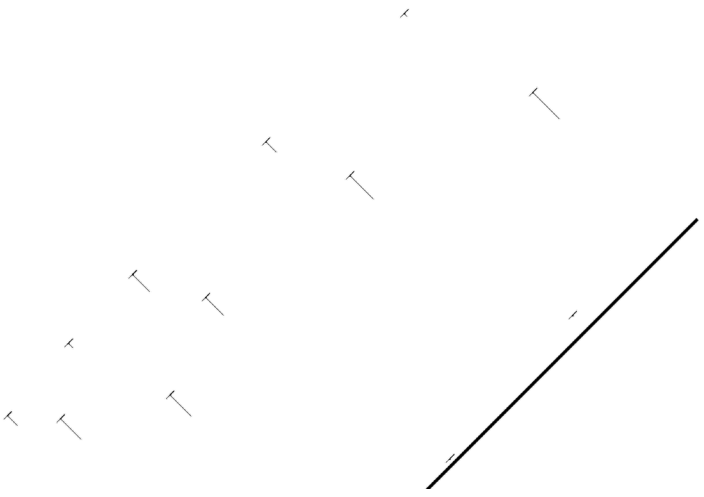

*Figure 1 V– Enhanced enzymatic degradation of emerging pollutants (EPs) under elevated temperature conditions (60 °C) relative to room temperature. *In the presence of a redox mediator.*