TITLE: FACTORIAL DESIGNS FOR IDENTIFICATION OF OPTIMUM REACTION CONDITIONS TO LIGNINOLYTIC ACTIVITY OF FILAMENTOUS FUNGI FROM MANGROVE, CERRADO AND CAATINGA

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ABSTRACT:

Filamentous fungi have known abilities to produce a wide range of bioactive compounds, such as enzymes with biotechnological applications. Ligninolytic enzymes can be applied by industries that use plant biomass as raw material, such as bioethanol refineries. Currently, the production of second-generation ethanol has a bottleneck linked to lignin contents, due to its high rigidity. Therefore, the aim of this study was to identify the optimum reaction conditions for Lignin Peroxidase (LiP) activities of filamentous fungi collected from three Brazilian environments: mangrove, cerrado and caatinga. Thus, the isolates were quantitatively analyzed in relation to the activities of Lignin Peroxidases (LiP) by spectrophotometric techniques. The isolates from each environment that had the highest LiP activities were selected to Factorial Designs. Therefore, three fungal strains were selected: 63.1 *Fusarium* sp. (from mangrove), LRA-9 (non identified, from cerrado) and FE-120 (non identified, from caatinga). All the fungi were submitted to Factorial Designs 3^3 using the R software, with three factors (pH, temperature and sodium chloride – NaCl concentration) at three levels (upper, central and lower). All models showed satisfactory goodness of fit and well correlation between data (predicted and observed). The studied factors and their interactions had a significant influence on LiP activities for the mangrove and caatinga isolates ($p < 0.05$). However, the NaCl concentration for the cerrado isolate did not show a significant influence ($p < 0.05$). The optimum reaction conditions for LiP activities of the isolate 63.1 – *Fusarium* sp. were high temperatures, basic pH and intermediate concentration of sodium chloride, which reflects the environment of origin, as mangroves are found in tropical regions, with high temperatures, salinity between 5 to 30%, only the pH which is generally acid. The optima conditions obtained for the LRA 9 were slightly acidic to basic pH, low NaCl concentration, under high temperatures, portraying the conditions of the cerrado, of acidic pH, low salt concentration and high temperature. The adequate conditions obtained for the LiP activities of the FE 120 isolate were low temperatures, absence of NaCl and acidic pH, where only the pH portrays the caatinga environment. Thus, probably the isolate FE 120 was adapted to live at caatinga environmental conditions, but its optimum LiP activity was obtained under conditions, considered as normal.

KEYWORDS: Biofuels, Factorial Designs, Ligninases, Lignin Peroxidase.

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