

研究论文

过氧化氢调控藜芦醇介导木素过氧化物酶催化氧化邻苯三酚红研究

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摘要 木素过氧化物酶(LiP)催化H₂O₂氧化邻苯三酚红(PR)反应的氧化产物受H₂O₂与PR的摩尔比控制, H₂O₂与PR的摩尔比不同, 所得降解产物不一样. 分析表明, H₂O₂在LiP催化氧化PR过程中的双重作用(即低浓度的H₂O₂是LiP的激活剂, 高浓度的H₂O₂是LiP的抑制剂)是导致上述现象的根本原因. 藜芦醇(VA)

对LiP催化氧化PR的反应有促进作用, 尤其是当H₂O₂与PR的摩尔比较高时这种促进作用更为明显;

然而PR对LiP催化氧化VA的反应却有抑制作用.

后者可以用来解释为什么在用白腐菌降解染料时在培养液中常常检测不到LiP的藜芦醇活力. 分析表明, VA的存在不但促进了LiP酶中间体LiP(II)和/或LiP(III)向LiP的转化, 使LiP的催化循环加速,

VA生成的VA⁺也间接氧化了染料PR, 从而使PR的氧化速率提高.

关键词 [木素过氧化物酶](#) [邻苯三酚红](#) [氧化降解](#) [藜芦醇](#) [抑制作用](#)

分类号

Studies on the Hydrogen Peroxide Regulated Veratryl Alcohol Mediated Oxidation of Pyrogallol Red Catalyzed by Lignin Peroxidase

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Abstract The oxidation reaction of pyrogallol red (PR) by H₂O₂ in the presence of lignin peroxidase (LiP) was studied at different concentrations of H₂O₂. Experiments showed that the oxidation products depended on the molar ratio of H₂O₂ to PR, suggesting that the LiP catalyzed oxidation products of PR should be controllable. This phenomenon was caused by the dual roles of H₂O₂, i.e., at lower concentrations it was an activator of LiP, while at higher concentrations it was an inhibitor. Veratryl alcohol (VA) could stimulate the oxidation of PR catalyzed by LiP, especially at higher molar ratios of H₂O₂ to PR, however, PR inhibited the LiP catalyzed oxidation of VA. The inhibition should be used to explain a phenomenon that no veratryl alcohol activity was detected in the culture of white rot fungi where dye was effectively decolorized. Kinetics analysis suggested that VA should accelerate the conversion of LiP(II) and/or LiP(III) to LiP, and therefore the catalytic cycle of LiP. Indirect oxidation of PR by the veratryl alcohol cationic radical was also contributed to the increase in the oxidation rate of PR.

Key words [lignin peroxidase](#) [pyrogallol red](#) [oxidative degradation](#) [veratryl alcohol](#) [inhibition](#)

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