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提高平菇深层培养木质素降解酶活性和对直接湖蓝5B脱色率的探索性研究

An exploratory study on elevation of the lignin degradation enzyme activity of *Pleurotus ostreatus* in submerged cultivation and its decolorization rate to direct sky blue 5B

关键词: [平菇和酵母菌混菌](#) [预适应培养的平菇菌种](#) [木质素降解酶](#) [直接湖蓝5B脱色率](#)

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摘要: 以稻草为主要营养基质对平菇进行深层培养,研究了不同浓度(100、200、400、600、800 mg · L⁻¹)直接湖蓝5B对平菇菌丝体产量的影响,以及平菇对不同浓度(100、150、200、250、300、400 mg · L⁻¹)直接湖蓝5B的脱色率.此外,还研究了平菇分别与3种酵母菌(酿酒酵母、产朊假丝酵母和热带假丝酵母)混菌培养及用不同浓度(50、100、200、300、400 mg · L⁻¹)直接湖蓝5B预适应培养的平菇菌种对木质素降解酶活性和直接湖蓝5B脱色率的影响.结果表明:100~400 mg · L⁻¹的直接湖蓝5B均可显著提高了平菇菌丝体产量,而800 mg · L⁻¹的染料对菌丝体的生长有显著抑制作用;染料浓度越高,平菇对其的脱色率越低,发酵时间越长,脱色效果越好.与平菇单菌发酵相比,平菇分别与酿酒酵母和产朊假丝酵母混菌培养可显著提高发酵体系漆酶的活性,平菇分别与所试3种酵母菌混菌培养时锰过氧化物酶活性均有显著增加,与产朊假丝酵母混菌培养时两种酶活性的增加量最大;用50、100、200 mg · L⁻¹直接湖蓝5B预适应培养的菌种接种可显著提高平菇分泌的漆酶的活性,而50 mg · L⁻¹和100 mg · L⁻¹的则显著提高锰过氧化物酶的活性.平菇分别与所试3种酵母菌混菌培养,以及用50 mg · L⁻¹和100 mg · L⁻¹直接湖蓝5B预培养的平菇菌种接种,发酵体系对直接湖蓝5B的脱色效果有显著促进作用,其中,平菇与产朊假丝酵母混菌培养时脱色率最高,达96.3%.通过比较直接湖蓝5B脱色率与漆酶、锰过氧化物酶活性之间的关系可以看出,漆酶、锰过氧化物酶活性与脱色率间基本呈正相关关系.

Abstract: The present study investigated the effects of direct sky blue 5B (DSB-5B) dye at different concentrations (100, 200, 400, 600 and 800 mg · L⁻¹) on the mycelia yield of *Pleurotus ostreatus*, which was submerged and cultivated in a medium with straw as a primary nutrient. In addition, the decolorization rates by *P. ostreatus* to DSB-5B at 100, 150, 200, 250, 300 and 400 mg · L⁻¹ were further studied in the same culture system. Moreover, we also investigated the lignin degradation enzyme activities and the decolorization rates to DSB-5B in a mixed-strain culture that *P. ostreatus* and yeasts (*Saccharomyces cerevisia*, *Candida utilis* or *Candida tropicalis*) were co-cultivated. In a pre-adaptive study, *P. ostreatus* was first inoculated in a medium that contained DSB-5B at 50, 100, 200, 300 and 400 mg · L⁻¹, respectively. The results demonstrated that DSB-5B at 100~400 mg · L⁻¹ significantly increased the *P. ostreatus* mycelial dry weight, but exerted an opposite effect when DSB-5B concentration was at 800 mg · L⁻¹. The decolorization rates to DSB-5B increased when fermentation course was prolonged but the rates were negatively correlated to the increase of dye concentrations. Comparing to the sole *P. ostreatus* culture, *P. ostreatus* + *S. cerevisiae* and *P. ostreatus* + *C. utilis* both significantly increased the laccase (Lac) activities, and all mixed-strain cultures of *P. ostreatus* with three different yeasts significantly elevated the manganese peroxidase (MnP) activities. The increase of MnP and Lac activities was the most significant in *P. ostreatus* + *C. utilis* culture. Pre-adaptation of *P. ostreatus* could significantly boost Lac activity when DSB-5B concentrations were at 50, 100 and 200 mg · L⁻¹, respectively, or increase MnP activity when at 50 mg · L⁻¹ and 100 mg · L⁻¹. Mixed-strain culture of *P. ostreatus* with all three yeasts, or pre-adaptation of *P. ostreatus* with 50 mg · L⁻¹ and 100 mg · L⁻¹ DSB-5B both significantly promoted the decolorization rate to the dye. The co-culture of *P. ostreatus* + *C. utilis* demonstrated the highest effects and the decolorization rate reached 96.3%. Based on these findings, we concluded that the activity of Lac and MnP were positively correlated with the decolorization rate of direct sky blue 5B dye.

Key words: [mixed-strains of *Pleurotus ostreatus* and yeast](#) [pre-adaptation cultured *Pleurotus ostreatus* inocula](#) [lignin degradation enzyme](#) [decolorization rate of direct sky blue 5B](#)

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