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Ethanol and Biomass Production from Spent Sulfite Liquor by Filamentous Fungi

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Abstract : Since filamentous fungi are capable of assimilating several types of sugars (hexoses and pentoses), they are potential candidates for bioconversion of spent sulfite liquor (SSL). Three filamentous fungi such as Aspergillus oryzae, Mucor indicus, and Rhizopus oryzae were investigated in this work. The SSL was diluted in order to obtain concentrations of 50, 60, 70, 80, and 90% and supplemented with two types of nutrients. The results from cultivations in shake flask showed that A. oryzae and M. indicus were not able to grow in pure SSL and SSL90% while R. oryzae could grow only in SSL50% and SSL60%. Cultivation with A. oryzae resulted in the highest yield of produced fungal biomass, while R. oryzae cultivation resulted in the lowest fungal biomass yield. Although, the mediums containing yeast extract, (NH₄)₂SO₄, KH₂PO₄, CaCl₂•2H₂O, and MgSO₄•7H₂O as nutrients supplementations produced higher fungal biomass compared to the mediums containing NH₄H₂PO₄ and ammonia, but there was no significant difference between two types of nutrients in terms of sugars and acetic acid consumption rate. The sugars consumption in M. indicus cultivation was faster than A. oryzae and R. oryzae cultivation. Acetic acid present in SSL was completely consumed during cultivation of all fungi. M. indicus was the best and fastest ethanol producer from SSL among the fungi examined, when yeast extract and salts were used as nutrients supplementations. Furthermore, no further improvement in ethanol concentration and rate of sugars consumption was obtained in medium supplemented with NH₄H₂PO₄ and ammonia compared to medium containing yeast extract, (NH₄)₂SO₄, KH₂PO₄, CaCl₂•2H₂O, and MgSO₄•7H₂O. On the other hand, the higher dilution of SSL resulted in a better fermentability, and better consumption of sugars and acetic acid.

Keywords : ethanol, filamentous fungi, fungal biomass, spent sulfite liquor
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