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Identification and characterisation of xylanolytic yeasts isolated from decaying wood and sugarcane bagasse in Brazil

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Abstract In this study, yeasts associated with lignocellulosic materials in Brazil, including decaying wood and sugarcane bagasse, were isolated, and their ability to produce xylanolytic enzymes was investigated. A total of 358 yeast isolates were obtained, with 198 strains isolated from decaying wood and 160 strains isolated from decaying sugarcane bagasse samples. Seventy-five isolates possessed xylanase activity in solid medium and were identified as belonging to nine species: *Candida intermedia*, *C. tropicalis*, *Meyerozyma guilliermondii*, *Scheffersomyces shehatae*, *Sugiyamaella smithiae*, *Cryptococcus diffluens*, *Cr. heveanensis*, *Cr. laurentii* and *Trichosporon mycotoxinivorans*. Twenty-one isolates were further screened for total xylanase activity in liquid medium with xylan, and five xylanolytic yeasts were selected for further characterization, which included quantitative analysis of growth in xylan and xylose and xylanase and β-D-xylosidase activities. The yeasts showing the highest growth rate and cell density in xylan, *Cr. laurentii* UFMG-HB-48, *Su. smithiae* UFMG-HM-80.1 and *Sc. shehatae* UFMG-HM-9.1a, were, simultaneously, those exhibiting higher xylanase activity. Xylan induced the highest level of (extracellular) xylanase activity in *Cr. laurentii* UFMG-HB-48 and the highest level of (intracellular, extracellular and membrane-associated) β-D-xylosidase activity in *Su. smithiae* UFMG-HM-80.1. Also, significant β-D-xylosidase levels were detected in xylan-induced cultures of *Cr. laurentii* UFMG-HB-48 and *Sc. shehatae* UFMG-HM-9.1a, mainly in extracellular and intracellular spaces, respectively. Under xylose induction, *Cr. laurentii* UFMG-HB-48 showed the highest intracellular β-D-xylosidase activity among all the yeast tested. *C. tropicalis* UFMG-HB 93a showed its higher (intracellular) β-D-xylosidase activity under xylose induction and higher at 30 °C than at 50 °C. This study revealed different xylanolytic abilities and strategies in yeasts to metabolise xylan and/or its hydrolysis products (xylo-oligosaccharides and xylose). Xylanolytic yeasts are able to secrete xylanolytic enzymes mainly when induced by xylan and present different strategies (intra- and/or extracellular hydrolysis) for the metabolism of xylo-oligosaccharides. Some of the unique xylanolytic traits identified here should be further explored for their applicability in specific biotechnological processes.

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