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Research Letter

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Morphological and enzymatic response of the thermotolerant fungus *Fomes* sp. EUM1 in solid state fermentation under thermal stress

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One sentence summary: Modification of fungal enzymatic profiles in solid state fermentation by thermal stress.
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ABSTRACT

Thermotolerance of the fungus *Fomes* sp. EUM1 was evaluated in solid state fermentation (SSF). This thermotolerant strain improved both hyphal invasiveness (38%) and length (17%) in adverse thermal conditions exceeding 30°C and to a maximum of 40°C. In contrast, hyphal branching decreased by 46% at 45°C. The production of cellulases over corn stover increased 1.6-fold in 30°C culture conditions, xylanases increased 2.8-fold at 40°C, while laccase production improved 2.7-fold at 35°C. Maximum production of lignocellulolytic enzymes was obtained at elevated temperatures in shorter fermentation times (8–6 days), although the proteases appeared as a thermal stress response associated with a drop in lignocellulolytic activities. Novel and multiple isoenzymes of xylanase (four bands) and cellulase (six bands) were secreted in the range of 20–150 kDa during growth in adverse temperature conditions. However, only a single laccase isoenzyme (46 kDa) was detected. This is the first report describing the advantages of a thermotolerant white-rot fungus in SSF. These results have important implications for large-scale SSF, where effects of metabolic heat are detrimental to growth and enzyme production, which are severely affected by the formation of high temperature gradients.

Keywords: thermotolerance; white-rot fungi; solid state fermentation; lignocellulolytic enzymes

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