Elucidation of the regulatory network of *Trichoderma reesei* operating under cellulose-degrading conditions

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Introduction

CAZymes (carbohydrate-active enzymes) produced by the filamentous ascomycete *T. reesei* are of high importance for the production of second generation biofuels from renewable lignocellulosic biomass. Hence, research of their production mechanisms as well as the investigation of their regulatory mechanisms on a cellular level is highly relevant from a scientific point of view and becomes even more important as the demand for plant derived biofuels is constantly growing. The goal of this project is to shed light on different cellular regulation mechanisms operating during cellulose degradation. Therefore we assess the function of different regulators upregulated during growth on cellulolytic substrates. As a starting point we generated respective gene knock-out strains and tested their growth behaviour under different conditions.

Strategy

By analysing in-house and available transcriptome data (Ries et al., 2013), 13 candidate transcriptional regulators being upregulated on wheat straw (UWS) and weakly expressed on glucose were identified (Fig.1). Their expression pattern lets us speculate that these regulators play a crucial role in the degradation of wheat straw.

Growth on different carbon sources

The growth ability in the presence of different nutrient carbon sources present in lignocellulosic material was tested for all deletion strains (Fig. 2).

Stress tests

Furthermore their behavior in the presence of various stressors was tested. The results of the oxidative stress tests (H2O2) are depicted here (Fig. 3).

Cellulase activity

*T. reesei* deletion strains were cultivated on 1% lactose and their biomass formation and cellulase activity measured (Fig.4).

Summary

13 candidate transcriptional regulators were selected, subsequently knocked out and characterized in terms of their growth phenotype on different carbon sources, their behavior in the presence of certain stressors and their cellulase activity.

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