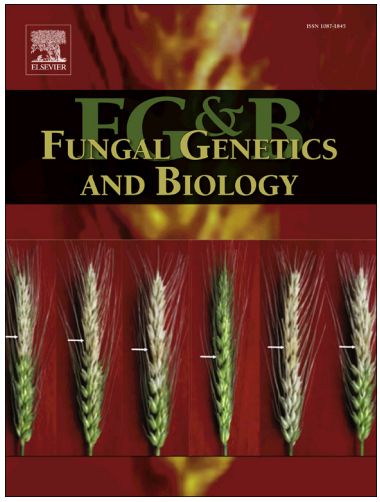

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Smelling the difference: Transcriptome, proteome and volatilome changes after mating

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Abstract
Mushrooms, such as *Schizophyllum commune*, have a specific odor. Whether this is linked to mating, prerequisite for mushroom formation, or also found in monokaryotic, unmated strains, was investigated with a comprehensive study on the transcriptome and proteome of this model organism. Mating interactions were investigated using a complete, cytosolic proteome map for unmated, monokaryotic, as well as for mated, dikaryotic mycelia. The regulations of the proteome were compared to transcriptional changes upon mating and to changes in smell by volatilome studies. We could show a good overlap between proteome and transcriptome data, but extensive posttranslational regulation was identified for more than 80 % of transcripts. This suggests down-stream regulation upon interaction of mating partners and formation of the dikaryon that is competent to form fruiting bodies. The volatilome was shown to respond to mating by a broader spectrum of volatiles and increased emission of the mushroom smell molecules 3-octanone and 1-octen-3-ol, as well as ethanol and ß-bisabolol in the dikaryon. Putatively involved biosynthetic proteins like alcohol dehydrogenases, Ppo-like oxygenases, or sesquiterpene synthases showed correlating transcriptional regulation depending on either mono- or dikaryotic stages.

Keywords: *Schizophyllum commune*; basidiomycete; mating; transcriptome; proteome; volatilome

1. Introduction

Sexual reproduction in mushroom forming basidiomycetes is governed by a complex, tetrapolar mating type system (Kues et al., 2011; Raper, 1966). Upon recognition of a mate, the haploid mycelium, also called the monokaryon due to the presence of one haploid nucleus in every cell, fuses to form a dikaryon, which harbors both haploid nuclei of the mates in each cell. This stage in the life cycle is prolonged; the short-lived diploid cellular state can only be found within the spore bearing hymenium of a fruiting body, directly before meiosis. After meiosis, the basidia produce four haploid basidiospores, which are dispersed *via* air. Since reproduction is based on sexual propagation, the system experiences a high selective pressure. While mating interaction, mate recognition, or production of fruiting bodies are extensively studied, e. g. in the filamentous split gilled mushroom *Schizophyllum commune* (Ohm et al., 2010; Raudaskoski and Kothe, 2010), cellular responses during the dikaryophase are less well researched. However, the dikaryon is the relevant life stage to