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IDENTIFICATION AND CHARACTERIZATION OF SEX-RELATED GENES IN *TUBER MELANOSPORUM* GENOME

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Tuber, truffles, mating type, pheromones, signal transduction

The genome of *T. melanosporum,* the symbiotic ascomycete producing the most valuable black truffles, has been recently sequenced providing researchers with an exceptional opportunity to learn more about the biology of this fungus (Martin *et al.*, 2010). The genetic traits controlling the symbiotic process, the metabolic pathways responsible for aroma production as well as mechanisms of mating and fruit body development are fundamental aspects not yet fully disclosed in this fungus. More specifically, understanding the reproductive mode that governs the production of truffles has been a long-standing dilemma for mycologists (Rubini *et al.,* 2007). The availability of *T. melanosporum* genome has however provided us with genetic tools to identify, and study the organization of, the mating type (*MAT*) genes and conclude this fungus is heterothallic, i.e. an obligate outcrossing species (Martin *et al.,* 2010; Rubini *et al.,* 2011a; 2011b).

In heterothallic ascomycetes the *MAT* genes encode transcription factors that regulate expression of genes involved in signaling among compatible sexual partners: the so called pheromone/receptor system. Binding of mating type specific pheromones (α-factor and a-factor) to their specific G protein-coupled receptors (STE2 and STE3) triggers a signal transduction pathway that induces the expression of several genes involved in many processes such as cell fusion, fruit body development and meiosis (Kim *et al.,* 2002).

In this study an inventory of candidate sex-related genes was compiled by performing *in silico* analysis of *T. melanosporum* genome. This analysis revealed that most of the key components of the fungal pheromone-dependent signaling pathways are conserved in *T. melanosporum* including the pheromones and their receptors. Furthermore, several *T. melanosporum* homologs of genes controlling karyogamy, meiosis and fruit body development in other ascomycetes were identified.

T. melanosporum mycelial strains of opposite mating types have been also isolated and *in vitro* dual cultures of mycelia of opposite mating type set to study the nutritional, environmental and genetic components that drive the transition between vegetative and reproductive phase.

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