A Secreted Effector Protein of *Laccaria bicolor* is Required for Symbiosis Development

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- The first demonstration that mutualistic fungi use effector-like proteins to control the host cell in a manor that mirrors the role of fungal pathogen effectors is shown. This results suggests that the establishment of symbiosis is closer to the colonization of plant tissues by pathogens than previously thought.
- MYCORRHIZAL iNDUCED SMALL SECRETED PROTEIN7 (MiSSP7), from the mutualistic ectomycorrhizal fungus *L. bicolor,* encodes a 68 amino acid-long protein secreted by the fungus upon receipt of diffusible signals from the host plant. Its size and induction conditions suggested that it may act similar to effector-like proteins encoded by pathogens.
- MiSSP7 was found to be one of the factors necessary for the formation and maintenance of the Hartig net, the network of fungal hyphae within the root apoplastic space across whose interface nutrients are exchanged between the host and the fungus.
- MiSSP7 actively enters the plant cell via endocytosis through the binding of an RXLR-like domain (RALG) to phosphatidylinositol 3-phosphate. MiSSP7 quickly accumulates in the plant nucleus (Fig.1) where transcriptional alteration of the host cell occurs – confirming that MiSSP7 is an effector-like protein.
- Transcriptomic analysis of the plant cell revealed that 225 genes were significantly regulated by MiSSP7. A large proportion of the modulated genes are involved in the alteration of cell wall and root architecture.

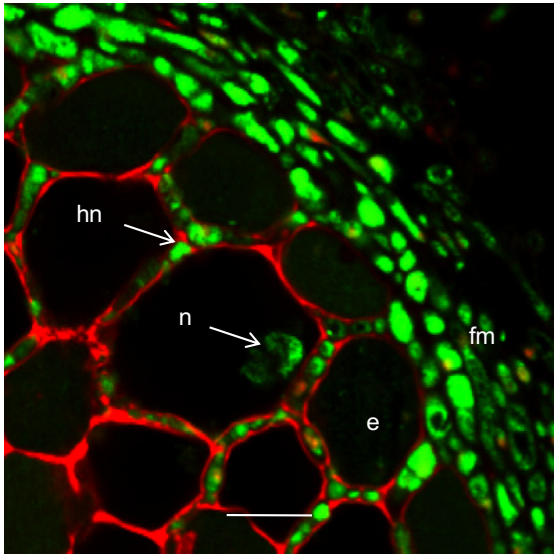
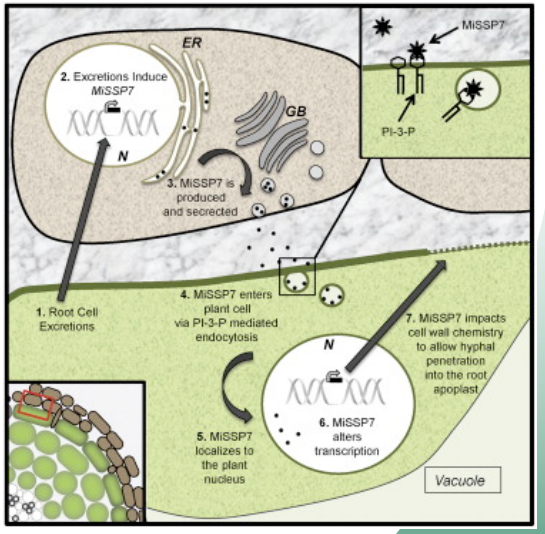


Figure 1. MiSSP7 expression. Indirect immunolocalization of MiSSP7 (green signal) in colonized root. hn, Hartig net, n, nucleus; e, root epidermal cell layer; fm, fungal mantle. Plant cell walls (red signal). Scale bar = 20 µm.



Graphical representation of MiSSP7 localization.

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