

Involutin Is an Fe³⁺ Reductant Secreted by the Ectomycorrhizal Fungus *Paxillus involutus* during Fenton-Based Decomposition of Organic Matter.

Shah F, Schwenk D, Nicolás C, Persson P, Hoffmeister D, Tunlid A (2015) Involutin Is an Fe³⁺ Reductant Secreted by the Ectomycorrhizal Fungus *Paxillus involutus* during Fenton-Based Decomposition of Organic Matter. *Appl Environ Microbiol* 81(24), 8427-8433. [PubMed](#)

ILRS Authors

[Daniel Schwenk](#)

Abstract

Ectomycorrhizal fungi play a key role in mobilizing nutrients embedded in recalcitrant organic matter complexes, thereby increasing nutrient accessibility to the host plant. Recent studies have shown that during the assimilation of nutrients, the ectomycorrhizal fungus *Paxillus involutus* decomposes organic matter using an oxidative mechanism involving Fenton chemistry ($\text{Fe(2+)} + \text{H}_2\text{O}_2 + \text{H(+) } \rightarrow \text{Fe(3+)} + \cdot\text{OH} + \text{H}_2\text{O}$), similar to that of brown rot wood-decaying fungi. In such fungi, secreted metabolites are one of the components that drive one-electron reductions of Fe(3+) and O₂, generating Fenton chemistry reagents. Here we investigated whether such a mechanism is also implemented by *P. involutus* during organic matter decomposition. Activity-guided purification was performed to isolate the Fe(3+)-reducing principle secreted by *P. involutus* during growth on a maize compost extract. The Fe(3+)-reducing activity correlated with the presence of one compound. Mass spectrometry and nuclear magnetic resonance (NMR) identified this compound as the diarylcyclopentenone involutin. A major part of the involutin produced by *P. involutus* during organic matter decomposition was secreted into the medium, and the metabolite was not detected when the fungus was grown on a mineral nutrient medium. We also demonstrated that in the presence of H₂O₂, involutin has the capacity to drive an in vitro Fenton reaction via Fe(3+) reduction. Our results show that the mechanism for the reduction of Fe(3+) and the generation of hydroxyl radicals via Fenton chemistry by ectomycorrhizal fungi during organic matter decomposition is similar to that employed by the evolutionarily related brown rot saprotrophs during wood decay.

Identifier

doi: 10.1128/AEM.02312-15 PMID: 26431968