Title

The endophytic fungus Serendipita indica affects auxin distribution in Arabidopsis thaliana roots through alteration of auxin transport and conjugation to promote plant growth

Abstract

Plants share their habitats with a multitude of different microbes. This close vicinity promoted the evolution of interorganismic interactions between plants and many different microorganisms that provide mutual growth benefits both to the plant and the microbial partner. The symbiosis of Arabidopsis thaliana with the beneficial root colonizing endophyte Serendipita indica represents a well-studied system. Colonization of Arabidopsis roots with S. indica promotes plant growth and stress tolerance of the host plant. However, until now, the molecular mechanism by which S. indica reprograms plant growth remains largely unknown. This study used comprehensive transcriptomics, metabolomics, reverse genetics, and life cell imaging to reveal the intricacies of auxin-related processes that affect root growth in the symbiosis between A. thaliana and S. indica. Our experiments revealed the sustained stimulation of auxin signalling in fungus infected Arabidopsis roots and disclosed the essential role of tightly controlled auxin conjugation in the plant–fungus interaction. It particularly highlighted the importance of two GRETCHEN HAGEN 3 (GH3) genes, GH3.5 and GH3.17, for the fungus infection-triggered stimulation of biomass production, thus broadening our knowledge about the function of GH3s in plants. Furthermore, we provide evidence for the transcriptional alteration of the PIN2 auxin transporter gene in roots of Arabidopsis seedlings infected with S. indica and demonstrate that this transcriptional adjustment affects auxin signalling in roots, which results in increased plant growth.

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