Epichloë sibirica enhanced the pathogen resistance of Achnatherum sibiricum by activating jasmonic acid and ethylene transduction pathway

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April 05, 2024

Abstract

Epichloë endophytes can improve the resistance of host grasses to pathogenic fungi. However, little is known about the mechanisms involved. We studied the effect of Epichloë sibirica on the resistance of Achnatherum sibiricum to Curvularia lunata. Then, the global gene expression between endophyte-infected and endophyte-free leaves was compared. Finally, exogenous hormones were applied to verify the action mechanism of the endophyte. The endophyte improved pathogen resistance of host. Before pathogen inoculation, the endophyte had activated the host's immunity by increasing jasmonic acid (JA) accumulation, and upregulating the expression of genes encoding pathogenesis-related proteins and EIN3/ERF1 transcription factors. After pathogen inoculation, the endophyte increased the accumulation of both JA and ethylene (ET), and amplified the gene response in the EIN3/ERF1 transduction pathway. Moreover, the endophyte altered the expression of genes encoding putative WRKY transcription factors and glutathione-S-transferase, which are related to disease resistance. Overall, this work first revealed that E. sibirica enhanced the resistance of A. sibiricum to C. lunata by inducing the response of EIN3/ERF1 transduction pathway regulated jointly by JA/ET. Before pathogen inoculation, the endophyte induced JA accumulation to improve constitutive resistance in the host. After pathogen inoculation, the endophyte enhanced the induced systemic resistance by promoting ET synthesis.

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