ANALYSIS OF THE ROLE OF *COI1* IN ETHYLENE RESPONSE IN *ARABIDOPSIS THALIANA*

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Abstract

Interaction between the plant hormones jasmonates (JAs) and ethylene in stress responses has been extensively studied. Both of these hormones also inhibit plant growth. The *coi1* mutant, a JA-insensitive mutant, was found in this study to be less sensitive to root growth inhibition by ethylene and by its immediate precursor, 1-aminocyclopropane-1-carboxylic acid (ACC). *COI1* is a key component of JA signalling. However, JA biosynthesis, and other components of the JA signal pathway, were not required for ACC-induced root growth inhibition. Light was a crucial component for this *COI1*-mediated response to ACC. The activation was due to high light dose but appeared to be independent of a specific photoreceptor. The known ethylene pathway was found to function primarily in the dark, and it contributed additively with COI1 to inhibit root growth in the light. A screen for mutants insensitive to ACC in the light identified two new alleles of *ein2*, each of which showed greater insensitivity to ACC in the light than did *ein2*-1. The results suggest that EIN2 is an integration point for stress signalling.

COI1 was found to function differently in response to JAs and ACC. COI1 is an F-box protein which forms a SCF complex to target a substrate for proteolysis. Root growth inhibition by JAs requires the intact COI1 protein capable of making a SCF complex and binding a target protein. By contrast, root growth inhibition by ACC requires the domain of COI1 which is essential for binding a target protein but not the domain essential for SCF complex assembly.

Interaction between components of JA and ethylene signalling was also suggested by the observed regulation of germination and fertility. Interestingly, COI1 was not required for root hair elongation in response to ACC. Taken together, these results indicate a novel role for *COI1* in ethylene signalling by a mechanism that is different from its proposed function in JA signalling.

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