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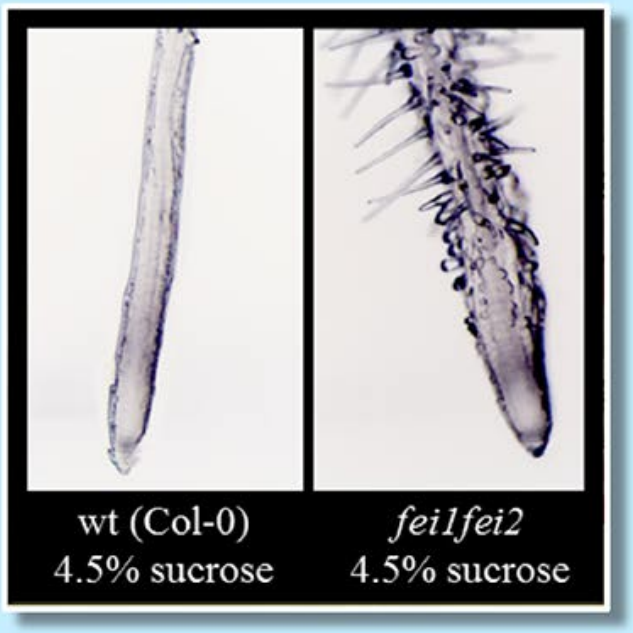

fei1fei2* Root Swelling Compared to Wild-type (Columbia-0) *A. thaliana

1-Aminocyclopropane-1-Carboxylic Acid Signals Independently of Ethylene in the FEI Cellulose Synthesis Pathway in *A. thaliana*

Cellulose is an important structural molecule in the plant cell wall. Recently, the receptor-like kinases FEI1 and FEI2 were found to regulate cellulose synthesis. The *fei1fei2* double mutant has short, swollen roots due to cellulose deficiency, when grown on high sucrose media. While the phytohormone ethylene is known to induce root growth defects, the *fei1fei2* phenotype is not reverted to wild-type when ethylene perception is disrupted, indicating that ethylene is not the signal acting in the FEI pathway. However, a reversion of the *fei1fei2* phenotype to wild-type is seen when ethylene biosynthesis is inhibited. In the ethylene biosynthesis pathway, 1-aminocyclopropane-1-carboxylic acid (ACC) is the direct precursor to ethylene. Its synthesis is disrupted to block ethylene biosynthesis. This, and other genetic and biochemical studies, suggests that ACC is the signal in the FEI pathway. Here, we examined the role of ACC in cellulose biosynthesis. To do so, we genetically and physiologically disrupted ethylene biosynthesis and signaling. The robustly ethylene-insensitive line, *ein2-5*, responds to the application of ACC but not ethylene, suggesting that ACC signals independently of ethylene. Additionally, ACC reestablishes swelling in *fei1fei2ein2-5* mutants in which ethylene biosynthesis has been inhibited. Further genetic experiments are in progress to confirm the biochemical effects of ACC in the FEI pathway. Our findings on the role of ACC in the FEI signaling pathway and thus cellulose synthesis will likely impact and inform industry, where understanding cell wall composition may lead to enhanced production of cellulose-based goods such as paper and biofuels.