Evaluation of Cuscuta Interaction With Arabidopsis thaliana Expressing RUBY Reporter

Reczek, Kane (School: Roanoke Valley Governor's School for Science and Technology)
Mizuba, Hannah (School: Roanoke Valley Governor's School for Science and Technology)

Cuscuta, known as dodder, is a parasitic plant which draws all necessary resources from its host through the formation of haustoria, root-like organ structures. Its hosts include Arabidopsis thaliana, a flowering dicotyledon. RUBY is a reporter DNA construct recently developed which codes for three enzymes in the metabolic pathway of betalain, a red pigment. The goal of this study was to evaluate the transfer of betalain from Arabidopsis modified with 35S:RUBY construct to dodder using spectrophotometric assays and sectioning of haustorial attachments. Of the planted RUBY-Arabidopsis, some expressed the construct, while others silenced it. After these hosts had flowered, C. campestris and C. gronovii were attached to the stems and leaves. Haustorial attachments were harvested and extracted in distilled water. After being spun in a centrifuge, the supernatant of each sample was read for absorbance at 535 nm. Sectioning was performed with a vibratome or by hand under a microscope. Two extractions were performed and analyzed. A Welch’s ANOVA compared haustoria absorbance of both Cuscuta species on expressing and silenced hosts, and results ($p=0.121$) indicated there was no significant difference between the mean of any group. However, photographs of cross-sections taken under microscope showed patches of pigment in both Cuscuta species on expressing and silenced hosts. These results indicate that betalain is present in the parasite, but that it may have been mRNA crossing the haustorium and synthesizing the pigment, rather than betalain alone being transferred.

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