Public Abstract
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Title:The Role of ERF Transcription Factors in Defenses Against Specialist and Generalist Herbivores in Arabidopsis thaliana

Plant responses to herbivory are complex, involving differential perception, multiple signaling pathways, and the transcription of defense-responsive genes. Using a whole-genome microarray and bioinformatics tools, we identified transcription factors and cis-elements important in differential responses in Arabidopsis thaliana after attack by aphids, the specialist caterpillar, Pieris rapae, and the generalist caterpillar, Spodoptera exigua. Insect-specific changes in gene expression were observed and involved the fine-tuning of the stress-related hormones, jasmonate, salicylate, and ethylene. Ethylene was produced in response to both insect species, although the amounts and timing of production differed. Additionally, rapid and increased jasmonate and jasmonate-isoleucine elicitation in Arabidopsis after attack by both insects confirmed these signals as general herbivore-related responses. Using RT-PCR, we found members of the ERF (Ethylene Response Factor) transcription factor family and AtMYC2 to be differentially regulated in response to the two caterpillars. We assessed the feeding behavior of S. exigua and P. rapae in wild-type and ERF mutant plants (erf5, erf6, erf104, and erf105) using a novel digital phenotyping technique. S. exigua maintained similar growth rates despite consuming less mutant tissue. Although induced aliphatic and indolyl glucosinolate (GS) levels were significantly higher in erf104 plants after S. exigua feeding, no consistent relationships between GS and tissue consumption by insects were found. Our results demonstrate clear insect resistance phenotypes in erf mutants, suggesting a role for ERFs in the negative regulation of a defense mechanism other than glucosinolate production.