# Comparative analysis of grass defense responses to Poaceae-adapted and generalist Lepidopteran herbivores

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Lepidopteran herbivores cause massive losses to agricultural yields worldwide. One such species, the fall armyworm (*Spodoptera frugiperda*) causes the greatest damage to maize and exhibits host plant preference for Poaceae species. The beet armyworm (*Spodoptera exigua*) is more commonly a pest on dicot vegetable crops. In response to herbivory, plants produce toxic and deterrent metabolites. For example, maize synthesizes indole-derived benzoxazinoids that limit the growth of non-adapted insects. Green foxtail (*Setaria viridis*), the wild progenitor of domesticated foxtail millet (*Setaria italica*), synthesizes serotonin as a defensive compound. Although insect feeding induces the accumulation of hundreds of metabolites in both maize and green foxtail, the species-specificity of these responses has not been investigated. This work aims to compare the transcriptional impacts of herbivory from the monocot-adapted fall armyworm and the generalist beet armyworm on maize and green foxtail. The results of these experiments show transcript-level changes in plant defensive pathways, including jasmonic acid biosynthesis and signaling, and secondary metabolic pathways such as indole-derived metabolism and terpenoids. Global analyses of differentially expressed genes show enriched gene functions, including terpene synthase activity, indole metabolism, and lipid metabolism in response to herbivory. Differences in plant defense responses against the two caterpillars also identify genes that are specifically affected by one herbivore. Additionally, these results show shared defensive pathways as well as divergent strategies between the domesticated and undomesticated plant hosts. Defense responses unique to green foxtail may contribute to herbivore resistance that is lacking in domesticated crops such as maize.