#43: Turnabout Is Fair Play: Herbivory-Induced Plant Chitinases Excreted in Fall Armyworm Frass Suppress Herbivore Defenses in Maize

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The perception of herbivory by plants is known to be triggered by the deposition of insect-derived factors such as saliva and oral secretions, oviposition materials, and even feces. Such insect-derived materials harbor chemical cues that may elicit herbivore and/or pathogen-induced defenses in plants. Several insect-derived molecules that trigger herbivore-induced defenses in plants are known; however, insect-derived molecules suppressing them are largely unknown. In this study, we identified two plant chitinases from fall armyworm (*Spodoptera frugiperda*) larval frass that suppress herbivore defenses while simultaneously inducing pathogen defenses in maize (*Zea mays*). Fall armyworm larvae feed in enclosed whorls of maize plants, where frass accumulates over extended periods of time in close proximity to damaged leaf tissue. Our study shows that maize chitinases, Pr4 and Endochitinase A, are induced during herbivory and subsequently deposited on the host in the feces. These plant chitinases mediate the suppression of herbivore-induced defenses, thereby increasing the performance of the insect on the host. Pr4 and Endochitinase A also trigger the antagonistic pathogen defense pathway in maize and suppress fungal pathogen growth on maize leaves. Frass-induced suppression of herbivore defenses by deposition of the plant-derived chitinases Pr4 and Endochitinase A is a unique way an insect can co-opt the plant's defense proteins for its own benefit. It is also a phenomenon unlike the induction of herbivore defenses by insect oral secretions in most host-herbivore systems.