# Tomato plant-mediated physical and chemical defenses shape tritrophic interactions between an herbivorous pest and its predator

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Plant physical and chemical defense traits play a central role in mediating plant-insect interactions, exerting direct effects on herbivorous pests and indirect effects by influencing the behavior or performance of natural enemies. Consequently, characterizing plant defense traits and their interactions with both herbivores and their natural enemies is essential for understanding tritrophic dynamics in agroecosystems. In this study, we investigated how six tomato genotypes differing in physical defense traits influence the performance of the tomato leafminer *Tuta (Phthorimaea) absoluta* (Meyrick) (Lepidoptera: Gelechiidae), a globally important pest, and its predator *Macrolophus pygmaeus* (Rambur) (Hemiptera: Miridae). We further examined the behavioral responses of both species to volatile organic compounds emitted by these tomato genotypes. We found that the wild, resistant tomato *Solanum arcanum*, characterized by a high density of glandular trichomes, significantly reduced *T. absoluta* pressure [1] but also constrained predator efficacy, revealing trade-offs at the tritrophic level [2]. Volatiles emitted by *T. absoluta*-infested *Solanum arcanum* were more attractive to female *M. pygmaeus* than those from the susceptible, domesticated *S. lycopersicon* cultivar Noire de Crimée, which possesses fewer glandular trichomes. Female predators showed no discrimination between constitutive and *T. absoluta*-induced volatile blends in resistant genotypes, whereas responses varied in susceptible domesticated tomatoes. Females were more attracted to constitutive volatiles from Noire de Crimée than to *T. absoluta*-induced volatiles from Noire de Crimée but preferentially responded to volatile blends emitted by *T. absoluta*- induced volatiles from Rentita over constitutive volatiles from Rentita. In contrast, female *T. absoluta* were attracted to volatiles emitted by conspecific-infested Noire de Crimée but did not distinguish among volatile cues from other genotypes. Our findings demonstrate that variation in glandular trichome density and volatile profiles among and within tomato genotypes influence herbivore and predator responses. Chemical characterization of volatile emissions will allow the identification of compounds associated with differential herbivore and predator responses among tomato genotypes.

[1] A. J. Zannou, J. Romeis, J. Collatz, *Pest Management Science*, **2025**, *81*, 1345–1359.
[2] A. J. Zannou, J. Arnó, J. Romeis, J. Collatz, *Biological Control*, **2025**, 205, 1–12.