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

Ayomide Joseph Zannou[1], Ivan Hiltpold[2], Jörg Romeis[1], Diana La Forgia[2], Jana Collatz[1]
[1]Agroscope, 8046 Zurich, Switzerland; [2]Agroscope, Nyon, Switzerland
www.agroscope.ch | ayomide.zannou@agroscope.admin.ch

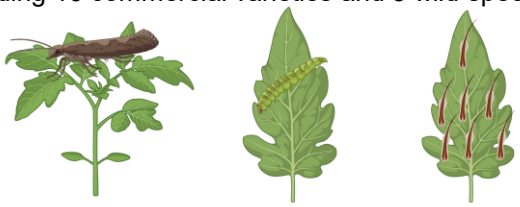
Background

Plant physical and chemical defenses are crucial in plant-insect interactions. They directly affect herbivores and indirectly influence their natural enemies. Understanding these effects is key for selecting tomato genotypes that combine pest resistance with effective biological control. We evaluated tomato genotypes with contrasting physical defenses and their effects on the performance and behavior of *Tuta absoluta* and its predator *Macrolophus pygmaeus*.

Experimetal setup

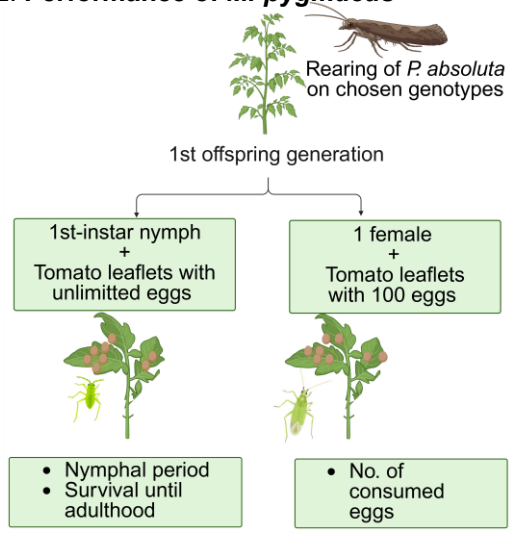
1. Screening against *T. absoluta*

Resistance assessment of 19 tomato genotypes including 16 commercial varieties and 3 wild species



Effect on oviposition | Larval performance | Trichome density

2. Performance of *M. pygmaeus*



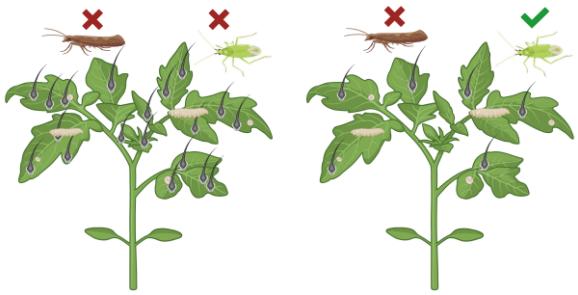
3. Olfactory response of both insects

Results

1. Performance of *T. absoluta*

- **Resistant genotypes:** *Solanum arcanum* (high density of glandular trichomes); *S. neorickii* (low density of glandular trichomes); *S. lycopersicon* var. Corona F1 (low density of glandular trichomes).
- **Susceptible varieties:** *S. lycopersicon* var. Rentita, Noire de Crimée, and Romabelle (low density of glandular trichomes)[1].

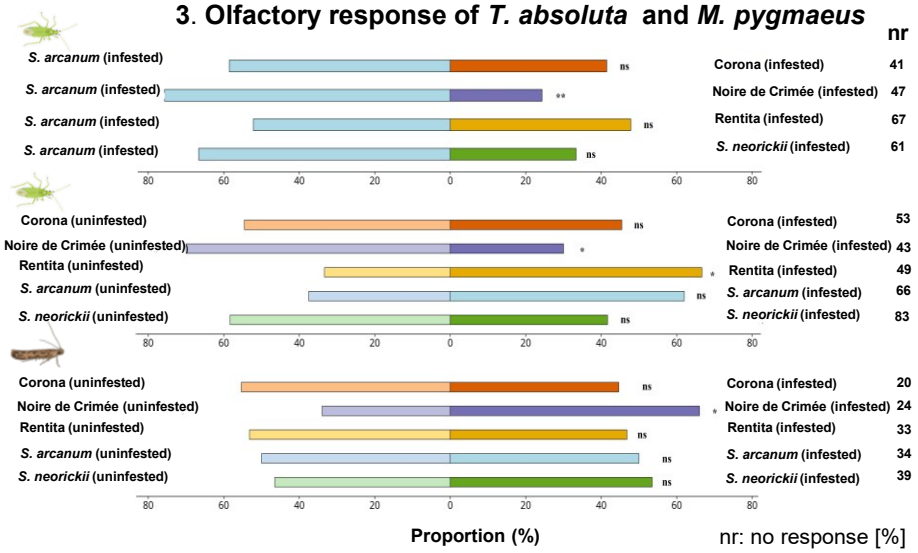
2. Performance of *M. pygmaeus*



Many glandular trichomes on resistant tomato hindered the predator

Resistant tomato with fewer glandular trichomes promoted the predator [2]

3. Olfactory response of *T. absoluta* and *M. pygmaeus*



nr: no response [%]

Summary: Predator attraction to herbivore-induced volatiles depends on plant genotype and resistance traits, with a resistant tomato attracting *M. pygmaeus*, while *T. absoluta* females respond mainly to conspecific cues from one susceptible tomato variety.

Outlook: Ongoing work explores VOCs associated with differential herbivore and predator responses.

References:
[1]Zannou et al. 2025a, *Pest Management Science*, 81, 1345-1359;
[2]Zannou et al. 2025b, *Biological control*, 205, 105772.

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation
Federal Department of Economic Affairs, Education and Research EAER
Agroscope

Agroscope good food, healthy environment