Effect of entomopathogenic fungi as root endophyte on the development of a specialist & generalist herbivore

J. Takacs, G. Messelink, J. Woelke

Pests

Herbivore pests such as the invasive specialist *Tuta absoluta* or the native generalist *Chrysodeixis chalcites* known as the tomato looper can cause severe damage in tomato greenhouses. Systematic defences of the plants could slow down the build-up of the pest populations, thus prolong the time before economical damage. Especially for organic growers, this form of functional biodiversity could serve as first line of the defence

Entomopathogenic fungi & Root endophytes

- Various Metarhizum EPFs
- Collected from EU org. growers
- Assumed to work as a root endophytes
- Novel method to use EPFs as endophyte
- Total 60 strains, which ones to test and use?

- Promoting plant defenses:
  - Secondary plant metabolites SPMs
  - Direct defense by the fungi
- Functional biodiversity
- Proved to hinder herbivore dev.
- Proved to improve biological control

Isolate code	Isolate scientific name	Source
untreated	-	-
BIO1020	*Metarhizium brunneum*	Bayer, product
58IT18	*Metarhizium robertsii*	Italy
5BE8-2	*Metarhizium robertsii*	Belgium
30FR12-2	*Metarhizium robertsii*	France
12ZW5	*Metarhizium robertsii*	Switzerland
49IT9-1	*Metarhizium anisopliae*	Italy
14DK4	*Metarhizium majus*	Denmark

Research questions:

What is the effect of the tested entomopathogenic fungi on the developmental time and larval mortality of :

1. ***T. absoluta*, when it completes its development on the intact whole plant?**
2. ***T. absoluta*, when it completes its development on detached leaves?**
3. ***C. chalcites*, when it completes its development on detached leaves?**

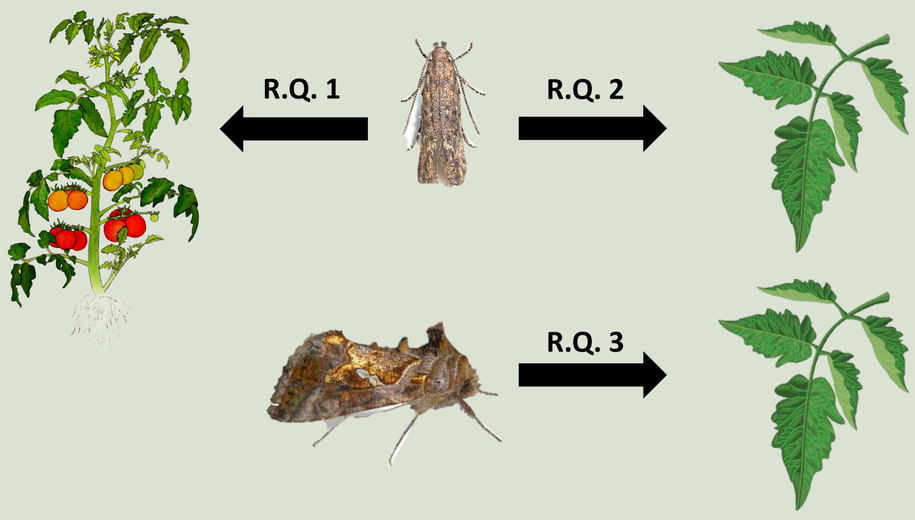
Hypotheses:

EPFs are able to :

1. Colonize the plants as root endophytes
2. Present in the plant organs
3. Promote the IR and increase the synthesizes of SPMs

Specialist a generalist feeding guilt will responds differently as:

1. Specialist are better adjusted to specific SPMs but not to EPF
2. Generalist less adjusted to specific SPMs but better tolerate EPF



Methods

Compartments& EPF

- Randomized block design, 6 blocks, 8 treatments,~10^7 Spores/ inoculation 2x

Climate chamber exp.
Detached leaves

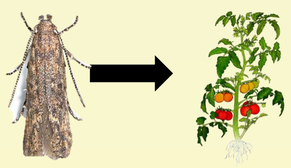
- 1 individual / cup
- 20 ind. / treatment
- Observing development

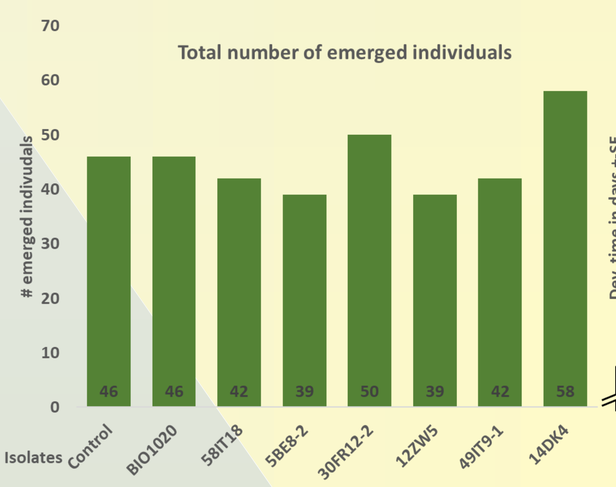
Cage experiment
Intact plants

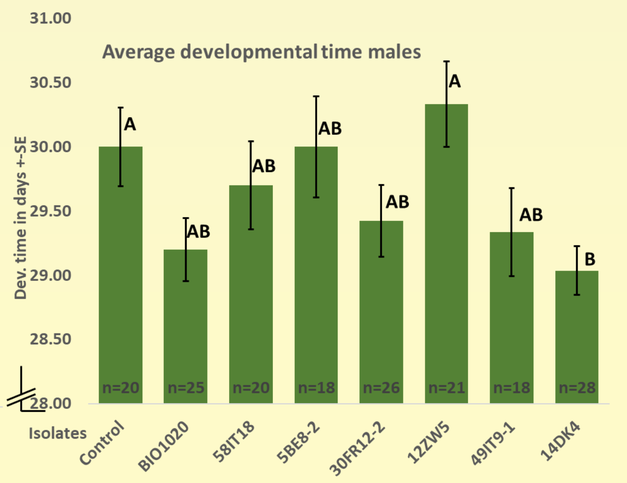
- 20 eggs/plant, 120 eggs/treatment
- Checking for emergence

Results

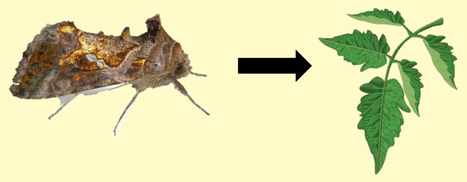
T. absoluta fed on intact plants

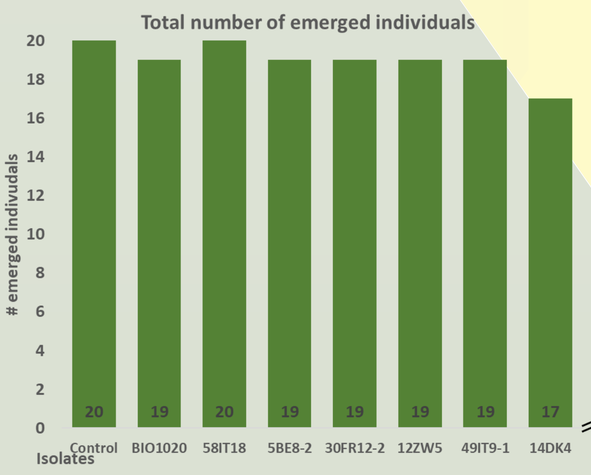


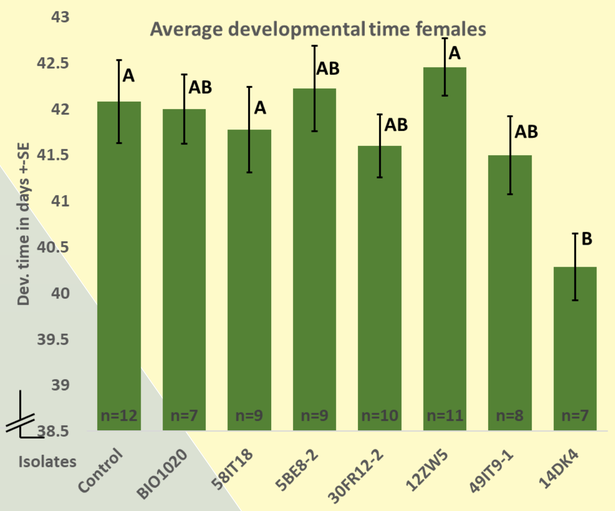




C. chalcites fed on detached leaves







Conclusions& Recommendations

- Mortality, developmental time did not increase
- Weight and sex are neither influenced

→ **As it is now, no use or benefits for the growers**

→ **What could be done?**

- Better understanding of endophytes
- Measuring SPMs, fungi colonization
- Tri-trophic food web: introduction of natural enemies, possible affect on the plant physiology

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