Continuous invasion of exotic thrips: their damage in horticulture and biological control implications

BIOCONTROL CONFERENCE

Tuesday 22 November, 2022

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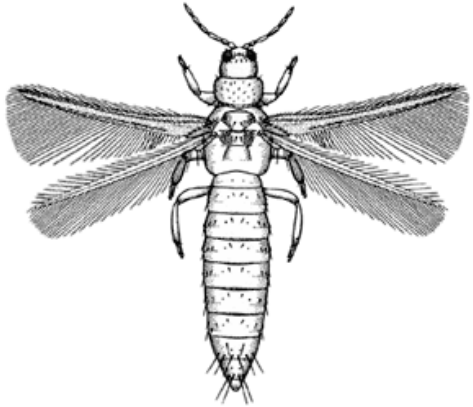
Thrips (Thysanoptera)



- About 6.000 extant species, occupying different ecological niches.
- Average size ~ 2 mm.

Fungal feeders (~50%)

Idolothrips spp.

Plant feeders (~40%)

Frankliniella spp.
Thrips spp.

Obligatory Predators

Scolothrips spp.
Franklinothrips spp.

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Thrips as crop pests

- Phytophagous thrips may be further distinguished based on the plant tissue they prefer to feed upon.

True flower thrips

Frankliniella spp.
Thrips spp.

Immature foliage thrips

Scirtorhips spp.

Mature foliage thrips

Heliothrips haemorrhoidalis
Echinothrips americanus

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Thrips as invasive pests

- Several aspects of the biology of thrips predisposes them to be successful when introduced in new regions
  - Abundant in the region of origin
  - Cryptic behaviour
  - Polyphagous
  - Multivoltine
  - Parthenogenetic
  - Rapid development of insecticide resistance

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Thrips as crop pests in Europe

- *Thrips tabaci* the main pest in European horticulture in the 19th century
    - Mostly affects *Allium* spp. but is damaging also several horticultural crops
    - Nowadays spread worldwide through trade, but originates from the Mediterranean region

The arrival of *Frankliniella occidentalis*

- One of the most important invasive pests worldwide is introduced in the Netherlands in 1983, and then quickly spreads around the globe

Almeria (Spain) 1988

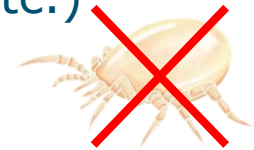
- Insecticide resistance
- Vector of TSWV
- Pressure from the market for low residues

- Research on BC in the Netherlands and Spain

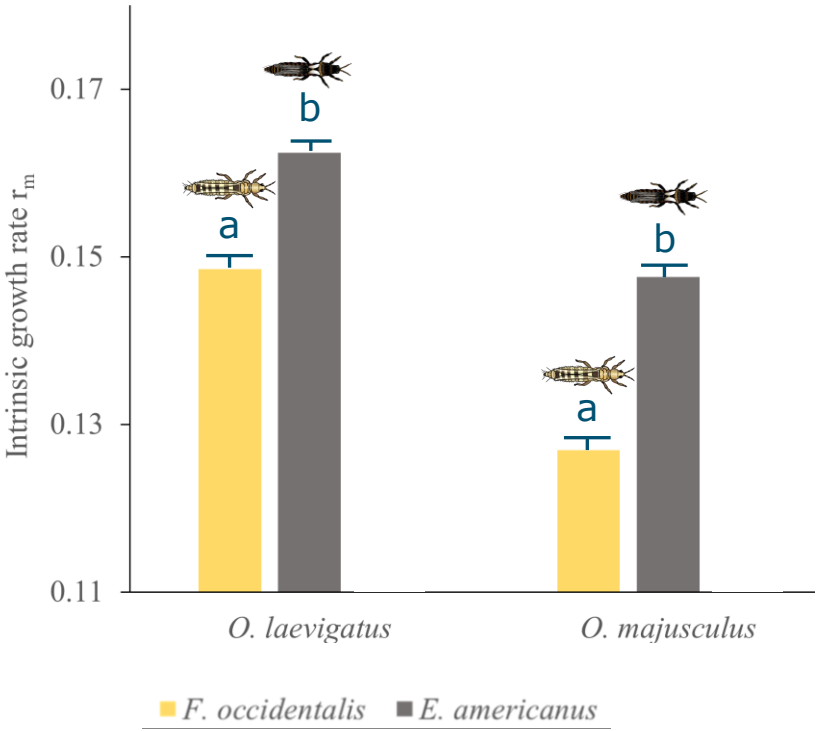
Success of Biological control programmes starts in 1980s, based initially on *Amblyseius* predators and later on *Orius*

Echinothrips americanus

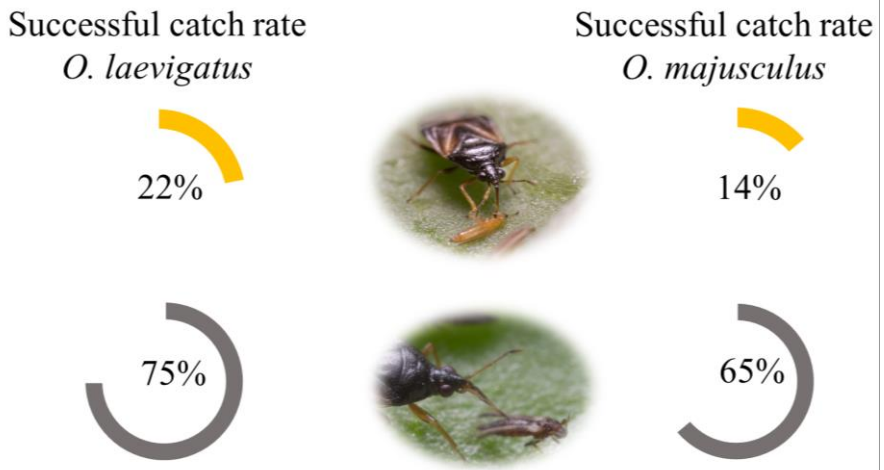
- A leaf-feeding thrips is introduced in the Netherlands in 1993 from the US
- This thrips feeds mature leaves and often co-exists with *F. occidentalis* in many crops (sweet pepper, gerbera, roses, etc.)



Life tables & predation success



- Observation = 1 h
- % Success = $\frac{N^o\ thrips\ predated}{N^o\ encountered}$



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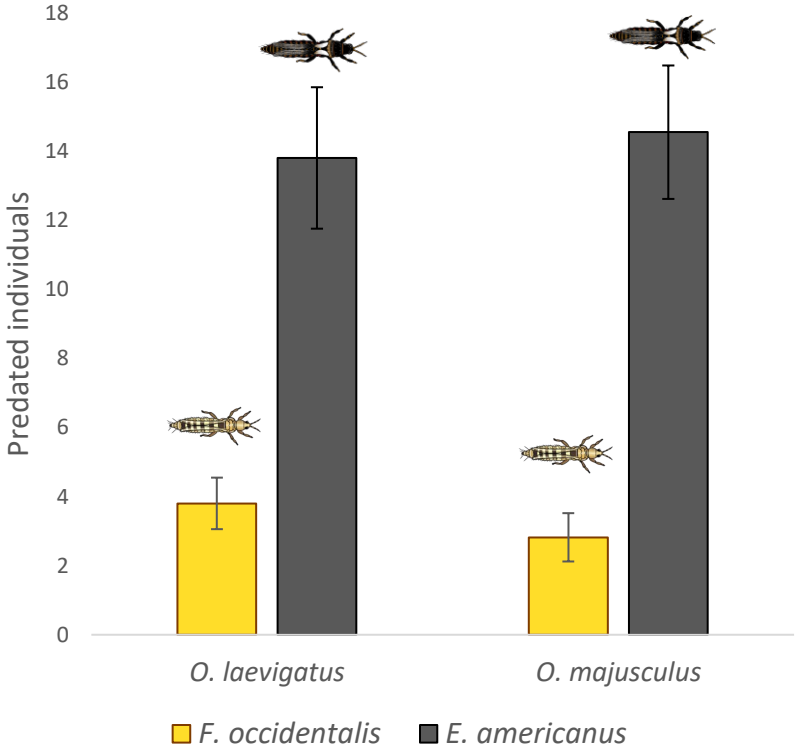
Prey preference in the lab

- 30 thrips of both species offered to 1 predator for 8 hours



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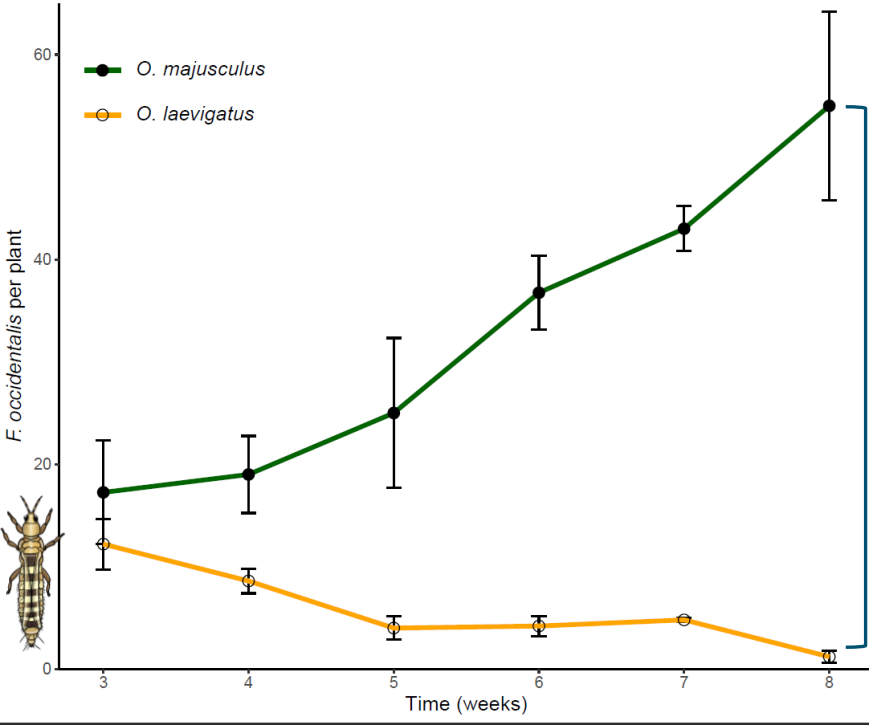
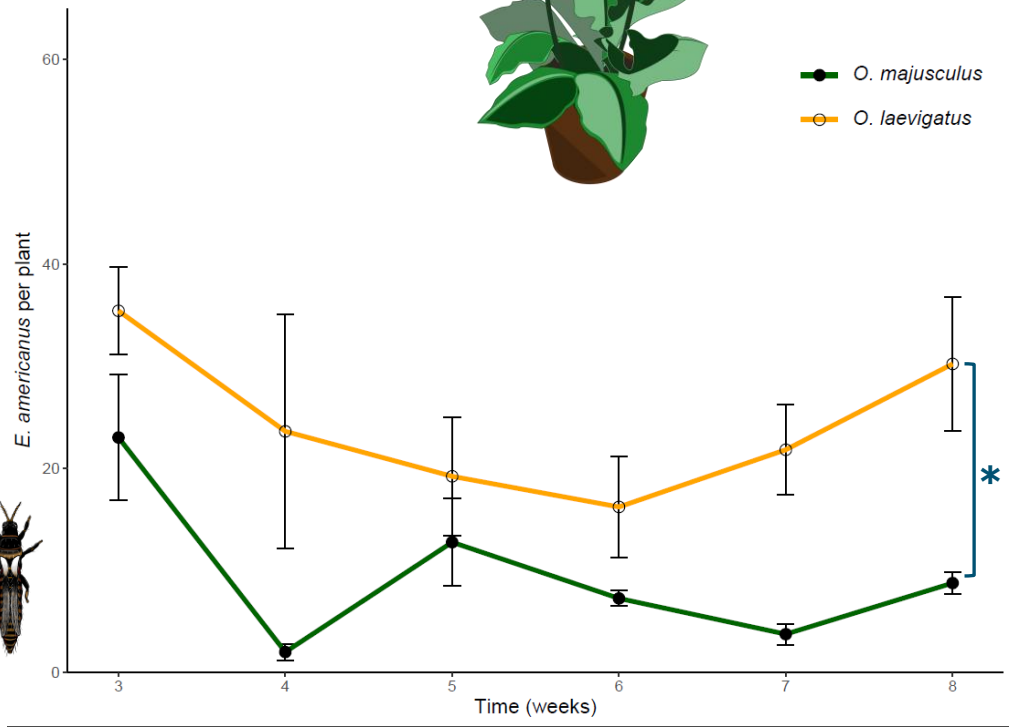
Control of *E. americanus* and *F. occidentalis*

Orius predators have distinct habitat preferences





Thrips setosus

- Originally from Japan and detected in the Netherlands in 2014.
- Leaf-feeding thrips that causes problems in ornamentals in the Netherlands (Hortensia, Lillie, Hosta etc..)
- Biological control options at the moment lacking due to unfavourable plant characteristics for the BCAs.

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Dichromothrips corbetti

- First record in the Netherlands in 1988. Native to the Malaysian Region.
- Stenophagous thrips, pest of Orchidaceae
- In recent years causing increasing damage in *Phalenopsis*

Thrips parvispinus

- First finding in 2019 on Ficus and gerbera in the Netherlands
- This species quickly adapted to the greenhouse crops in Europe and is now an emerging pest in anthurium (Netherlands) and sweet pepper (Spain)
- Feeds on both leaf tissue and flower resources (like *F. occidentalis*).

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Chaetanaphothrips orchidii

- Widespread in South East Asia and Central Americas
- Pest of orchids, citrus, bananas, anthurium etc.
- Currently causing problem in anthurium and monsteras in the Netherlands, and citrus in Spain (2016)

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Scirtothrips

- Species of this genus are key pests for many crops
- In recent years these thrips are repeatedly intercepted in mainland Europe and efforts to prevent their establishment are crucial

S. inermis, Canary islands

S. aurantii, Spain 2020

S. dorsalis, Spain 2016

Orthotospovirus vectors

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Mound et al. 2022. *Insects*

Wageningen UR Research on thrips

- Species identification is crucial
- Our team has developed a card that helps professionals identify thrips in European horticultural crops

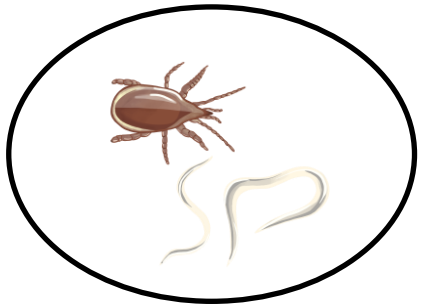
Thrips diversity around the greenhouse

- Floral diversity increases spontaneous natural enemies around the greenhouse, but also *flower thrips*

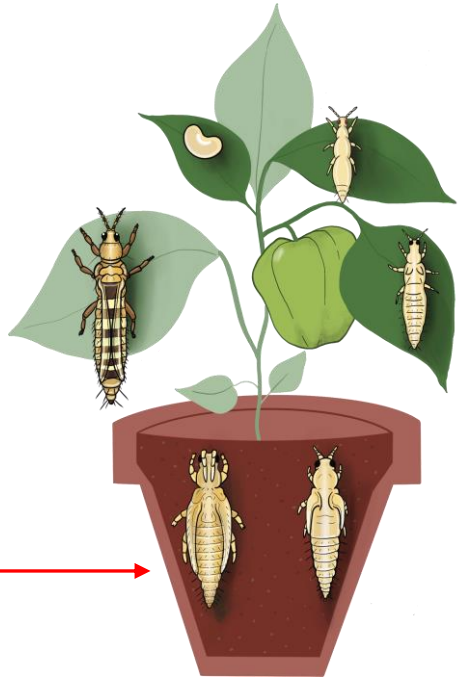
- However, most of the thrips we find are endemic and not key crop pests

Thrips as crop pests

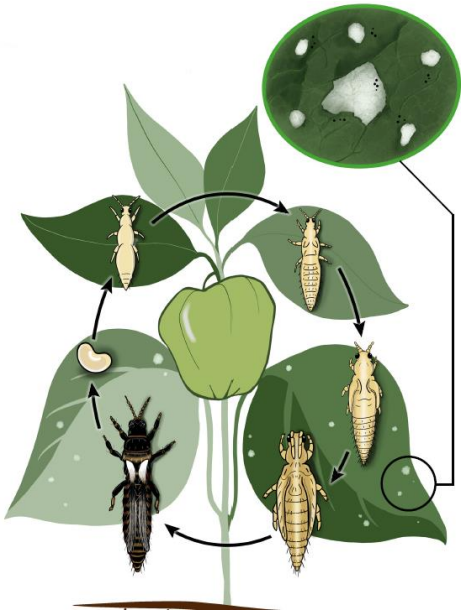
- Fundamental knowledge on the biology of thrips is crucial when designing a control programme, and is often lacking for certain species.



Soil BCAs

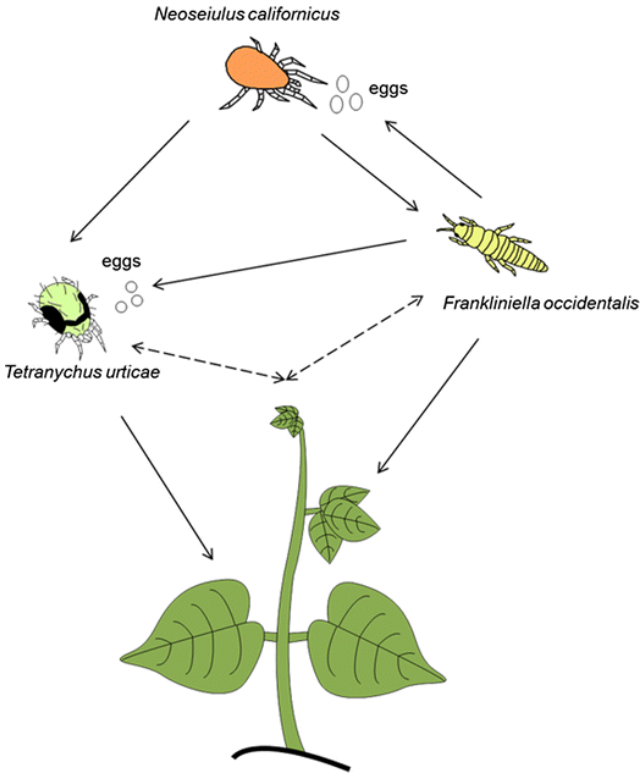


Many flower thrips pupate in the soil



Other leaf-feeders stay on the leaves

Thrips omnivory



Several other thrips show this behavior as well

- *Thrips tabaci*
- *Frankliniella schultzei*
- *Frankliniella fusca*
- *Thrips parvispinus?*

Choh et al. 2017. *Beh Ecol and Soc*

Outlook to the future

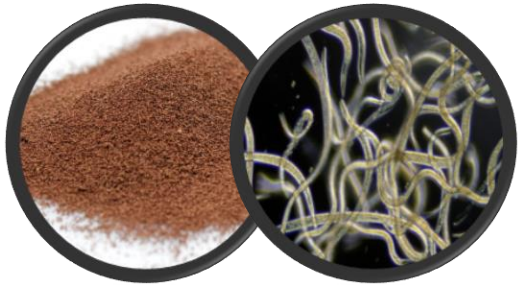
- Successful biocontrol of thrips is based on early establishment of generalist predators
- No silver bullet – crop and pest specific strategies are needed

➢ *Expand our knowledge on recent invasive species*

➢ *Develop strategies to improve establishment of BCAs*

Banker plants

Supplemental food



New natural enemies

Wageningen UR thrips team and collaborators

Prof. Gerben J. Messelink

Ada Leman

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www.thrips-id.com

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