2011 Salinas Valley Entomology

December 6, 2011; 8:00 a.m. to 12 Noon

Continuing Education Units
Code M-1146-11
"Other" category: 3.5 hours

check-in / check-out procedures
Phones off/muted
Afternoon session here: CAPCA

Thrips: Biology, Virus Vector, Trouble-Makers

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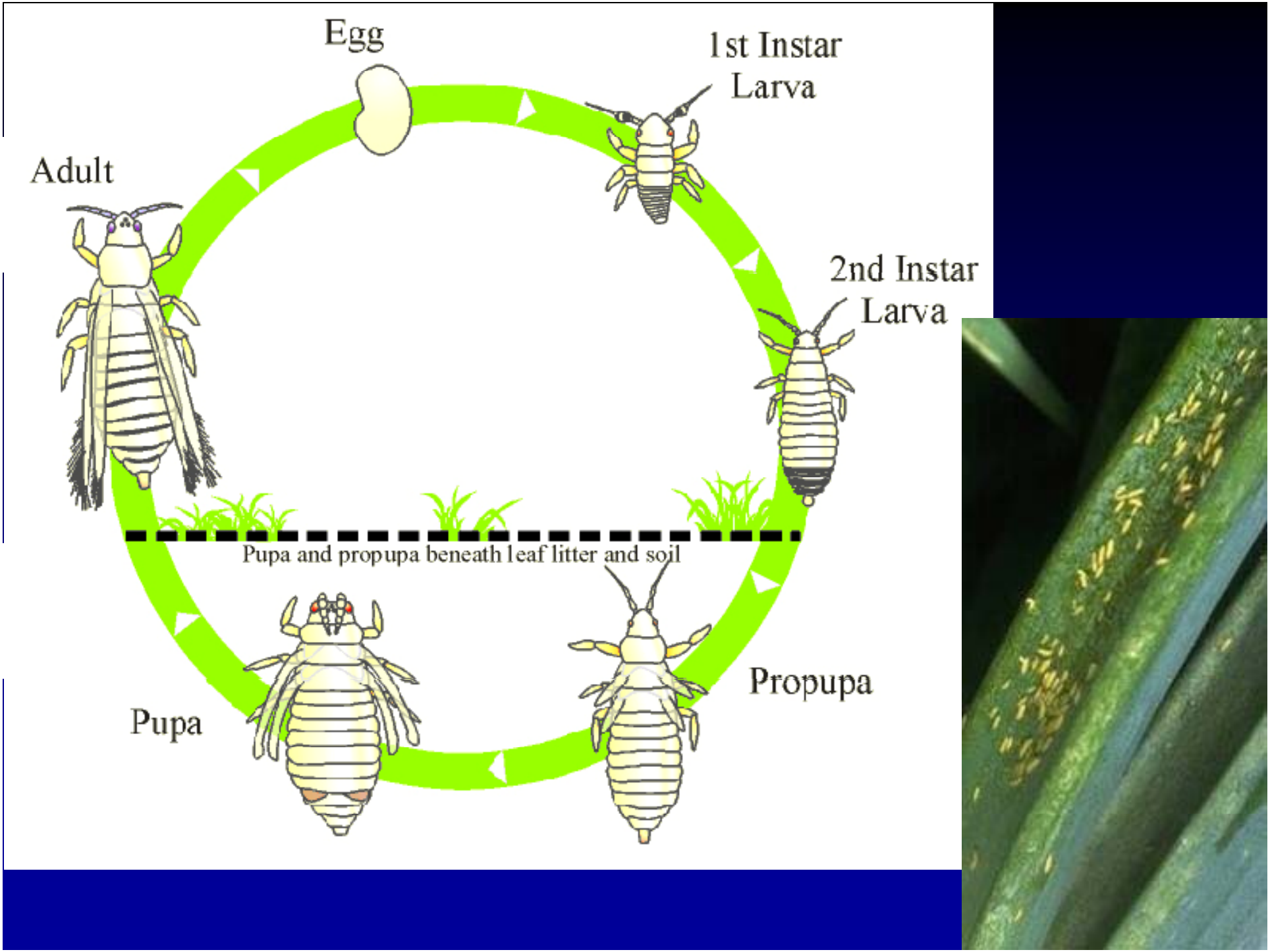
Thrips basics

- Small insects (order: Thysanoptera)
- Weak fliers (“fringe wings”)
- 5,000 species worldwide
- Only 1% are important plant pests
- Usually have broad host ranges
- Vector viruses
- Life cycle:

egg → 2 larval instars → propupa → pupa → adult


Egg
1st Instar Larva
2nd Instar Larva
Propupa
Pupa
Adult
Pupa and propupa beneath leaf litter and soil

Why thrips are trouble

- Small: they get everywhere.
- Numerous: “sea of thrips” (L. Mound)
- Direct damage via feeding, frass
- Indirect damage via virus vectoring
- Contaminants in quarantine settings
- Difficult to control
  - Wide range of host plants (weeds, crops, ornamentals)
  - Resistant to insecticides

Symptoms

- Direct feeding:
  - Silvered patches
  - Flecking with black fecal specks
  - Deformed foliage
  - Scarring, drying, cracking of fruit tissues
- Vectoring of viruses
  - Chlorosis and necrosis
  - Deformed foliage
  - Stunted growth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Plant-feeding thrips, Coastal CA

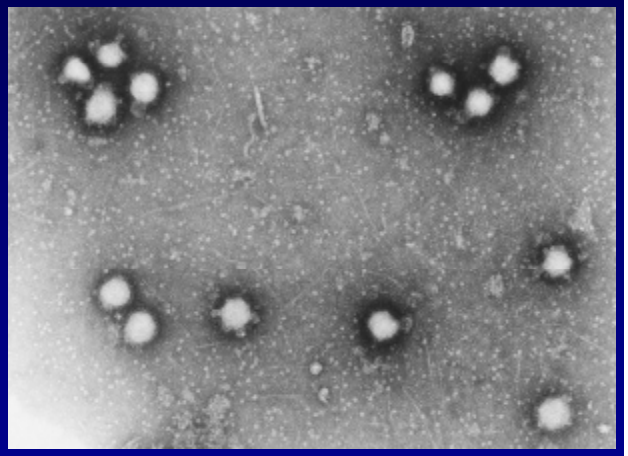
- **Vegetables**
  - Western flower thrips, mostly; virus +
  - Onion thrips (alliums); virus +
- **Strawberry**
  - Western flower thrips; virus --
- **Grape**
  - Western flower thrips; virus --
  - Grape thrips; virus --

Plant-feeding thrips, Coastal CA

- Ornamentals, field
  - Western flower thrips; virus +
- Ornamentals, greenhouse
  - Western flower thrips; virus +
  - Greenhouse thrips

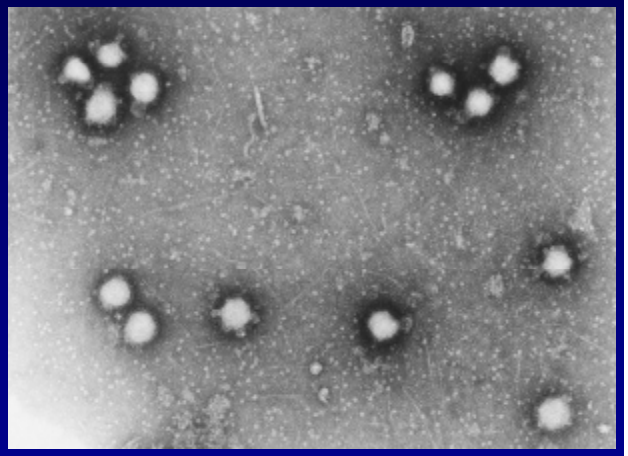
Tospoviruses

- 19 proposed tospoviruses; 8 accepted:
  - Groundnut bud necrosis virus
  - Groundnut ringspot virus
  - Impatiens necrotic spot virus
  - Iris yellow spot virus
  - Tomato chlorotic spot virus
  - Tomato spotted wilt virus
  - Watermelon silver mottle virus
  - Zucchini lethal chlorosis virus



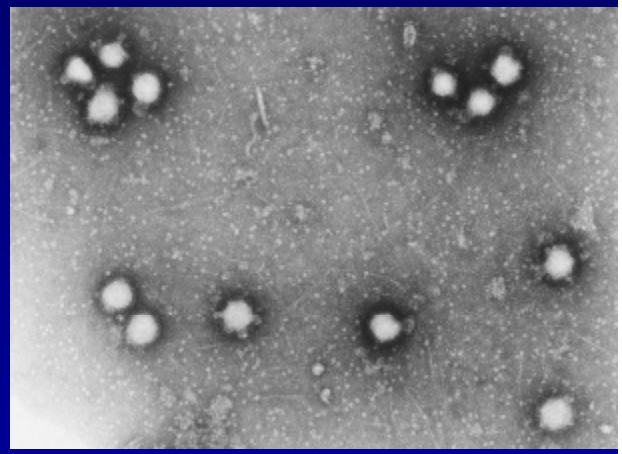
Tospoviruses

- 3 found in North America / California*:
  - Groundnut bud necrosis virus
  - Groundnut ringspot virus
  - Impatiens necrotic spot virus*
  - Iris yellow spot virus*
  - Tomato chlorotic spot virus
  - Tomato spotted wilt virus*
  - Watermelon silver mottle virus
  - Zucchini lethal chlorosis virus
  - (Melon severe mosaic virus? Mexico?)



Tospoviruses

- Of 5,000 thrips species, only 10 species can transmit virus.
- Transmission of virus only occurs if thrips acquired virus during larval stage
- Virus replicates, increases inside the thrips.
- Virus remains in thrips for the life of the insect.



Thrips-vectored viruses on the California coast

- Tomato spotted wilt virus (TSWV)
  - Dozens of host crops, ornamentals, weeds
  - Vectors: mostly Frankliniella species:

F. cephalica, F. occidentalis, F. schultzei,
F. intonsa, F. bispinosa, F. fusca,
Thrips setosus, Thrips tabaci

Thrips-vectored viruses on the California coast

- Impatiens necrotic spot virus (INSV)
  - Mostly ornamentals
  - Lettuce, radicchio, other vegetables
  - Vectors:

F. occidentalis, F. schultzei, F. intonsa

Thrips-vectored viruses on the California coast

- Iris yellow spot virus (IYSV)
  - Onion
  - Vector:

Thrips tabaci


INSV

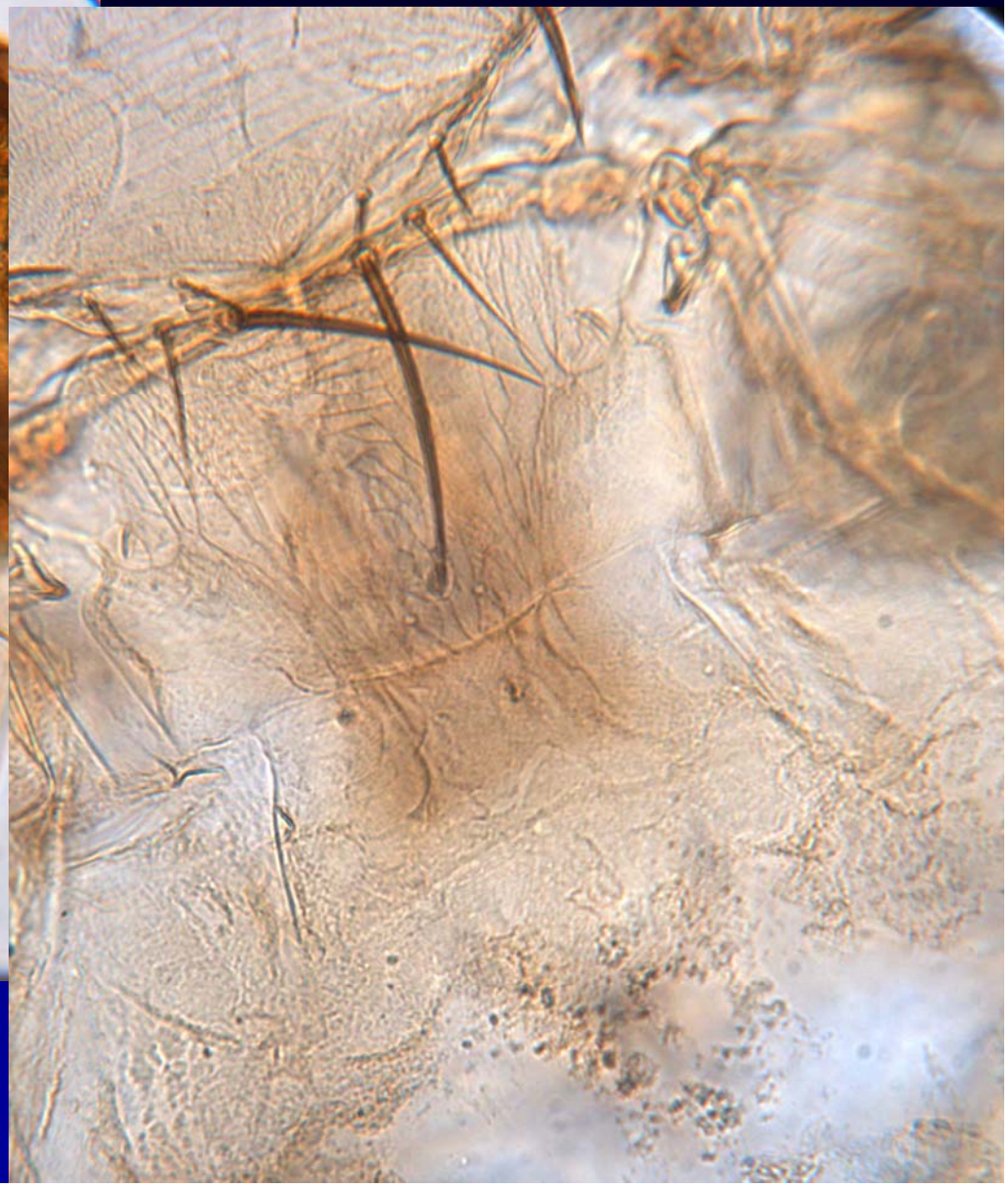

TSWV

IYSV

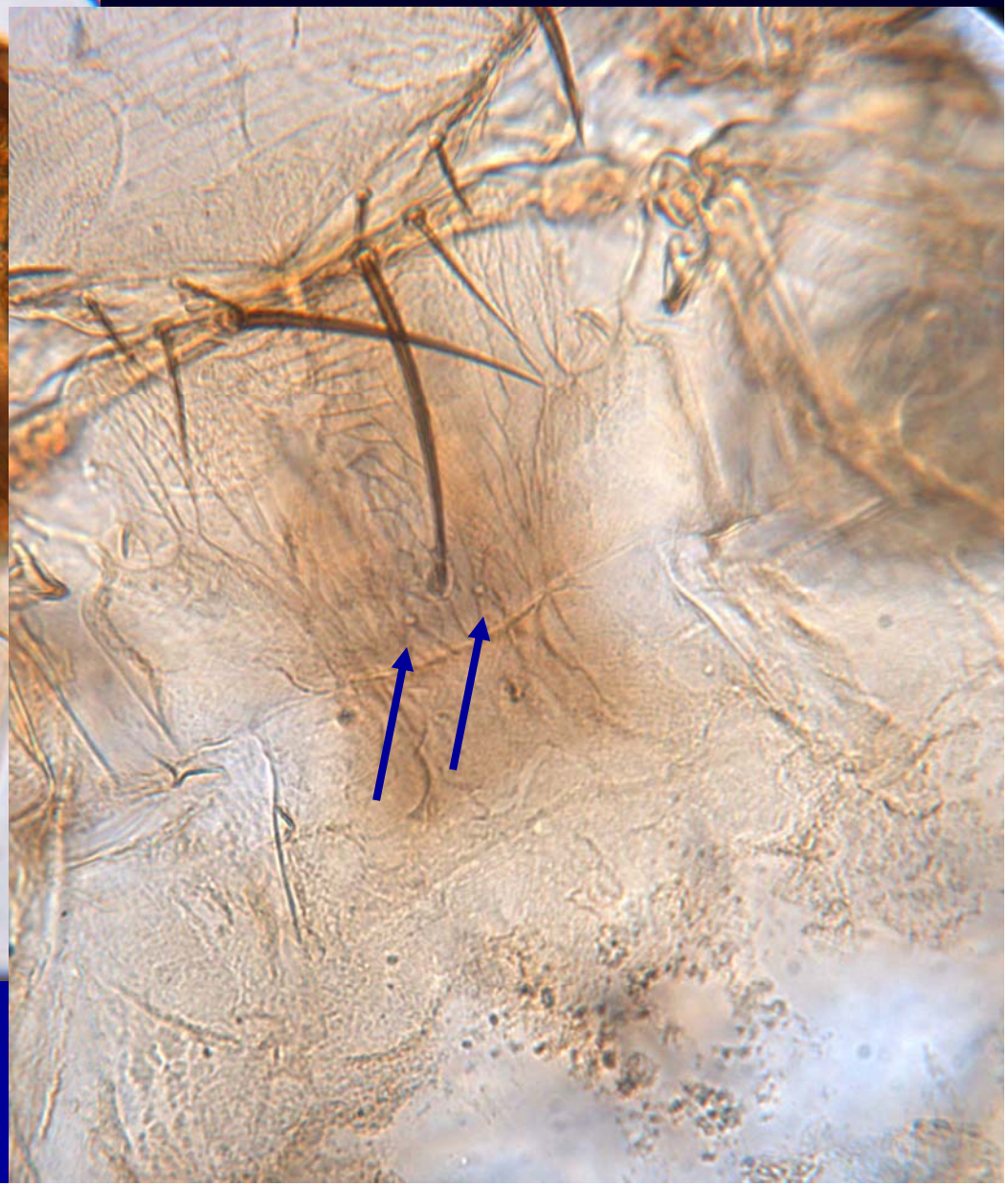
Thrips identification

- "A thrips is a thrips" is enough, mostly.
- New species/introductions occur.
- Beneficial thrips are also present.
- Precise species ID sometimes needed:
  - Clear thrips with NaOH soak
  - Mount on glass slides
  - Examine with compound microscope
  - Look for fine (small) features

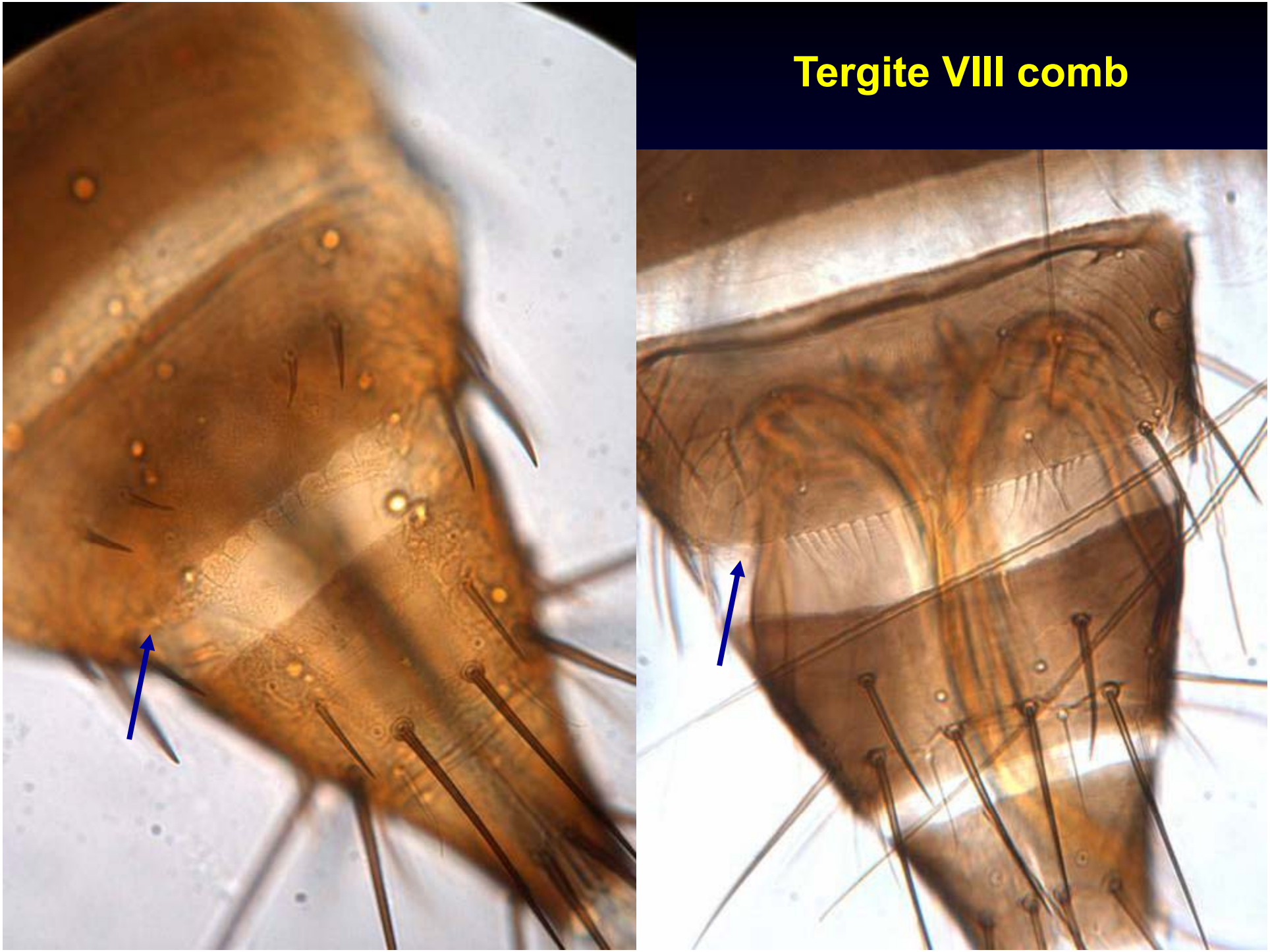
Campaniform sensilla

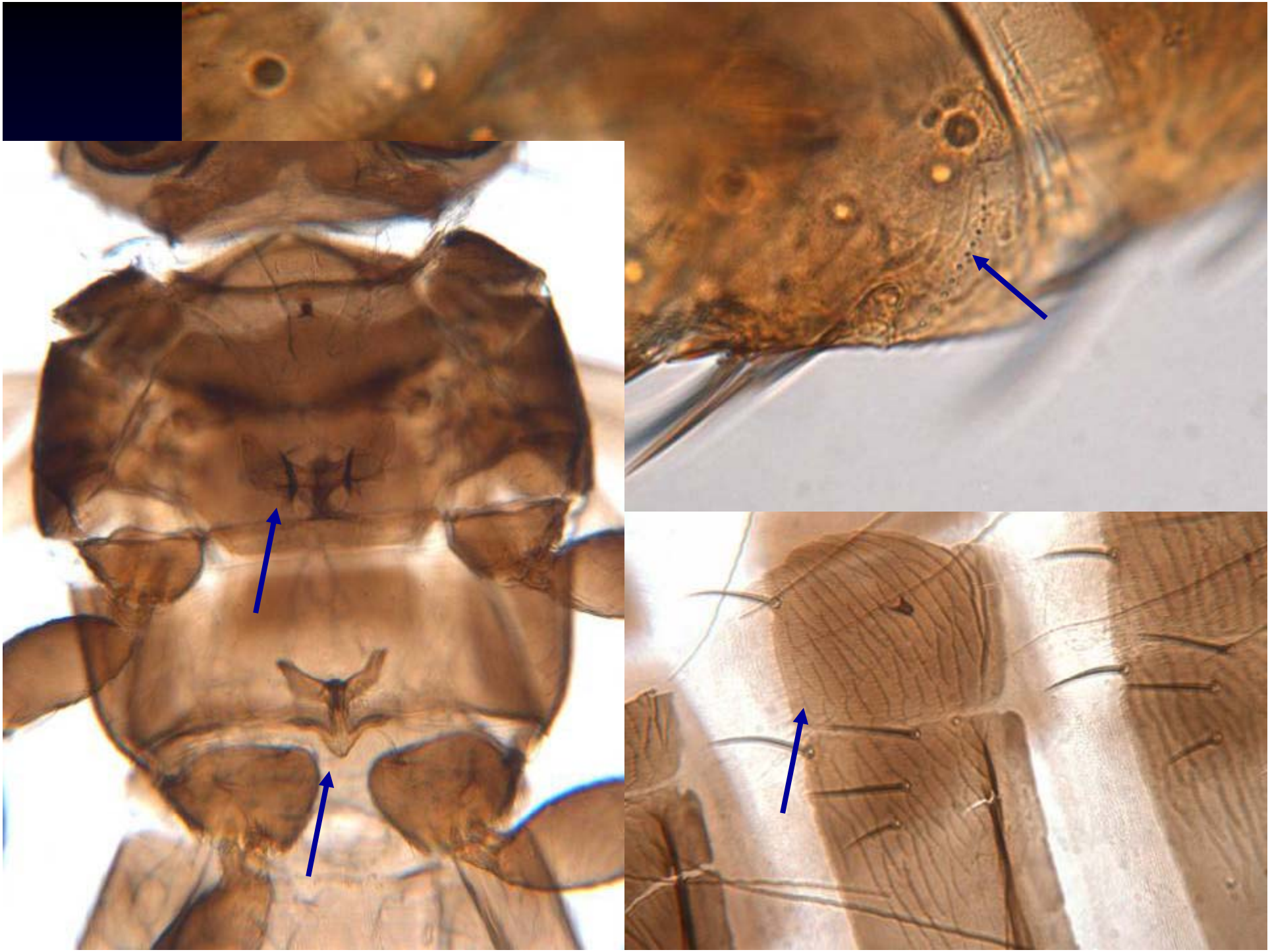


Campaniform sensilla



Tergite VIII comb





Thrips management

- Select sites that have less pressure
- Plant tolerant crops in problem areas
- Monitor populations
- Manage surrounding weeds
- Plow down old fields
- Apply insecticides
- (resistant cultivars: not available)
- (greenhouse: exclusion)

Insecticide strategies

- Select effective products.
- Enhance coverage of the spray.
- Properly time the multiple applications.
- Combine / alternate products with different modes of action.

Synthetic insecticides

- acephate
- abamectin
- chlorpyrifos
- cyhalothrin-λ
- cypermethrin
- diazinon
- dimethoate
- endosulfan
- methiocarb
- methomyl
- methyl parathion
- permethrin
- spinetoram
- spinosad

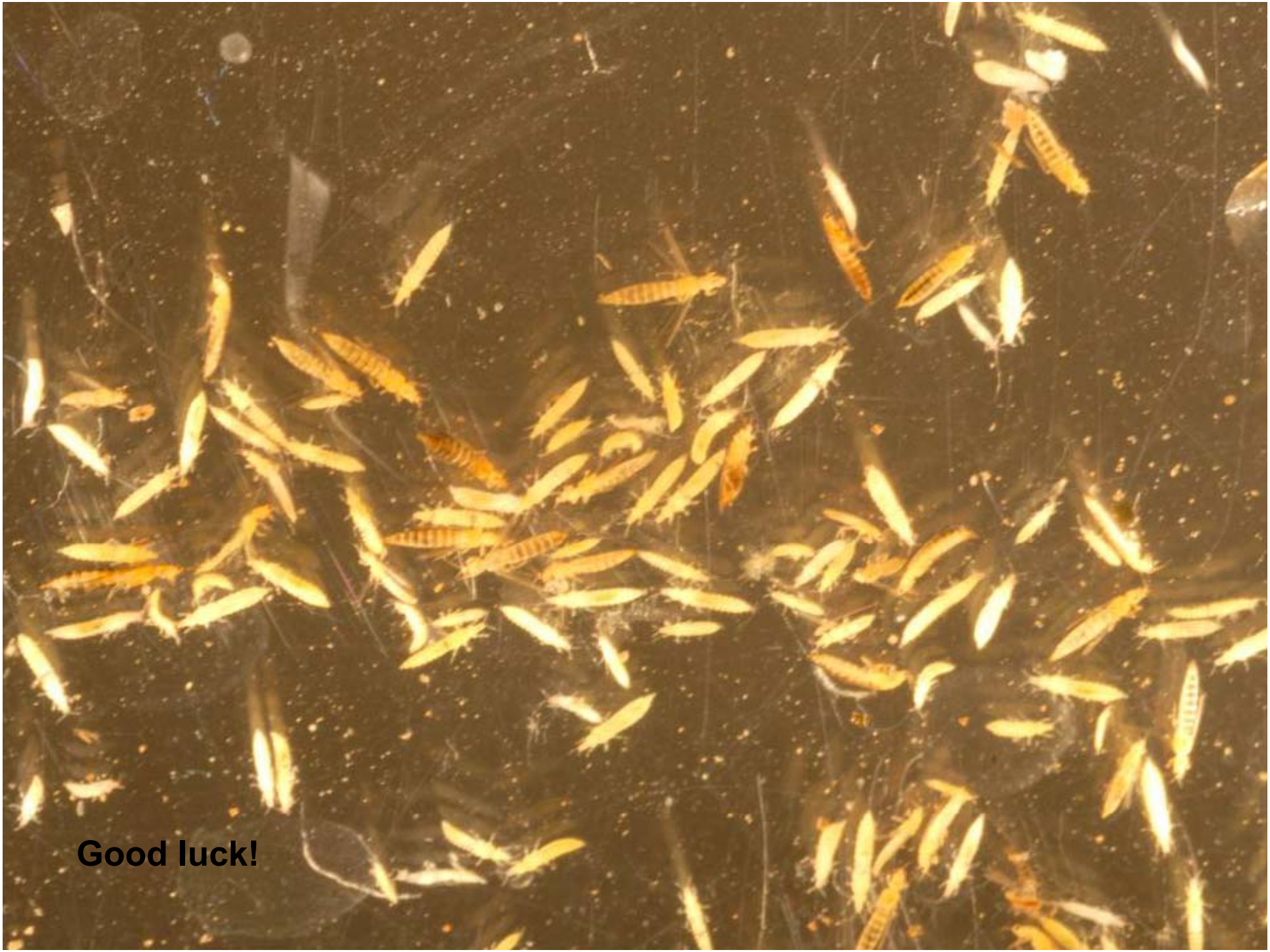
Synthetic insecticides

- acephate*
- abamectin*
- chlorpyrifos
- cyhalothrin-λ
- cypermethrin*
- diazinon*
- dimethoate
- endosulfan*
- methiocarb*
- methomyl*
- methyl parathion
- permethrin*
- spinetoram
- spinosad

* Resistance reported

Other spray materials

- Botanical: cinnamaldehyde, pyrethrin
- Neonicotinoid: acetamiprid, imidacloprid
- Insect growth reg.: azadirachtin, novaluron
- Biological: *Beauveria bassiana*, nematodes
- Organic: oils, soaps


Good luck!