

Integrated Pest Management of the exotic invasive pest

Tuta absoluta



ABIM

Luzern, 21-10-2009

Karel Bolckmans

Tuta absoluta : passport

- Name : *Tuta absoluta* (Meyrick)
- Family : Lepidoptera: Gelechiidae, Leafmining moth
- Origin : Latin America
- Host plant range : Solanaceae
- Immigration year and country of entrance : 2007, Spain.
- Address : Mediterranean, North Africa, and conquering more territory ...
- Status : illegal immigrant, highly invasive, permanently established
- Control measure to be taken : Integrated Pest Management, develops quickly resistance to chemical pesticides

Leaf damage



Tuta absoluta ≠ *Liriomyza* spp.



Mines of *Liriomyza* sp.



Mine of *Tuta absoluta*

Damage on shoots and stems

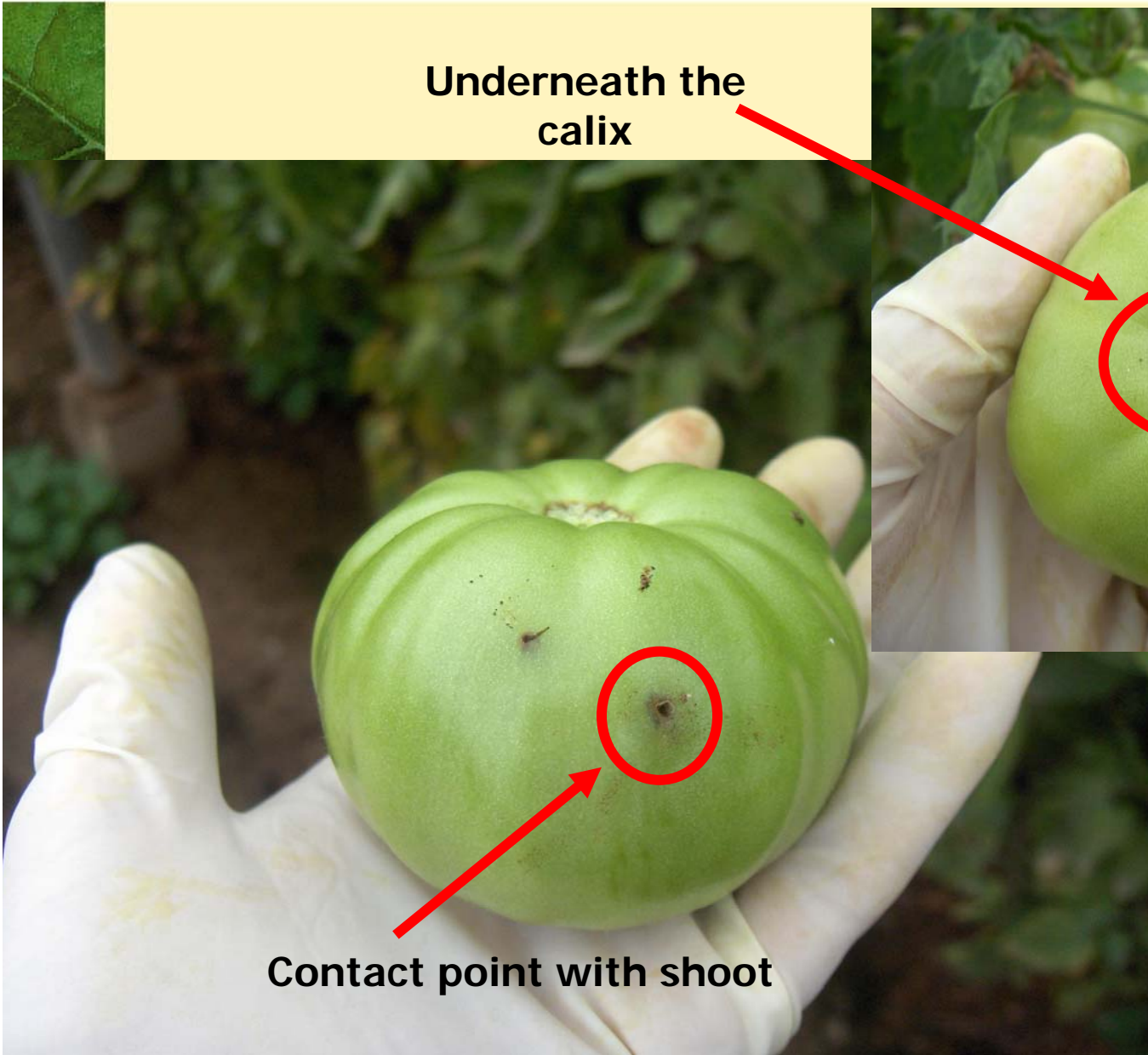


Fruit damage

Underneath the
calix



Contact point with shoot



Fruit damage





crédit photo : Anne-Isabelle Lacordaire-Koppert France

Integrated Pest Management

- Prevention
- Predatory bugs :
 - *Nesidiocoris tenuis*
 - *Macrolophus caliginosus*
- Pheromone traps :
 - Monitoring
 - Trapping
- Parasitoids :
 - Egg parasites (Trichogramma spp.)
 - Larval parasites
- *Bacillus thuringiensis*
- Selective pesticides



Prevention

"Preventing is better than curing"

1. Insect netting + double entrances
2. Removing old crop
3. Hygiene in and around the greenhouse : Old crop, Fruits
4. Weeds : Solanaceae !
 - Solanum spp. (e.g. black nightshade)
 - Datura spp.
 - Nicotiana spp.
 - Potatoes, peppers, eggplants, ... ?
5. Packaging tomatoes from the Mediterranean next to a tomato greenhouse ... ???? (Netherlands)

Monitoring : Pheromone Traps

- Deltatraps with Pherodis pheromone
 - 10-20 traps/ha in plant propagation
 - 2 tot 3 traps/ha in greenhouse crop
- Check traps minimum 1x/week
- Replace dispensers every 4 to 6 weeks
- Act a.s.a.p



Predatory Mirid Bugs

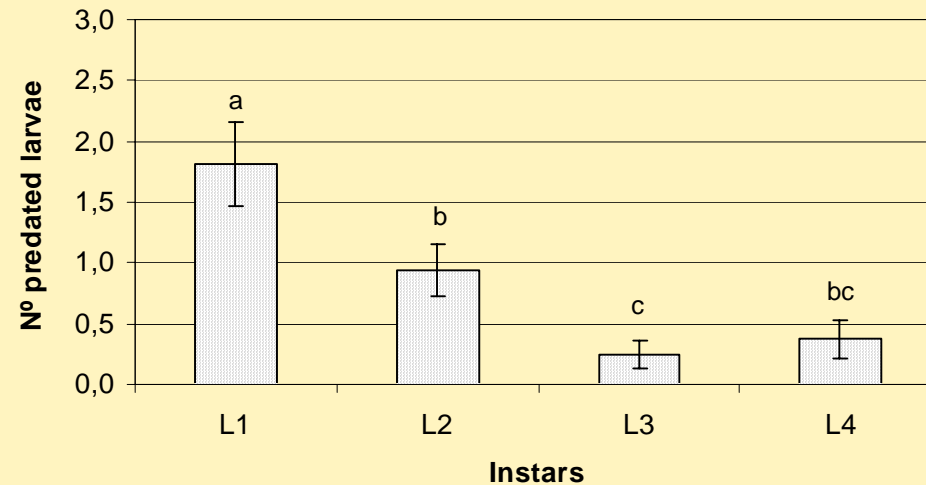
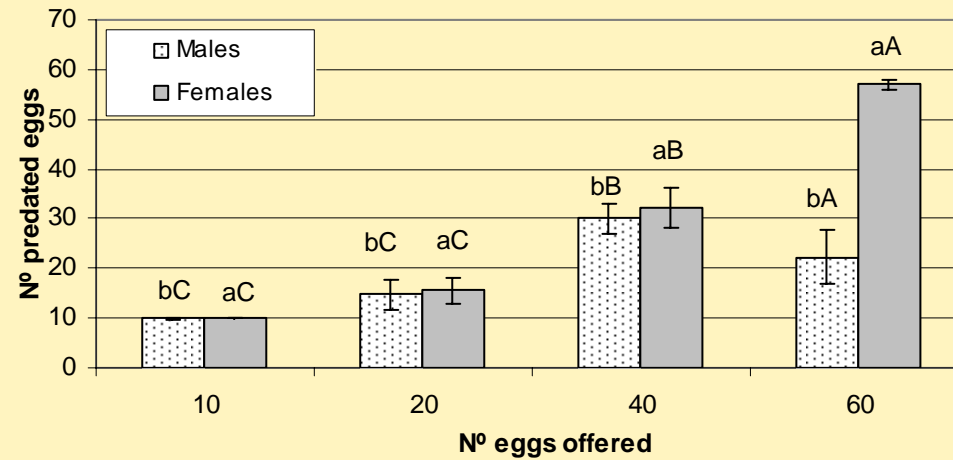
- Already widely and successfully used against whiteflies (*Trialeurodes vaporariorum* and *Bemisia tabaci*) in tomatoes in combination with parasites (*Encarsia formosa*, *Eretmocerus* spp.)
- *Nesidiocoris tenuis* (Mediterranean)
- *Macrolophus pygmaeus* (= *M. caliginosus*) (North Europe)





Laboratory research : Suitability as prey for predatory bugs

- $T = 25 \pm 2^\circ\text{C}$,
- $RH = 60 \pm 10\%$,
- $L : D = 16:8 \text{ h}$

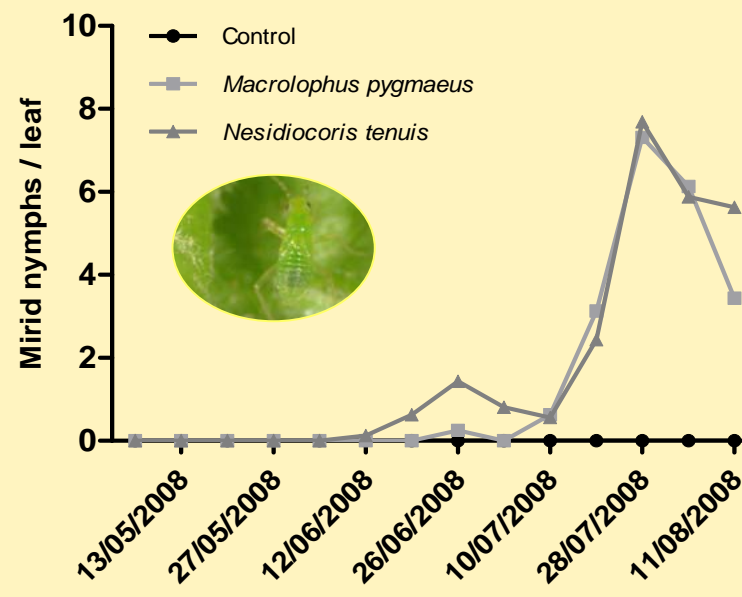
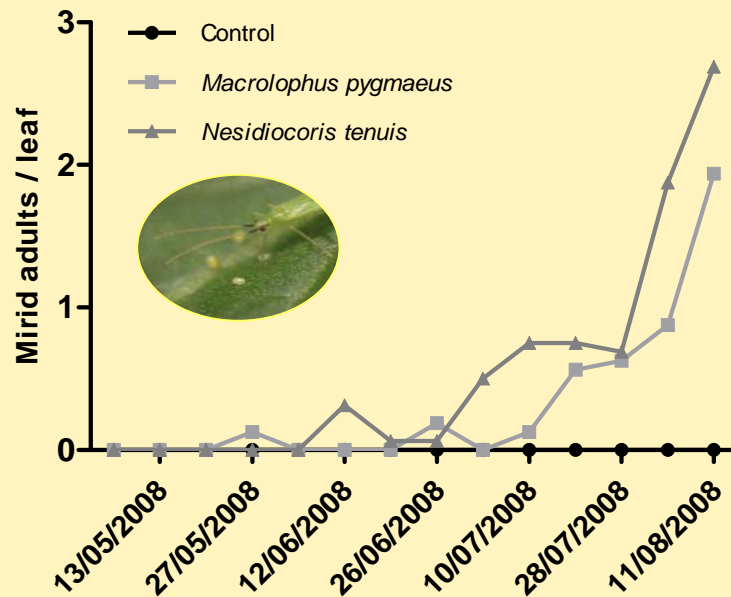
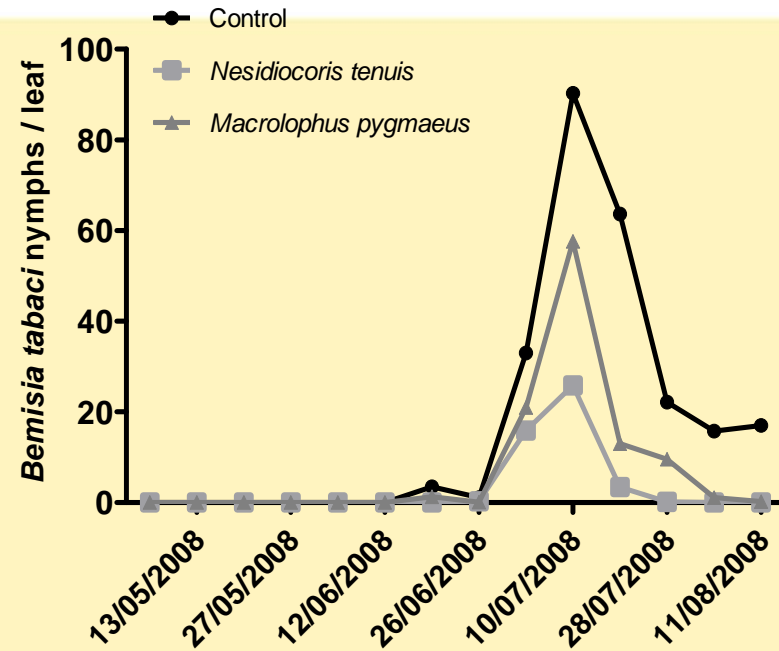
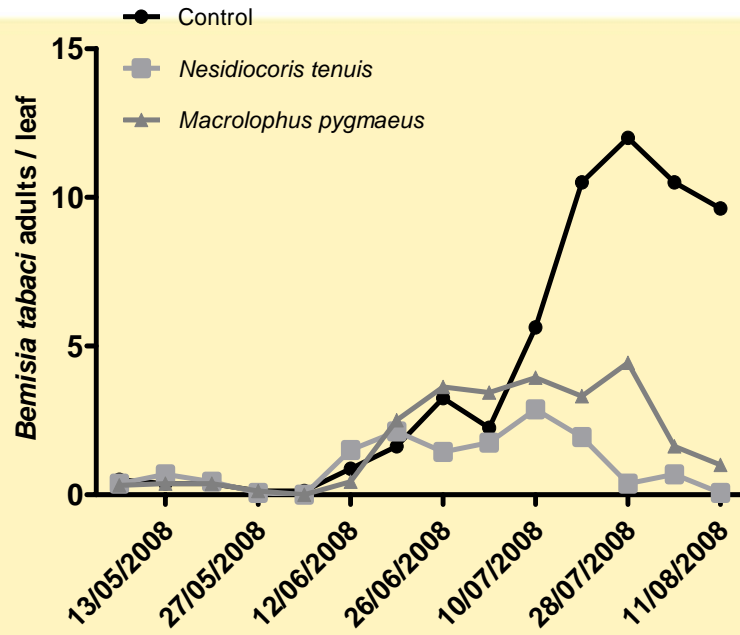




Semi-field trials

- Greenhouse with 12 experimental cages
 - Tomato
 - 3 treatments : control, Nesidiocoris, Macrolophus
 - 4 replicates
 - CRBD
 - *Bemisia tabaci* (29/4/'08)
 - Predatory Mirid Bugs, 2/m² (20/5 en 24/6/'08)
 - *Tuta absoluta* (11/7/'08)
- ⇒ Release *Tuta absoluta* adults after predators have established

Semi-field trials



Semi-Field Trials



% Reduction leaf damage:

✓ *N. tenuis* = 97%

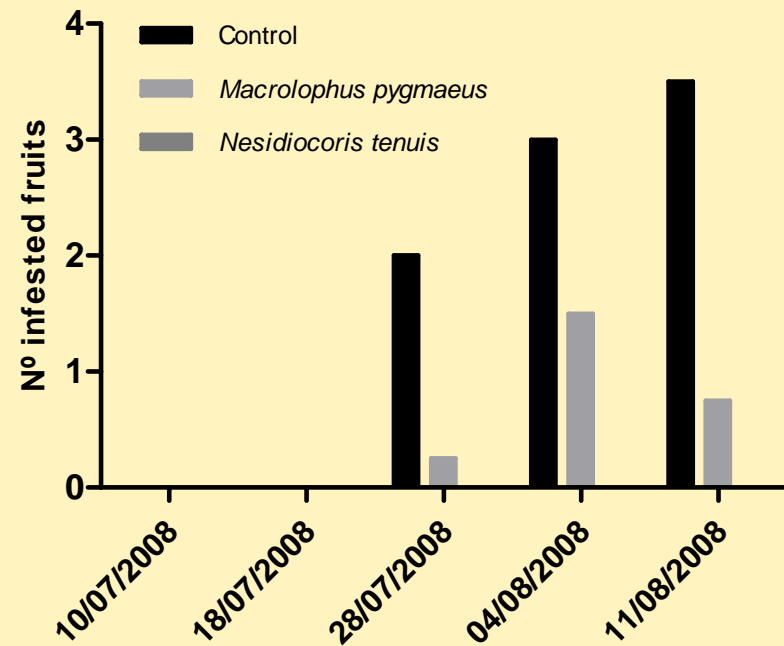
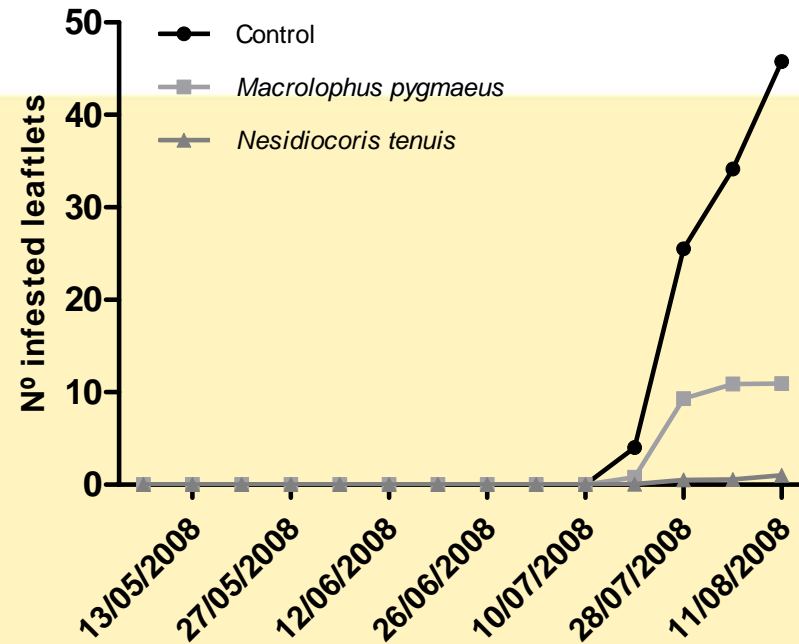
✓ *M. pygmaeus* = 76%



% Reduction fruit damage:

✓ *N. tenuis* = 100%

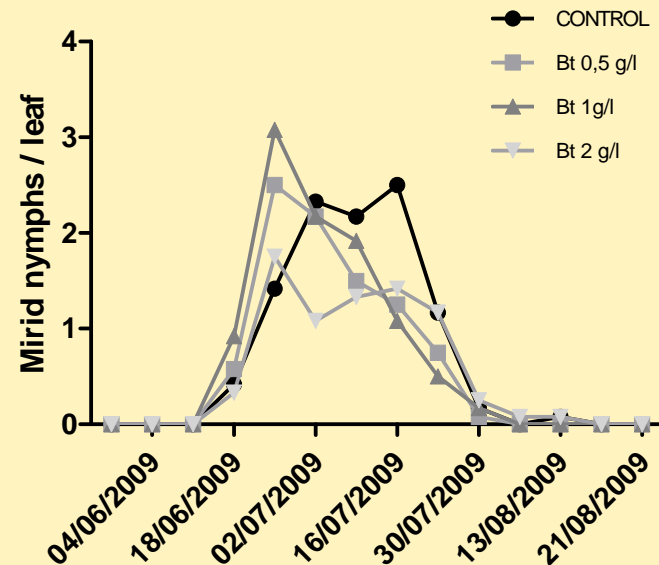
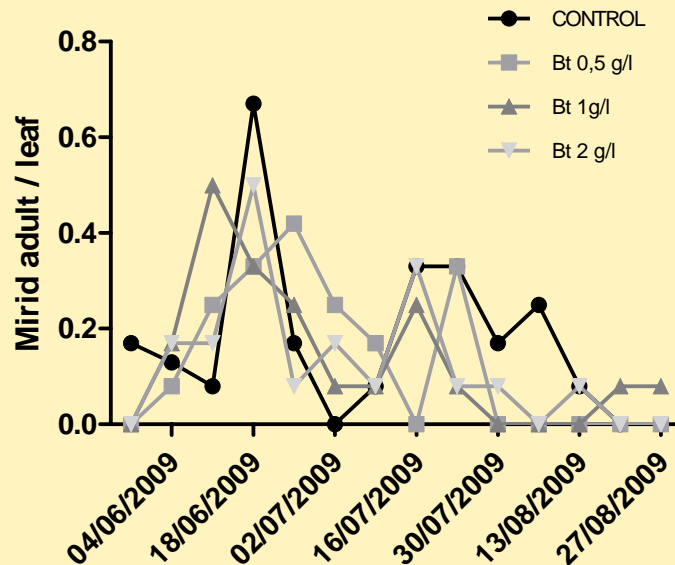
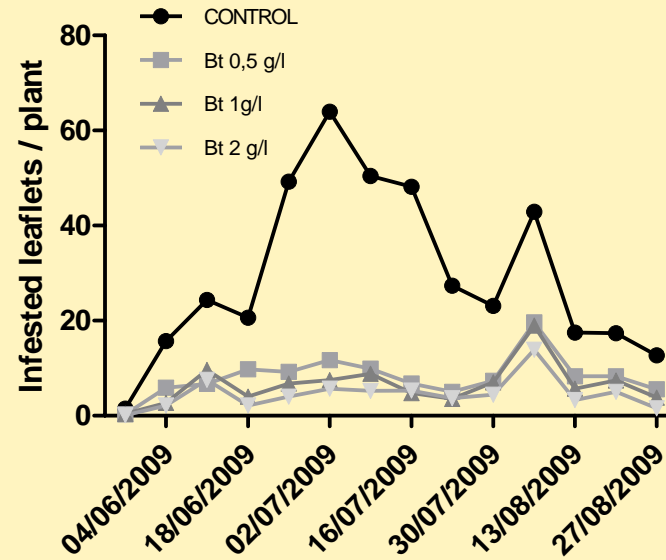
✓ *M. pygmaeus* = 56%

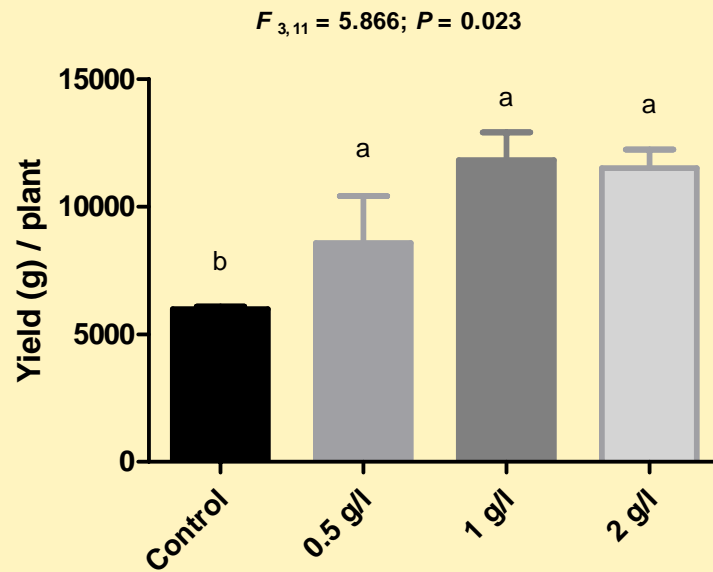
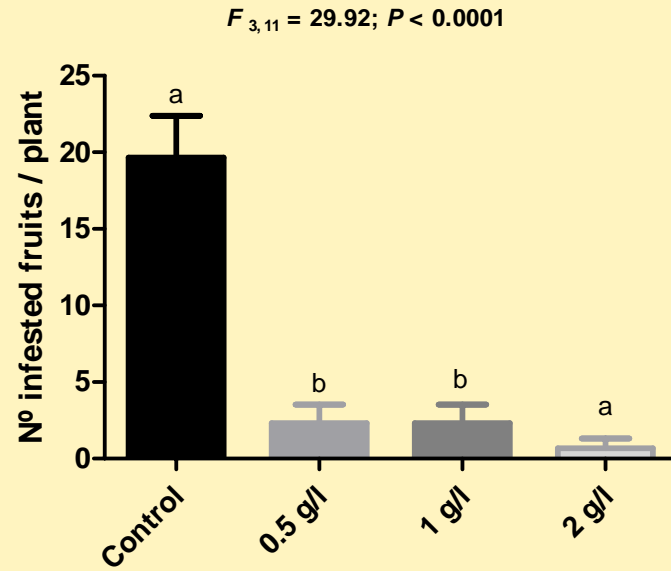


Field Trials : Integration with Bt

2 *N. tenuis* / m²

- Weekly Bt in **3 different concentrations** (0.5, 1 and 2 g/l).





Nesidiocoris or Macrolophus = basis !

- *Predatory Mirids Bugs* are effective if *Tuta absoluta* infests the crop after the predators have build up a sufficiently high population.
- *Predatory Mirids Bugs* need time to build up a sufficiently high population.

A. How to build up a population of Predatory Mirid Bugs **faster** ???

1. Release **more** : 1-2/m²
2. Release **timely**
3. **Feed with** Ephestia eggs in the crop (winter crops, North Europe)
4. **CO₂** concentration !

B. How to **bridge** this period with other IPM techniques ?

1. **Trapping** with pheromone traps
2. *Bacillus thuringiensis*
3. **Parasites**
4. Selective **pesticides** (spinosad, indoxacarb)

Trapping : Pheromone Traps

- Water traps "Tutasan" with Pherodis pheromone
 - 30/ha in plant propagation
 - 20-25/ha in crop
 - 40-50/ha in open field crops
- Replace dispensers every 4 to 6 weeks

Advantages of water traps compared to deltatraps :

- 3 to 4 times more effective
- More easy to maintain
- Very large trapping capacity
- Less sensitive for dust
- Long lifespan
- Important to add soap or oil to the water



Trapping : Light Traps

- Catch both males AND females
- Use in sensitive places such as near the entry doors
- Only use during sunset and sundown



Bridging the establishment period of Mirids

1. Pheromone Traps and Light Traps
 - Very nice results
2. Egg parasites : *Trichogramma* spp.
 - Large numbers need to be released frequently due to (1) short life span of *Trichogramma*'s, (2) glandular trichomes of tomatoes
 - Inundative biocontrol
3. Larval parasites :
 - research
 - Inoculative or even classical biocontrol
4. *Bacillus thuringiensis*
 - Both neonates AND older stages can eat Bt
 - Apply very regularly (weekly) !
5. Selective pesticides
 - *Tuta absoluta* very quickly develops pesticide resistant populations!
 - Spinosad, indoxacarb

Summary

1. **Prevention**: *"preventing is better than curing"*
2. **Predatory Mirid Bugs** are the basis but need time to establish a sufficiently high population.
3. **Accelerate** population build-up of Predatory Mirids :
⇒ release more, release timely, feed Ephestia, CO₂, ...
4. **Bridge** population build-up period of Predatory Mirids :
⇒ trapping with pheromone traps, Tricho's, Bt and selective pesticides
5. **Research** into new BCA's :
 - Larval parasites
 - Viruses
 - Mating disruption

Thank you



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