

Amblyseius swirskii

a new breakthrough
in biological control
in greenhouses

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Biological control in greenhouses

- Commercial biological control with natural enemies started in 1967 in the UK and the Netherlands.
- *Phytoseiulus persimilis* against two-spotted spider mites in greenhouse cucumbers.
- Today around 30 different beneficial insects and mites are available

Biological control in greenhouses

- Standard technique in greenhouse *vegetables* in North/Central Europe and North America.
- Increasingly used in greenhouse *ornamentals*.
- Developing in Mediterranean and Asia.
- Main pests: whiteflies, western flower thrips, two-spotted spider mites, aphids, leafminers + minor secondary pests.

Biological control of Thrips & Whiteflies

- Western Flower Thrips (*F. occidentalis*)
 - *Amblyseius cucumeris* (1985)
 - Orius spp. (1991)
 - *Iphiseius degenerans* (1994)
- Whiteflies (*T. vaporariorum*, *B. tabaci*)
 - *Encarsia formosa* (1970)
 - *Verticillium lecanii*
 - *Eremocerus eremicus* (1994)
 - *Macrolophus caliginosus* (1994)
 - *Eretmocerus mundus* (1996)

North vs. South Europe

Key contradiction =

Pest Pressure

vs.

Economics

Predation of Whiteflies by Phytoseiidae

- **Teich, Y.** (1966) Mites of the family of Phytoseiidae as predators of the tobacco whitefly, *Bemisia tabaci* Gennadius. Israel J. Agric. Res. 16: 141-142.
- **Swirski, E., Amitai, S. and Dorzia, N.** (1967) Laboratory studies on the feeding, development and oviposition of the predaceous mites *Amblyseius rubini* Swirski and Amitai and *Amblyseius swirskii* Athias-Henriot (Acarina: Phytoseiidae) on various kinds of food substances. Israel J. Agric. Res. 17: 101-119.
- **El-Badry, E.A.** (1967) Three new species of phytoseiid mites preying on the cotton whitefly, *Bemisia tabaci* in the Sudan (Acarina, Phytoseiidae) The Entomologist 100: 106-111.
- **El-Badry, E.A.** (1968) Biological studies on *Amblyseius aleyrodis* as predator of the cotton whitefly (Acarina, Phytoseiidae) Entomophaga 13: 323-329.

- **Gameel, O.I.** (1971) The whitefly eggs and first larval stages as prey for certain phytoseiid mites. Rev. Zool. Bot. Afr. 84: 79-82.

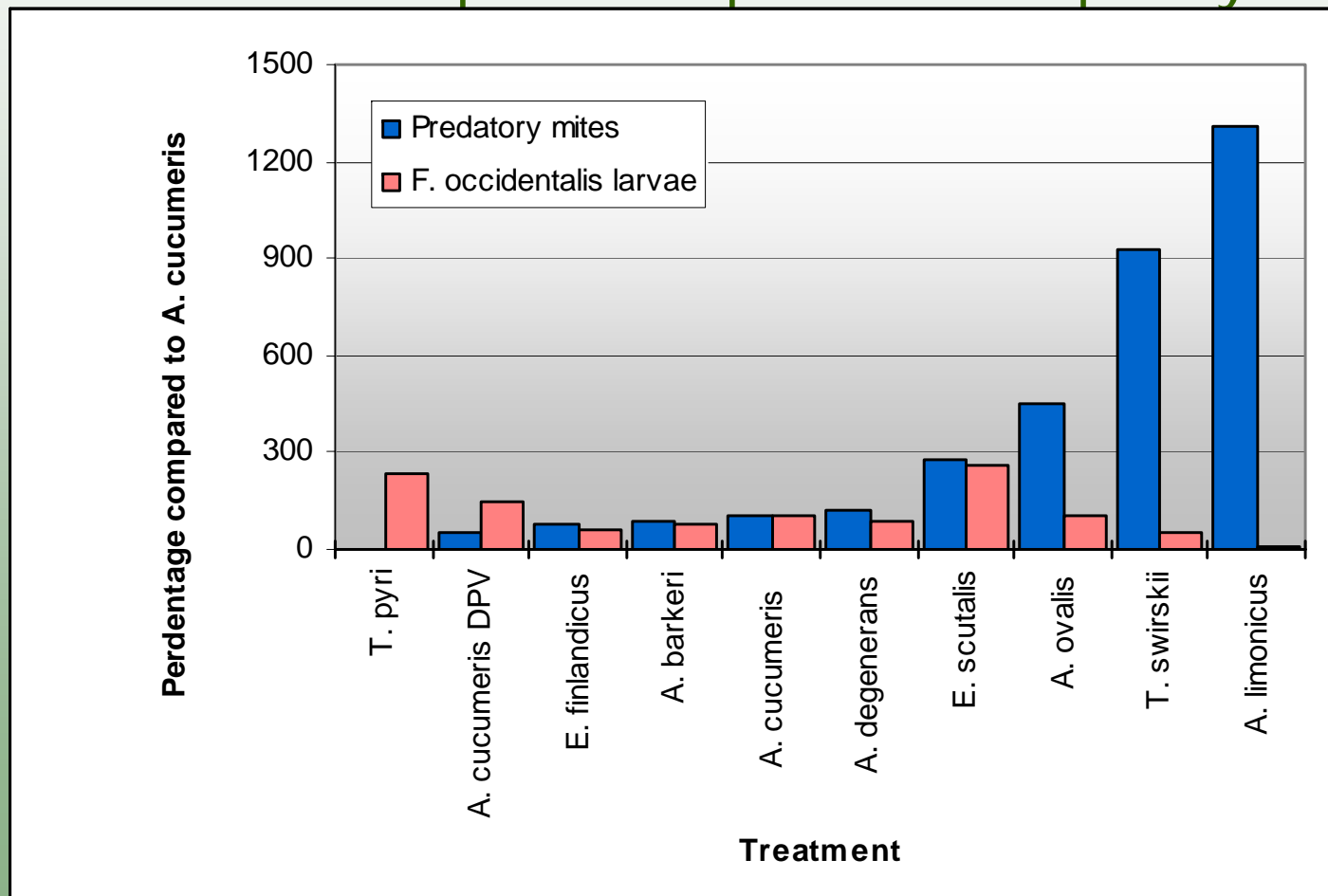
- **Meyerdirk, D.E. & Coudriet, D.L.** (1985) Predation and developmental studies of *Euseius hibisci* (Chant) (Acari: Phytoseiidae) feeding on *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae). Environ. Entomol. 14:24-27.
- **Meyerdirk, D.E. & Coudriet, D.L.** (1986) Evaluation of two biotypes of *Euseius scutalis* (Acari: Phytoseiidae) as predator of *Bemisia tabaci* (Homoptera: Aleyrodidae). J. Econ. Entomol. 79: 659-663.
- **Borah, D.C. & Rai, P.S.** (1989) Potentiality of *Amblyseius ovalis* (Acari: Phytoseiidae) as a biological control agent of *Bemisia tabaci* (Homoptera: Aleyrodidae). In: Progress in Acarology, Vol. 2, G.P. ChannaBasavanna and C.A. Viraktamath (eds.), pp. 375-379. E.J. Brill, Leiden, The Netherlands.

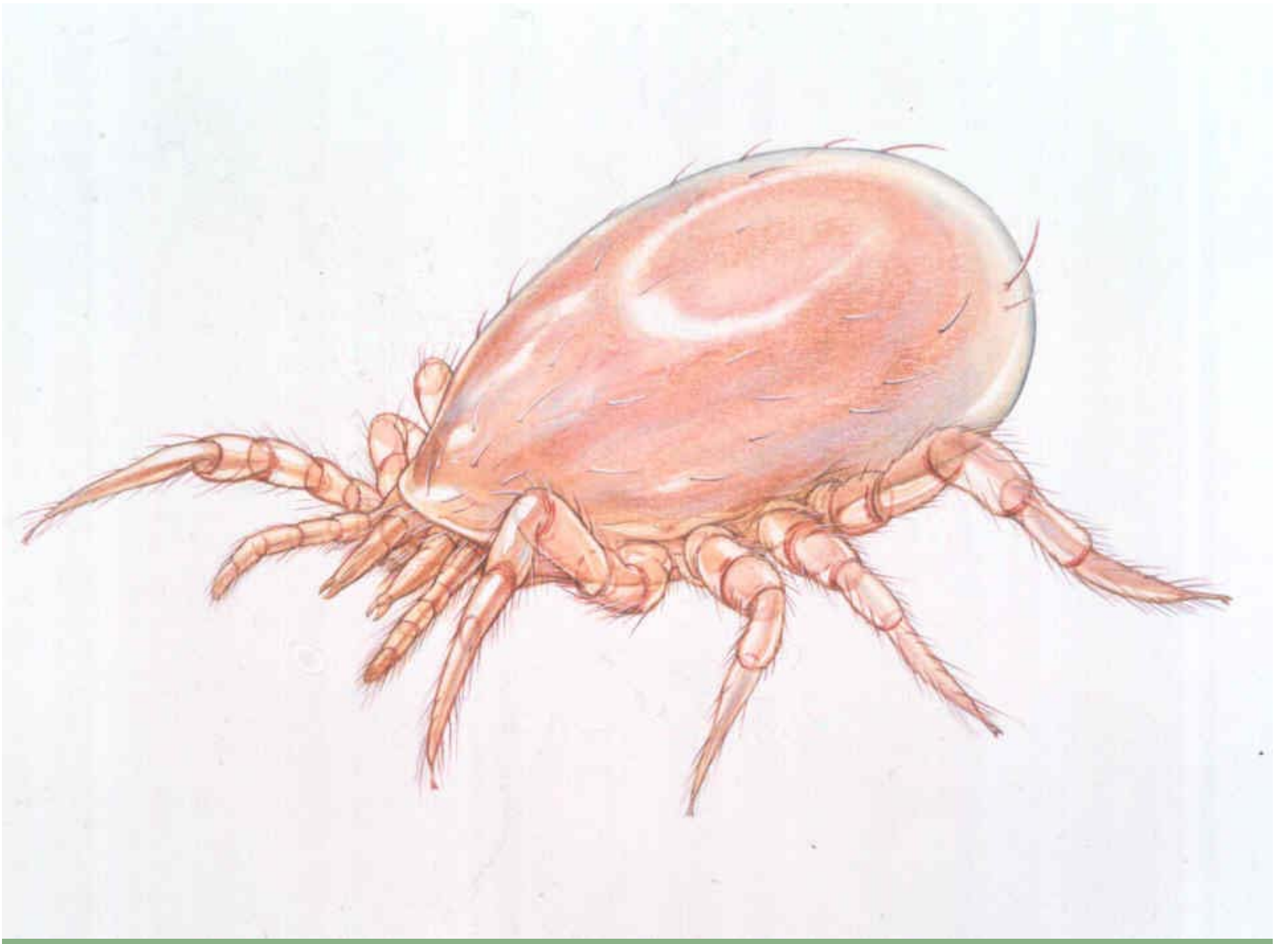
- **Nomikou, M., Janssen, A., Schraag, R. and Sabelis, M.W.** (2001) Phytoseiid predators as biological control agents for *Bemisia tabaci*. Exp.Appl.Acarol. 25: 270-290.

WFT control in cucumbers

(Applied Plant Research, Gerben Messelink,
Groenten & Fruit, november 2003)

numerical response vs. predation capacity





Amblyseius swirskii

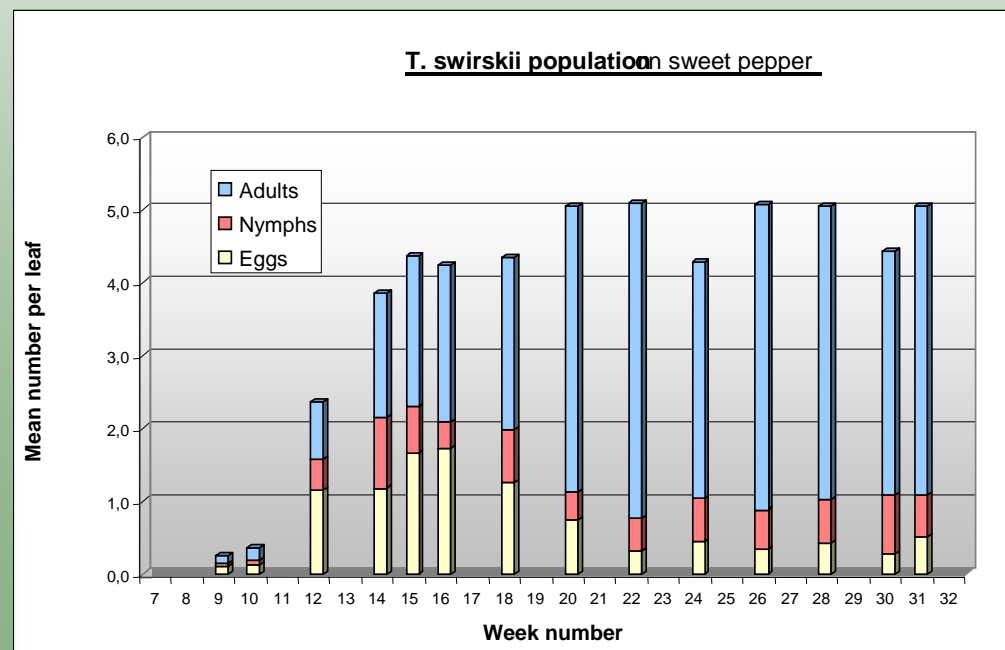


- *syn. Typhlodromips swirskii*
- In 1966 described by Y. Teich to feed on whiteflies
- Coastal areas of Eastern Mediterranean
- Citrus, fruit trees, cotton, ...
- No diapause
- Unable to survive low winter temperatures

Sweet pepper: preventive release

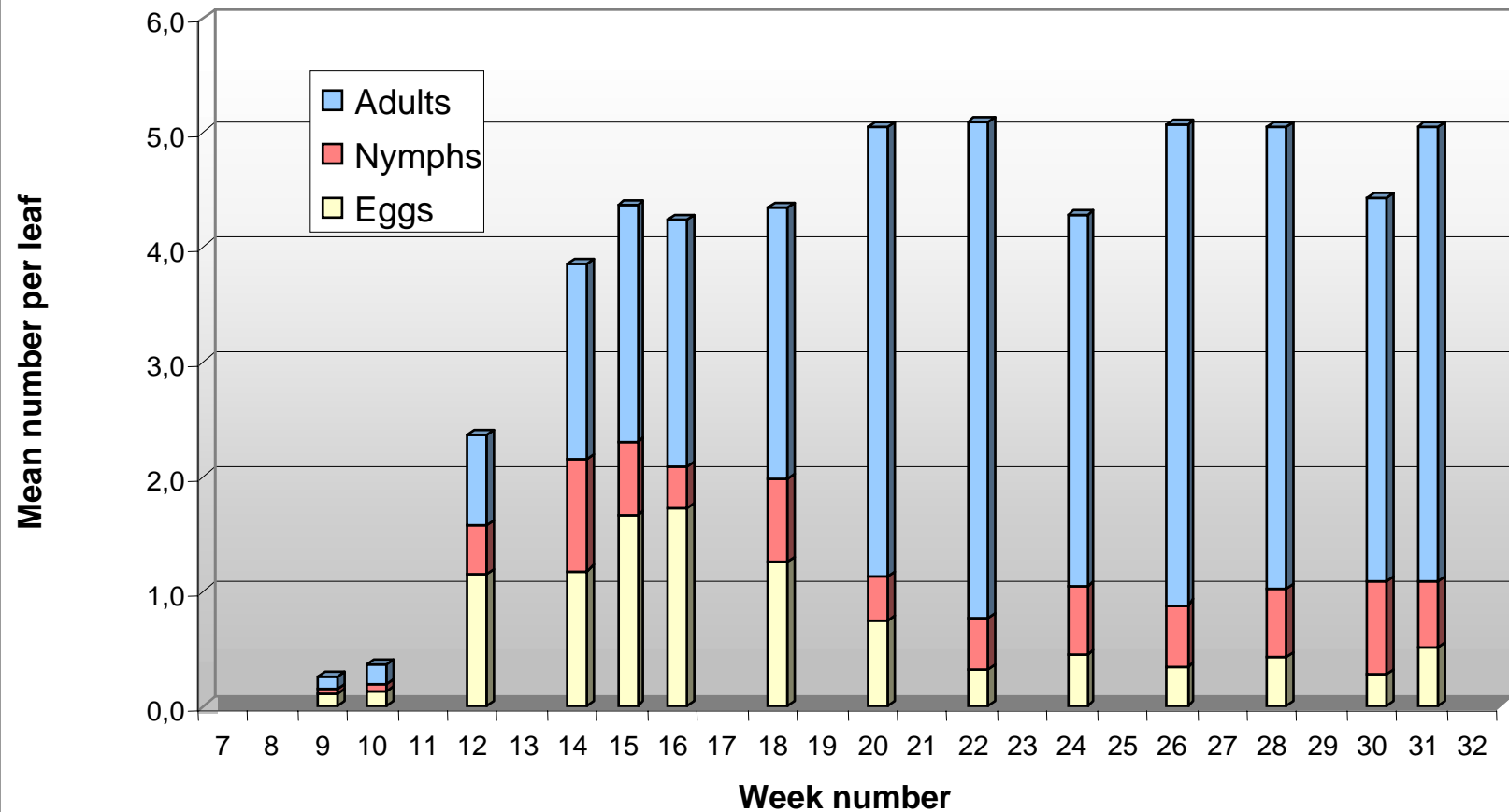
the Netherlands, field trial

- 1 plot of 1.600 m², commercial greenhouse
- *T. swirskii* released in week no. 7 & 10, 2004
- 20 + 15 = 35/m² in total
- NO release of *A. cucumeris*, *A. californicus* or *A. degenerans*
- Spider-mite pest-in-first, *O. laevigatus* and *M. caliginosus*
- Sulfur vaporized



Establishment on plant pollen

A. swirksii population on sweet pepper

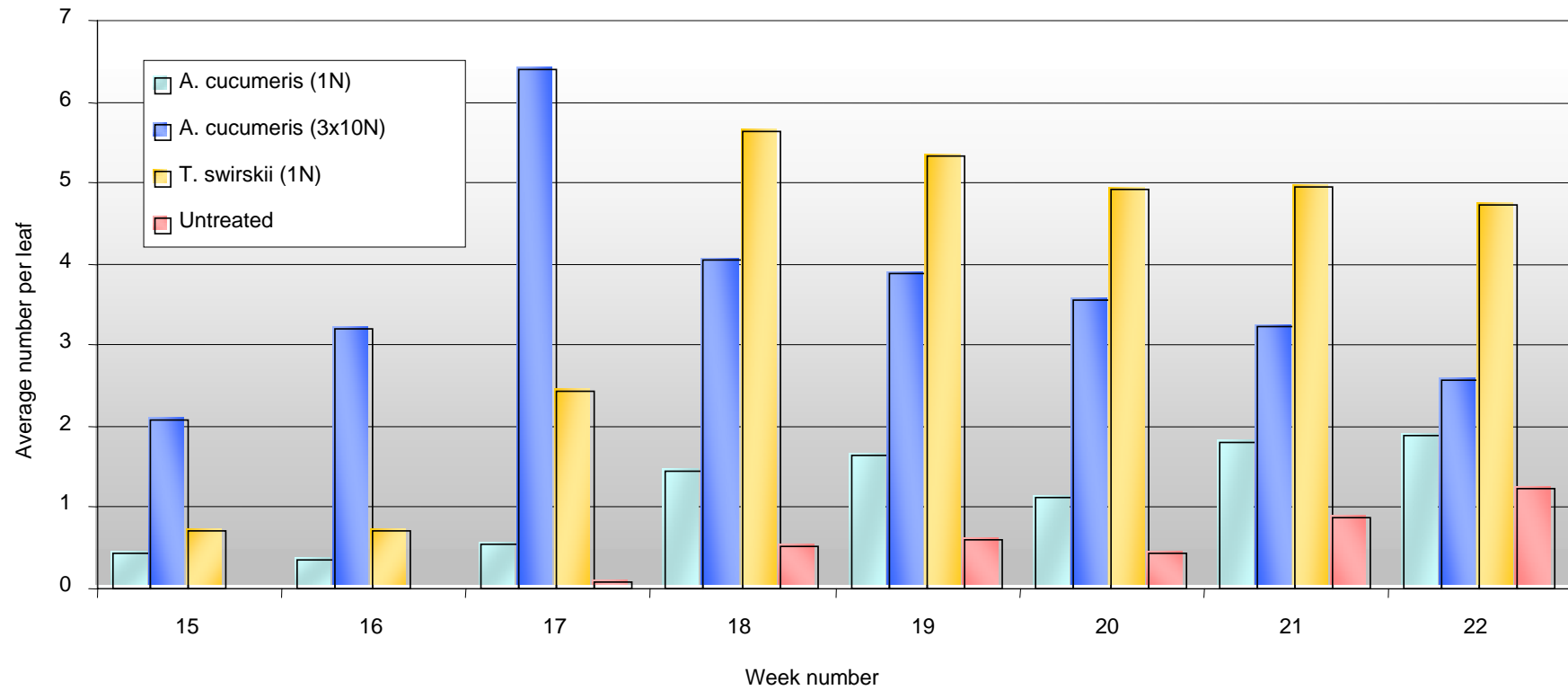


Sweet pepper: *F. occidentalis* control

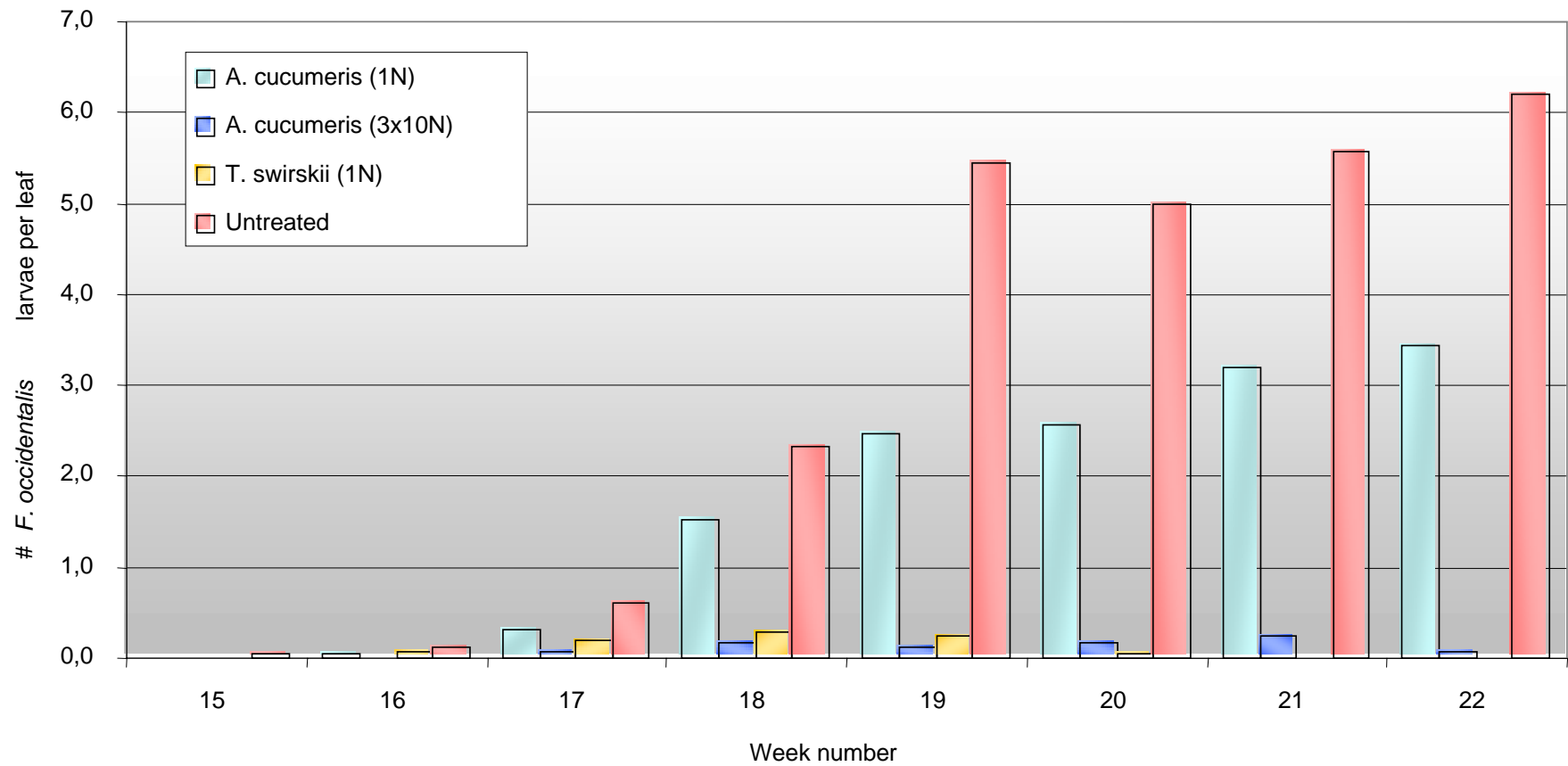
the Netherlands, semi-field trial

- 4 cages of 3 m²
- 5 sweet pepper plants per cage
 - *A. cucumeris* (1N/leaf)
 - *A. cucumeris* (3x10N/leaf)
 - *T. swirskii* (1N/leaf)
 - Untreated control
- *F. occidentalis* released 3 times 2♀ per plant

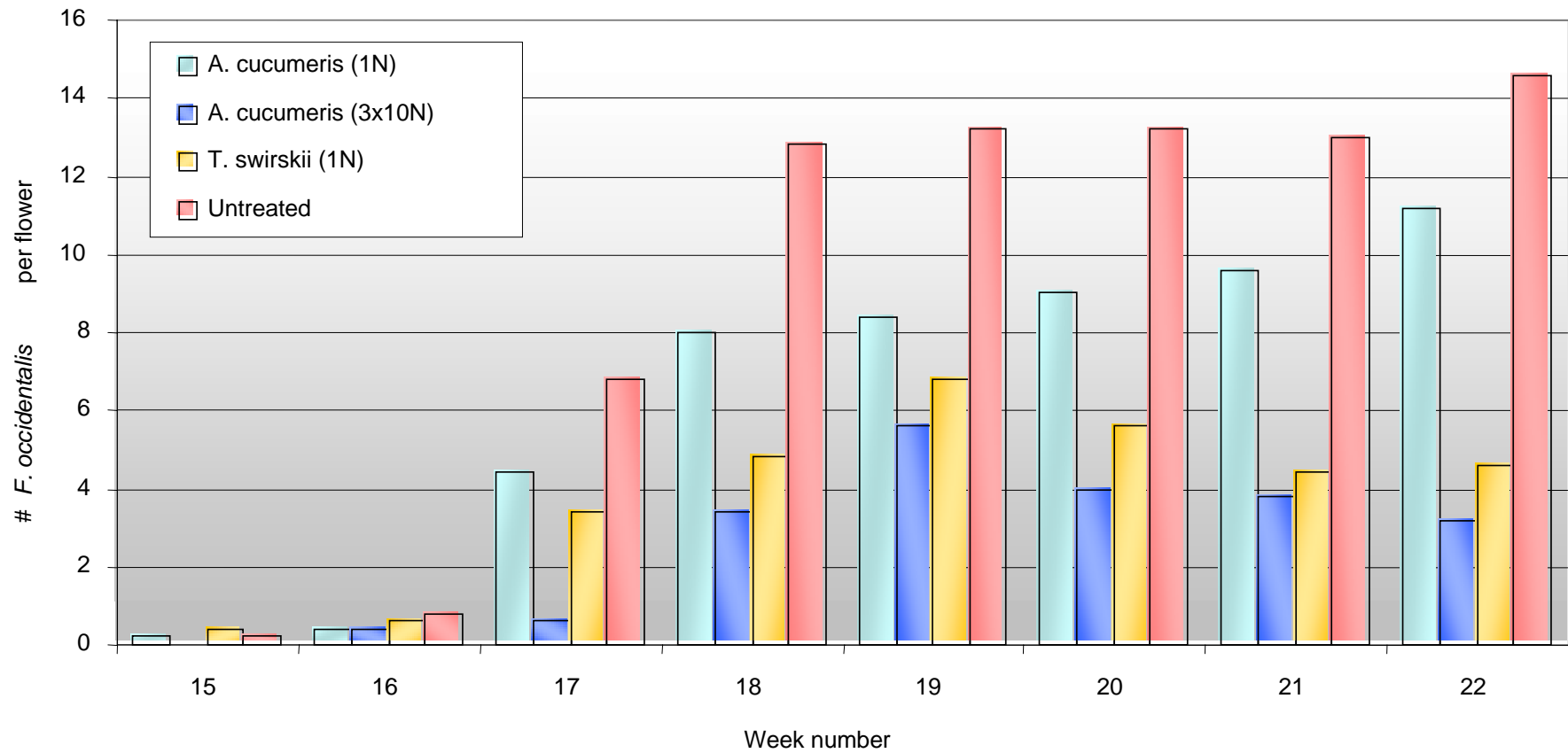
Predatory mite population



Frankliniella occidentalis
larvae on the leaves



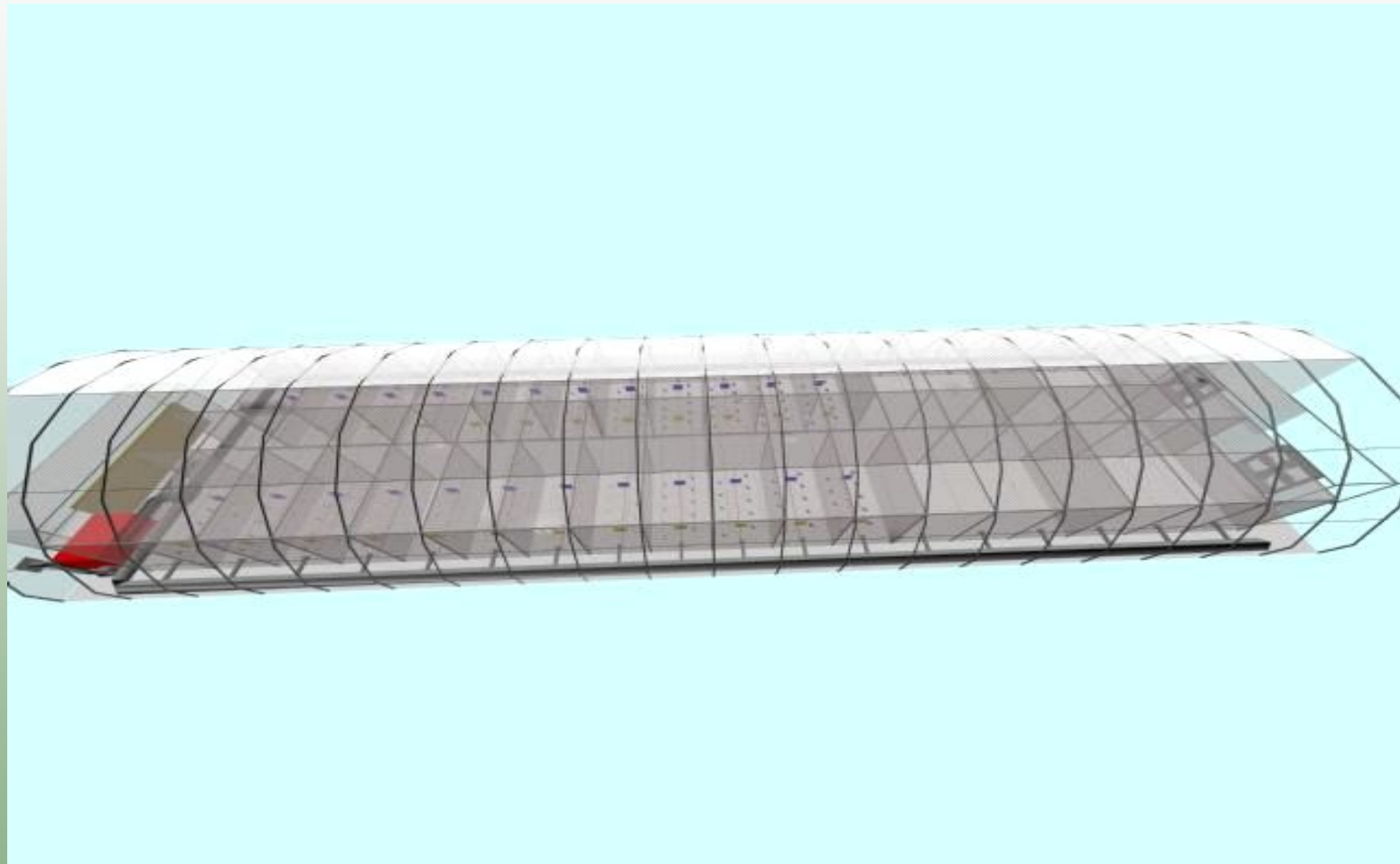
Frankliniella occidentalis
(mobile stages) in the flowers



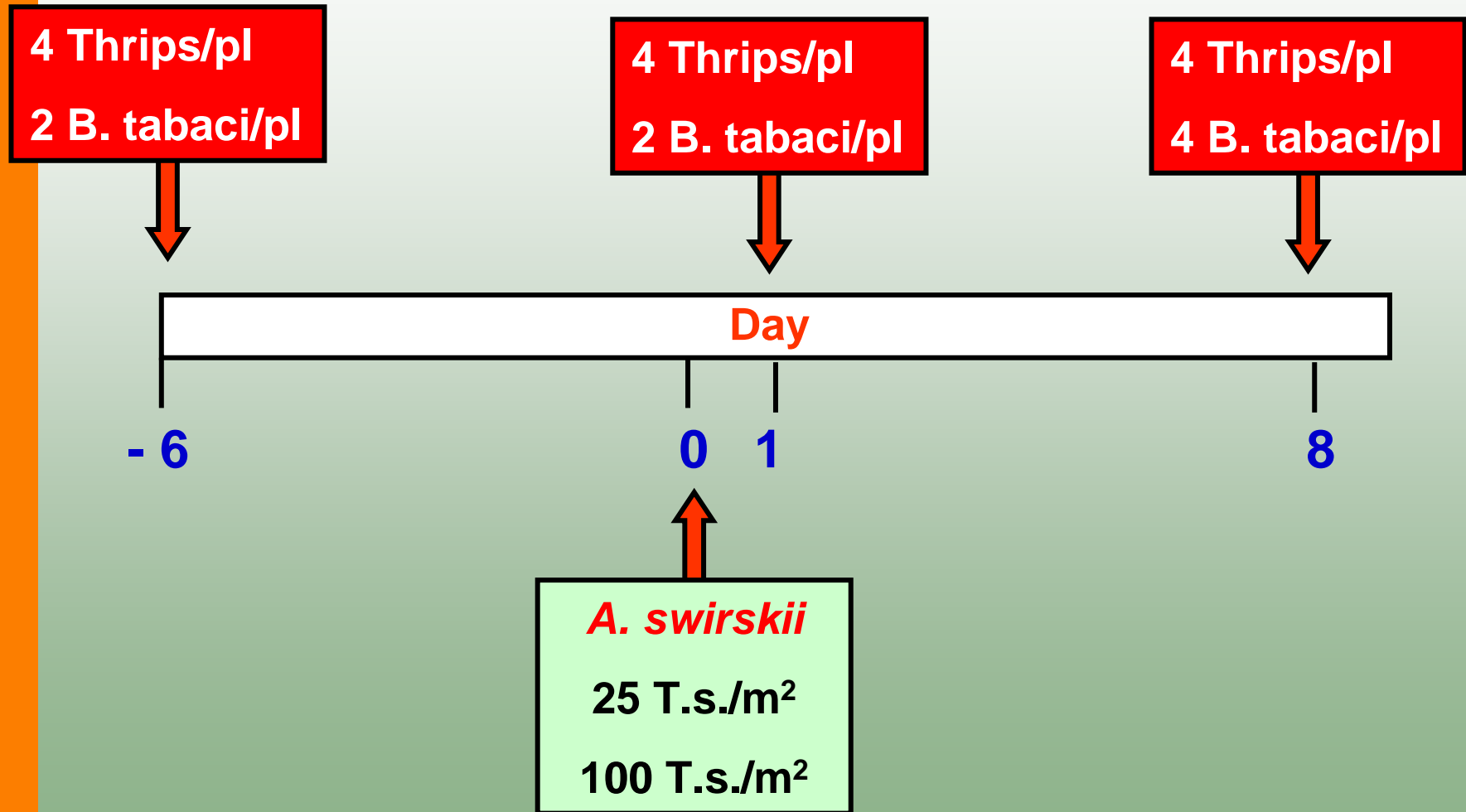
Sweet Peppers : Thrips + Whiteflies

Aguilas, Spain, semi-field trial

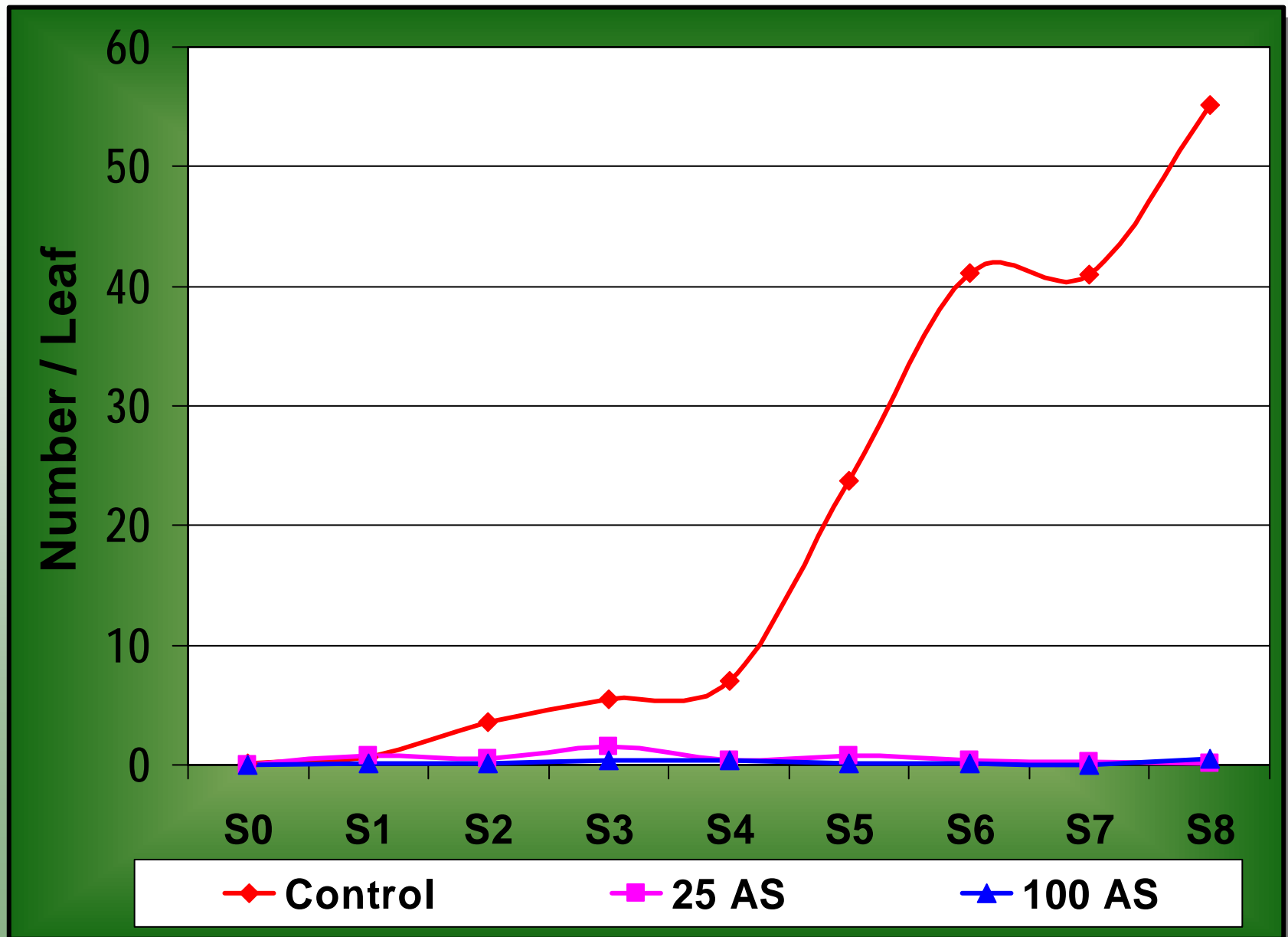
- Experimental tunnel with isolated walk-in cages
- 20 sweet pepper plants per cage
- 3 replicates, CRBD
- 3 treatments
 - Untreated Control
 - 25 *A. swirskii*/m²
 - 100 *A. swirskii*/m²



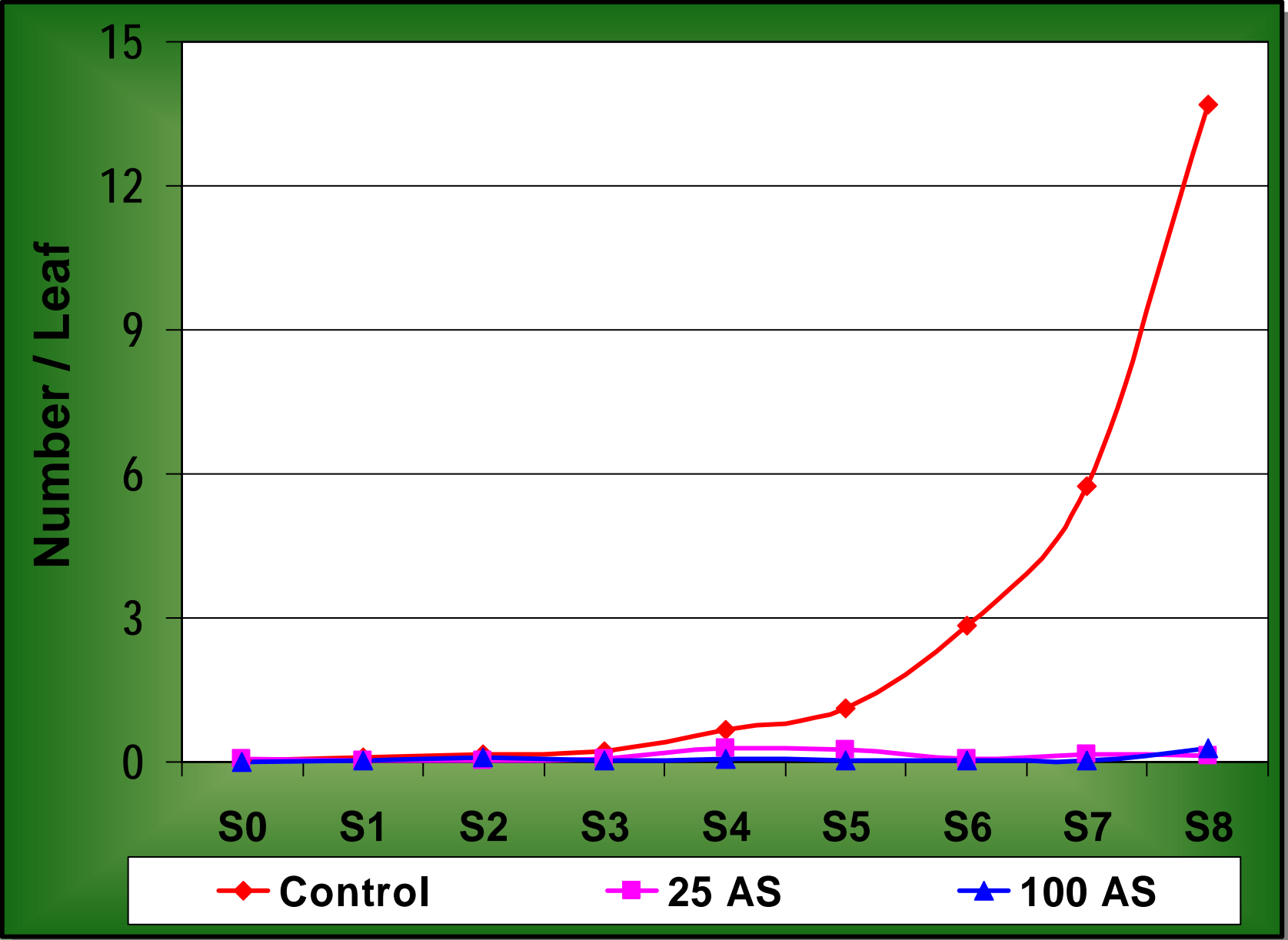
Trial Plan



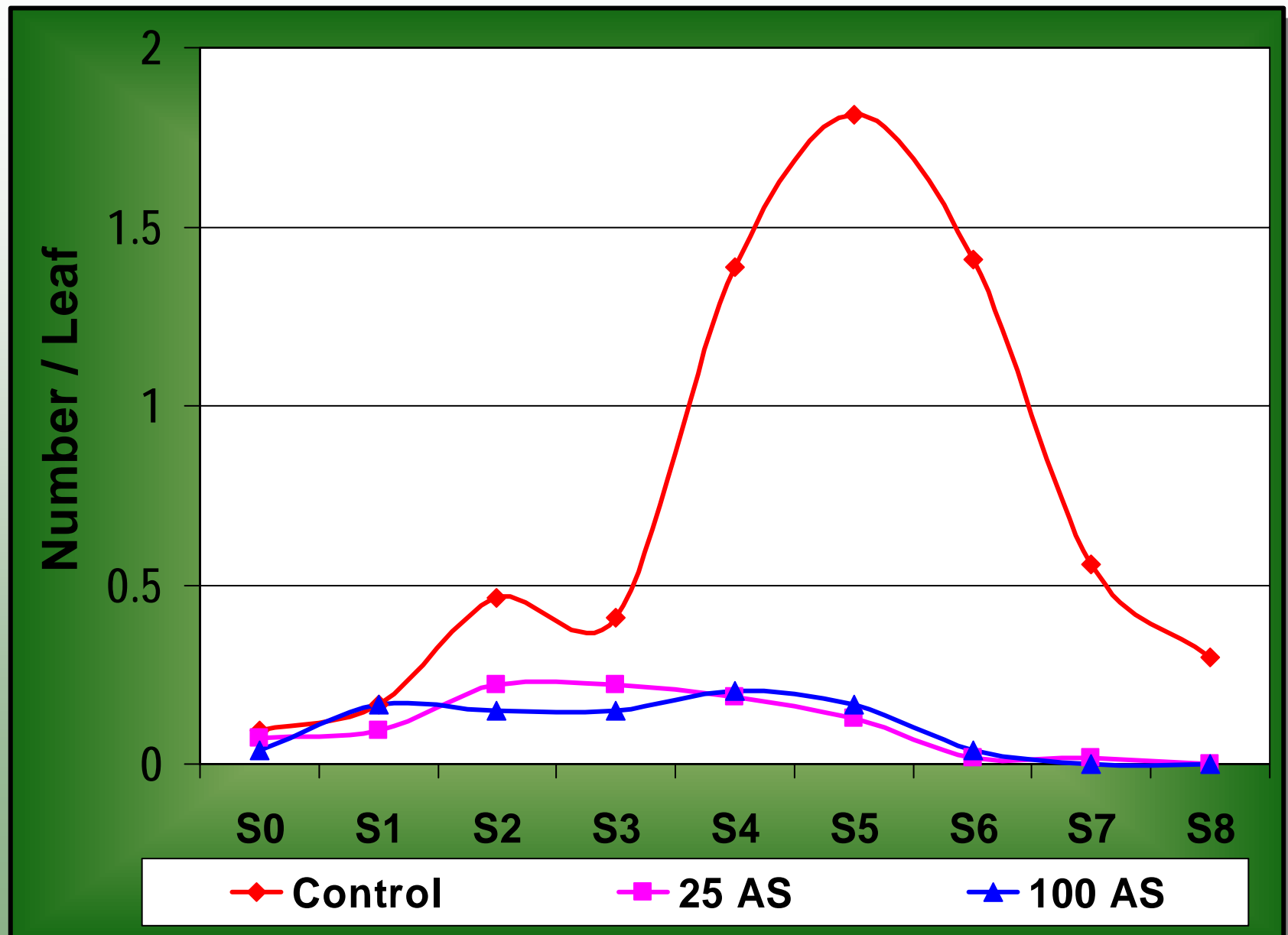
Whitefly Population: Nymphs



Whitefly Population: Adults



Thrips Population (leaves)

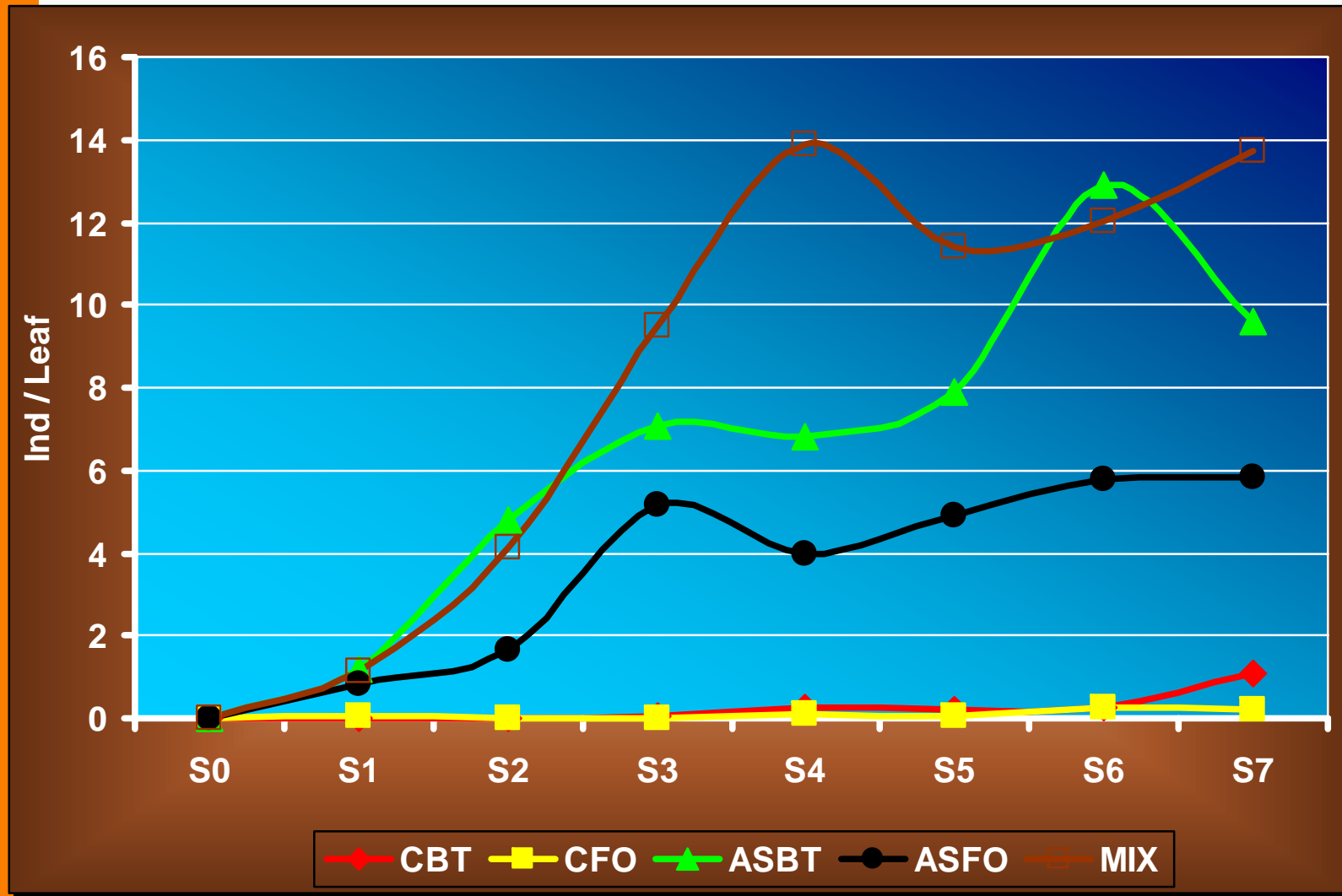


Cucumbers: whitefly and thrips control

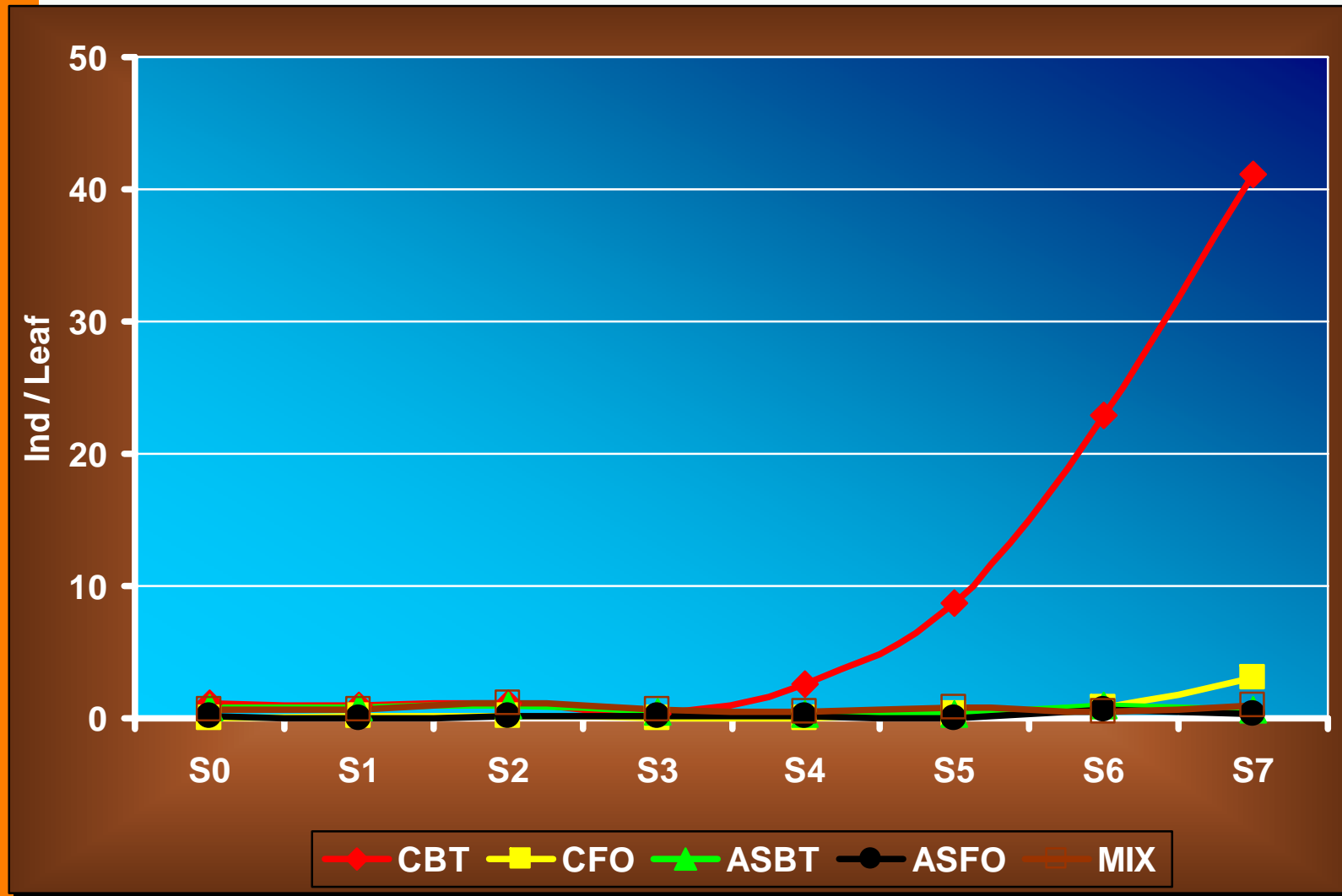
Spain, Semi-field Trial

- Date: March – April 2006
- 5 treatments @ 3 replicates (CRBD)
- Treatments:
 - CBT: 30 Bt/plant
 - CFO: 15 Fo/plant
 - ASBT: 75 As/m² + 30 Bt/plant
 - ASFO: 75 As/m² + 15 Fo/plant
 - MI X: 75 As/m² + 30 Bt/plant + 15 Fo/plant
- Infestation 3 weekly releases: B.t (10 + 10 + 10) F.o. (5 + 5 + 5)

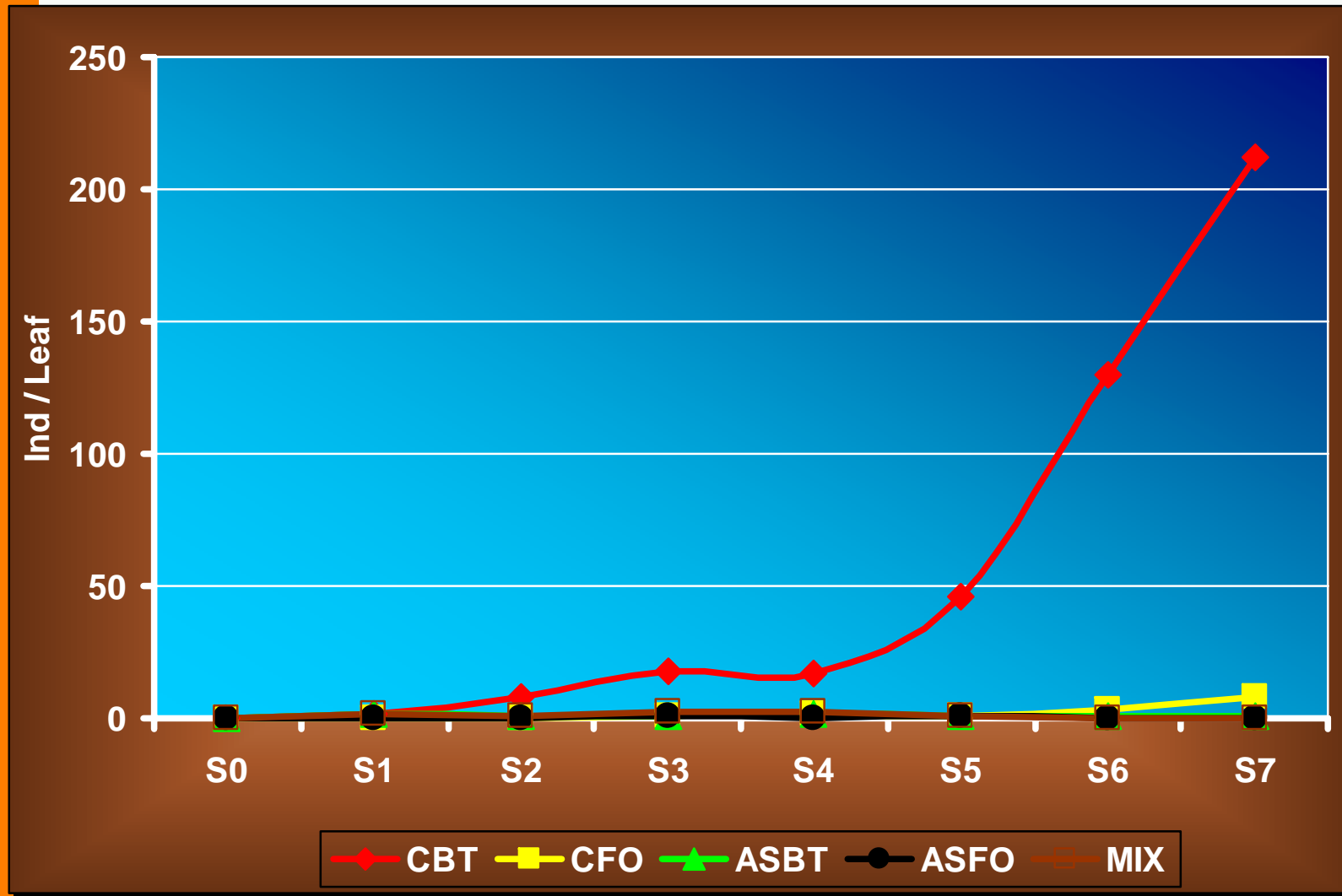
A. swirskii



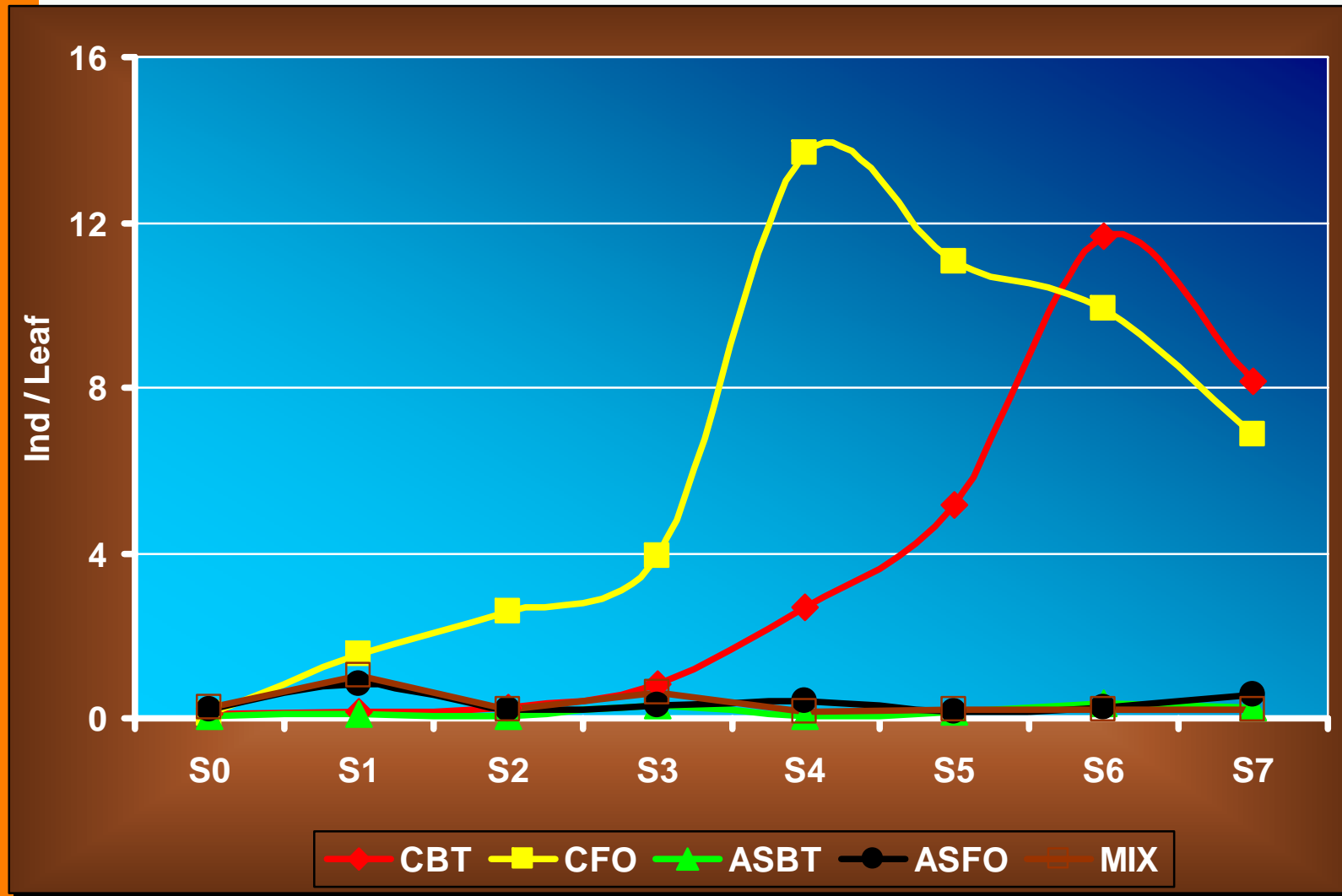
B. tabaci (Adults)



B. tabaci (Nymphs + Pupae)



Western Flower Thrips

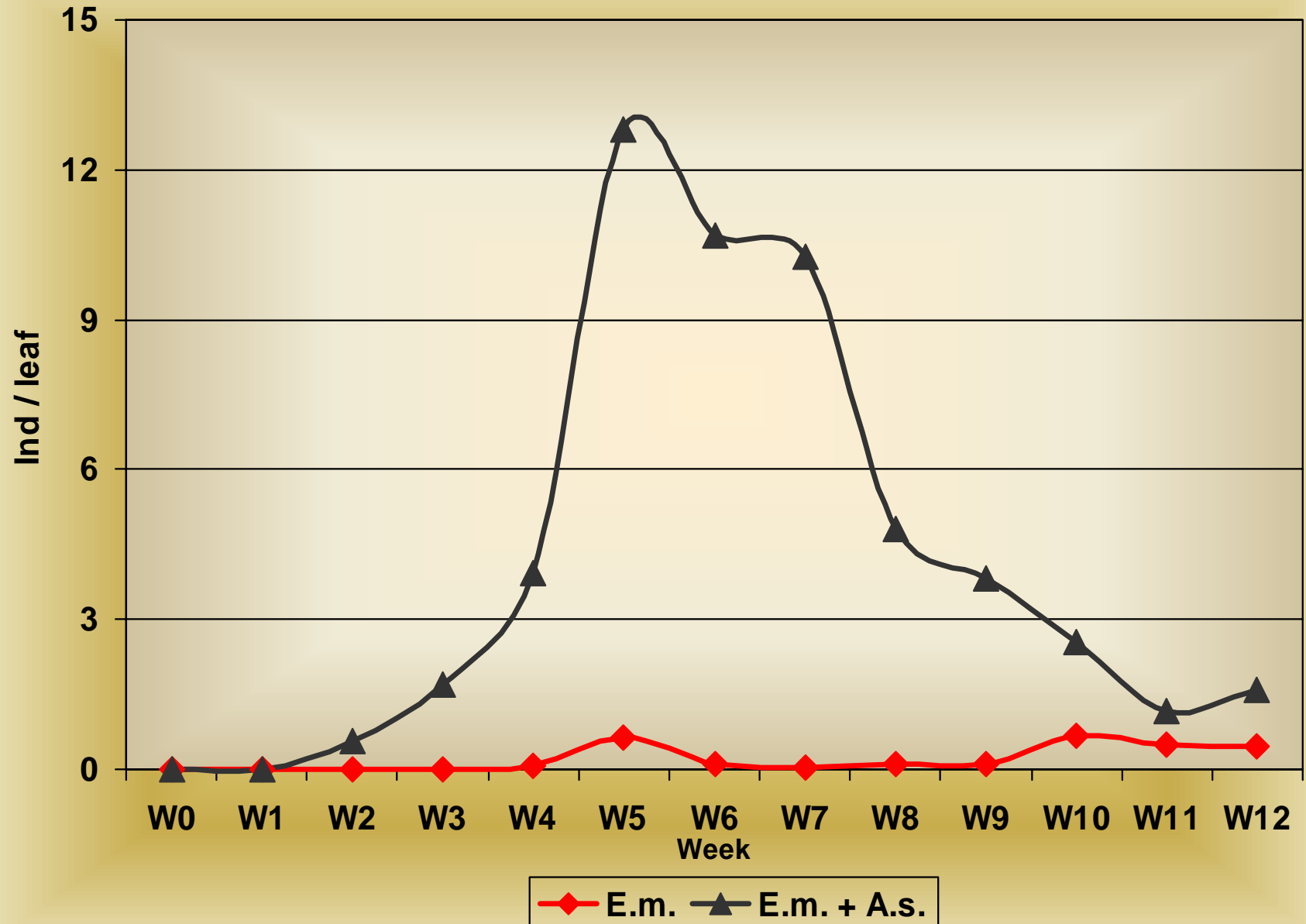


Sweet Peppers: *B. tabaci* control

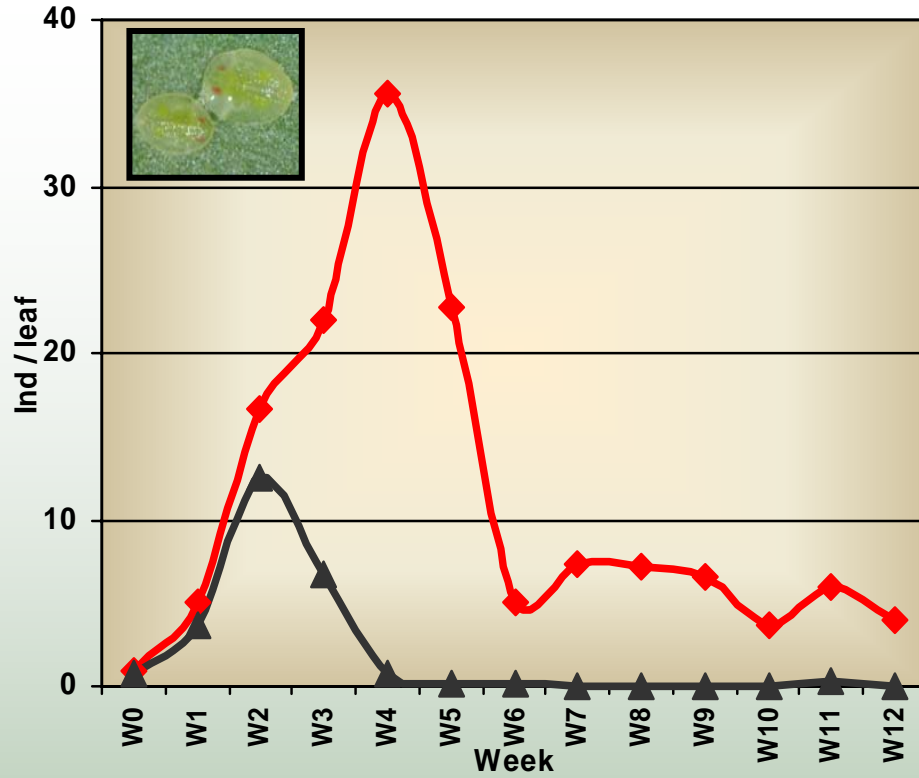
Spain, semi-field trial

- 3 replicates
- 2 treatments
 - *E.mundus*
 - *E.mundus* + *A.swirskii*
- *Bemisia tabaci*
 - 5 x 10 adults/plant
 - weekly intervals
- *E. mundus* :
 - 4 x 6/m²,
 - starting 1 week after 1st release of *B. tabaci*
- *A. swirskii*
 - 50/m²
 - 1 release, 1 week after 1st release of *B. tabaci*

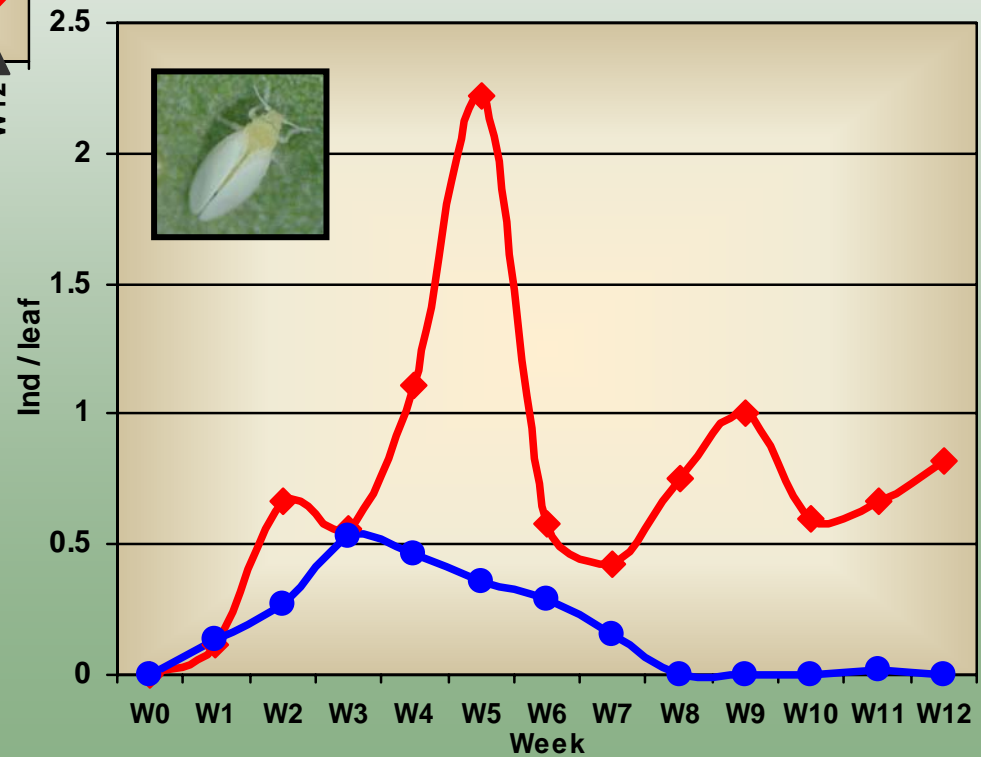
Amblyseius swirskii



Bemisia tabaci



Red = E. mundus (4x6/m²)
 Grey = E. mundus (4x6/m²)
 + A. swirskii (1x50/m²)



Mass-rearing *A. swirskii*

1. Plant pollen (e.g. *Ricinus communis*)
2. Factitious rearing host:
 - *Carpoglyphus lactis* ("Sugar Mite", "Dried Fruit Mite")
 - PCT Patent Pending (submitted 31-12-2004)

The development of a cost-effective mass-rearing method was the key to large scale use.

Product Formulations





www.allaboutswirskii.com



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All about swirskii

On this website, you can read all about the new predatory mite, *Amblyseius swirskii*. Not that we know absolutely everything. On the contrary, we are learning more and more every day. But we are keen to share what we do know with you, because we believe that this predatory mite really offers something valuable that you as a grower can use.

We believe that this is a good example of how research and practice can go together. The information from both these fields can be found on this site.

This website is a translation of a website about swirskii that was previously launched in the Netherlands (www.allaboutswirskii.nl)

Conclusions

- High numerical response to availability of food.
- Highly efficacious against western flower thrips, greenhouse whiteflies and tobacco whiteflies. Also an effect on broad mites and two-spotted spider mites.
- In combination with standard beneficials
- **Establishment**
 - Good establishment in peppers and eggplants on pollen
 - Whiteflies in cucumbers, melons and ornamentals such as gerbera and hibiscus can play the role of pollen in peppers
 - No good establishment on tomatoes
- Good results in North and South Europe
- Not cold tolerant
- Will replace *A. cucumeris* and *A. degenerans*.

Conclusions

- The development of *Amblyseius swirskii* is a good example of the role of universities, research stations and companies in the development of new biological control agents
- Marketed in Europe, USA and Canada for sweet peppers, eggplants, cucumbers, melons, beans and several ornamentals.
- Inoculative release in vegetables. Requires very little technical support.
- Can be produced at lower cost than parasitoids and predatory bugs. PCT Patent Pending technology.
- Will play a key role in the development of economic and user-friendly biological control programs in summer plantings of peppers, eggplants, beans and cucurbits in the Mediterranean.

Acknowledgements

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Thank you !