

Biological Control of Whiteflies in Organic Squash

Prof. Oscar E. Liburd &
Dr. Lorena Lopez

Entomology & Nematology Dept.
Univ. of Florida, Gainesville, FL



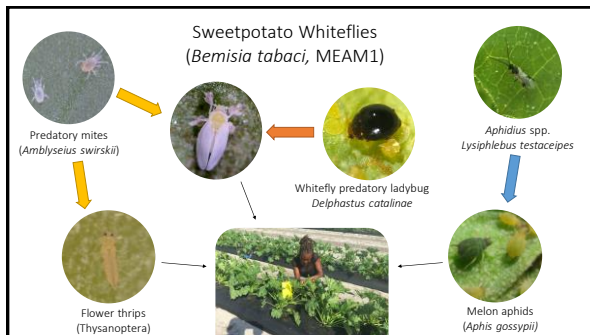
Outline

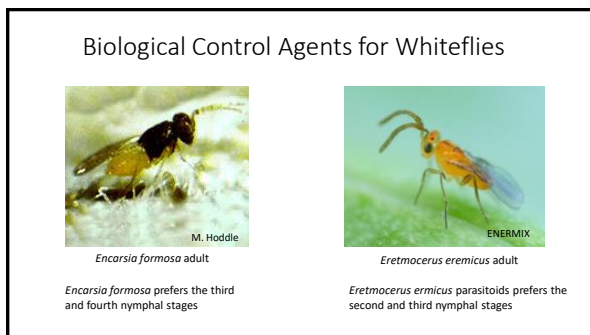
- I. Brief introduction on whitefly biology and economic importance
 - i. Common predators and parasitoids for management of whiteflies
- II. Strategies for biological control
- III. Preference studies with *Delphastus catalinae* in buckwheat and squash
- IV. Experiments evaluating release methods with *Amblyseius swirskii*
- V. Experiments with companion plants, sweet alyssum and *Amblyseius swirskii*

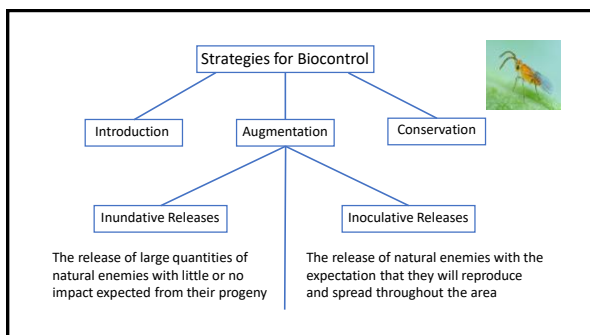
Whiteflies – Economic Importance

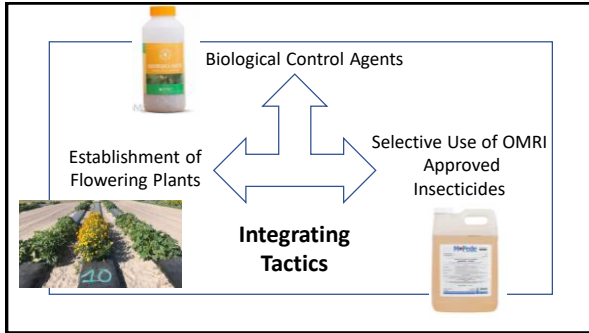
- Whiteflies, *Bemisia tabaci*, is an important pest of vegetable crops, including squash
- They injure plants by sucking cell sap, transmit viruses, and cause physiological disorders (Squash silverleaf disorder)
- Whiteflies are managed principally with soil applied systemic insecticides

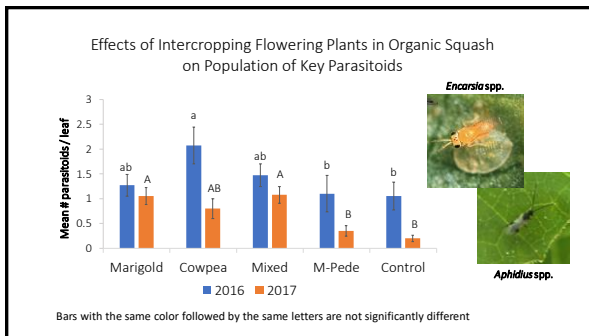












Whitefly predatory ladybug
Delphastus catalinae
(Insecta: Coleoptera: Coccinellidae)

- Specialist predator on whiteflies
- High prey consumption rates
- Long adult survival
- High reproduction rates
- Commercially available

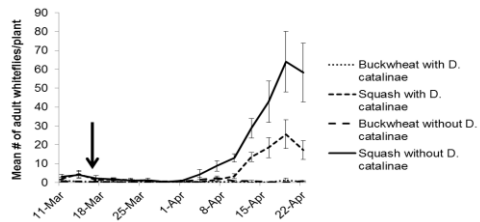
- Exclusion cages with zucchini squash, buckwheat, and whiteflies
- Evaluate densities of whiteflies, and *D. catalinae* on both squash and buckwheat

Experimental Design

- Split-plot with 4 replicates
- Main plot: Presence/absence of *D. catalinae*
- Subplot: Squash, Buckwheat

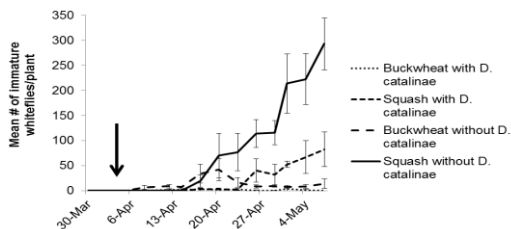


Preference of adult whiteflies MEAM1 on zucchini squash and buckwheat and the effect of *Delphastus catalinae* on whitefly populations

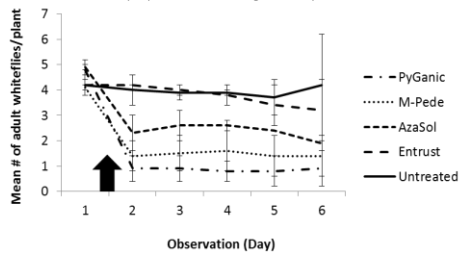


Razze et al. 2016, *Pest Management Science*, 72:1335 – 1339

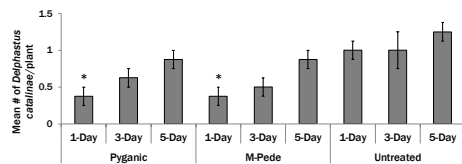
Preference of immature whiteflies on zucchini squash and buckwheat and the effect of *Delphastus catalinae* on whitefly populations



Evaluation of OMRI-Approved Organic Pesticides on whitefly population in organic squash



Effects of releasing *Delphastus catalinae* post-application of OMRI-approved organic pesticides in organic squash



PyGanic and M-Pede significantly fewer *D. catalinae* compared to untreated control

* *Delphastus catalinae* densities were significantly reduced at 1-day post-pesticide application

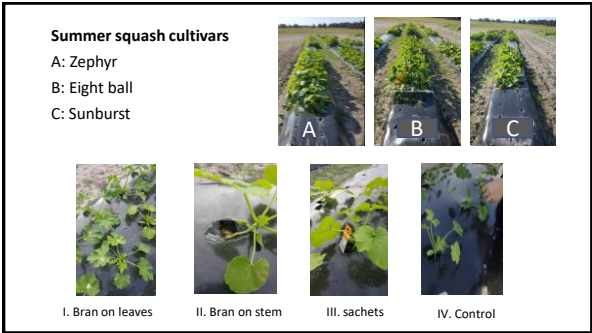
J. Econ Entomol. 109: 1766-1771

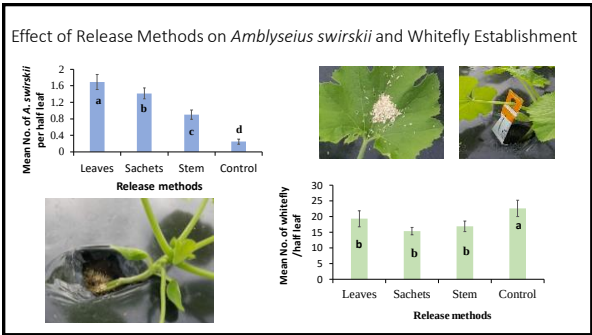
Determine the best release method for the predatory mite, *Amblyseius swirskii* in field-grown squash

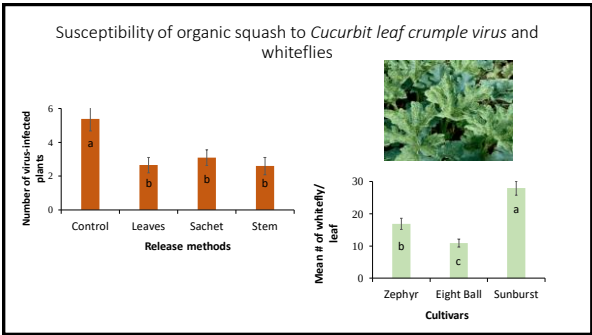
Amblyseius swirskii (Athias-Henriot) (Acari: Phytoseiidae)

- Attracted substantial interest as a biological control agent of mites, thrips, and whiteflies in greenhouse and nursery crops
- Very limited studies have been conducted under field conditions
- Prefer eggs and first nymphal stage of whiteflies
- Different formulations are available for the release of *A. swirskii*

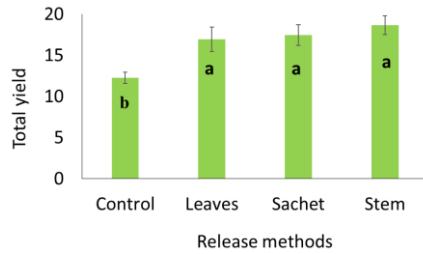








Effects of release methods of *A. swirskii* on marketable yield of organic squash



Summary and Findings

- *Delphastus catalinae* reduced whitefly population in organic squash
- M-Pede and PyGanic were the best performing organic insecticides that were compatible with *D. catalinae*.
- These insecticides can be used 3-5 days after field deployment of *D. catalinae*
- The use of companion plants increased the number of natural enemies in organic squash
- *Amblyseius swirskii* reduced whitefly population below the control treatment irrespective of the release methods
- The release methods did not affect the performance of *A. swirskii* in reducing whitefly population, viral infection, and organic squash yield

Effect of intercropping flowering plants plus releases of *A. swirskii*



Squash, 'CashFlow'



African Marigold, 'Crackerjack'

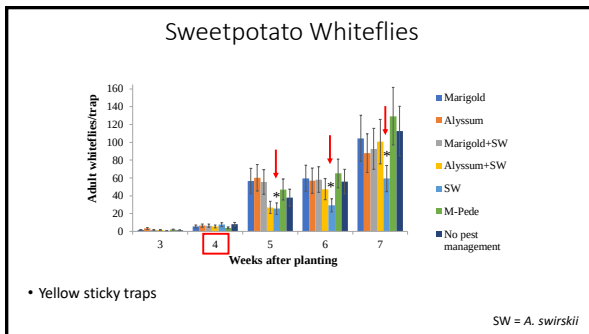


Alyssum, 'Tall White'

Main crop

Companion plants





Lessons Learned

Sweet alyssum

- Not used by predatory mites
- No aphids or whiteflies
- Fewer aphids in the squash
- Attractive to predatory flies and minute pirate bugs
- Hosted few thrips

Marigold

- Not used by predatory mites
- Hosted aphids
- More aphids in the squash
- Attractive to minute pirate bugs
- Hosted lots of thrips. Trap crop for thrips?

+
Predatory mites

On-Farm Trials

How does **predatory mites** and **flowering strips** impact:

- Pest and predator distribution?
- Pest suppression?
- Organic squash yield?

Sweet alyssum
intercropped with three
summer squash varieties



Squash cultivars



Green zucchini
'Cash Flow'



Yellow zucchini
'Gold Rush'



Summer squash
'Zephyr'

Flowering
plant



Alyssum
'Tall White'

Summary

- Predatory mites established and dispersed successfully regardless of the squash variety
- Sweet alyssum together with *A. swirskii* reduced aphid and whitefly populations, as well as silverleaf disorder in open field squash
- These combined practices reduced the need to spray pesticides during the season (reduced pest management costs)



Acknowledgements



- USDA-NIFA Organic Agriculture Research and Extension Initiative (OREI), grant # AWD04921. Titled *"Development and Implementation of Biological Control Tactics for Key Vegetable Insect Pests in the Southeastern US"*

- All members of the Small Fruit and Vegetable IPM lab

Thank you!