

Managing Insects Sustainably in Vegetables:

Implementing Old Strategies with New and Better Tools

Susan Webb, Assoc. Professor,
Entomology and Nematology
Dept.



Overview

- IPM revisited—basis for sustainability
- Techniques
 - Metalized reflective mulch
 - Row covers
 - Borders and banker plants
 - Trap crops
 - Insecticides

Integrated Pest Management

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THE INTEGRATED CONTROL CONCEPT¹

VERNON M. STERN, RAY F. SMITH, ROBERT van den BOSCH,
and KENNETH S. HAGEN²

ALL ORGANISMS are subjected to the physical and biotic pressures of the environments in which they live, and these factors, together with the genetic make-up of the species, determine their abundance and existence in any given area. Without natural control, a species which reproduces more than the parent stock could increase to infinite numbers. Man is subjected to environmental pressures just as other forms of life are, and he competes with other organisms for food and space.

Utilizing the traits that sharply differentiate him from other species, man has developed a technology permitting him to modify environments to meet his needs. Over the past several centuries, the competition has been almost completely in favor of man, as is attested by decimation of vast vertebrate populations, as well as populations of other forms of life (Thomas, 1956).

Constraints to the use of IPM

- Complexity and specificity of farmscaping and other methods that do not use pesticides
- Expense and time for implementing methods that will allow reduced use of pesticides
- Expense of augmenting biological controls agents
- Complexity of developing and using thresholds, expense of scouting
- Demand for “perfect produce”

Metalized reflective mulch

- First reports of repellent properties in 1964 by Kring and Smith et al.
- Report of tests in Florida in 1968 (Wolfenbarger and Moore in Homestead)
- Original materials included aluminum foil, paper-backed aluminum and laminated plasticized aluminum
- Repelled aphids and leafminers, attracted bees

Metalized reflective mulches

- Quality much improved
- Severity of problems with insect-vectored viruses has led to increased use
- Cost justified with high value crops



Row covers

- Originally developed for frost protection and to promote early yield
- First commercial use of polyethylene row covers was in California in 1958
- Later, floating, spun-bonded polypropylene covers were developed (1980s) that are draped over plants
- Different weights, with heavier for frost protection

Floating Row covers

- Lightweight row covers will exclude pests but must be removed for pollination (if needed)
- It may be possible to reuse them—more UV-resistant than at first
- High cost and disposal issues





Squash plant on left recently uncovered. On right, a plant from a check plot (no mulch, no cover) showing severe virus symptoms and damage from pickleworm.

Beetle banks and borders

- Beetle bank term dates from early 1990s
- Perennial plants in hedgerows increased beneficial insects
- Flowering plants in and around crops sustain beneficials



Tithonia photo from EdenBrothers.com

Buckwheat



Trap crops

- First report of the use of a trap crop was in 1860 (parsnips in carrot plantings)
- More recent work by Mizell et al. (2008, Proc. FSHS 121:377-382) with trap crops for stink bugs and leaffooted bugs
- Triticale, sorghum, buckwheat, sunflower and millet were all attractive
- Determining location and size of trap crop planting is complex

Trap crops

- Trap crops (sunflowers for stink bugs, collards for diamondback moth)
- This plant attracted leaf-footed bugs (photo, R. Hochmuth)
- Plant in outside border, not within the crop
- Distance and location important



Trap crops

- If the trap crop is also for attracting beneficials, then a succession of plantings is important
- Buckwheat flowers quickly (40-45 days from seed). Plant early to attract beneficials in vegetable plantings
- Trap crops specifically for pests can be treated with insecticide before pest moves to crop

Insecticides for Organic Production

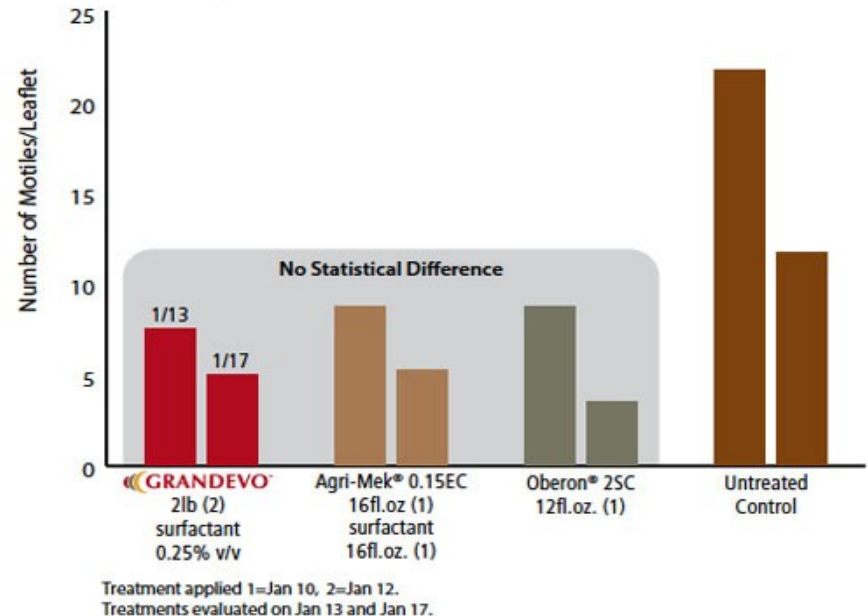
- Organic growers under increasing pressure to provide cosmetically perfect produce for wholesalers
- Result is greater insecticide use
- National standards and increased market share have led to development of more products for this market

Insecticides for organic production

- Grandevo, (Marrone Bio Innovations)
- Bacterial product, broad spectrum, long residual
- 4-hour reentry interval, 0-day preharvest interval
- Good results in tests against whiteflies, spider mites, and beet armyworm

From Marrone Bio Innovations
Brochure

Twospotted Spider Mite on Strawberry
(*Tetranychus urticae*)
J. Price, Wimauma, FL 2012



Insecticides for organic production

- PFR-97 20% WDG (Certis)—a fungus, also broad spectrum, but particularly for whiteflies
- Certis has strong emphasis on products for organic production
- A premix: Azera (MGK), pyrethrins and azadirachtin
- <https://attra.ncat.org/attra-pub/biorationals/index.php> searchable database, by pest or product, but not current (2011)

Sustainable systems

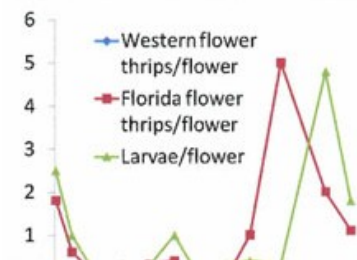
Managing Thrips in Pepper and Eggplant¹

Joe Funderburk, Stuart Reitz, Phil Stansly, Steve Olson, David Sui, Gene McAvoy, Alicia Whidden, Ozan Demirozer, Greg Nuessly, and Norm Leppla²

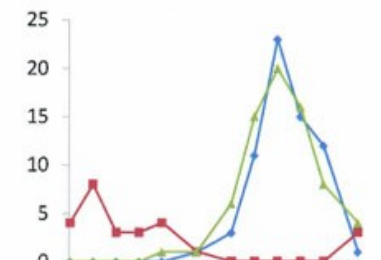
Several invasive species of thrips have established in Florida and become pests of vegetable, ornamental, and agronomic crops. Damage to crops results from thrips feeding and egg-laying injury, thrips vectoring of plant diseases, the cost of using control tactics, and the loss of pesticides due to resistance.

The key pest thrips in pepper and eggplant is the western

PALM BEACH COUNTY 1995/96



PALM BEACH COUNTY 2006/07



Thrips in peppers and eggplant

- Development for south Florida driven by new pests (western flower thrips and TSWV) and insecticide resistance



Feeding damage caused by WFT-
photos, J. Funderburk



TSWV symptoms on pepper

Thrips in peppers and eggplant

- Incorporates economic thresholds, scouting, conservation biological control, reduced-risk insecticides, reflective mulch
- Also, nutrient management, refuge plantings (Mexican sunflower, Spanish needles), cultural practices, augmentation with predaceous mites
- Kaolin clay may be alternative to reflective mulch in the winter months
- Push-pull strategy pushes pests away, attracts beneficials

Living IPM Extension Field Laboratory

- Suwannee Valley Agricultural Extension Center
- Small farm perspective
- Farmscaping, trap cropping, attraction of bats and birds
- Multiple crops
- Scouting, reduced pesticide use
- Demonstration, effects not fully documented yet

Conclusions

- Most of our methods and strategies are not new
- IPM and sustainable systems are still complex and specific to location and cropping system, costly to develop
- Development and adoption will be driven by need and lack of alternatives