

Working the Wild Side of Biocontrol: Banker and Guardian Plant Decisions Explained

Carol S. Glenister

IPM Laboratories, Inc.

TriState IPM Workshop: ME, NH, VT

January 7 - 9, 2014

Predators, Beneficials and Biological Control of
Greenhouse and High Tunnel Insect and Arthropod Pests



Guardian Plants

In 2005, we began putting plants to work as pest management tools

In the process, we learned that plants can both pull pests and support their natural enemies

Indicator and trap plants pull pests

Habitat and banker plants support natural enemy reproduction

The term Guardian Plant includes all these functions

Banker Plant

You grow “pests” on this plant on purpose to support natural enemy establishment.

Ideally, the banker plant “pest” does not attack your crop.

Examples:

Aphid banker plants: barley with grain aphids support aphid parasites and predators

Corn plants with banks grass mite supports predatory mites, Stethorus, and Feltiella

Aphid Guard Banker Plant

Cereal aphid on barley to host *Aphidius colemani* or *Aphidoletes*



Bug Dorm 2 Rearing Cage

www.bioquip.com

~\$50 with freight

Tight

Washable

Collapsible

Specify the fine
screen!! 1462W



Banker Plant Production Decisions

- G Grow more banker plants from your clean aphid stock
- B Buy fresh banker plant aphids and cage them for a couple of weeks
- C Coast: Shut down cage. Let the current banker plants run their course but do not grow or buy more
- D Discontinue the banker plants completely. Remove them from the greenhouse

Trap Plant

You know that pests love this plant, so you lure them to this plant and then kill the pests on the “trap” plant.

Death comes from natural enemies, pesticides, or plant removal.



Plants that are good “Pullers”

- | | Pull Ratio |
|---------------------------------|-----------------|
| • Eggplants: WF, SM, Aphids | 55 GHWF bed pl |
| • Lantana: WF | 79 GHWF herbs |
| • Marigolds: Thrips, SM, WF | 20 Thrips herbs |
| • Peppers: Aphids | |
| • Sweet alyssum: Thrips, Aphids | |
| • Tomatoes : WF | |
| • Fuchsia, Garten Mister : WF | |

WF: whitefly SM: spider mites

Habitat Plant

You grow this plant in order to support beneficials. It does not necessarily have to have pests on it, but it may.



Guardian Plants are like wild cards

- For example, a marigold can act as trap, banker and habitat all at once, or may only serve one function at a time.
- There is a difference. You designate the function of a wild card whereas you have to discover what the Guardian plant is accomplishing.
- If the predators or parasites are not taking over, you must be the “predator”

Mark Zittel, Karen Dean Hall and Robert Hadad at Amos Zittel and Sons in Eden, NY in 2010

- Looking for spider mite predatory mites in eggplant inter-planted with snap beans.



Marigolds in sweet peppers to attract and support Orius before the peppers flower in 2011, 2012, and 2013



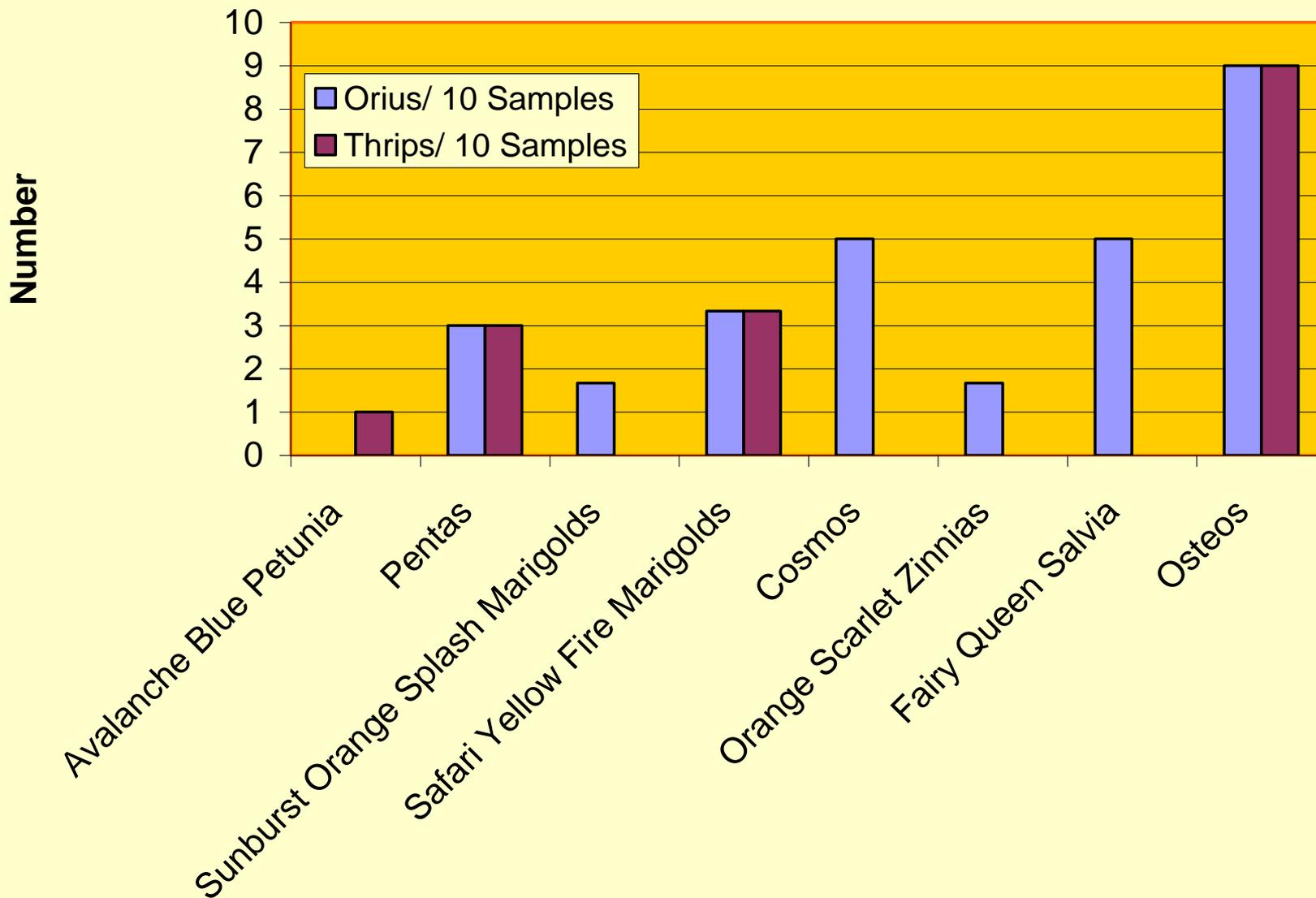
A Real World Ideal Orius/Thrips Outcome in Flowers

Stokes Seed Variety Trial Gardens, Thorold, Ontario



Thrips predator and thrips observations per 10 samples

Stokes Seed Variety Trial Gardens August 16, 2007



Conclusions on natural balance in an outdoor trial garden

- Orius nearly 1.8 times as frequent as thrips. The pest to natural enemy ratio was 0.56
- A maximum of 2 Orius observed per sample with an average of 1 Orius per 3 samples
- No thrips observed on Pentas, Cosmos, Sunburst Orange Splash, Zinnias, Salvia.
- No Orius observed on Petunias.
- No thrips occurred in one of the flowers that had an Orius.

Balance Ratio

- Number of Pests per Beneficial:
0.56 in the trial garden

Habitat pot in retail herb greenhouse, 2005



- 12" hanging basket
- 3 marigold (Bonanza)
- 3 alyssum
- 1 lantana
- 1 fennel
- 1 barley banker plant for aphids

In same Habitat Pots: Clean
young lantana leaves, parasitized
whitefly scale on older leaves



7 out of 9 whitefly scales on
lantana leaf parasitized by Encarsia

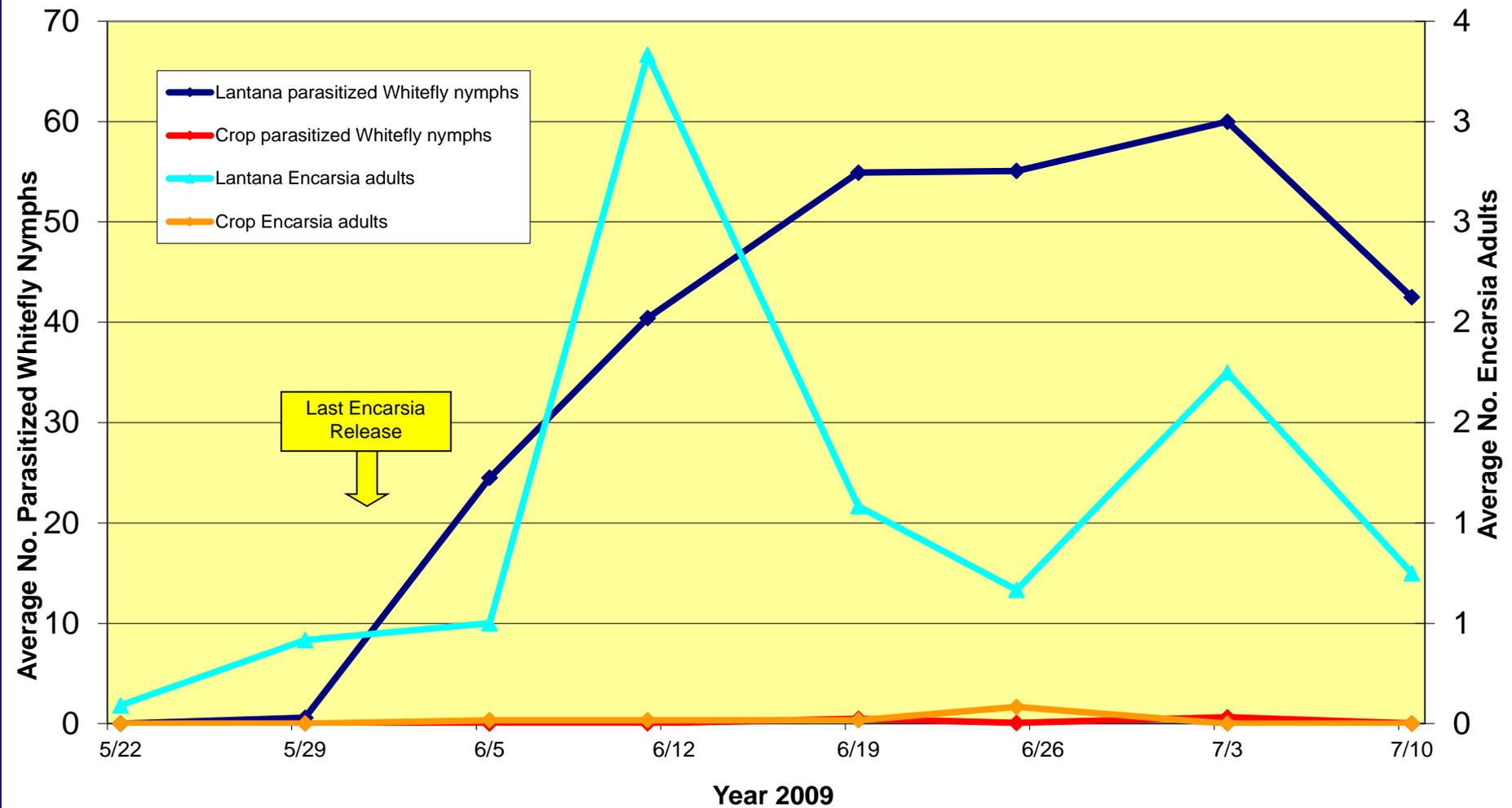


Lantana in herbs 2009 trial

- one lantana plant in 4.5 inch pot per table, 6 tables, 2 branches sampled per plant weekly
- 10 whole herb plants sampled weekly as “crop” per table, each table with different herbs
 - scented geranium
 - lemon balm/lemon verbena
 - oregano and mint
 - salvia
 - catnip and mixed herbs
 - stevia
- Records of # of all stages of whitefly and Encarsia

11 Weekly releases of
Encarsia
March 9 to June 1

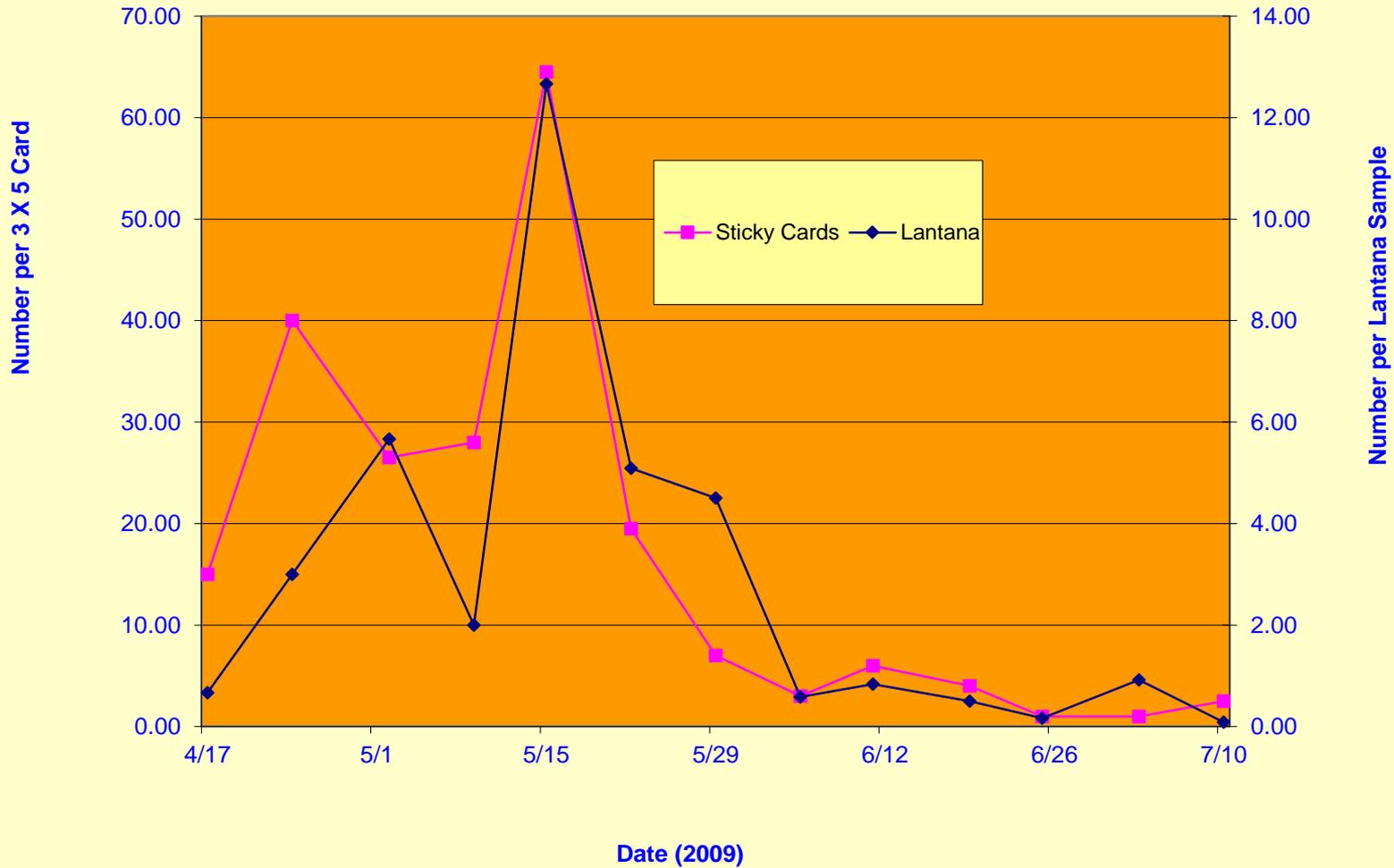
Average No. Parasitized Whitefly Nymphs & Average No. Adult Encarsia on the Lantana Guardian Plant versus the Crops



Proportion of observations with immature Ef: .88

Lantana & Yellow Sticky Cards

Average Number of Whitefly Adults (Entire Season)



Metrics for Guardian Plant Selection

- Pull Ratio ($\frac{\text{\#pests on GP}}{\text{\#pests on crop}}$)
- Suitability as habitat for beneficials

Metrics for Guardian Plant Management

- Pest frequency in crop (% plants with pests)
- Balance Ratio ($\frac{\text{\#pests}}{\text{\#natural enemies}}$)
- Presence of immature beneficials (Y or N)
(are the beneficials multiplying?)

Balance ratio and immatures much easier to determine on Guardian Plant because pests and beneficials are so concentrated there and so rare in crop

Whitefly/Encarsia Metrics on Lantana in Herbs 2009

Metric	Median	Min	Max
Pull Ratio	79	56	203
Balance Ratio	0.6	0.16	397
Pest frequency in crop	0.13	0.08	0.33

- Encarsia-blackened whitefly immatures in 88% of 8 observations between May 22 and July 10
- But from April 17 to May 15, only 1 observation of immatures. Only adult Encarsia seen and these are from the weekly Encarsia introductions

Guardian Plant Decisions

- B Buy more beneficials to supplement what you have
- C Coast: Let the current natural enemies do their thing
- D Discontinue the Guardian Plants. Remove them from the greenhouse, CAREFULLY (in bags)
- P crop: Pesticides on the crop
- P GP: Pesticide on the Guardian Plant

When Nature Talks: LISTEN

- Keep Alert
- Watch and Analyze
- DON'T PANIC

Collaborators

Reenie Sandsted and Cathy Kessler of Baker's Acres of N.
Lansing, NY

Lloyd Traven and Joe Volpe of Peace Tree Farm
Kintnersville, PA

Mark Zittel of Amos Zittel and Sons, Eden, NY

Acknowledgements

- USDA Northeast Sustainable Agriculture Research and Education Grants ONE05-03, ONE06-056 and ONE07-071
- Joe Ogradnick, NYS Agricultural Experiment Station
- Dr. Kevin Zippel,
Michelle Ten Eyck, and
Dr. Sally Newman
- NE IPM Center Grants 3376-IPM-USDA-2103 & 3613 IPML-USDA-8446
- Margaret Skinner and Cheryl Frank, University of Vermont

Banker Plant Production Decisions

- G Grow more banker plants from your clean aphid stock
- B Buy fresh banker plant aphids and cage them for a couple of weeks
- C Coast: Shut down cage. Let the current banker plants run their course but do not grow or buy more
- D Discontinue the banker plants completely. Remove them from the greenhouse

Guardian Plant Decisions

- B Buy more beneficials to supplement what you have
- C Coast: Let the current natural enemies do their thing
- D Discontinue the Guardian Plants. Remove them from the greenhouse, CAREFULLY (in bags)
- P crop: Pesticides on the crop
- P GP: Pesticide on the Guardian Plant

Thrips/Orius Metrics on Marigolds in Vegetables

Metric	Median	Min	Max
Pull Ratio	27	22	39
Balance Ratio	6	2	17
Pest frequency in crop	0.5	0.3	0.6