High Tunnel Pest Management

David Orr
NCSU Entomology

3 Keys to IPM

1. Know Your Friends

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Most Relevant NCSU Entomology IPM Specialists:

Mark Abney

Stephen Bambara

Steven Frank

3 Keys to IPM

1. Know Your Friends

2. Know Your Enemies

High Tunnel Pests

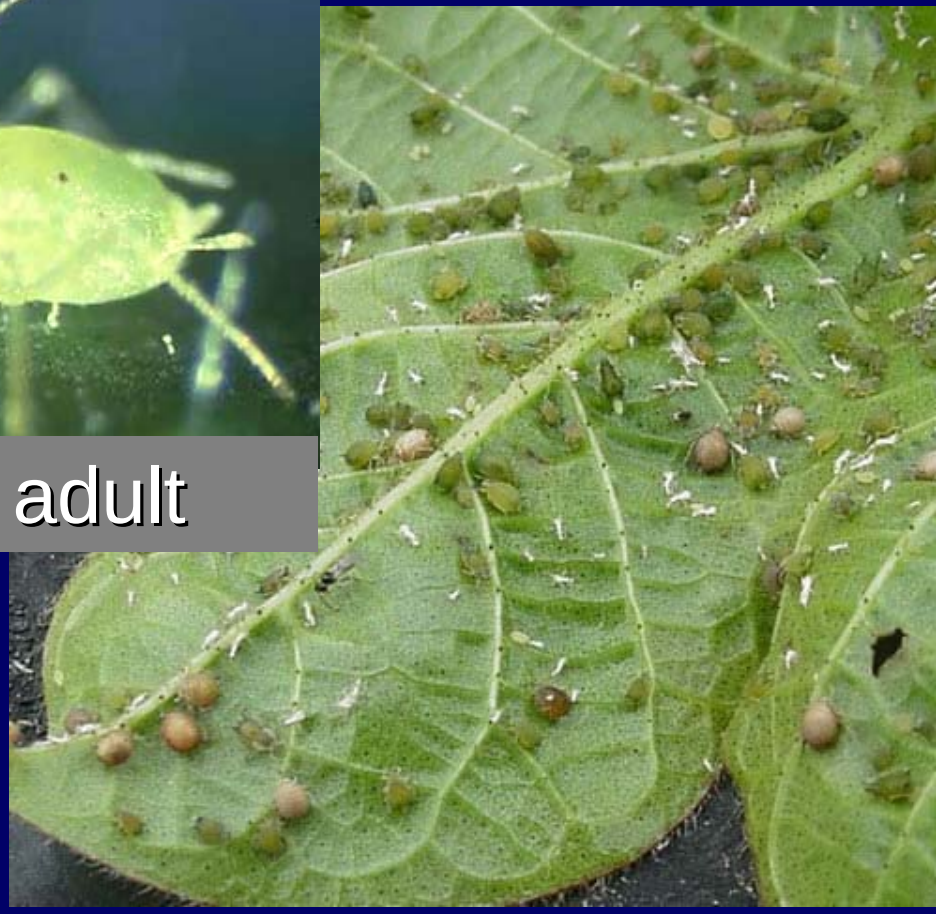
Aphids

Whiteflies

Aphids - Damage

Aphid adult

Direct and



Indirect Crop Damage

Identification of Aphids

Scouting For Aphids

Whiteflies - Damage

Whitefly Immatures, Adult

Direct and Indirect Crop Damage

Identification of Whiteflies

Greenhouse Whitefly

‘Hamburger’

‘non-tented’ wings

Bemisia Whitefly

‘Fried Egg’

‘tented’ wings

Sampling For Whiteflies

3 Keys to IPM

1. Know Your Friends

2. Know Your Enemies

3. Know Your Natural Enemies

Natural Enemies For Aphids

- **Aphid Wasps**

  -larvae parasitic on aphids

  -native and commercial

mummy

Natural Enemies For Aphids

- ***Lysiphlebus testaceipes*** **(Hym.: Braconidae)**

  -native

  -attacks wide variety of aphids

  -commonly found in high tunnels

Natural Enemies For Aphids

Aphidius colemani
(Hym.: Braconidae)

- Control of aphids, including *A. gossypii* and *M. persicae*
- Introduced as mummies/adults
- Mummies w w/o granular carrier
- Inoculative releases

Natural Enemies For Aphids

- **Aphidoletes**

  -Aphid midge

  -Larvae are aphid predators

Aphid midge adult

Larvae

Natural Enemies For Whiteflies

Greenhouse Whitefly

Encarsia formosa

Bemisia Whitefly

Eretmocerus eremicus

Natural Enemies For Whiteflies

Encarsia formosa
(Hym.: Aphelinidae)

- **Control of greenhouse whitefly**
- **Cards with pupae**
- **Inoculative releases**
- **Most commonly used beneficial organism in greenhouse crop production.**

Natural Enemies For Whiteflies

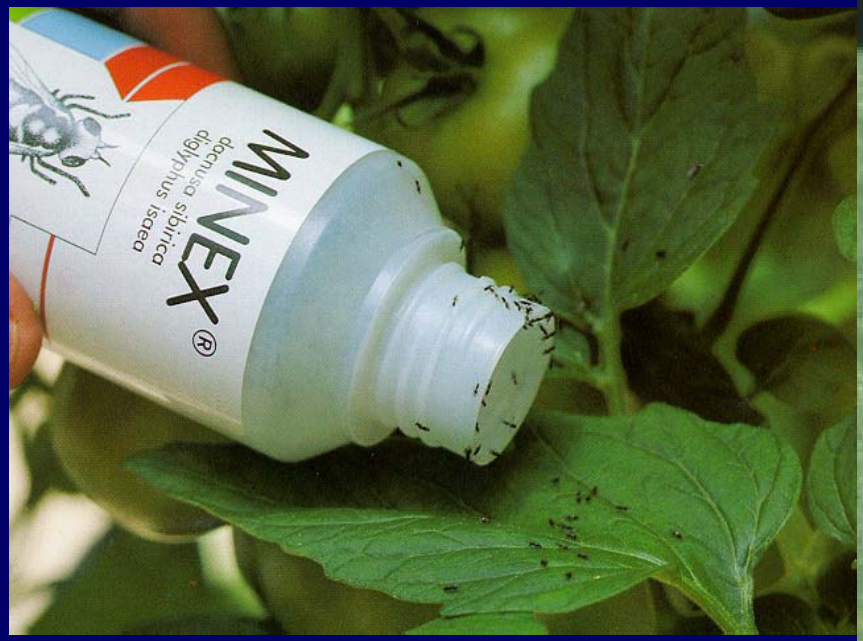
Greenhouse Whitefly

Bemisia Whitefly

Whitefly Destroyer
(Delphastus)

PURCHASE & RELEASE OF BENEFICIALS:

CONSIDERATIONS FOR CONSUMERS



Purchase and Release of Beneficial Insects

Some Considerations:

1. Accurately identify pest problem

Purchase and Release of Beneficial Insects

Some Considerations

1. Accurately identif
2. Smart shopping

Quality of Greenhouse Biocontrols

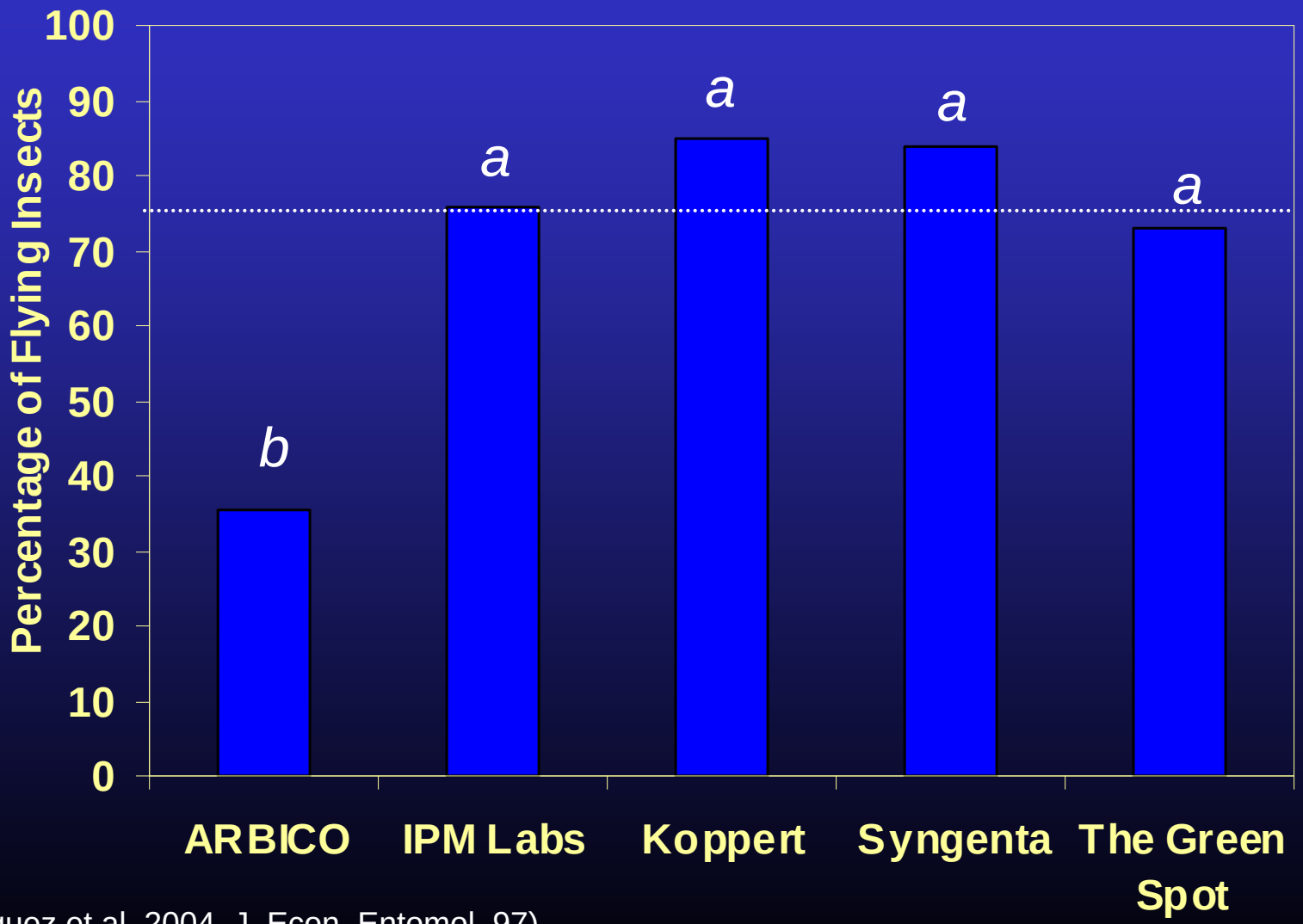
- **Study evaluated and compared the quality of three commercially available natural enemies from six companies as received by consumers.**

Encarsia formosa

Aphidius colemani

Aphidoletes aphidimyza

Results: How Many Fly?



(From: Vasquez et al. 2004. J. Econ. Entomol. 97)

Purchase and Release of Beneficial Insects

Some Considerations:

1. Accurately identify pest problem
2. Smart shopping
3. Making the most of your purchase

Purchase and Release of Beneficial Insects

Some Considerations:

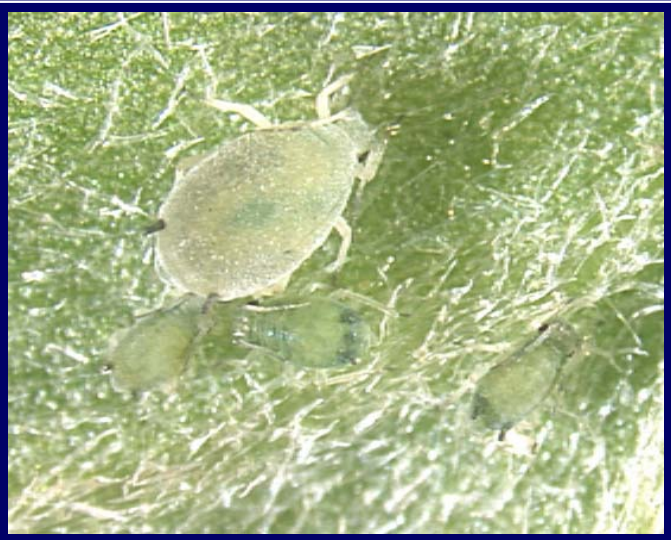
1. Accurately identify pest problem
2. Smart shopping
3. Making the most of your purchase
4. Cost effectiveness?

Release of *Aphidius* Wasps for Aphid Control in Greenhouse Grown Chrysanthemum

Materials and Methods

Pest Insects:

- *Cotton aphid* reared on chrysanthemum var Kory.



Aphidius Wasps:

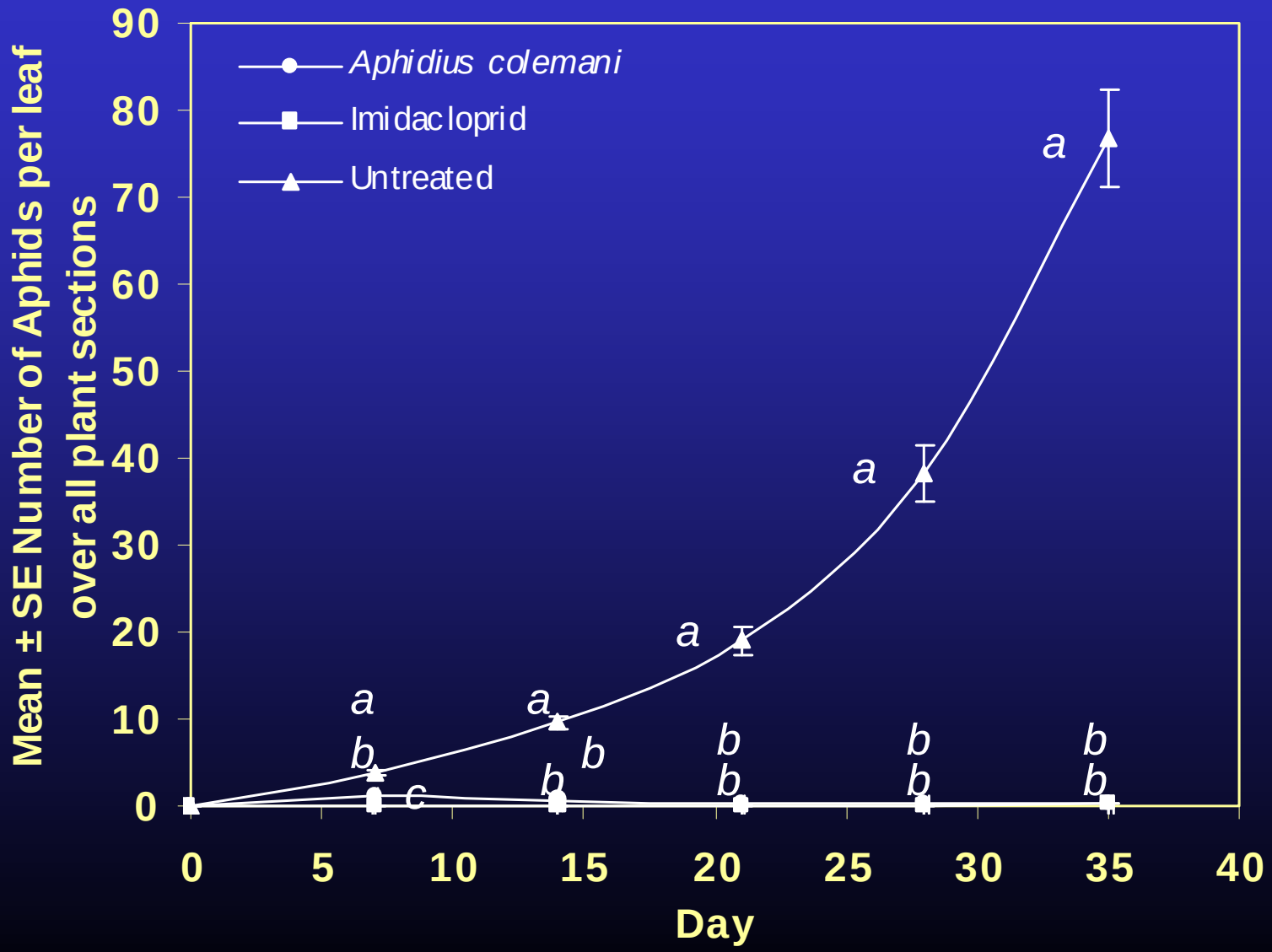
- (Aphiline c500, Syngenta) purchased from The Green Spot

Control:

- Imidacloprid

Results: Aphid Numbers

(FROM: Vasquez et al. 2006. J. Econ. Entomol. 99: 1104-1111)



Results: Product & Application Costs

(305 m^2 greenhouse - 450 pots)

	Imidacloprid	*Aphidius colemani*
Product application rate	1.4g/pot	5 adults/m^2
Product cost	$29.86	$299.17
Labor cost	$6.39	$4.11
Other costs	$20.56	N/A
TOTAL	$56.81	$303.28

(FROM: Vasquez et al. 2006. J. Econ. Entomol. 99: 1104-1111)

Banker Plants for Biocontrol in Green-houses and High Tunnels

Banker Plants

-”open rearing system”

Banker Plants

Common Mullein (*Verbascum thapsus*)
Target Pest: greenhouse whitefly
Crop: Tomatoes

Predator -predatory bug (*Dicyphus hesperus*)

Prey -none needed, bug feeds on plant, but might need Ephestia eggs

Rate ~ 1/1000 sq. ft.

Cost – 0.5 cents/ft^2

Problems -plant feeding?

Banker Plants

Rye / Barley / Wheat
Target Pest: aphids (various)
Crop: various

Parasitoid -Aphidius

Predator -Aphidoletes

Prey - bird-cherry oat aphid

Rate ~ 1/1000 sq. ft.; 1 wasp/100 sq ft.

Cost – 2.5 cents/sq. ft.

Problems -none for most crops
-cost?
-supplier?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IPM LABORATORIES, INC
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IPM Laboratories, Inc.
Locke, NY 13092-0300
(315) 497-2063
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02.06.2008


02.06.2008


500 Aphidius colemani
APHIPAR
KOPPERT
02.12.2008


02.17.2009


01.21.2009

High Tunnel Pest Management

Additional Considerations

Pesticide Compatibility

Koppert.com

-new website

-updated “side effects” of pesticides

-can help with decision-making

Spot-treating

Beneficial Insect Habitat in Greenhouses/High Tunnels

Some suppliers recommending use of habitat plant seed mixes to be grown in greenhouse alongside crop to “feed” beneficials

I would recommend skepticism, and to ask for data

NC State study demonstrated commercial habitat mixes have no value for pest management

Beneficial Insect Habitat Around Greenhouses

What about attracting beneficials with habitat planted around/outside greenhouse?

Again, I would recommend skepticism, since there are no supporting data


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