

Greenhouse Crops



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Insect Management in Greenhouses

Luis Cañas

Department of Entomology, Ohio State University Extension

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Luis Cañas, Ph. D.
Entomology
The Ohio State University
canas.4@osu.edu



Western flower thrips




Photo by Maria Acosta
The Ohio State University, OARDC
2008

Frankliniella occidentalis, western flower thrips adult

Poinsettia thrips

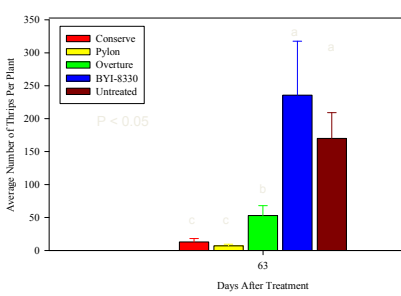


Image by Laurence Mound, ANIC, CSIRO


Thrips attack on Basil



Destructive sampling, Gerberas, Adults + Immatures, whole plant



Treatment	Average Number of Thrips Per Plant
Conserve	~15
Pylon	~10
Overture	~50
BYI-8330	~230
Untreated	~170



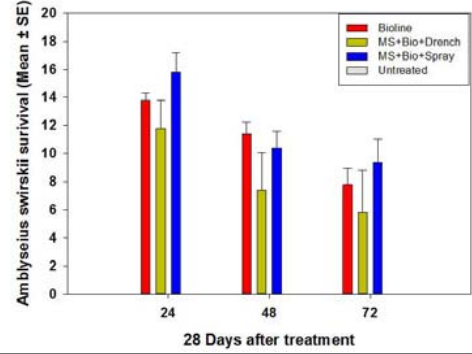
IPM for Thrips: Some Insecticides Available for Rotations

Effect	Trade Name (each row is a mode of action)	Impact on Biologicals
VG	Conserve (spinosad)	Harmless
VG	Pylon (chlorfenapyr)	Slightly toxic
G	Overture (pyridalyl)	
G	Mesuroil (methiocarb)	Harmful
	Hachi-Hachi (tolfenpyrad)	
G	Avid (abamectin)	Moderately toxic
	Pedestal (novaluron)	Harmless to adults
	Botanigard (<i>Beauveria bassiana</i>)	

IPM for Thrips: Some Insecticides Available for Rotations for Vegetables

Effect	Trade Name (each row is a mode of action)	PHI (days)	Impact on Biologicals
VG	Entrust (spinosad)	1	Harmless
VG	Pylon (chlorfenapyr)	0	Slightly toxic
	Botanigard (<i>Beauveria bassiana</i>)	0	

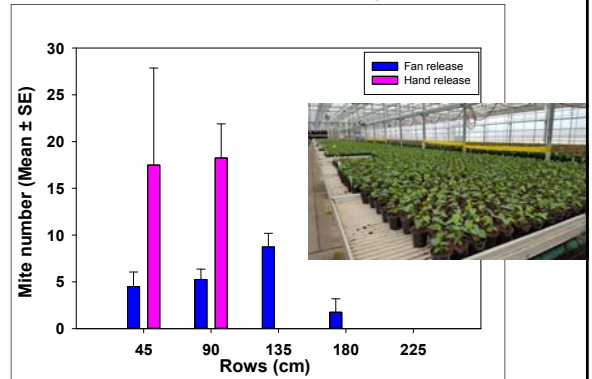
Amblyseius swirskii compatibility – Mainspring



Releasing predatory mites



Mite release using fan



IPM for Aphids



- Examples
 - Green peach = *Myzus persicae*
 - Melon = *Aphis gossypii*
- Biological control
 - *Aphidoletes aphidimyza*,
 - *Aphidius colemani*,

Neonicotinoids

MOA	Trade Name	
4A	Marathon (imidacloprid),	
	Flagship (thiametoxam),	
	Tristar (acetamiprid),	
	Safari (dinotefuran)	
	Celero (clothianidin)	

IPM for Aphids: Some Insecticides Available for Rotations

Effect	Trade Name (each row is a mode of action)	Impact on Biologicals
E	Endeavor (pymetrozine)	Harmless to larvae
E	Marathon (imidacloprid), Flagship (thiametoxam), Tristar (acetamiprid), Safari (dinotefuran)	Toxic as spray, non-toxic as drench
	Kontos (spirotetramat)	
	Aria (flonicamid)	
	Ultra fine oil	Harmless
	Orthene (acephate)	Harmful
	Insecticidal Soap, M-Pede	
	Azatin XL (azadirachtin)	Harmless

IPM for Aphids: Some Insecticides Available for Rotations

Effect	Trade Name (each row is a mode of action)	Impact on Biologicals
E	Xxpire (spinetoram + sulfoxaflor)	Harmless?
E	Mainspring (cyantraniliprole)	Harmless?

Mites (two spotted spider mite)



Broad mites



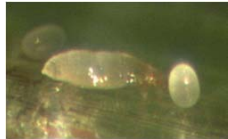
Mite Damage

Crop	Pre-infestation	Post-Infestation			Comments
		Day 2	Day 6	Day 8	
Strawberry					After one week of the leaves was evidence of mite feeding
Impatiens					Mite damage to leaf apparent and progressed with time. Younger leaves with more damage than older leaves

Broad mite damage



IPM for Mites



- **Examples**
 - Two spotted spider mite = *Tetranychus urticae*
 - Cyclamen mite = *Phytonemus pallidus*
 - Broad mite = *Polyphagotarsonemus latus*
- **Biological control**
 - *Phytoseiulus persimilis*,
 - *Amblyseius cucumeris*,



IPM for Mites: Miticides

Effect	Trade Name (each row is a mode of action)	Impact on Biologicals
E	Floramite (bifenazate)	
E	Pylon (chlorfenapyr) (vs Broad, Cyclamen)	Harmful
E	Avid (abamectin) (vs Broad, Cyclamen)	Harmful
E	TetraSan (etoxazole), Hexygon (hexythiazox), Ovation (clofentezine)	Harmful
E	Sanmite (pyridaben) (vs Broad), Akari (fenpyroximate)	Harmful
VG-E	Shuttle (acequinocyl)	
E	Sultan (cyflumetofen)	
	Insecticidal Soap, M-Pede	Harmful
E	Judo (spiromesifen) (vs Broad and Cyclamen), Kontos (spirotetramat)	

Miticide Activity – Woody Ornamentals

Spider mites and rust mites:

- Avid nymphs, adults
- Forbid nymphs, adults
- Horticultural oil eggs, nymphs, adults

Spider mites but not rust mites:

- Floramite eggs, adults
- Hexygon eggs, nymphs

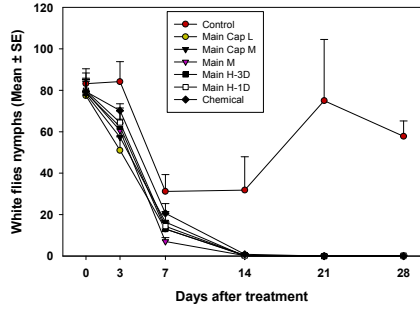
Whiteflies

Banded wing Greenhouse Silver leaf



(From Flint 1995)

Insecticide tests: Mainspring (cyantraniliprole)



Canas et al. In preparation for publication in Arthropod Management Tests, 2014.

Parasitized Nymphs

Encarsia



Eretmocerus



Natural enemy release



Whitefly control ornamentals

Suggested Products for Harvested Cuttings	IRAC Class	B-Biotype	Q-Biotype
Avid (abamectin)	6	Yes	Yes
Flagship (thiamethoxam)	4	Yes	Yes
Judo (spiromesifen) – targeting nymphs at this plant stage for unrooted cuttings or cultivars tested for crop safety	23	Yes	Yes
Mainspring	28	Yes	Yes
PFR-97	n/a	Yes	Yes
Safari (dinotefuran)	4	Yes	Yes
Sanmite (pyridaben)	21	Yes	Yes
TriStar (acetamiprid) – targeting adults at this plant stage	4	Yes	Yes
XXpire	4C + 5	Yes	No

<http://www.mrec.ifas.ufl.edu/LSO/bemisia/bemisia.htm>

Citrus Mealybug



OSU, Luis Gomez, Maria Lopez

IPM for Mealybugs: Insecticides

Effect	Trade Name (each row is a mode of action)	Impact on Biologicals
E, VG	Safari (dinotefuran), Flagship (thiamethoxam), Tristar (acetamiprid), Marathon (imidacloprid), clothianidin	Harmful as spray
VG	Distance (pyriproxyfen)	Harmless
E	Talus (buprofezin)	Harmless
E	Kontos (spirotetramat)	?
VG,G	Insecticidal Soap, M-Pede (potassium salts of fatty acids) Herbal aphid control (thyme, mint oil), GSHGIS (canola oil, pyrethrins)	Harmful
VG	Talstar (bifenthrin)	Harmful

Cloyd AMT 2005, G25; Ludwig AMT 2006, G14, G15; Canas AMT 2007, G42.

Fungus Gnat and Shore Flies

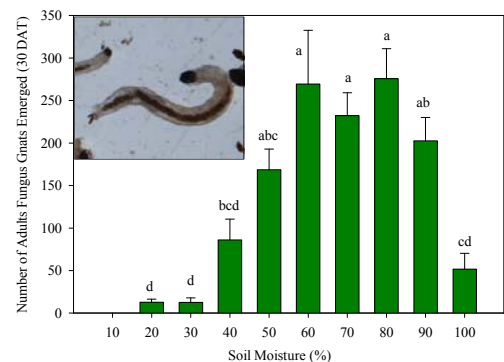


Fungus Gnat



Shore Fly

Fungus Gnats = Soil Moisture



IPM for Fungus Gnats and Shore Flies



- Pathogens
 - *Steinernema feltiae* (46 K / sq ft)
 - Also used against western flower thrips
 - Affected by high temperatures
 - *Steinernema carpocapseae*

IPM for FG and Shore Flies: Some Insecticides Available for Rotations

E	Trade Name (each row is a mode of action)	Impact on Biological Control Agents
VG	Nemasys	
VG	Citation (cyromazine)	Slightly toxic
VG	Distance (pyriproxyfen)	Slightly toxic
	Enstar II (s-kinoprene)	
	Adept (diflubenzuron)	
G	Marathon (imidacloprid), Safari (dinotefuran)	Toxic as spray, non-toxic as drench
	Azatin (azadirachtin) XL	Slightly toxic

Thanks!

- Address:
 - Dr. Luis Cañas
 - 1680 Madison Ave., Wooster, OH 44691
 - canas.4@osu.edu
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