Ventura CAPCA CE Meeting, Santa Paula Community Center
Santa Paula, CA. June 10th, 2015

IPM for Ornamental Plants

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SPECIAL REPORT
BIOCONTROLS
PROFILES in ADOPTION

SHOW PREVIEW
BIO CONTROLS

Xth International Symposium on
Thysanoptera
and Tospoviruses
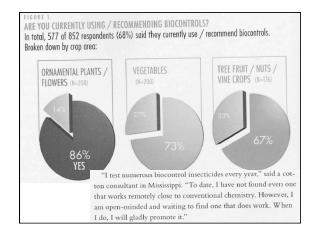Asilomar Conference Grounds
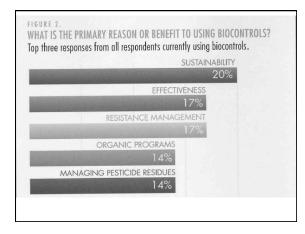May 16th through May 20th, 2015

Overview of Presentation

- Value of the industry

- Pesticide use in greenhouses and nurseries

- Survey of biological control practices (?)

- Biology and Management of Thrips

  - Behavior, IPM tactics, biological control

- Managing resistance; *Liriomyza* leafminers

Commodity	Top 20 Commodities for 2011-2013					
	Value and Rank					
	2011		2012		2013	
	$1,000					
Milk and Cream	7,680,751	1	6,899,743	1	7,617,641	1
Almonds (shelled)	4,007,860	2	4,816,860	3	5,768,100	2
Grapes	3,859,202	3	5,182,968	2	5,585,584	3
Cattle & Calves	2,630,025	4	3,188,125	4	3,048,390	4
Berries, All Strawberries	1,943,727	6	2,130,637	6	2,200,729	5
Walnuts	1,336,900	9	1,505,910	8	1,795,800	6
Lettuce, All	1,615,329	8	1,432,158	10	1,679,164	7
Hay, All	1,783,200	7	1,771,830	7	1,569,780	8
Tomatoes	1,146,224	10	1,169,666	11	1,222,470	9
Nursery	2,274,840	5	2,551,200	5	1,219,800	10
Flowers and Foliage	1,011,530	11	1,096,938	12	1,130,523	11
Pistachio	879,120	13	1,438,110	9	1,034,000	12
Broccoli	580,526	18	645,044	17	844,920	13
Rice	900,277	12	839,548	13	789,728	14
Oranges, All	656,338	16	764,783	14	742,076	15
Cotton Lint, All	823,915	14	665,691	16	623,242	16
Carrots, Fresh	641,250	17	512,849	18	555,000	17
Celery	368,822	21	344,024	24	437,406	18
Peppers	342,992	24	380,502	22	434,261	19
Eggs, Chicken	381,265	20	393,278	20	380,038	20
Other Poultry	(D)	(D)	(D)	(D)	(D)	(D)

FIGURE 1.
ARE YOU CURRENTLY USING / RECOMMENDING BIOCONTROLS?
In total, 577 of 852 respondents (68%) said they currently use / recommend biocontrols.
Broken down by crop area:

ORNAMENTAL PLANTS / FLOWERS (N=208)
14%
86% YES

VEGETABLES (N=200)
27%
73%

TREE FRUIT / NUTS / VINE CROPS (N=176)
33%
67%

"I test numerous biocontrol insecticides every year," said a cotton consultant in Mississippi. "To date, I have not found even one that works remotely close to conventional chemistry. However, I am open-minded and waiting to find one that does work. When I do, I will gladly promote it."

FIGURE 2.
WHAT IS THE PRIMARY REASON OR BENEFIT TO USING BIOCONTROLS?
Top three responses from all respondents currently using biocontrols.

SUSTAINABILITY
20%

EFFECTIVENESS
17%

RESISTANCE MANAGEMENT
17%

ORGANIC PROGRAMS
14%

MANAGING PESTICIDE RESIDUES
14%

FIGURE 3.
WHAT RESULTS HAVE YOU GENERALLY OBSERVED FROM USE OF BIOCONTROLS?
Biocontrols exceeded average expectations in citrus and cotton, but fell below the average in corn/soybeans.

Primary Crop Area (Respondents)	About As I Expected	Better Than I Expected	Somewhat Better Than I Expected	Somewhat Worse Than I Expected	Worse Than I Expected
ALL	42%	28%	21%	7%	2%
Ornamental Plants / Flowers (158)	39%	33%	22%	5%	1%
Vegetables (200)	42%	32%	18%	7%	1%
Tree Fruit / Nuts / Vine Crops (105)	42%	21%	28%	8%	1%
Citrus (26)	46%	35%	11%	8%	0%
Cotton (31)	49%	29%	19%	3%	0%

"University/Extension" popped up nearly unanimously — among both users and nonusers — in response to the question as to whose voice they are most apt to listen to in considering use of biocontrols. One notable exception was in ornamental flowers and plants, where growers using biocontrols trust biocontrols suppliers (37%) the most, followed by other growers (25%). One ornamentals producer in Georgia said biocontrols suppliers "seem to be the only ones who know anything about how to use [biocontrols], and the only ones really talking about them."
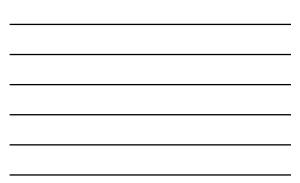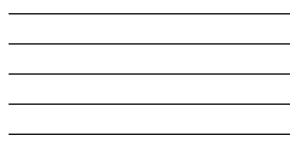
Pesticide Use

- In 2002 - 22,259 lbs. of pesticide a.i. applied to 27,346 acres of floriculture crops.
- In 2012 - 11,498 lbs. a.i. applied over 23,875 acres.
- Although the acreage association with floriculture production dropped sightly there was still more than a 50% decrease in pesticide use
- Data on pesticide use in greenhouse vegetable production is not as readily available - there are fewer pesticides registered for use on greenhouse vegetables.
- Tomato growers use bumblebees for pollination and this automatically restricts pesticide use
- The situation for the nursery industry (outdoor plants in containers) is not as positive. Although acreage has remained largely the same from 2002 and 2012 the number of pesticide applications actually increased over this 10 year period.
- We believe this is due to nursery growers following quarantine requirements associated with invasive species.
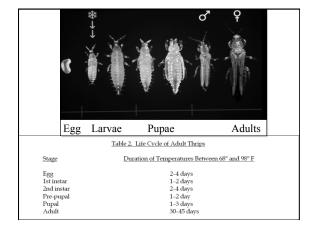
http://www.ipm.ucdavis.edu/PMG/r280301411.html

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UC IPM Online
STATEWIDE INTEGRATED PEST MANAGEMENT PROGRAM

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○ What's new

How to Manage Pests
UC Pest Management Guidelines

Floriculture and Ornamental Nurseries
Thrips
Scientific names: Western flower thrips: *Frankliniella occidentalis*
Greenhouse thrips: *Heliothrips haemorrhoidalis*
(Reviewed 3/09, updated 6/10)

In this Guideline:
• Description of the pest   • Publication
• Damage   • Glossary
• Management

DESCRIPTION OF THE PESTS
Thrips are tiny insects that have four featherlike wings, each consisting of a thick supporting strut with fine hairs on
piercing and removing the contents of individual plant cells.

Western flower thrips. This thrips has three color forms that vary in abundance depending on the time of year. Th
form that is dark brown. The intermediate form is present throughout the year, but in spring the dark form predomin
spring indicates thrips are migrating into the houses. Western flower thrips usually feed in enclosed tissues such a
and female eggs are produced once mating has occurred. Development times to complete one generation of west

Egg   Larvae   Pupae   Adults

Egg   Larvae   Pupae   Adults

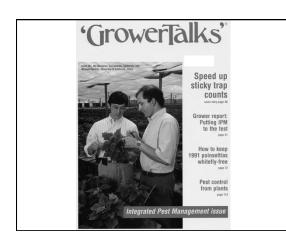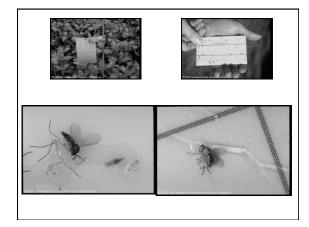| Table 2. Life Cycle of Adult Thrips	
Stage	Duration of Temperatures Between 68° and 98° F
Egg	2–4 days
1st instar	1–2 days
2nd instar	2–4 days
Pre-pupal	1–2 day
Pupal	1–3 days
Adult	30–45 days

UC IPM Guidelines for Monitoring Thrips

- Use yellow or blue sticky cards
  - yellow are easier to count and trap other insects
- Place vertically just above the crop canopy
  - Adjust height as the crop grows
- Use a minimum of 8 traps/100,000 ft^2
  - locate traps in more sensitive cultivars/doorways
- Check at least weekly - thresholds vary
  - Roses = 25-20 thrips per card
  - Other Crops = 5-10 thrips per card
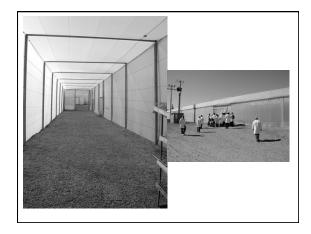- Correctly identify the WFT and check plants
- Sticky tape to reduce thrips populations?

'GrowerTalks'

Speed up sticky trap counts
cover story page 40

Grower report: Putting IPM to the test
page 21

How to keep 1991 poinsettias whitefly-free
page 72

Pest control from plants
page 113

Integrated Pest Management issue

www.green-tek.com/pdf/Insect.pdf

Spanish National Hydrological Plan (SNHP) in 2001.

24 Jan 1974

18 Jul 2004

http://www.allaboutswirskii.com/

All about swirskii
On this website, you can read all about the predatory mite, *Amblyseius swirskii*. Not that we know absolutely everything. On the contrary, we are learning more and more every day. But we are keen to share what we do know with you, because we believe that this predatory mite really offers something valuable that you as a grower can use.

We believe that this is a good example of how research and practice can go together. The information from both these fields can be found on this site.

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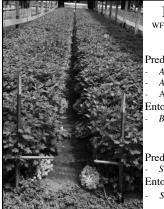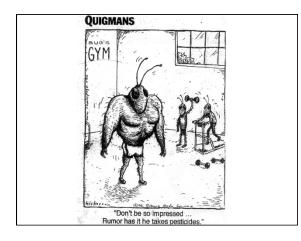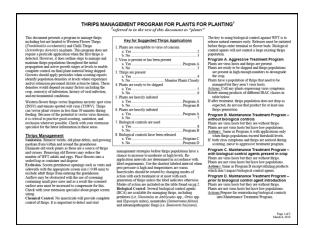Disclaimer
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ENTOMITE

Natural Enemies
WFT Management on Chrysanthemums

Plant Releases
Predatory Mites
- *Amblyseius cucumeris*
- *Amblyseius swirksi*
- Add alternate food

Entomopathogens
- *Beauveria bassiana*

Soil Releases
Predatory Mites
- *Stratiolaelaps scimitus*

Entomopathogenic nematodes
- *Steinernema feltiae*

QUIGMANS

BUG'S GYM

"Don't be so impressed …
Rumor has it he takes pesticides."

THRIPS MANAGEMENT PROGRAM FOR PLANTS FOR PLANTING[1]
[1]referred to in the rest of this document as "plants"

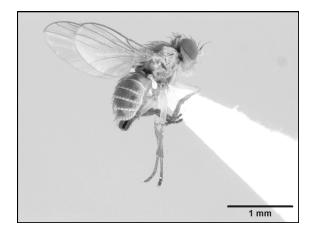## Comparative Evaluation of Insecticides For Control of Western Flower Thrips
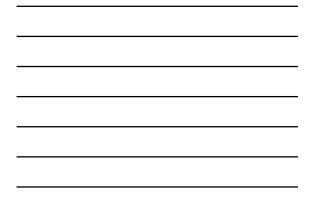
Major Problems include:
- highly mobile adults
- clumped distribution affects sample size
- what do you sample (leaves, flowers, buds?)
- how do you count the thrips?
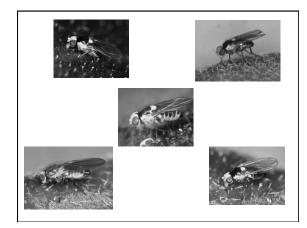- what stages do you count?
- Type of pesticide -
- repellent, contact, systemic, insect growth regulator

Thrips Management Program 2010 Potential Product Choices (see Note below)

Foliar Applied Products (active ingredients)	IRAC Class	Registered Use Site(s)	Knock Down	Residual Control (days)	REI	Thrips Efficacy				Life Stage			Treatment Program			
						Western Flower	Chilli	Gynaikothrips	Gladiolus	Immatures	Pupae	Adults	A Aggressive	B Maintenance w/out biological	C Maintenance with Biological	D Maintenance prior to biological
Aria Insecticide (flonicamid)	9c	G, N	M	7-14	12 h	P - E	?	P	P	x	?	x		B	C	D
Avid EC (abamectin)	6	G, N, S	F	Contact	12 h	P - G	G - E	P	E	x	?	x	A	B	C **	D
Azatin XL (azadirachtin)	18B	G, N, S	S	?	4 h	P	?	P	P	x	?	?	?	?	C	D
BotaniGard (Beauveria bassiana)	M	G, I, N, S	M	3	4 h	P - E	?	P	?	x	x	?	A	B	C *	D
Conserve SC (spinosad)	5	G, N	F	5	4 h	P - E	E	P - G	E	x	x	x	A	B	C **	D
Flagship 25WG (thiamethoxam)	4A	G, L, N, S	F	?	12 h	P - E	E	G	E	?	?	?	A	B	?	D
Mesurol 75WP (methiocarb)	1A	G, N	F	Contact	24 h	P - E	?	?	F	x	?	x	A	B	?	?
MPEDE (potassium salts of fatty acids)	M	G, I, N	F	Contact	12 h	?	?	?	?	x	?	?	A	B	?	D
Orthene, Acephate 97 UP and generics	1B	G, N	F	?	24 h	?	?	P	G	?	?	?	A	B	?	?
Overture (pyridalyl)	Unknown	G	M	7-14	12 h	P - E	F	P	F	?	?	?	A	B	C	D
Pedestal (novaluron)	15	G, N, S	S	7-14	12 h	G	?	?	G	x	?	?	A	B	C **	D
Preclude-TR (fenoxycarb)	7B	G	S	?	12 h	?	?	?	?	x	?	?	?	B	?	?
Pylon (chlorfenapyr)	13	G	M	?	12 h	F - E	E	?	G	?	?	?	A	B	?	?
Safari SG (dinotefuran)	4A	G, N	M	?	12 h	P - G	G - E	E	G	?	?	?	A	B	C **	D
Scimitar GC (lambda-cyhalothrin)	3	G, N, S	F	?	24 h	P	P	?	?	?	?	?	A	B	?	?
Talstar (bifenthrin)	3	G, I, N, S	F	?	12 h	?	P - F	P - E	?	?	?	?	?	B	?	?
TriStar (acetamiprid)	4A	G, L, N, S	F	?	12 h	P - E	E	F	E	?	?	?	A	B	?	D
Ultra pure oil (paraffinic oil)	M	G, N	F	Contact	4 h	?	?	?	?	x	x	x		B	C **	D

Registered Use Sites: G = Greenhouse, L = Lath House, I = Indoors, N = Nursery, S = Shade House
Knockdown: Fast (~ 1 day), Medium (3-7 days), Slow (>7 days).
Efficacy: P = Poor (< 70% control), F = Fair (70% to 85% control), G = Good (85% to 95% control) on immatures and/or adults 1 to 3 weeks after first app.
* Results of efficacy trials have been variable for entomopathogens and impact on beneficial organisms is presumed to be less than that of traditional pesticide chemistries but the data are sparse.
** This insecticide is toxic to many BCA's but has a short residual and may be suitable for treating hot spots and re-introducing BCA's soon thereafter.
*** Gynaikothrips sp. produce galls making it very difficult to control them with contact insecticides.

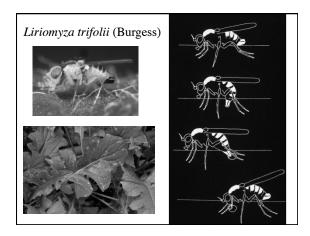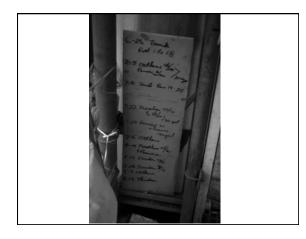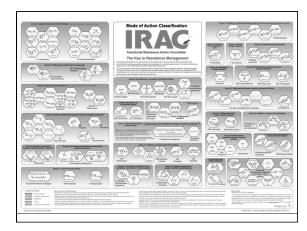1 mm

Liriomyza trifolii (Burgess)

Decline of Resistance in *Liriomyza trifolii* (Diptera: Agromyzidae) in the Absence of Insecticide Selection Pressure

Michael P. Parrella , John T. Trumble

Article   Information   Explore

Abstract

The decline of resistance to permethrin and chlorpyrifos in a population of *Liriomyza trifolii* (Burgess) in the absence of selection from these materials was determined. When the test began, LC_{50}'s (mg [AI]/g sticker) for permethrin and chlorpyrifos were 248.3 and 24.4, respectively. A susceptible population established at the same time had LC_{50}'s of 3.5 and 2.1 to permethrin and chlorpyrifos, respectively. After 15 generations (10 mol), LC_{50}'s for the decline population were 51.0 (permethrin) and 7.0 (chlorpyrifos). At rates recommended for field use, applications of permethrin to the decline and susceptible populations demonstrated that adults of the decline strain were still significantly more tolerant than adults in the susceptible population. No differences were found between populations with chlorpyrifos, however, this was not due to a decline in resistance, because mortality was very low for both populations when the test began. These results suggest that where *L. trifolii* has developed resistance to permethrin or chlorpyrifos, removal of one or both insecticides from a spray program for a period of 10 mo is insufficient to cause resistance reversion in this species.
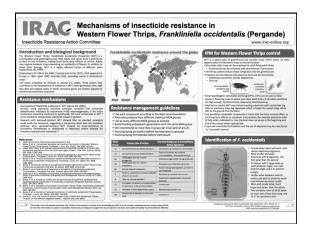
MODES OF ACTION

The IRAC Mode Of Action (MoA) Classification is the *definitive* global authority on the target site of insecticides. It is the basis of MoA labelling of insecticides worldwide and is an essential tool for the development of insecticide resistance management (IRM) strategies. For more information please visit the MoA Team page, and should you wish you are welcome to submit an active for classification by the IRAC MoA Team.

The colour scheme below associates mode of action into broad categories based on the physiological functions affected, as an aid to understanding symptomology, speed of action and other properties of the insecticides, and not for any resistance management purpose. Rotations for resistance management should be based only on the numbered mode of action groups.

Nerve & Muscle   Growth   Respiration   Midgut   Unknown or Non-Specific

IRAC MoA Classification v 7.1, June 2011[1]		
Main Group and Primary Site of Action	**Chemical Sub-group or exemplifying Active Ingredient**	**Active Ingredients**
1* Acetylcholinesterase (AChE) inhibitors Nerve action {Strong evidence that action at this protein is responsible for insecticidal effects} *Please see footnotes for further information on the use of compounds between sub-groups	**1A** Carbamates	Alanycarb, Aldicarb, Bendiocarb, Benfuracarb, Butocarboxim, Butoxycarboxim, Carbaryl, Carbofuran, Carbosulfan, Ethiofencarb, Fenobucarb, Formetanate, Furathiocarb, Isoprocarb, Methiocarb, Methomyl, Metolcarb, Oxamyl, Pirimicarb, Propoxur, Thiodicarb, Thiofanox, Triazamate, Trimethacarb, XMC, Xylylcarb
	1B Organophosphates	Acephate, Azamethiphos, Azinphos-ethyl, Azinphos-methyl, Cadusafos, Chlorethoxyfos, Chlorfenvinphos, Chlormephos, Chlorpyrifos, Chlorpyrifos-methyl, Coumaphos, Cyanophos, Demeton-S-methyl, Diazinon, Dichlorvos/ DDVP, Dicrotophos, Dimethoate, Dimethylvinphos, Disulfoton, EPN, Ethion, Ethoprophos, Famphur, Fenamiphos, Fenitrothion, Fenthion, Fosthiazate, Heptenophos, Imicyafos, Isofenphos, Isopropyl O-(methoxyaminothio-phosphoryl) salicylate, Isoxathion, Malathion, Mecarbam, Methamidophos, Methidathion, Mevinphos, Monocrotophos, Naled, Omethoate, Oxydemeton-methyl, Parathion, Parathion-methyl, Phenthoate, Phorate, Phosalone, Phosmet, Phosphamidon, Phoxim, Pirimiphos- methyl, Profenofos, Propetamphos, Prothiofos, Pyraclofos, Pyridaphenthion, Quinalphos, Sulfotep, Tebupirimfos, Temephos, Terbufos, Tetrachlorvinphos, Thiometon, Triazophos, Trichlorfon, Vamidothion

1 mm