Meeting the Challenge of the Asian Citrus Psyllid in California Nurseries

A two-day workshop in Riverside, California

June 11- 12, 2009


Florida-Foundation Block


Brazil-Citrus Nursery

Organizing Committee:

T. Delfino-California Citrus Nursery Society
A. Eskalen-Dept. of Plant Pathology & Microbiology, University of California Riverside
R. Lee-USDA- ARS, National Clonal Germplasm Repository for Citrus and Dates
G. Vidalakis-Citrus Clonal Protection Program, Dept. of Plant Pathology & Microbiology, University of California Riverside

Invited Speakers:

J. Ayres-Fundecitrus, Brazil
J. Bethke-UC, CA
G. Baze-Golden Pacific Structures, CA
T. Delfino-CCNS, CA
F. Dixon-Wells Fargo, CA
D. Elder-American Ag Credit, CA
T. Gast-Southern Gardens Citrus, FL
P. Gomes-CHRP, USDA -APHIS, NC
E. Grafton-Cardwell-UCR, CA
D. Howard-AgraTech, CA
N. Jameson-Brite Leaf Nursery, FL
R. Keijzer-KUBO, The Netherlands
P. Llatser-AVASA, Spain
S. McCarthy-CDFA, CA
G. Vidalakis-UCR-CCPP, CA

Registration: http://ccpp.ucr.edu & http://eskalenlab.ucr.edu

Location:
Sunkist Center
Citrus State Historical Park
9400 Dufferin Avenue
(Corner of Van Buren Blvd)
Riverside, California

Sponsored by:

California Citrus Nursery Board
Citrus Research Board
Stuewe & Sons, Inc. Tree Seedling Nursery Containers
Golden Pacific Structures, A Rough Brothers Company
AgraTech Greenhouse Manufacturers
Bayer CropScience

Information on line at: http://eskalenlab.ucr.edu

"Grafton-Cardwell, Beth" <BETHGC@uckac.edu>

Chemical Control of the Asian citrus psyllid in California

Beth Grafton-Cardwell
Dept. of Entomology, UC Riverside
Stationed at the Kearney Ag Center
And Director of Lindcove Research and Extension Center

Adult psyllids can feed on either young or mature leaves. This allows adults to survive year-round.

Insecticide goal: Frequent applications with greatest effect in late fall as they overwinter

The eggs are yellow-orange, tucked into the tips of tiny new leaves. They are difficult to treat because they are small and deposited in protected areas.

Insecticide goal: Difficult to control this stage, target the nymphs as they hatch

The nymphs can survive only by living on young, tender leaves and stems

Insecticide goal: Systemic control of nymphs as they feed on the tender flush

The nymphs spend several weeks in one place, passing through 5 instars.

As the psyllid feeds, it injects a salivary toxin that causes the tips of new leaves to easily break off. If the leaf survives, then it twists as it grows.

Three goals of insecticide protection:

1. **Eradication of ACP**
2. **Preventing damage to new flush**
3. **Preventing transmission of HLB**

Quick Reference Guide to Citrus Insecticides and Miticides

M.E. Rogers, P. A. Stansly, L. L. Stelinski and J. D. Yates

UF UNIVERSITY of FLORIDA IFAS Extension

Products recommended in the Florida Citrus Pest Management Guide and their effects on selected pests and their natural enemies.

Pesticide active ingredient	Target pest								Effects on natural enemies
	Mode of Action[1]	Psyllid	Leafminer	Rust Mites	Spider Mites	Root Weevil Adults	Scale Insects	Mealybugs	
Abamectin + oil	6	++	+++,R	+++,R	+	+ (oil)	+(oil)	+ (oil)	medium
Acetamiprid	4	-	+++,R	-	-	?	+	++	medium
Aldicarb	1A	+++,R	-	+++,R	+++	-	-	-	low
Carbaryl	1A	+++,R	-	+	-	+++,R	+++,R	+	high
Chlorpyrifos	1B	+++,R	+	+	-	+	+++,R	+++,R	high
Diflubenzuron	15	++	+++,R	+++,R	-	+++,R	-	-	low
Dimethoate	1B	+++	-	-	-	?	+++,R	+	high
Fenbutatin oxide	12	-	-	+++,R	+++,R	-	-	-	low
Fenpropathrin	3	+++,R	-	+	-	+++,R	-	+	high
Imidacloprid (soil application, nonbearing)	4	+++,R	+++,R	-	-	+	++	+	low
Imidacloprid (foliar application)	4	+++,R	+	-	-	-	++	+	medium
Petroleum oil	NR	+	++,R	++,R	++	+(eggs)	++,R	+	low
Phosmet	1B	+++, R	-	+	?	+++,R	?	?	medium/high
Pyridaben	21	-	?	+++,R	+++,R	-	-	-	high
Spinosad	5		+++,R	-	-	-	-	-	low
Spinetoram	5	+++,R	+++,R	-	?	?	?	?	low
Spirodiclofen	23	-	-	+++,R	+++,R	?	-	-	low
Spirotetramat	23	+++,R		+++,R	?	?	++	?	low
Sulfur	NR	-	-	+++,R	+++	-	?	?	high (short term)
Zeta-cypermethrin	3	+++,R	-	-	?	+++	?	?	high

[1]Mode of action class for citrus pesticides from the Insecticide Resistance Action Committee; NR = no resistance potential

(R) = product recommended for control of pest in Florida Citrus Pest Management Guide

(+++) = good control of pest

(++) = short-term control of pest

(+) = low levels of pest suppression

(-) = no observed control of pest

(?) = insufficient data available

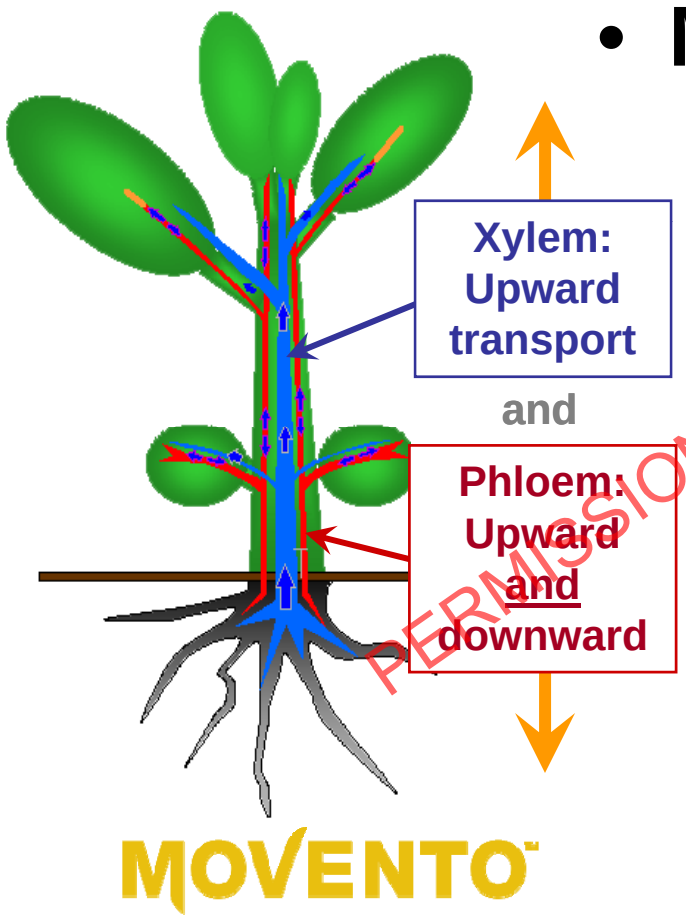
Revised December 2008

Effective Insecticide Treatments for ACP in California

Class	Insecticide	Orchard	Nursery
Pyrethroid	Cyfluthrin	Baythroid/Renounce	Tempo
Pyrethroid	Fenpropathrin	Danitol	Tame
Neonicotinioid	Imidacloprid soil	Admire Pro, Nuprid, Alias, Couraze	Merit, Marathon II, CoreTect
Neonicotinoid	Imidacloprid foliar	Provado, Nuprid, Couraze	Marathon II
Neonicotinoid	Thiamethoxam soil		Flagship
Neonicotinoid	Dinotefuran		Safari
Pyreth + neonic	**Cyfluthrin+imidacloprid**	Leverage 2.7	Discus
Organophosphate	Chlorpyrifos	Lorsban	Chlorpyrifos Pro
Organophosphate	Dimethoate	Cygon, dimethoate	Cygon, dimethoate
Carbamate	Carbaryl	Sevin	Sevin
Tetronic acid	Spirotetramat	Movento	Movento
Fermentation	Spinetoram	Delegate	
Fermentation	Abamectin	Agri-Mek	
IGR	Diflubenzuron	Micromite	Micromite

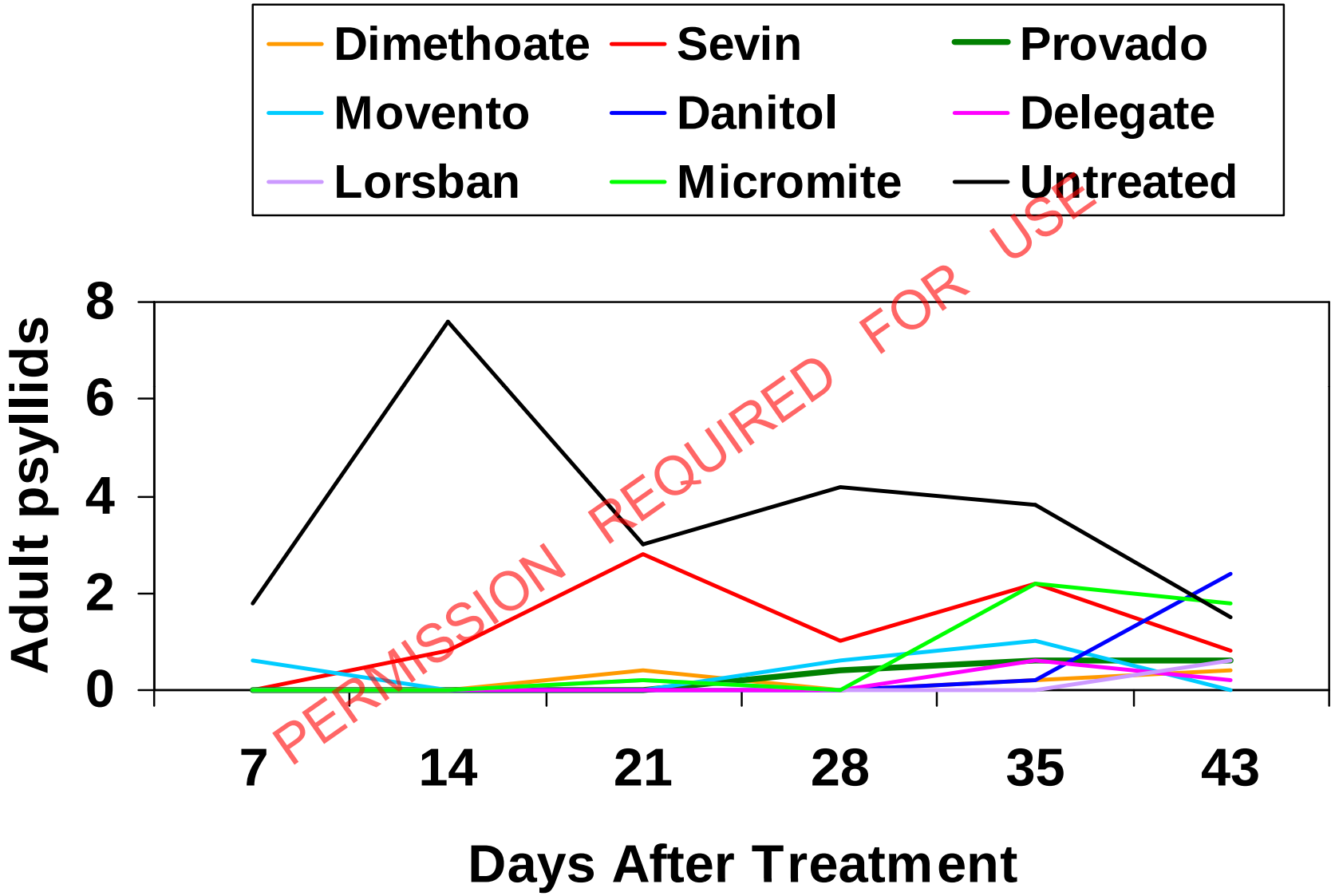
Insecticides tested that show insufficient efficacy

- Mineral oils
- Surround
- QRD 416: Plant extract
- Ecotrol: rosemary and peppermint oil
- Pyganic: pyrethrins
- Envidor
- Nexter
- Applaud
- Esteem
- Sulfur



- **Movento**: "Foliar Systemic"
  - Activity: Up and Down
    - Absorption – Movement in phloem and xylem:
    - Two-Way Systemicity:
      - Up and Down - into developing and new tissue
    - Coverage – No Runoff:
      - Spreader/Penetrating adjuvant, oil - increases uptake
        - » Check for adjuvant crop safety

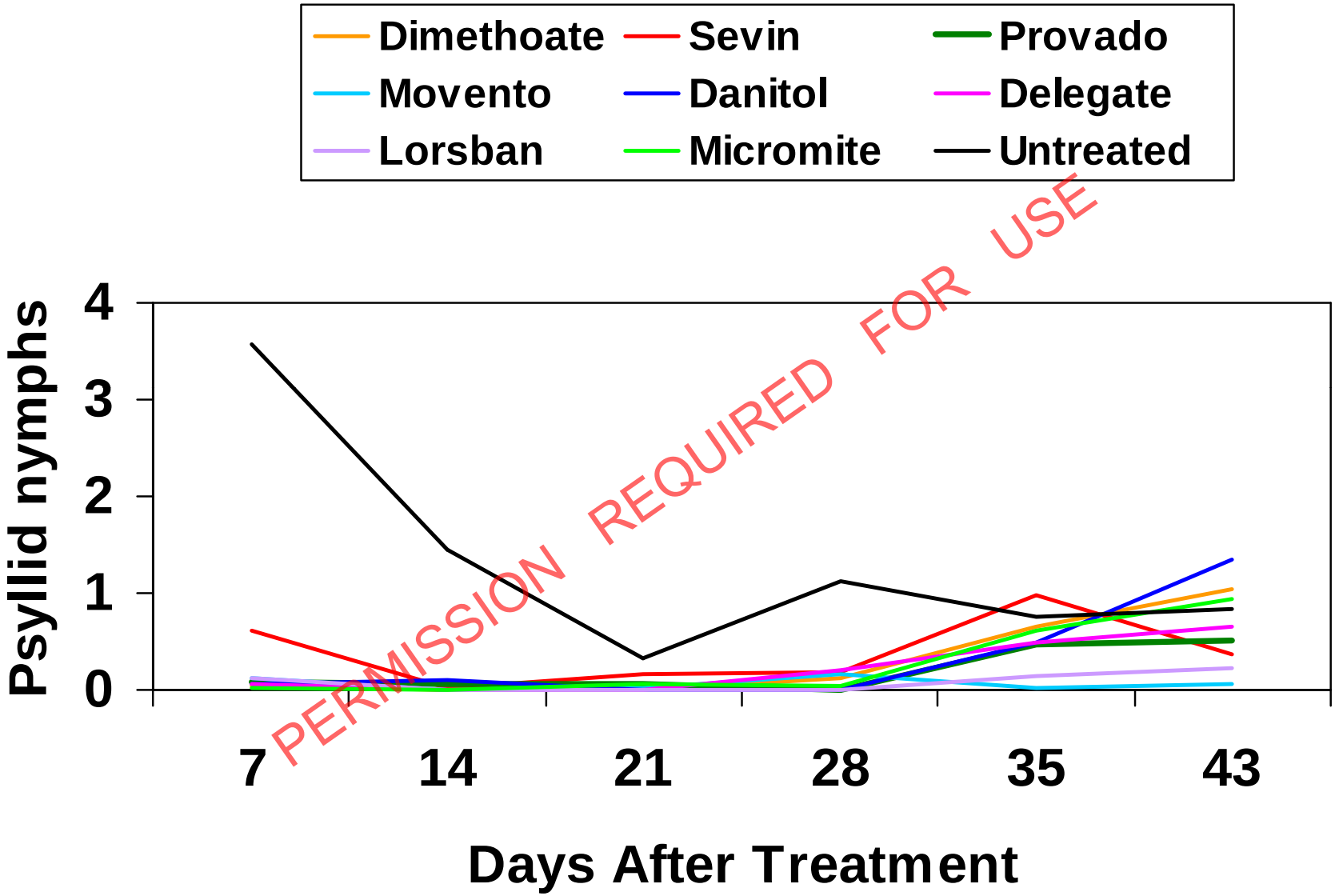
Effects of foliar insecticides on adult psyllids



M. Rogers UFL data

2 pts **Dimethoate**, 10 oz Movento, 10 oz Provado, 2 qts Sevin, 6.25 oz Micromite, 16 oz **Danitol**, 4 oz Delegate, 5 pts **Lorsban**

Effects of foliar insecticides on psyllid nymphs



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Admire Pro
Bayer CropScience

		PHI	REI	Max	
0.33 mls/0.1 ft^3 equivalent to 3.3 mls/1.0 ft^3 container media	Drench chemigation	0 day	12 hr	3 mls/ plant/crop season	Supplemental label CA: aphids, Asian citrus psyllid, citrus leafminer, leafhoppers, sharpshooters, mealybug, scales, whiteflies, root weevil/larval complex, citrus thrips
0.11 mls/0.1 ft^3 equivalent to 1.1 mls/1.0 ft^3 “citra pot” container	Drench, chemigation	0 day	12 hr	3 mls/ plant/crop season	Product bulletin 2(ee) label: aphids, citrus leafminer, leafhoppers, sharpshooters, mealybug, scales, whiteflies, citrus root weevil/ larval complex; citrus thrips (foliage feeding thrips only) Suppression
0.33 mls/1.0 ft^3 container media	Drench chemigation	0 day	12 hr		Specimen label CA: aphids, Asian citrus psyllid, citrus leafminer, leafhoppers, sharpshooters, mealybug, scales, whiteflies, citrus root weevil/larval complex (0.55 to 1.1 mLs/ft3), citrus thrips (foliage feeding thrips only, suppression 1.1 mls)
7 to 14 fl oz/acre	Drench, surface band, chemigation	0 day	12 hr	14 fl oz/acre /season	Specimen label CA: aphids, Asian citrus psyllid, blackfly, citrus leafminer, leafhoppers, sharpshooters, mealybug, scales, whiteflies. Suppression of citrus nematode, CVC vector control (foliage feed
14 fl oz/acre	Shank or subsurface injection	0 day	12 hr	14 fl oz/acre /season	CA 24c label: Field, furrow irrigated only, leafhopper, sharpshooters

Ed Ishida: ed.ishida@bayercropscience.com

AdmirePro Conversion Chart - Citrus Nursery:

Cylinder Containers:

Enter Diameter (inches) =	7.5	inches across
Enter height (inches) =	15	inches height
Gives Cubic Feet >	0.383	ft3
Enter AdmirePro rate: ml/ft3 is =	1.1	ml per ft3
Gives fluid oz/container >	0.014	fl.oz. / container
Enter number of containers >	10,000	containers
Gives Total Fluid Ounces >	142.6	fluid ounces

Box Containers:

Enter height (inches) =	12.0	inches height
Enter width (inches) =	12.0	inches wide
Enter length (inches) =	12.0	inches length
Gives Cubic Feet >	1.000	ft3
Enter AdmirePro rate: ml/ft3 is =	1.1	milliters per ft3
Gives fluid ounces >	0.037	fl.oz. / container
Enter number of containers >	10,000	containers
Gives Total Fluid Ounces >	372.0	fluid ounces

Cubic Feet Entry:

Enter Cubic Feet =	0.500	ft3
Enter AdmirePro rate: ml/ft3 is =	1.1	milliters per ft3
Gives fluid ounces >	0.019	fl.oz. / container
Enter number of containers >	10,000	containers
Gives Total Fluid Ounces >	186.0	fluid ounces

Conversions:

- volume of a cylinder = pi(3.14)xradius{2}xheight
- volume of a box = height x width x length
- cubic ft = 1728 cubic inches
- fluid ounce = 29.57 milliliters
- gallon = 0.1337 ft3
- cubic ft = 7.48 gallons

AdmirePro (Containerized Citrus) Labels:

CA Specimen Label: currently 11-27-07
Rate: 0.33 ml per cubic ft.
aphid, asian citrus psyllid, citrus leafminer, leafhopper/sharpshooter, mealybug, scales, whiteflies

Rate: 1.1 ml per cubic ft
citrus root weevil, foliage citrus thrips

CA Supplemental Label: 10-10-08
Rate: 0.33 - 0.5 ml per 0.1 cubic ft. = 3.3 - 5.0 ml per cubic ft.
aphid, asian citrus psyllid, citrus leafminer, leafhopper/sharpshooter, mealybug, scales, whiteflies; max 3.0 ml per plant per crop season

2(ee) Labeling: 11-10-08
Rate: 0.11 ml per 0.1 cubic ft. = 1.1 ml per cubic ft.
aphid, citrus leafminer, leafhopper/sharpshooter, mealybug, scales, whiteflies; max 3.0 ml per plant per crop season

Container Volume - Gallon Entry:

Enter Gallons:	3	gallons
Gives Cubic Feet >	0.40	ft3
Enter AdmirePro rate: ml/ft3 is =	1.1	milliters per ft3
Gives fluid ounces >	0.015	floz/container
	0.4	ml per container
Enter number of containers >	10,000	containers
Gives Total Fluid Ounces >	149.20	fluid ounces

Calculator Options:

1. Enter dimensions, rate and number of containers in the appropriate container type section to obtain total fl.oz. needed.

2 Find ft3 in cylinder chart and enter ft3 in 'Cubic Feet Entry' with rate and number of containers to obtain total fl.oz. needed.

3 Enter container gallon volume, rate and number of containers to obtain total fl.oz. needed.

Area is locked except entry cells, to change go to excel toolbar : tools, protection, unlock/lock; no password is used

Enter in3	Gives ft3
173	0.10
172.8	0.10
1728	1.00
3456	2.00
600	0.35
	0.00
	0.00
	0.00

Worksheet is locked within boarders;
To unlock sheet: Tools, Protection, Unlock; No password is used;
Be sure to possess specific label when making the application

Cylinder Cubic Feet from height (inches) by diameter (inches)

Height "inches"	Diameter - "inches" 3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0
6	0.02	0.03	0.04	0.06	0.07	0.08	0.10	0.12	0.13	0.15	0.17	0.20	0.22	0.25	0.27	0.30	0.33	0.36	0.39
7	0.03	0.04	0.05	0.06	0.08	0.10	0.11	0.13	0.16	0.18	0.20	0.23	0.26	0.29	0.32	0.35	0.38	0.42	0.46
8	0.03	0.04	0.06	0.07	0.09	0.11	0.13	0.15	0.18	0.20	0.23	0.26	0.29	0.33	0.36	0.40	0.44	0.48	0.52
9	0.04	0.05	0.07	0.08	0.10	0.12	0.15	0.17	0.20	0.23	0.26	0.30	0.33	0.37	0.41	0.45	0.49	0.54	0.59
10	0.04	0.06	0.07	0.09	0.11	0.14	0.16	0.19	0.22	0.26	0.29	0.33	0.37	0.41	0.45	0.50	0.55	0.60	0.65
11	0.04	0.06	0.08	0.10	0.12	0.15	0.18	0.21	0.24	0.28	0.32	0.36	0.40	0.45	0.50	0.55	0.60	0.66	0.72
12	0.05	0.07	0.09	0.11	0.14	0.16	0.20	0.23	0.27	0.31	0.35	0.39	0.44	0.49	0.55	0.60	0.66	0.72	0.79
13	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.25	0.29	0.33	0.38	0.43	0.48	0.53	0.59	0.65	0.71	0.78	0.85
14	0.06	0.08	0.10	0.13	0.16	0.19	0.23	0.27	0.31	0.36	0.41	0.46	0.52	0.57	0.64	0.70	0.77	0.84	0.92
15	0.06	0.08	0.11	0.14	0.17	0.21	0.25	0.29	0.33	0.38	0.44	0.49	0.55	0.61	0.68	0.75	0.82	0.90	0.98
16	0.07	0.09	0.12	0.15	0.18	0.22	0.26	0.31	0.36	0.41	0.47	0.53	0.59	0.66	0.73	0.80	0.88	0.96	1.05
17	0.07	0.09	0.12	0.16	0.19	0.23	0.28	0.33	0.38	0.43	0.49	0.56	0.63	0.70	0.77	0.85	0.93	1.02	1.11
18	0.07	0.10	0.13	0.17	0.20	0.25	0.29	0.35	0.40	0.46	0.52	0.59	0.66	0.74	0.82	0.90	0.99	1.08	1.18
19	0.08	0.11	0.14	0.17	0.22	0.26	0.31	0.36	0.42	0.49	0.55	0.62	0.70	0.78	0.86	0.95	1.04	1.14	1.24
20	0.08	0.11	0.15	0.18	0.23	0.27	0.33	0.38	0.45	0.51	0.58	0.66	0.74	0.82	0.91	1.00	1.10	1.20	1.31

AdmirePro Fl Oz per Container
(3 ml or 0.0113 floz maximum per plant)

	ml per ft3				
cu. ft.	0.33	0.55	1.10	3.30	5.00
0.10	0.0011	0.0019	0.0037	0.0112	0.0169
0.15	0.0017	0.0028	0.0056	0.0167	0.0254
0.20	0.0022	0.0037	0.0074	0.0223	0.0338
0.25	0.0028	0.0046	0.0093	0.0279	0.0423
0.30	0.0033	0.0056	0.0112	0.0335	0.0507
0.35	0.0039	0.0065	0.0130	0.0391	0.0592
0.40	0.0045	0.0074	0.0149	0.0446	0.0676
0.45	0.0050	0.0084	0.0167	0.0502	0.0761
0.50	0.0056	0.0093	0.0186	0.0558	0.0845
0.55	0.0061	0.0102	0.0205	0.0614	0.0930
0.60	0.0067	0.0112	0.0223	0.0670	0.1015
0.65	0.0073	0.0121	0.0242	0.0725	0.1099
0.70	0.0078	0.0130	0.0260	0.0781	0.1130
0.75	0.0084	0.0139	0.0279	0.0837	0.1130
0.80	0.0089	0.0149	0.0298	0.0893	0.1130
0.85	0.0095	0.0158	0.0316	0.0949	0.1130
0.90	0.0100	0.0167	0.0335	0.1004	0.1130
0.95	0.0106	0.0177	0.0353	0.1060	0.1130
1.00	0.0112	0.0186	0.0372	0.1116	0.1130
1.05	0.0117	0.0195	0.0391	0.1130	0.1130
1.10	0.0123	0.0205	0.0409	0.1130	0.1130
1.15	0.0128	0.0214	0.0428	0.1130	0.1130
1.20	0.0134	0.0223	0.0446	0.1130	0.1130
1.25	0.0139	0.0232	0.0465	0.1130	0.1130
1.30	0.0145	0.0242	0.0484	0.1130	0.1130
1.35	0.0151	0.0251	0.0502	0.1130	0.1130

Effects of Admire Pro on adult psyllids

M. Rogers UFL data
Admire Pro 14 oz/acre

Effects of Admire Pro on psyllid nymphs

M. Rogers UFL data
Admire Pro 14 oz/acre

Imidacloprid soil drench rates for solid plantings of nonbearing citrus in Florida

Tree Height	Rate Product/A*	Applications per season	Ounces per tree	Trees per ounce
Imidacloprid 2F (Admire and various generic products)				
2 ft – 4 ft	8 fl oz	4	0.057 fl oz	17.5 trees
4 ft – 6 ft	16 fl oz	2	0.114 fl oz	8.77 trees
Imidacloprid 4.6F (Admire PRO)				
2 ft – 4 ft	3.5 fl oz	4	0.025 fl oz	40 trees
4 ft – 6 ft	7 fl oz	2	0.05 fl oz	20 trees
**Rates based on 140 trees per acre*				

http://www.crec.ifas.ufl.edu/extension/pest/index.htm

Effects of Insecticides on Natural Enemies

	Aphytis melinus	*Rodolia cardinalis*	*Euseius tularensis*
OPs & carbamates	Toxic unless low rates – some resistance	Highly resistant	Resistant
Pyrethroids	Highly toxic	Highly toxic	Highly toxic
Neonicotinoids	Foliar toxic for 3 mo Systemic less toxic	Systemic toxic for 6 mo Foliar 3 mo	Systemic slight Foliar 2 mo
Spinosad, spinetoram, abamectin	Nontoxic	Nontoxic	Relatively nontoxic
Insect growth regulators	Nontoxic	Highly toxic for 7 mo	Nontoxic
Tetronic acid Spirotetramat	Nontoxic	Nontoxic	Toxic

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Citrus Red Mite, *Panonychus citri*

Citrus Thrips, *Scirtothrips citri*

Forktailed Bush Katydid, *Scuddaria furcata*

Asian citrus psyllid, *Diaphorina citri*

Pyrethroid or neonic For ACP

Delegate for thrips OP for katydid

Movento For red scale

Imidacloprid for ACP

Pyrethroid or neonic For ACP

California red scale, *Aonidiella aurantii*

Citricola scale, *Coccus pseudomagnoliarum*

Cottony cushion scale, *Icerya purchasi*

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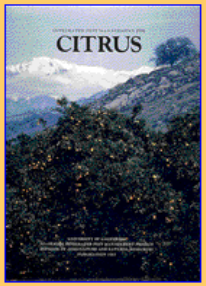
For more information, see this UC IPM book:



Integrated Pest Management for Citrus

How to Manage Pests
Home & garden
Agriculture
Natural environments
Exotic & invasive
Weather data & products
Degree-days
Interactive tools & models

Identification Galleries
Natural enemies
Weeds

Educational Resources
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- UC ANR: more topics

How to Manage Pests

Citrus

More crops

Provisional Treatment Guidelines

- Diaprepes Root Weevil
- Asian Citrus Psyllid

Year-Round IPM Program—tells you what you should be doing throughout the year in an overall IPM program. Includes Year-Round IPM Program Annual Checklist.

Year-Round IPM Program for Citrus (9/08)

- Prebloom activities
- Bloom activities
- Petal fall activities
- Fruit development activities
- Fall activities

UC IPM Pest Management Guidelines—University of California's official guidelines for pest monitoring techniques, pesticides, and nonpesticide alternatives for managing pests in agriculture, floriculture, and commercial turf. More

| Authors/credits | Index to crops | PDFs to print | Recent updates |

General Pesticide Information

- Mandatory Intervals Between Application, Reentry, and Harvest, and Hazards to Bees (9/08)
- Selectivity of Insecticides and Miticides (9/08)
- Spray Coverage (9/08)
- Precautions for Using Petroleum Oil Sprays (9/08)
- Cultural Practices that Affect Pests (9/08)
- Timings for Key Cultural and Management Practices (9/08)
- When to Monitor Pests and Natural Enemies (9/08)
- General Properties of Fungicides used in Citrus (9/08)

Diseases

- Alternaria Rot (9/08)
- Anthracnose (9/08)
- Armillaria Root Rot (9/08)
- Bacterial Blast (9/08)
- Botrytis Rot (9/08)
- Brown Rot (9/08)
- Dothiorella Gummosis (9/08)
- Dry Root Rot (9/08)
- Exocortis (9/08)
- Lemon Sieve Tube Necrosis (9/08)
- Phytophthora Gummosis (9/08)
- Phytophthora Root Rot (9/08)
- Psorosis (9/08)
- Septoria Spot (9/08)
- Stubborn Disease (9/08)
- Tristeza Disease Complex (9/08)

Nematodes

Insects, Mites, and Snails

Armored Scales

- California Red Scale and Yellow Scale (3/09)
- Purple Scale (9/08)

Soft Scales

- Black Scale (9/08)
- Brown Soft Scale (9/08)
- Citricola Scale (9/08)
- Cottony Cushion Scale (9/08)

Thrips

- Bean Thrips (9/08)
- Citrus Thrips (3/09)
- Greenhouse Thrips (9/08)

Lepidoptera (Orangeworms)

- Amorbia (Western Avocado Leafroller) (9/08)
- Beet Armyworm (9/08)
- California Orangedog (9/08)
- Citrus Leafminer (9/08)
- Citrus Peelminer (9/08)
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- Fruittree Leafroller (9/08)
- Loopers (9/08)
- Omnivorous Leafroller (9/08)
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A New Pest in California, Diaphorina citri (Asian Citrus Psyllid): Provisional Treatment Guidelines for Citrus in Quarantine Areas

Citrus pest management guidelines

The Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Psyllidae), is a tiny (1/8 inch, 3 mm in length) mottled brown insect that is about the size of an aphid. It attacks citrus and very closely related ornamental plants in the family Rutaceae (mock orange, Indian curry leaf, orange jasmine and other Murraya species). This pest attacks new citrus leaf growth and, because of the salivary toxin that it injects, causes the new leaf tips to twist or burn back. However, the more serious damage that it causes is vectoring the bacteria (*Candidatus* Liberibacter asiaticus and related species) that cause Huanglongbing (HLB or citrus greening) disease. Huanglongbing causes shoots to yellow, assymetrical leaf mottling, and abnormally shaped fruit with bitter juice. The disease can kill a citrus tree within 3 to 5 years, and there is no known cure for the disease. Asian citrus psyllid arrived in southern California from Mexico in 2008. At this point, Huanglongbing has not been detected in California. However, in Florida the psyllid rapidly spread throughout the state on *Murraya*, and a few years later began to spread Huanglongbing. It is thought that Huanglongbing was present in Florida backyard citrus trees, and it took the arrival of Asian citrus psyllid to move the disease into commercial citrus orchards. Florida citrus growers are now treating up to 8 times per year with broad-spectrum pesticides to reduce Asian citrus psyllid and slow the spread of the disease. Pesticides can reduce the number of psyllids, but an adult psyllid carries the bacteria its entire life and can transmit the disease faster than some pesticides will kill it.

Because Asian citrus psyllid has only recently entered California, we are relying heavily on research done on this pest in Florida and Texas. Currently, treatments that are applied to California citrus orchards in the quarantine zone are designed to disinfest trees and thus minimize the risk of moving Asian citrus psyllid in bins of harvested fruit and to limit the natural spread of Asian citrus psyllid throughout California. Adult psyllids can be detected through visual surveys and yellow sticky cards. Immature stages (eggs and nymphs) are limited to new growth so direct monitoring efforts towards "feather flush" to detect these stages.

For more information, read UC ANR Publication 8205: Asian citrus psyllid.

If you see the Asian citrus psyllid, please contact the **CDFA Exotic Pest Hotline at 1-800-491-1899**. Personnel from CDFA will inspect plants for the presence of this psyllid and send any specimens to diagnostic laboratories for identification and determination of the presence of Huanglongbing.

Provisional treatment guidelines for citrus in quarantine zones only

The following treatment guidelines have been developed for citrus growers within the quarantine zones. Treat with both a foliar insecticide for immediate control and a systemic insecticide for long-term control. Systemic insecticides take time for uptake and should not be depended on for immediate control. The most important treatment periods are when Asian citrus psyllid adults are found during visual surveys or on yellow sticky traps and during periods of new growth flush when immature stages are developing. Because the systemic insecticides take some time for uptake, apply them before the initiation of flush. For resistance management purposes, rotate between insecticides from different classes.

FOLIAR INSECTICIDES

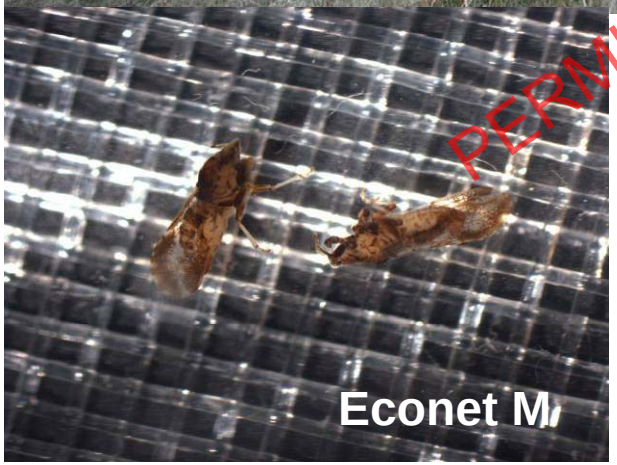
A. **Danitol 2.4 EC** (fenpropathrin*) use 21.3 oz/acre. Apply in 100-500 gal water/acre.
Restricted entry interval (REI): 24 hours; Preharvest interval (PHI): 1 day.
MODE OF ACTION GROUP NUMBER[1]: 3
COMMENTS: Use only on citrus trees 3 years or older. Do not apply in the vicinity of aquatic areas and do not apply more than 21.33 fl oz/acre/year.

B. **Baythroid XL** (cyfluthrin*) use 6.4 oz/acre in 100-500 gal water/acre.
Restricted entry interval (REI): 12 hours; Preharvest interval (PHI): 0 day.
MODE OF ACTION GROUP NUMBER[1]: 3
COMMENTS: Only a single application may be made per crop season. Do not apply within 25 feet of lakes, reservoirs, rivers, permanent streams, marshes, or natural ponds, estuaries, and commercial fish farm ponds.

C. **Delegate** (spinetoram) use 6 oz/acre in 100-500 gal water/acre along with 0.5% 415 Narrow Range Oil.
Restricted entry interval (REI): 4 hours; Preharvest interval (PHI): 1 day.
MODE OF ACTION GROUP NUMBER[1]: 5
COMMENTS: For use on all varieties. Oil improves translaminar movement and insecticide persistence. Do not apply to citrus nurseries or to citrus in greenhouses. To avoid potential phytotoxicity of oil to the fruit, do not apply 30 days before or after a sulfur application, and do not apply to small fruit (less than 1 inch in diameter) on a day when the ambient temperature has or is expected to exceed 95°F or when the relative humidity has or is expected to drop below 20%.

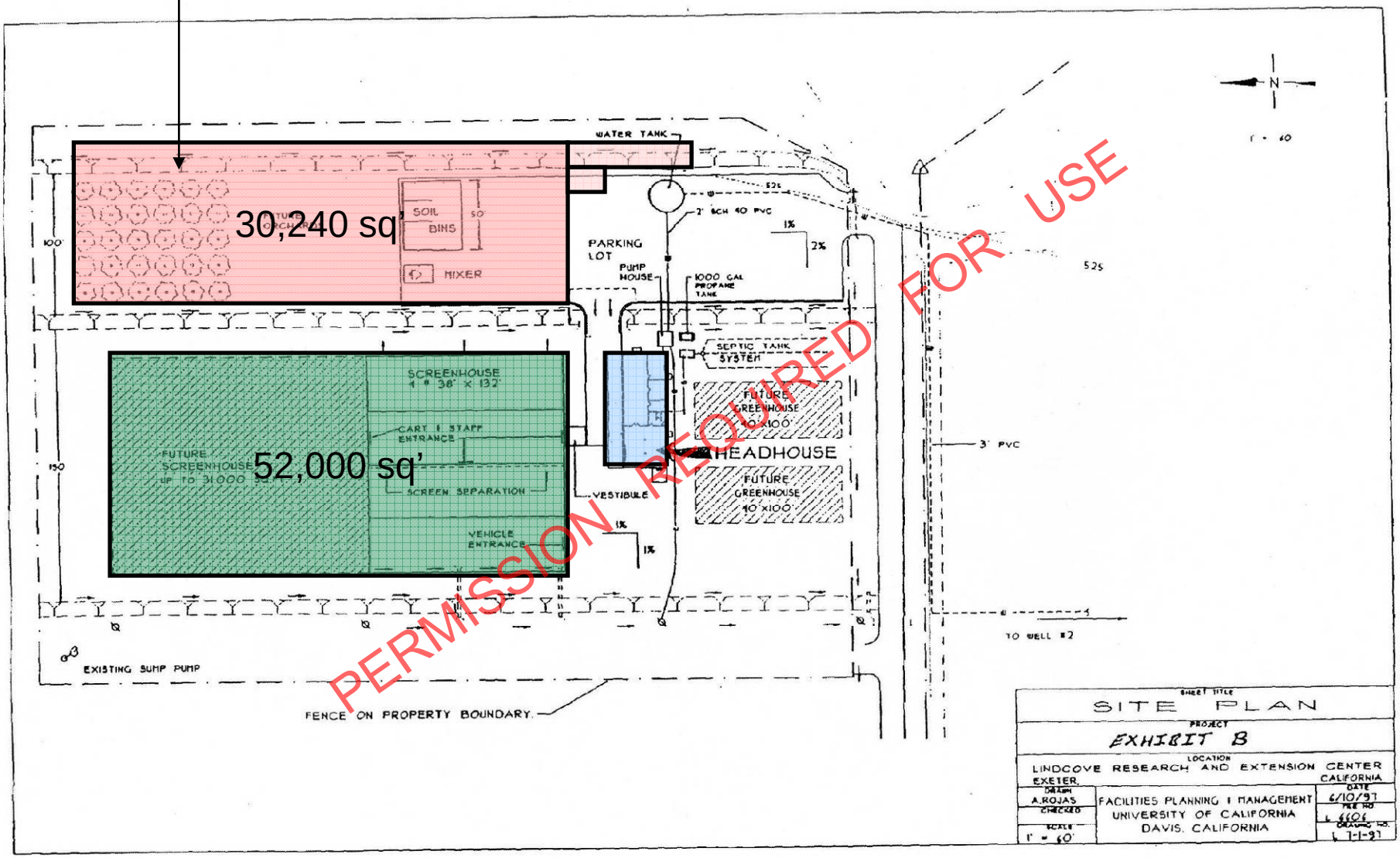
Asian Citrus Psyllid Protection for Nurseries

UC LREC Screenhouses



LS Econet M (current), LS Econet T (proposed)

Screenhouse addition planned for the CCPP program (August 2009)



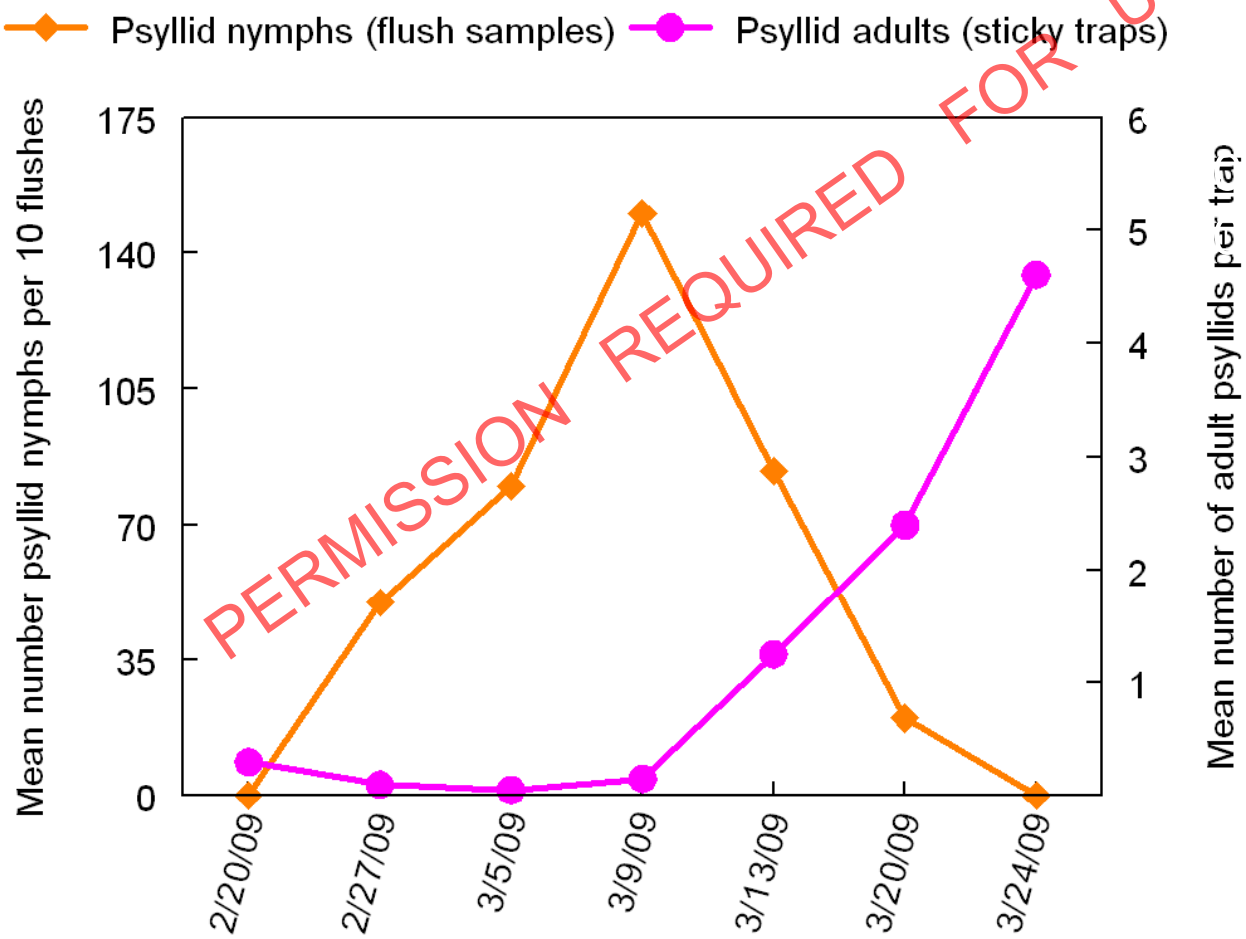
Methods of monitoring for psyllids

Visual surveys and yellow sticky cards

Sticky cards are most effective at 1 meter height and when there is no flush to distract them

Psyllid Monitoring

(spring 2009)



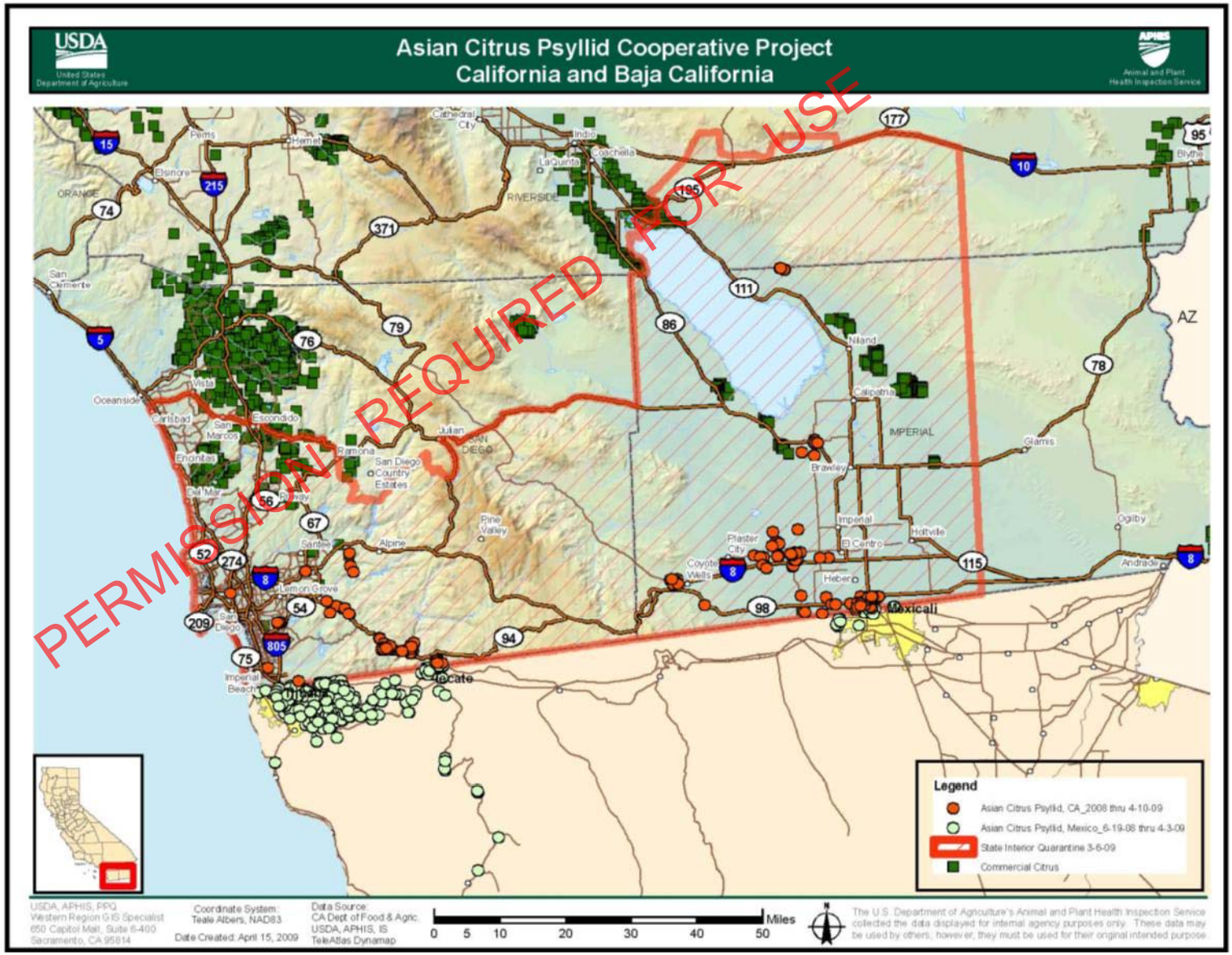
Search for immature stages of psyllids where you would expect to see aphids: on the new flush.

Detection focuses on new flush whenever it is present

E. Grafton-Cardwell

Asian citrus psyllid arrived in California from Mexico in 2008 and was found in backyard citrus in San Diego and Imperial Counties

The red dots indicate locations where the psyllid has been found in California and the green dots in Mexico.



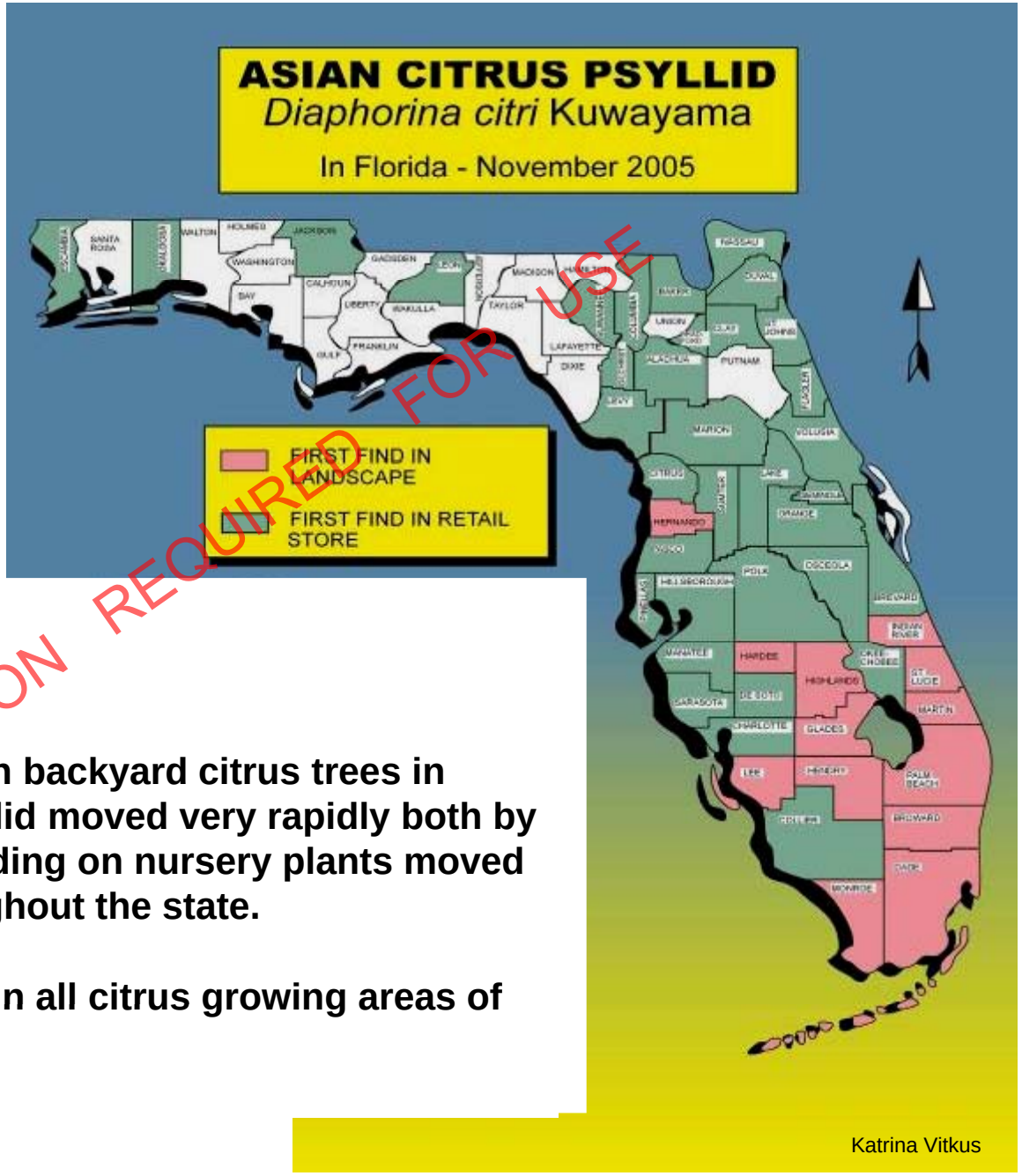
What happens when Asian citrus psyllids are found in a California backyard?

If a psyllid is found, all of the host plants in that yard and 400 meters around the yard, are treated with a foliar and a systemic insecticide.

A professional applicator treats the backyard citrus trees and closely related plants with insecticides
cyfluthrin (Tempo) a foliar pyrethroid
imidacloprid (Merit) a systemic neonicotinoid

How did the psyllid spread through Florida?

In retail nurseries, orange jasmine (*Murraya paniculata*) was a common host.



The psyllid was first detected in backyard citrus trees in south Florida in 1998. The psyllid moved very rapidly both by flying (pink areas) as well as riding on nursery plants moved between retail nurseries throughout the state.

The psyllid is well established in all citrus growing areas of FL.

Nursery Quarantine Treatments for ACP

Class	Insecticide	Bearing	Nursery
Systemic			
Neonicotinioid	Imidacloprid soil	Admire Pro, Nuprid, Alias, Couraze	Merit, Marathon II, Core Tec
Neonicotinoid	Thiamethoxam soil		Flagship
Neonicotinoid	Dinotefuran		Safari
Foliar			
Pyrethroid	Cyfluthrin	Baythroid	Tempo
Pyrethroid	Fenpropathrin	Danitol	Tame
Pyrethroid + neonicotinoid	Cyfluthrin + imidacloprid		Discus
Organophosphate	Chlorpyrifos	Lorsban	Chlorpyrifos Pro
Carbamate	Carbaryl	Sevin	Sevin
Tetronic acid	Spirotetramat	Movento	Movento

One foliar and one systemic required to move within the ACP quarantine area

http://www.cdfa.ca.gov/phpps/acp/quarantine.html

Points to Remember

- Many types of broad spectrum pesticides work
- Pyrethroids are best for adults
- Systemics are best for nymphs
- Both are needed and combined only last several months
- Rotate between chemistries to prevent resistance

See www.CaliforniaCitrusThreat.com
For brochures, cards and bookmarks to print out and distribute

Resources

For more information on Asian citrus psyllid (download pdf)

For more information on the disease (download pdf)

Printable versions of posters and cards in English, Spanish and

Posters*

English

Spanish

Chinese

Identification Cards*

English

Spanish

Chinese

Bookmark*

English

CaliforniaCitrusThreat.org