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

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Benefits of Insect Exclusion Screening

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Outline of the Presentation

What makes a good exclusion screen?
Positive and negative aspects
Types of materials
Research based studies
Some examples of protected culture are interspersed

Positive Aspects

- Benefits of Screening

Pest exclusion

Wind damage

Disease free clean Stock

- IPM is more efficient

Release of beneficials and pest control is easier

Reduction in pesticide use (more spot treatments), Reduced occurrence of resistance

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Efficiency of insect exclusion screens for preventing whitefly transmission of tomato yellow leaf curl virus of tomatoes in Israel

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Abstract

Tomato yellow leaf curl virus (TYLCV) is the most frequently occurring virus in tomatoes in the Middle East, and the most harmful one. It is transmitted solely by the whitefly *Bemisia tabaci* (Gennadius). Within 4–6 h of inoculative feeding, a whitefly can transmit TYLCV to a healthy plant with 80% probability. The symptoms are apparent after two to three weeks whereupon fruit-set is effectively terminated. The only means of controlling TYLCV is by controlling the whitefly. Until 1990 this was exclusively by insecticides. Starting in 1990, growers of greenhouse tomatoes in Israel began adopting insect exclusion screens to prevent inoculation of TYLCV. This article reports on the methods used in the search for efficient screening materials and presents data on their relative efficiencies in excluding *B. tabaci* and several other greenhouse pests. Ten materials were tested, of which five were found to be effective in excluding *B. tabaci* under laboratory conditions. This number was reduced to three following field trials and trials in commercial tomato greenhouses. These materials are now in widespread use in Israel: by 2000 practically all table tomatoes in Israel were grown under exclusion screens. The use of exclusion screens has been shown to be an economically viable pest management method.


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Negative Aspects

- Light Reduction
- Thermal screen, retains heat
- Air Restriction

  Static pressure drop, Positive air flow vs negative air flow, Passive air flow
- Screens need to be washed
- Costs to retrofit

Exclusion Screen Materials

Polyethylene

- sheeting (perforated), various
- weaves, unwoven

Polyester

- various weaves

Brass, Stainless steel, Nickel

Filters (unwoven)

- Polyester, Polypropylene

Where do I start?

The target pest!

- Common small notorious pests in protected culture
  - Whiteflies, aphids, thrips, mealybugs, leafminers, mites
- Thrips exclusion will cause profoundly different changes in protected culture than the effects of leafminer exclusion

Western Flower Thrips

Aphids

Whiteflies

Greenhouse Whiteflies

Silverleaf Whiteflies

Leafminers

Vegetable leafminer
Liriomyza sativae

Serpentine Leafminer
Liriomyza trifolii

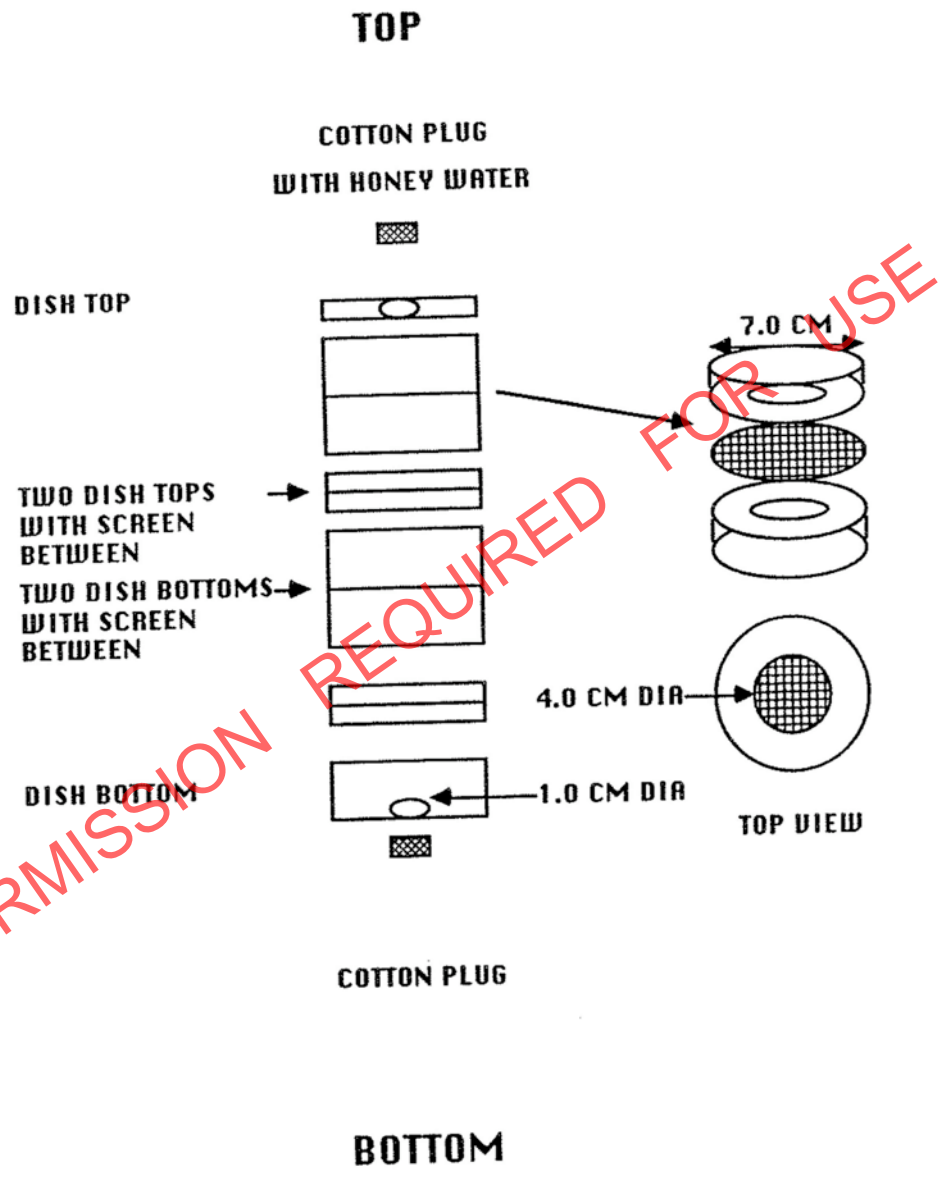

Fig. 1. Cage design for testing insect movement through barriers with different size holes.

Screening materials commercially available

Common name	Source	Description
Polyethylene sheet		
Vispore® 400, 1600	Tredegar	Sheet of high-density polyethylene film with formed holes.
Visqueen	Tredegar	Solid sheet film that will not allow any air flow, but can be used as a solid barrier.
Spunbonded filters		
Flybarr	Hygrogardens	An unwoven polyester filter.
Tybar	Reemay	An unwoven polypropylene fabric.
Reemay	Reemay	An unwoven polyethylene fabric.
Polyester woven materials		
Bug Bed 85, 123	NazDar	Regular weave polyester screens with small holes.
Protex 1, 2	Perifleur	Warp net knitted polyester screens. Protex 1 is metalized.
50062-280	Lumite	A 52 x 52 mesh high-density screen with a small hole size.
50094-435	Lumite	2-1-twill weave screen with 42 x 42 mesh.
50060-435	Lumite	A 32 x 32 mesh with relatively large hole size.
Econet L	L.S. Americas	High-density polyethylene fiber with a relatively large hole size and a polyester yarn interwoven.
Econet M	L.S. Americas	A regular weave high-density polyethylene fiber screen.
Econet T	L.S. Americas	High-density polyethylene fiber with a relatively small rectangular hole and a polyester yarn interwoven.
No-Thrip	Green-Tek	A regular weave high-density polyethylene screen with small fiber widths and a relatively small hole size.
Anti-virus Net	Green-Tek	A high-density polyethylene regular weave with large fiber width for strength and longevity.

Screen	Hole size (width x length)		Longevity	Fiber width [a]	
	Micrometers	Inches	(in years [b])	Micrometers	Inches [a]
No-Thrip	134 x 134	0.0053 x 0.0053	3	175	0.0069
Bug Bed 123	135 x 135	0.0053 x 0.0053	3	75	0.0030
Econet T	150 x 450	0.0059 x 0.0177	5	175	0.0069
Bug Bed 85	200 x 200	0.0079 x 0.0079	3	112	0.0044
AntiVirus Net	239 x 822	0.0094 x 0.0324	8	300	0.0118
Protex 1	267 x 738[c]	0.0105 x 0.0291	—	—	—
50062-280	296 x 296	0.0117 x 0.0117	5-7	225	0.0089
Protex 2	313 x 511[c]	0.0123 x 0.0201	—	—	—
50094-435	340 x 340	0.0134 x 0.0134	5-7	275	0.0108
Econet M	470 x 470	0.0185 x 0.0185	—	250	0.0098
50060-435	546 x 546	0.0215 x 0.0215	5-7	275	0.0108
Econet L	659 x 659	0.0259 x 0.0259	5	212	0.0083

[a] As determined in the laboratory by microscope.
[b] As determined by the source.
[c] Triangular shaped hole (base x height).

Screen	FM	WFT	SLW	GHW	MA	GPA
No-Thrip	10.1	10.0	0.0	0.0	0.0	—
	(115) [a]	(358)	(127)	(158)	(64)	(0)
Bug Bed 123	2.1	8.4	0.0	0.0	0.0	0.0
	(166)	(339)	(160)	(189)	(84)	(12)
Econet T	37.9	20.7	0.1	0.2	0.0	0.0
	(194)	(182)	(177)	(147)	(33)	(11)
Bug Bed 85	43.1	21.0	0.2	0.6	0.0	0.0
	(135)	(300)	(155)	(181)	(65)	(12)
AntiVirus Net	34.5	14.3	0.0	0.1	0.0	0.0
	(256)	(337)	(266)	(210)	(128)	(10)
Protex 1	24.5	12.4	0.4	0.6	0.0	—
	(172)	(358)	(202)	(194)	(59)	(0)
50062-280	30.0	11.4	0.0	0.1	0.0	0.0
	(493)	(332)	(217)	(204)	(88)	(94)
Protex 2	29.0	8.9	0.0	0.5	0.0	—
	(211)	(236)	(200)	(165)	(120)	(0)
50094-435	25.5	20.0	0.0	0.2	0.0	0.0
	(122)	(340)	(388)	(204)	(171)	(88)
Econet M	—	—	3.0	4.0	1.6	0.0
	(0)	(0)	(66)	(72)	(71)	(3)
50060-435	28.6	38.0	6.1	1.3	9.1	0.0
	(147)	(238)	(226)	(204)	(100)	(128)
Econet L	26.8	16.0	7.2	2.5	2.2	—
	(213)	(246)	(169)	(271)	(79)	(0)
Flybarr	—	58.4	65.9	—	44.3	0.0
	(0)	(101)	(0)	(0)	(131)	(83)

[a] Total number of insects tested in cages are in parenthesis.

Gerbera Daisies Grown Using IPM Practices


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Summary

Protected culture

- The target pest!
- Screening should be selected by exact hole size
- Benefits to pest control, IPM
- If vectors are excluded, disease is excluded as well
- There are negative impacts, but the benefits outweigh the costs