Management of Citrus Thrips

Joseph Morse
Entomology, UC/Riverside

Citrus thrips populations vary from year to year and require that growers and pest control advisors monitor carefully and apply treatments on an as--needed basis. A number of natural enemies (e.g., *Euseius tularensis*, spiders, lacewings) assist in reducing citrus thrips numbers, but in some years citrus thrips levels exceed treatment thresholds and lead to economic fruit scarring unless corrective measures are applied.

Broad-spectrum pesticide treatments appear to exacerbate citrus thrips populations. In past years, reliance on these broad-spectrum materials (e.g., Cygon, Carzol, Baythroid, Danitol) has led to control failures in some regions, increased resistance levels have been confirmed in laboratory and field bioassays, and these materials are not fully compatible with many natural enemies such as *Aphytis melinus*. At present, many growers rely on Success for citrus thrips control, but there is concern that overuse may lead to resistance with this material. Newer materials (e.g., Entrust, Admire, Surround, Assail) require further evaluation in order to determine how and whether they should be used against citrus thrips. The materials will provide less persistent residual control, and treatments will need to be timed carefully in order to achieve effective control. The search for effective biological and chemical controls useful in citrus thrips management is a high priority and continues.

Our citrus thrips research has three current objectives: (1) Continue laboratory and field citrus pesticide efficacy trials in order to evaluate possible new control materials such as Entrust, Admire, Surround, and Assail; continue the search for new and effective products with different chemistries. (2) Evaluate citrus thrips resistance to currently used products such as Success and Agri-Mek. (3) Evaluate biological control agents potentially useful against citrus thrips (e.g., *Goetheana incerta* and *Ceranisus menes).* Note that our present plan is to de-emphasize research on these two parasitoids while we concentrate on objectives 1 and 2.

Greenhouse Pesticide Screening Trials: Because we have been frustrated by low levels of fruit scarring by citrus thrips in the small plot trials at Lindcove over the past several years, we have decided to re-institute pesticide screening trials on laurel sumac (*Rhus laurina*) plants at Riverside. Two greenhouses have been obtained for this purpose and we have completed two *Rhus* trials to date. The second trial (see Figure 1 below) was quite encouraging. Finally, a new product (with new chemistry) is showing promise for future development as a citrus thrips control material (listed as "Exp" = Experimental in Figure 1, evaluated at low (L), medium, and high rates). It is a systemic feeding inhibitor (thus the slow action) that is probably 5-6 years away from registration.

Small Plot Pesticide Efficacy Trial at Lindcove: In the past, we ran small plot (4-5 replicates of 4 trees per treatment sprayed with a hand-gun) pesticide efficacy trials at the Lindcove Research and Extension Center each year aimed at comparing various citrus thrips treatments. In 2004, we evaluated 26 experimental treatments. Citrus thrips pressure was low again in 2004 – only 2.2% of the outside fruit were scarred by citrus thrips on the untreated control trees making it difficult to draw strong conclusions from these data. Thus, we have shifted from field small

plot trials to greenhouse screening trials as our primary method to evaluate new pesticides, alternative formulations or combinations of materials, impacts of pH, additives on efficacy, etc.

Study on Pesticide Suppression / Stimulation: We have set up a new study at Lindcove in cooperation with Dr. Grafton-Cardwell to evaluate to what degree Esteem (a key summer red scale treatment) is suppressive to citrus thrips populations the following spring and whether broad-spectrum treatments such as Lannate (pre-bloom worm treatment), Dimethoate-Carzol (petal fall citrus thrips treatments), and/or Supracide (summer red scale treatment) stimulate citrus thrips populations.

Two replicates of 0.5 acre plots (we would have liked to use larger replications but this is all the size of the field will allow) were sprayed with each of the following 6 treatments (listed in order of expected greatest thrips suppression to highest expected stimulation): (1) no pre-bloom spray, Success + Oil applied at petal fall and two weeks later, Esteem in June-July for red scale; (2) no pre-bloom spray, no petal fall citrus thrips spray, Esteem in June-July for red scale; (3) no sprays (untreated control); (4) no pre-bloom spray, Dimethoate at petal fall and Carzol two weeks later for citrus thrips, Supracide in June-July for red scale; (5) Lannate pre-bloom for worms, no petal fall citrus thrips spray, Supracide in June-July for red scale; (6) Lannate pre-bloom for worms, Dimethoate at petal fall and Carzol two weeks later for citrus thrips, Supracide in June-July for red scale.

We view this as a long-term (3-year) study and it will be interesting to see whether and when citrus thrips populations are suppressed or stimulated. Treatments were initiated in 2005 with the Lannate pre-bloom spray and Dr. Grafton-Cardwell's personnel are taking citrus thrips beating counts every 2 weeks in each block.

Large Plot Speed-Sprayer Trial: Because we have had low citrus thrips fruit scarring in the speed sprayer trial put on at the Lindcove station over the last several years, we decided to move our large plot trial to a grower cooperator grove. This trial near Delano worked so well in 2004 that we decided to expand the work to two different study sites in 2005. Sites were chosen that had a history of high citrus thrips pressure and treatments were applied by the cooperators -- the same site near Delano (Cooperator Rick Dunn and Badger Farming Co.) and a second site in Tulare County just north of the Kern County line, near Terra Bella (Cooperator Joe Stewart and Sun World Intl.).

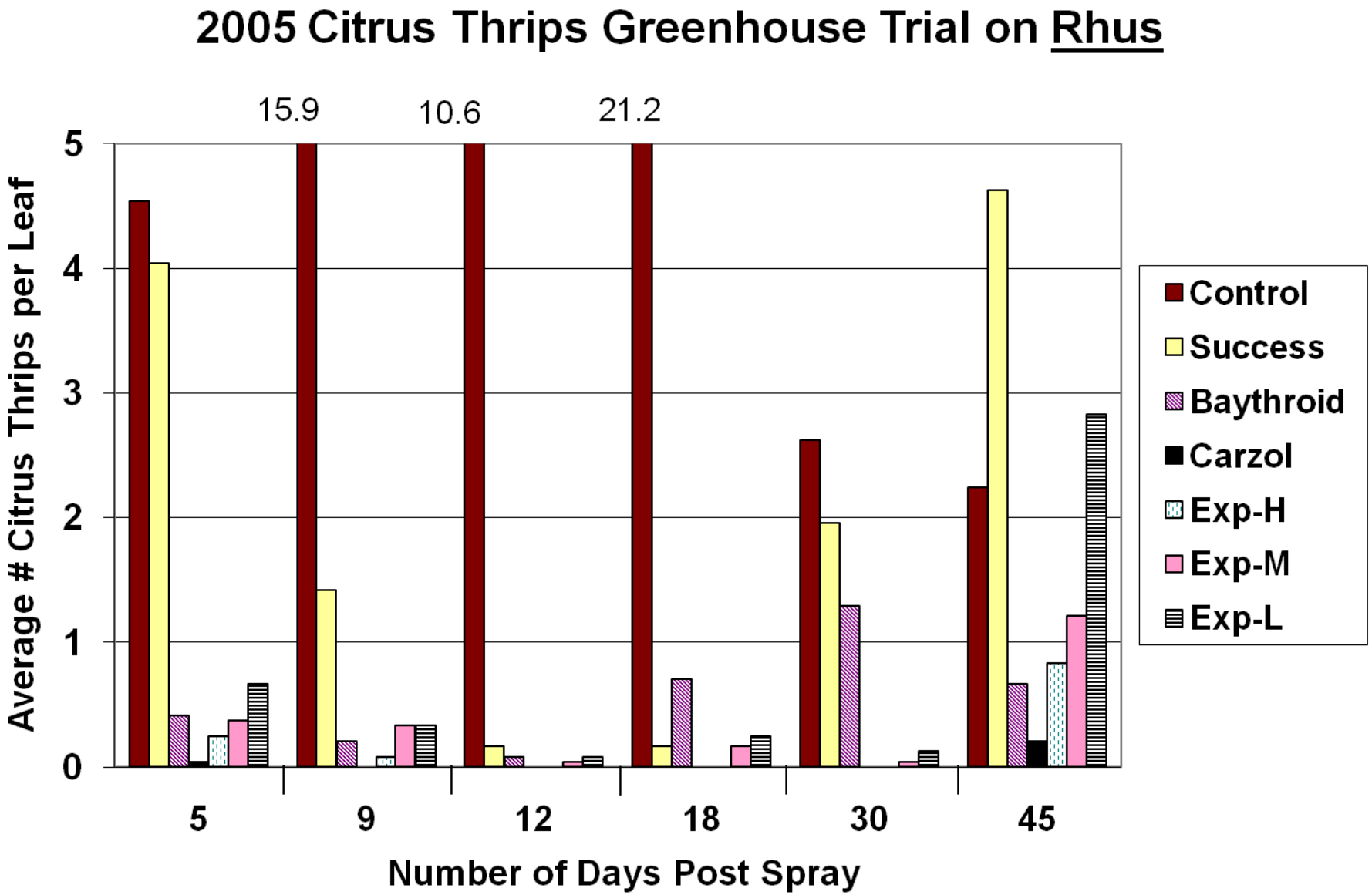
At both sites, 3 large replicate blocks were used to evaluate each of 4 treatments, 10 fl oz Agri-Mek per acre + 1% Oil, 2.9-3 oz Assail + Oil, 6.4 oz Success ± Oil (added at Terra Bella but not Delano) and 12 lbs Veratran D + 1.5 gal molasses. A small, untreated control block was included in the corner of each block. Grower spray practices were utilized.

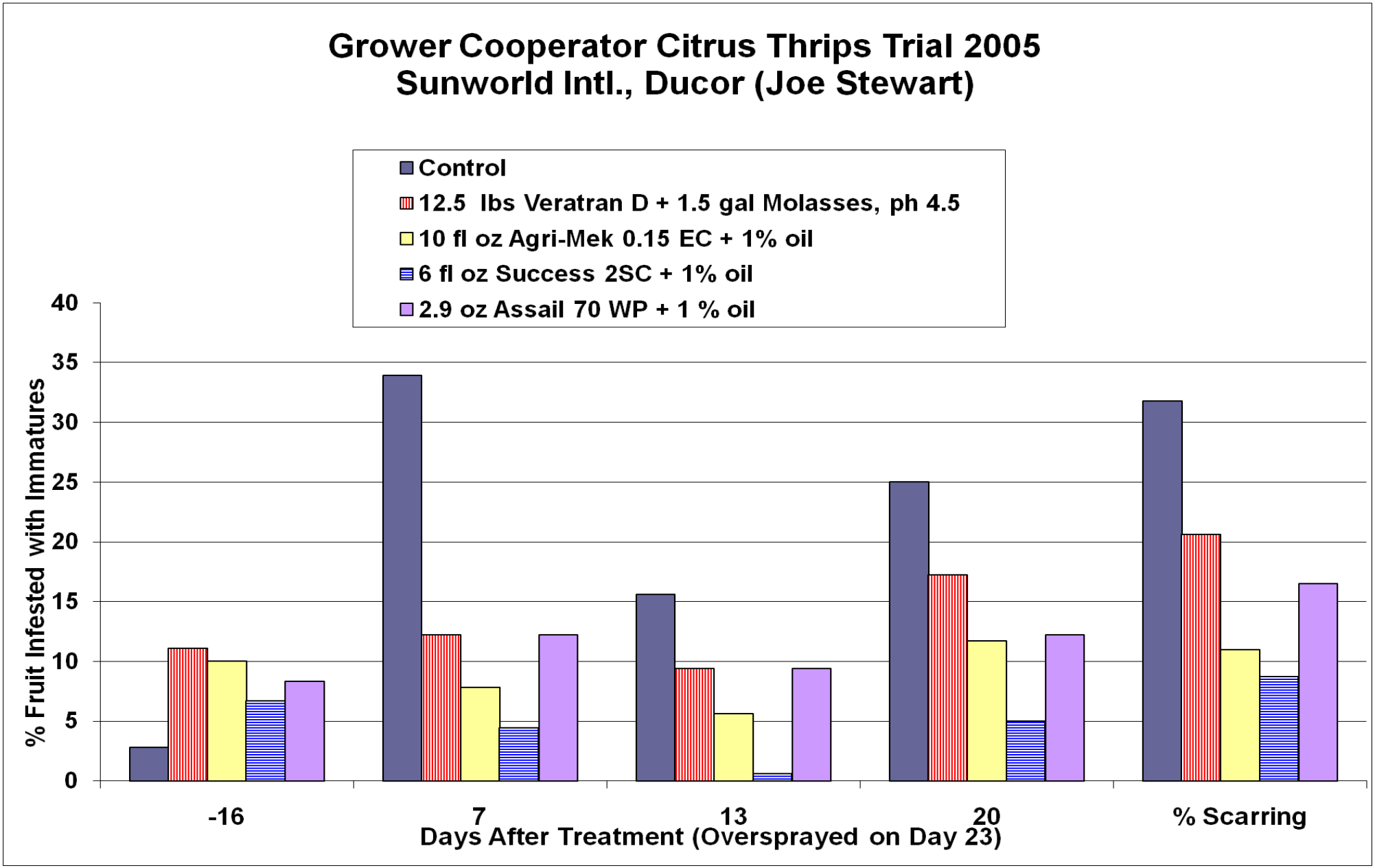
At Delano (see Figure 2), a total of 24 acres was treated on May 12 (2-acres per plot), application was with an FMC PTO sprayer driven at 3 mph, and fan speed was reduced to achieve outside coverage. Spray gallonage was 100 gpa and pH was reduced to 4.5 using 2 lbs. of citric acid for the Veratran treatment (pH 7 otherwise). For the Terra Bella site (see Figure 3), a total of 26 acres was treated on May 11 (roughly 2.2 acres per plot), application was with an FMC airblast sprayer driven at 2.5 mph, and fan speed was reduced to 1500 rpm to achieve outside coverage. Spray gallonage was 125 gpa and pH was reduced to 4.5 using 2.4 lbs. of citric acid for the Veratran D treatment (pH 8 otherwise). Percent of fruit infested with immature citrus thrips were counted in the center of each plot as graphed below. Fruit scarring counts were taken in September.

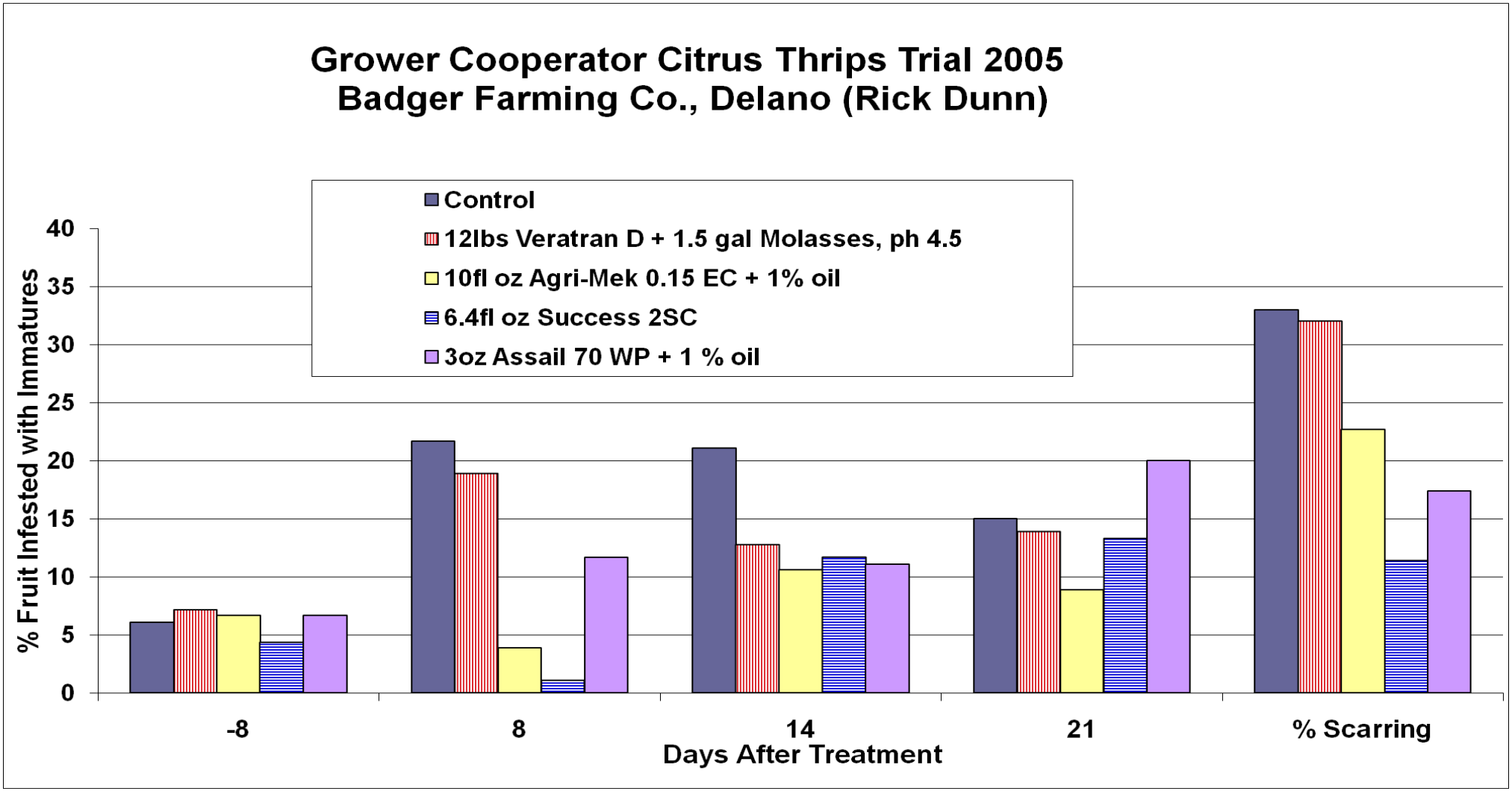
Citrus Thrips Resistance Evaluations: We are concerned by reports from three different sites of lack of citrus thrips control observed after Success treatments and also by a report from Ventura County of a decline in citrus thrips control after repeated Agri-Mek sprays for citrus bud mite control. Citrus thrips resistance evaluations are not easily conducted but we have initiated work on this project. Citrus thrips resistance to Agri-Mek and Success will be evaluated using colonies initiated with thrips from Ducor, Highgrove, and Ventura. It will be important to determine if resistance is present and whether there is cross-resistance between the two materials.

Research with *Goetheana incerta* and *Ceranisus menes*: *Goetheana incerta* is a small eulophid parasitoid that was found in 1995 to attack South African citrus thrips (same genus but a different species from the citrus thrips we have in California). Dr. Tim Grout (Nelspruit, South Africa) sent us a shipment of parasitoids that arrived 26 April 2004. After several months of work in quarantine, we were able to clearly observe parasitism and emergence of second generation parasitoids out of California citrus thrips but were frustrated by our inability to maintain the culture.

Ceranisus menes is a parasitoid of thrips that attacks western flower thrips, avocado thrips, and in the laboratory will attack citrus thrips. At present, we plan to discontinue research with *Goetheana* until we develop better expertise working with *Ceranisus* outside of quarantine. Both species are very tiny parasitoids that are difficult to work with. We will continue working on this as a lower priority relative to objectives 1 and 2.


2005 Citrus Thrips Greenhouse Trial on Rhus
15.9
10.6
21.2
Average # Citrus Thrips per Leaf
0
1
2
3
4
5
5
9
12
18
30
45
Number of Days Post Spray
Control
Success
Baythroid
Carzol
Exp-H
Exp-M
Exp-L


Grower Cooperator Citrus Thrips Trial 2005
Sunworld Intl., Ducor (Joe Stewart)
Control
12.5 lbs Veratran D + 1.5 gal Molasses, ph 4.5
10 fl oz Agri-Mek 0.15 EC + 1% oil
6 fl oz Success 2SC + 1% oil
2.9 oz Assail 70 WP + 1 % oil
% Fruit Infested with Immatures
40
35
30
25
20
15
10
5
0
-16
7
13
20
% Scarring
Days After Treatment (Oversprayed on Day 23)


Grower Cooperator Citrus Thrips Trial 2005
Badger Farming Co., Delano (Rick Dunn)
Control
12lbs Veratran D + 1.5 gal Molasses, ph 4.5
10fl oz Agri-Mek 0.15 EC + 1% oil
6.4fl oz Success 2SC
3oz Assail 70 WP + 1 % oil
% Fruit Infested with Immatures
40
35
30
25
20
15
10
5
0
-8
8
14
21
% Scarring
Days After Treatment