Evaluation of Insecticide Applications for Citrus Thrips Control Under Hot Conditions

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Abstract

A small plot efficacy trial was conducted evaluating citrus thrips control under hot conditions. Average daily maximum temperatures ranged from the mid-90's to low 100°F's. Success and Carzol were the most efficacious products evaluated, followed by Lorsban and Dimethoate. Both Lorsban and Dimethoate provided good initial thrips control but were short lived. Lorsban appeared to have a slightly longer residual than Dimethoate. Both of the pyrethroids, Baythroid and Danitol, performed poorly. Neither provided good thrips knockdown or residual control. Pyrethroids should be avoided for thrips control when temperatures equal or exceed 95°F. We were not able to demonstrate any adverse effect on efficacy towards thrips by acidifying Success. However, Success is not prone to hydrolysis at high pHs, and acidification is not necessary or advised.

Introduction

It is a well-excepted fact that insecticides targeting citrus thrips, *Scirtothrips citri* (Moulton) perform differently early vs. late in the thrips season. Early season applications when trees have an abundance of fresh flush and temperatures are moderate tend to provide better and/or longer control than late in the season when most of the growth has hardened and temperatures are high. The reason for this difference is not well understood and may be related to higher photo degradation under more intense temperatures and sunlight, and/or due to a more rapid thrips generation time. Additionally, some have speculated that more insecticide tolerant thrips are being selected as the season progress making control more difficult. Regardless of the reasons causing this difference, it is important to evaluate insecticides for their activity early and late in the season to quantify performance. In this study, we report the efficacy of a number of insecticides applied late in the season for control of citrus thrips. To avoid biasing the results, no early season applications were evaluated.

In the last three years, Success has become one of the insecticides of choice for citrus thrips control. However, several efficacy complaints have resulted that may have been due to tank mixing Success with micronutrients and/or acidifiers. Personnel with DowAgrosciences have reported that Success should not be buffered to a pH below 6. They suggest that acidifying the spray solution breaks down the Success aggregates leading to a more rapid photo degradation. If this does occur, logic would suggest that his would be most pronounced late in the season under high intensity sunlight. To evaluate this we included treatments where Success is applied with and without an acidifying adjuvant.

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Materials and Methods

Six year old "Limoneira 8A Lisbon" lemon trees grown at the Yuma Mesa Agricultural Center were used in this study. The test was a randomized complete block design consisting of four replicates. Each plot consisted of three trees in a row spaced ca. 30 ft apart. Treatments included Success (spinosad) at 4 oz/ac, 6 oz/ac without an acidifier, and Success at 6 oz/ac with an acidifier (buffered to a pH of 5.2). Other treatments were Dimethoate at 2 lbs-ai/ac, Baythroid (cyfluthrin) at 6.4 oz/ac, Danitol (fenpropathrin) at 21 oz/ac, Lorsban 4E at 64 oz/ac, and Carzol (formetamate HCL) at 1.25 lbs/ac. Baythroid, Danitol, Lorsban, and the non-acidified Success treatments included Kinetic spreader-sticker at 0.1% v/v. The remaining treatments included the acidifier LI-700 at 1.0%v/v. Treatments were applied on an as needed basis, when the number of fruit infested with immature citrus thrips exceeded or approached 10%. Applications were made using a backpack air-blast sprayer calibrated to deliver 100 gal/acre.

Percent-infested fruit were estimated by sampling ten fruit per tree for the presence or absence of immature citrus thrips. Fruit damage was estimated on 10 Oct, by rating the degree of scarring to the rind. Scarring was rated as 1=no scarring, 2=slight scarring around the stem, 3=significant scarring around the stem, 4=slight scarring on the side of the fruit and 5=major scarring on the side of the fruit. Fruit with a damage rating of 1, were considered Fancy grade, while those with a rating of 2 or 3 were considered choice. Fruit with damage ratings of 4 or 5 were graded as juice. Differences among insecticide treatments for thrips infestation, fruit grade and the cost effectiveness index were separated using ANOVA and an F protected LSD, $P<0.05$.

Results and Discussion

Temperatures during the evaluation period were high with maximum daily temperatures averaging from the mid-90's to the low 100's (Table 1). At five days following the first application, neither of the pyrethroids treatments (Danitol or Baythroid) differed from the untreated (Table 1). The Success treatments, Carzol, Lorsban, and Dimethoate contained significantly fewer infested fruit than the untreated; however, Dimethoate appeared to be slightly inferior since it did not significantly differ from the pyrethroids (Table 1). These findings were not unexpected; pyrethroids and Dimethoate have previously demonstrated poor control activity under hot conditions. However, it was surprising that the pyrethroids did not offer better knockdown activity than demonstrated.

By 14 days after treatment (DAT), the thrips populations had declined across the entire test and only the Success treatments and Carzol maintained the thrips populations significantly below that of the untreated. Success and Carzol continued to offer the best control through 20 DAT, although Success at 4 oz and the acidified Success at 6 oz did not differ from Dimethoate. Only Danitol had a percentage of infested fruit that did not statistically differ form the untreated.

Because some of the treatments had exceeded the 10% infestation threshold, on 25 May we made an additional application of Danitol, Baythroid, Dimethoate, and Lorsban (Table 1). Similar to the first application, Baythroid and Danitol failed to reduce the thrips infestation significantly below that of the untreated. There were no significant differences among the other treatments. By 14 DAT, only Lorsban, Carzol and the Success treatments had fewer infested thrips than the untreated, while at 20 DAT Dimethoate was also significantly better than the untreated.

At no time were we able to detect a statistically significant detriment from acidifying Success. If the problem of acidifying were pronounced, we would expect to see similar acute toxicity and knockdown between the acidified and non-acidified Success, but poorer residual control with the acidified. Regardless, Success does not need to be acidified to prevent hydrolysis as is seen with Carzol or Dimethoate. Thus, it is recommended that Success not be acidified.

Both of the pyrethroids performed very poorly under hot conditions. These products should not be used for thrips control if average maximum daily temperatures equals or exceed are 95°F. When temperatures are high, Success or Carzol are the products of choice before the fruit reaches 1 inch in diameter. At that point, Success is the best choice followed by Lorsban or Dimethoate. Both Lorsban and Dimethoate provided fairly good knockdown, but are shorter lived that

Success or Carzol. Lorsban appears to have a slightly longer residual than Dimethoate.

Significant thrips scarring to the fruit was evident in all the treatments (Figure 1). This is most likely due to the delayed onset of the experiment leaving much of the early fruit exposed to thrips feeding. Treatments receiving Success, Carzol, Lorsban, or Dimethoate produced the greatest percentages of fancy fruit and did not differ among each other. As expected from the thrips counts, the pyrethroids produced the poorest quality of fruit. Danitol was the only treatment that did not differ from the untreated in fancy fruit.

Table 1. Percentage of fruit infested with immature citrus thrips on lemons following two insecticide applications.

	Applications and mean percentage fruit infested with immature citrus thrips (CT)						
03 May App. 1	08 May 5 DAT	17 May 14 DAT	23 May 20 DAT	25 May App. 2	31 May 6 DAT	08 Jun 14 DAT	14 Jun 20 DAT
Treatment[ab]	CT (97.2°F)[c]	CT (93.6°F)[c]	CT (95.9°F)[c]	Treatment	CT (102.4°F)[c]	CT (103.6°F)[c]	CT (102.3°F)[c]
Untreated	21.67 ab	7.50 a	25.00 a	Untreated	12.50 a	21.67 ab	16.67 a
Success-4 oz	10.83 c	0.83 b	4.17 de	none	3.33 bcd	10.83 c	4.17 c
Success-6 oz	6.67 c	0.83 b	1.67 e	none	2.50 cd	6.67 c	5.00 c
Dimethoate	14.17 bc	5.00 ab	10.83 cd	Dimethoate	1.67 d	14.17 bc	9.17 bc
Baythroid	20.00 ab	5.00 ab	14.17 bc	Baythroid	9.17 ab	20.00 ab	15.00 ab
Danitol	26.67 a	5.00 ab	19.17 ab	Danitol	8.33 abc	26.67 a	21.67 a
Lorsban	8.34 c	3.33 ab	11.67 c	Lorsban	4.17 bcd	8.34 c	6.67 c
Carzol	6.67 c	0.83 b	1.67 e	none	3.33 bcd	6.67 c	6.67 c
Success B-6 oz	9.18 c	0.83 b	4.17 de	none	4.17 bcd	9.17 c	4.17 c

Means in a column followed by the same letter are not significantly different (F protected LSD $P < 0.05$).

[a]Rates: Success-4 oz (4 oz/ac); Success-6 oz (6 oz/ac); Dimethoate (2.0 lbs-ai/ac); Baythroid (6.4 oz/ac); Danitol (21 oz/ac); Lorsban (64 oz/ac); Carzol (1.25 lbs/ac); Success B-6 oz (6 oz/ac).

[b]Treatments containing Baythroid, Danitol, Lorsban, Success-4 oz, or Success-6 oz were applied with Kinetic non-ionic surfactant at 0.1% v/v; treatments containing Dimethoate, Carzol, or Success B-6 oz were applied with LI-700 acidifier at 1.0% v/v.

[c]Average maximum daily temperature °F, from time of most recent application.

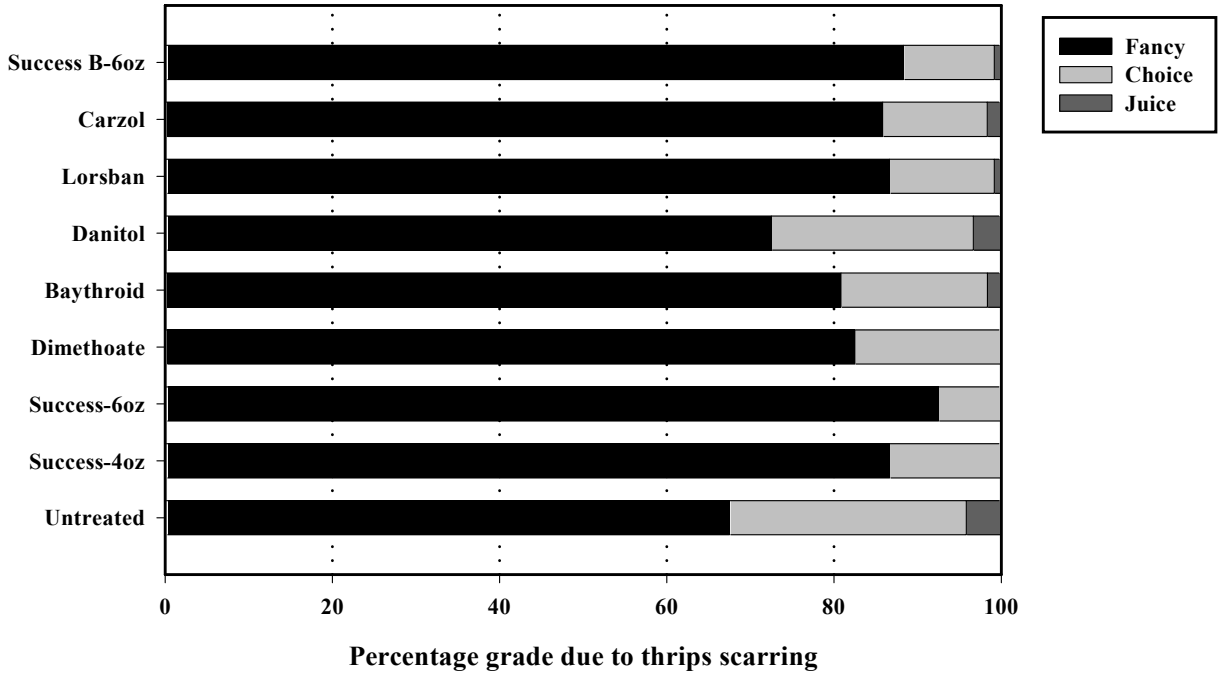

Figure 1. Percentages of grades of lemons based on rind scarring by citrus thrips.