

Tank Mixing Success for Citrus Thrips Control is Not Necessary¹

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Abstract

A small plot efficacy trial was conducted evaluating thrips control with Dimethoate, Baythroid, and Success at rates of 4, 6, and 9 oz/ac, and tank mixes of the low and medium rates of Success with Dimethoate or Baythroid. Based on a 10% fruit infestation threshold, Dimethoate required three applications while the other treatments required two applications to achieve season long thrips control. However, when evaluating the treatments based on a cost effectiveness index, none of the tank mixes or Success at 9 oz./ac were economically advisable. The most cost effective treatment was Success at 4 oz/ac, followed by Success at 6 oz/ac, Dimethoate, and Baythroid.

Introduction

In 1998, Success (spinosad) was registered for use in citrus and has proven to be an effective tool for managing citrus thrips, *Scirtothrips citri* (Moulton). Success is labeled for use against thrips at rates of 4 to 10 oz of product per acre, and specifies that lower rates should be used for light infestations and higher rates should be used for heavy infestations. In Yuma, growers typically use Success at 6 oz per acre, which has been highly effective but costly, averaging a little over \$30.00 per acre per application. Although this cost is similar to other premium citrus thrips control products, using lower rates of Success maybe more economically sustainable without greatly compromising thrips control. There are questions as to whether or not tank-mixing Success at lower rates with other insecticides enhances control and/or reduces thrips management expenses. In this trial we evaluated low, medium and high rates of Success and tank mixes of Success with Dimethoate or Baythroid for citrus thrips control relative to treatment costs.

Materials and Methods

Eleven year old 'Limoneira 8A Lisbon' lemon trees grown on the Yuma Mesa were used in these studies. 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 at 4 oz/ac, 6 oz/ac and 9 oz/ac, Dimethoate at 2 lbs-ai/ac, Baythroid (cyfluthrin) at 6.4 oz/ac, and combinations of Success at 4 or 6 oz/ac with either Dimethoate at 2 lbs-ai/ac or Baythroid at 6.4 oz/ac. All treatments included Kinetic spreader-sticker at 0.1% v/v. All product costs were estimated using suggested retail prices from a single distributor: Baythroid = \$601.33/gal, Dimethoate 4E = \$39.55/gal, and Success = \$662.34/gal. Treatments were applied on an as needed basis, when the number of fruit infested with immature citrus thrips was $\geq 10\%$. 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 19 Aug, by rating the degree of scarring to the rind. Scarring was rated as 1=no

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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 2, are not considered to be scarred heavy enough to cause a downgrade in quality. Fruit with a 3 damage rating, are considered slightly scarred and subject to downgrading to choice, while fruit with damage ratings of 4 or 5 are graded as juice. A cost effectiveness index for each treatment regime was calculated by multiplying the damage rating by the cost (\$/acre). The resultant values provide a relative assessment of the quality of fruit produced in relation to the cost of the treatments. 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 spring of 1999 were cooler than normal resulting in a significant delay in petal fall. Thus, applications were not initiated until 20 April. Following the first application, temperatures were moderate and all treatments provided good initial knockdown of the thrips populations and approximately three weeks of control (Table 1). By 22 days after treatment (DAT), only Dimethoate and Success-L + Dimethoate did not differ from the untreated, and required retreatment on 14 May based on a 10% fruit infestation threshold. By 18 May, Baythroid, Success-L, Success-H and Success-M + Dimethoate required an additional application (Table 1). Although, Success-M, Success-L + Baythroid and Success-M + Baythroid did not require an additional application until 21 May (based on a 10% infestation threshold), did not statistically offer better thrips control than the other treatments 28 DAT (Table 2). In late May and June, temperatures were high but the thrips populations declined during this period probably because of a reduction in flush growth.

Although there were differences in the length of time before individual insecticide treatments required additional applications, with the exception of Dimethoate, which required three applications, only two applications were required to achieve season long thrips control. Since all treatments were applied on an as needed basis, all insecticide treatments produced equivalent percentages of Fancy and Choice grade fruit, and were all better than the untreated (Table 2). The fact that Dimethoate required three applications to achieve this result relative to the other treatments renders this treatment as slightly inferior based on efficacy. However, based on the cost effectiveness index, Dimethoate was equivalent to Baythroid and Success-M (Table 2). Under the thrips pressure and temperatures experienced in this trial, Success-L was statistically the most cost effective treatment, while Success-H and all of the tank mixes proved to be too costly to justify their use.

Table 1. Percentage of fruit infested with immature citrus thrips on lemons following applications 1, 2 and 3.

Treatment Regime ^{ab}	Applications and mean percentage fruit infested with immature citrus thrips (CT)							
	20 Apr	27 Apr 7 DAT	6 May 16 DAT	12 May 22 DAT	14 May	18 May 4 or 28 DAT	19 May	20 May 1, 6 or 30 DAT
	Application # 1	CT (85.9°F) ^c	CT (83.7°F)	CT (86.2°F)	Application # 2	CT (93.8°F)	Application #3	CT (97.0°F)
1.	Untreated	5.83 a	13.33 a	29.17 a	Untreated	41.67 a	Untreated	31.67 a
2.	Dimethoate	0.83 b	3.33 b	21.67 ab	Dimethoate	7.50 b	none	12.50 bc
3.	Baythroid	1.67 b	0.83 bc	9.17 bc	none	15.00 b	Baythroid	7.50 cde
4.	Success-L	0.83 b	1.67 bc	6.67 c	none	10.00 b	Success-L	2.50 de
5.	Success-M	0.00 b	0.00 c	9.17 bc	none	7.50 b	none	11.66 bcd
6.	Success-H	0.00 b	0.00 c	7.50 c	none	10.00 b	Success-H	0.00 e
7.	Success-L + Dimeth	0.00 b	1.67 bc	16.67 abc	Success-L + Dimeth.	4.17 b	none	7.50 cde
8.	Success-L + Bay	0.00 b	0.00 c	8.34 bc	none	9.17 b	none	20.83 b
9.	Success-M + Dimeth	0.00 b	0.00 c	9.17 bc	none	10.84 b	Success-M + Dimeth	2.50 de
10.	Success-M + Bay	0.00 b	0.83 bc	8.33 bc	none	6.67 b	none	11.67 bcd

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

^aRates: Dimethoate and Dimeth = Dimethoate 4E (2 lbs-ai/ac), Baythroid and Bay = Baythroid 2 (EC) (6.4 oz/ac), Success-L = Success 2SC (4 oz/ac), Success-M = Success 2SC (6 oz/ac), and Success-H = Success 2SC (9 oz/ac).

^bAll treatments were applied with Kinetic non-ionic surfactant at 0.1% v/v.

^cAverage maximum daily temperature °F, from time of most recent application.

Table 2. Percentage of fruit infested with immature citrus thrips on lemons following application 4, grade , and cost.

Treatment Regime ^{ab}	Applications and mean percentage fruit infested with immature citrus thrips (CT)						Percent Grade based on thrips scarring			No. of applications / \$/ac insecticides ^d	Cost Effectiveness Index ^e
	21 May	25 May 4, 6 or 11 DAT	2 June 12, 14 or 19 DAT	10 June 20, 22 and 27 DAT	15 June 25, 27 and 32 DAT	22 June 32, 34 and 39 DAT					
	Application # 4	CT (93.4°F)	CT (96.2°F)	CT (94.4°F)	CT (96.2°F)	CT (98.2°F)	Fancy	Choice	Juice		
1.	Untreated	23.34 a	17.50 a	8.33 a	12.48 a	5.83 a	62.50 a	33.35 a	4.15 a	0 / 0.00	NA
2.	Dimethoate	3.33 bc	5.00 b	3.33 a	4.16 bcd	1.67 a	85.80 b	14.20 b	0.00 b	3 / 59.34	69.28 d
3.	none	6.65 b	2.50 b	4.17 a	6.66 b	4.17 a	84.18 b	15.82 b	0.00 b	2 / 60.14	71.57 d
4.	none	0.83 c	0.83 b	1.67 a	5.83 bc	2.50 a	90.85 b	8.32 b	0.83 b	2 / 41.40	46.16 e
5.	Success-M	2.50 bc	3.33 b	1.67 a	1.67 cd	0.00 a	93.33 b	6.67 b	0.00 b	2 / 62.10	66.29 d
6.	none	0.83 c	3.33 b	1.67 a	0.00 d	0.83 a	94.18 b	5.82 b	0.00 b	2 / 93.14	99.43 b
7.	none	1.66 bc	4.17 b	8.33 a	3.33 bcd	1.67 a	92.48 b	7.52 b	0.00 b	2 / 80.96	87.84 c
8.	Success-L + Bay	0.00 c	3.33 b	4.17 a	2.50 bcd	0.83 a	93.33 b	6.67 b	0.00 b	2 / 101.54	110.17 a
9.	none	3.33 bc	2.51 b	5.00 a	0.83 d	1.67 a	90.85 b	9.15 b	0.00 b	2 / 101.66	114.37 a
10.	Success-M + Bay	4.17 bc	0.83 b	3.33 a	1.67 cd	4.17 a	86.70 b	13.30 b	0.00 b	2 / 122.24	118.29 a

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

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^bAll treatments were applied with Kinetic non-ionic surfactant at 0.1% v/v.

^cAverage maximum daily temperature °F, from time of most recent application.

^dAll product costs were estimated using suggested retail prices from a single distributor: Baythroid = \$601.33/gal, Dimethoate 4E = \$39.55/gal, and Success = \$662.34/gal.

^eCost effectiveness index = total cost of the treatment regime (\$/acre, Table 2) X the damage rating.