IN-SEASON CONTROL OF VINE MEALYBUG IN EARLY-SEASON TABLE GRAPES, 2008

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Vine mealybug is one of the most prolific pests of table grapes. Its exponential growth rate and affinity for feeding within clusters close to harvest make its management of highest priority for grape growers dealing with infested vineyards. In 2008, an in-season trial was conducted near Arvin, Kern Co. CA. to evaluate the effects of insecticides on vine mealybug.

The trial was conducted in a 2.0 acre portion of a mature Flame Seedless vineyard on sandy loam soil. Vines were planted at a spacing of 12 ft x 5 ft. The trial was organized into a randomized complete block design with four blocks and 16 treatments, including an untreated check (Table 1). Each of the 64 plots was two rows wide by 12 vines long, with the plots organized to include one center row for data collection and half of each adjacent row.

Experimental Design

Insecticide treatments were made either as a foliar spray or directly to the soil. Foliar sprays were made by spraying both directions down two adjacent drive rows with an air-blast sprayer. This caused applications to be made to both sides of one data row in the center of the plot and to one half of each of the flanking vine rows. Foliar applications were made on 26 Feb, 29 Apr, 22 May or 17 June. Water volume was 150 gpa for applications on 26 Feb and 29 Apr and 200 gpa for the May and June applications. Soil applications were made using a cup system we developed. Each of the 12 vines in the data row had two, 0.5 gallon per hour drip emitters. Underneath each emitter we placed a 16 fl oz plastic disposable cup that was duct-taped to a bamboo pole. Applications were made by calculating the total amount of pesticide required per vine. This amount was divided by four, with one quarter of the product placed into each of the two cups per vine. Cups were then filled with water, stirred, and the drip system was turned on. Water then dripped into the cup, causing water to overflow out of the cup one drip at a time for 30 minutes. During this 30-minute period, the contents of the cup were stirred every 10 minutes. After 30 minutes, the remaining two quarters of the pesticide for each vine were placed into the two cups and the drip system was left on for an additional 30 minutes, stirring again at 10-minute intervals. At the end of the 1-hour period, the liquid in the cup, which by this time was mostly water, was poured onto the soil under the drip emitter. Soil treatments were applied on 28 Feb, 21 Apr, and 20 May.

Evaluations

Trials were evaluated through a variety of methods depending on where the mealybugs were located. We conducted timed searches on 29 Apr, 23 May and 10 June. For each timed search we counted the total number of mealybugs that could be found on a vine in a 3-minute period on each of the 8 vines at the center of each plot. This process involved peeling bark at different locations on the vine depending on the time of year. We also evaluated the total number of mealybugs per leaf on 26 Jun and 8 Jul. On each evaluation date we collected five leaves from each of four vines per plot and counted the total number of mealybugs on them. Leaves were collected from a standard location just above a cluster. We also did cluster evaluations on 25 Jun and 8 Jul. For each plot we evaluated 10 clusters per vine on each of the 8 vines in the center of each plot. Each cluster was given a rating from 0 to 2 with 0 = no mealybug, 1 = honeydew only, and 2 = mealybug present.

Data were analyzed by ANOVA. Means separation was determined using Fisher's Protected LSD (P=0.05) using untransformed data for leaf evaluations, and transformed data for timed searches (square root (x + 0.05)) and for cluster evaluations (arcsine(x)).

Results

All treatments provided significant reductions in either mealybug density or damage during at least one evaluation. The overall most effective products across all evaluation dates and evaluation types were the five treatments that included Movento and the soil-applied Clutch.

Timing studies for Movento showed that April provided the best results, though excellent results were also seen with both May and June applications. The primary exception to this rule is the 25 June cluster evaluation where the 17 June foliar Movento application had not yet had time to take effect. Evaluations of Movento in May with no surfactant, Dyne-Amic, or Latron resulted in no significant differences among the three treatments.

Timing studies with Venom in February, April and May did not result in any significant differences among the three treatments. However, there was a consistent trend among the data where earlier treatments did better: February treatments provided the least mealybugs or damage, followed by April and then May treatments.

Evaluations of split 12 oz applications of Applaud compared to a single 24 oz application showed that a single application at the high rate can provide the same results as the split application. The results were not only statistically equivalent, but also numerically similar.

Side-by-side evaluations of soil-applied neonicotinoids in May revealed that Clutch and Admire resulted in the least amount of mealybugs and damage, followed by Venom and Platinum. This pattern held true throughout most of the evaluation dates and types. However, these differences were usually not significant on any one evaluation date by LSD comparisons.

Evaluations of foliar versus soil-applied Clutch revealed numerically improved control with the soil-applied product compared to the foliar product. However, these differences were not statistically significant on any evaluation date as even the foliar Clutch applications performed very well in the trials.

Table 1. Insecticide treatments, rates and timing

Insecticide	Form.	App. Date	Method	Rate Form Prod/Acre	Surfactant	Rate
Lorsban	4E	26 February	Foliar	4 pt	Latron B-1956	4 oz/100
Applaud	70DF	29 April 22 May	Foliar	12 oz 12 oz	Latron B-1956 Latron B-1956	4 oz/100 4 oz/100
Applaud	70 DF	29 April	Foliar	24 oz	Latron B-1956	4 oz/100
Movento	240SC	29 April	Foliar	8 fl oz	Dyne-Amic	4 oz/100
Movento	240SC	22 May	Foliar	8 fl oz	n/a	
Movento	240SC	22 May	Foliar	8 fl oz	Dyne-Amic	4 oz/100
Movento	240SC	22 May	Foliar	8 fl oz	Latron B-1956	4 oz/100
Movento	240SC	17 June	Foliar	8 fl oz	Dyne-Amic	4 oz/100
Clutch	2.13 EC	22 May	Foliar	6 fl oz	Latron B-1956	4 oz/100
Clutch	2.13 EC	20 May	Soil	12 fl oz	n/a	
Venom	20SG	28 Feb	Soil	6 oz	n/a	
Venom	20SG	21 April	Soil	6 oz	n/a	
Venom	20SG	20 May	Soil	6 oz	n/a	
Admire Pro	4.6F	20 May	Soil	14 fl oz	n/a	
Platinum	75SG	21 April	Soil	3.67 oz	n/a	

Table 2. Effects of insecticides treatments on the density of vine mealybug

	Timed Searches			Mealybugs per leaf	
Treatment	29 April	23 May	10 June	26 June	8 July
Lorsban Feb	9.0a	33.0c	7.1abcdef	0.20a	1.10a
Applaud Split 12oz	--	6.3abc	5.3abcd	0.00a	1.00a
Applaud April 24oz	--	15.9ab	3.0abc	0.04a	3.30a
Movento April	--	0.3a	0.9a	0.60a	0.18a
Movento May (No Surfactant)	--	--	5.8abcd	0.03a	0.83a
Movento May (Dyne-Amic)	--	--	6.0abcd	0.14a	1.34a
Movento May (Latron)	--	--	3.4abcd	0.10a	1.40a
Movento June	--	--	--	0.25a	2.40a
Clutch Foliar May	--	--	6.3abcde	0.23a	0.73a
Clutch Soil May	--	--	2.1ab	0.33a	0.10a
Venom Feb	10.5a	19.1bc	13.6def	0.13a	1.13a
Venom April	--	14.8abc	14.7cdef	0.88a	3.55a
Venom May	--	--	18.0ef	0.11a	3.16a
Admire Pro May	--	--	8.5bcdef	0.04a	0.05a
Platinum April	--	16.1bc	5.5abcd	0.11a	2.23a
Untreated	4.1a	31.0c	20.0f	0.41a	10.35b
F	0.81	2.52	2.48	0.71	2.24
P	0.487	0.048	0.0118	0.764	0.019

Means in a column followed by the same letter are not significantly different ($P > 0.5$, Fisher's protected LSD) after transformation of the data by square root (x + 0.5) for timed searches. No transformations were use for leaf data. Untransformed means are shown.

Table 2. Effects of insecticides treatments on the density of vine mealybug in clusters.

	Cluster Ratings[1], 25 June Percentage clusters per category				Cluster Ratings[1], 8 July Percentage clusters per category			
	0	1	2	1 + 2	0	1	2	1 + 2
Lorsban Feb	96abcd	3.4a	0.9abc	4.4abcd	92bcdef	4.5abcd	3.3abc	8.0abcde
Applaud Split 12 oz	95abcd	2.5a	2.5abcd	5.0abcd	88bcde	6.0abcde	5.8bc	11.8bcde
Applaud April 24 oz	96abcd	3.1a	1.3abc	4.4abcd	86bc	8.8cde	4.8bc	14.0de
Movento April	99a	0.6a	0.0a	0.6a	98f	1.5a	0.5a	2.3a
Movento May (No Surfactant)	95abc	2.0a	2.8bcde	4.8abc	89bcde	6.3bcde	4.3abc	10.8bcde
Movento May (Dyne-Amic)	97abcd	2.8a	0.3ab	3.1ab	93bcdef	5.0abcd	2.5ab	7.5abcd
Movento May (Latron)	98abc	1.6a	0.3ab	1.9ab	89cdef	4.3abc	6.8c	11.0bcde
Movento June	89cd	5.3a	5.3e	10.6e	91bcdef	5.5abcde	3.8abc	9.3abcde
Clutch Foliar	96abc	2.2a	2.2abcd	4.4abcd	91bcdef	6.5bcde	2.5ab	9.0abcde
Clutch Soil	97ab	1.3a	1.6abc	2.8ab	93def	3.8ab	2.8abc	6.8abc
Venom Feb	96abcd	2.5a	1.6abc	4.1abcd	87bcd	8.5cde	4.5abc	13.3cde
Venom April	93cd	5.0a	1.9abcd	6.9bcde	90bcde	5.5abcde	4.0abc	9.8bcde
Venom May	91d	5.6a	3.4cde	9.1de	86bcd	8.5cde	5.3bc	13.8bcde
Admire Pro May	96abcd	3.1a	0.6ab	3.8abc	95ef	2.3ab	2.0ab	4.8ab
Platinum April	94abcd	3.8a	2.2abcd	5.9bcde	85ab	9.0de	6.1bc	14.9ef
Untreated	91bcd	4.4a	4.4de	8.8cde	78.3a	10.0e	12.0d	21.8f
F	2.62	1.64	2.51	2.62	3.07	2.21	2.91	3.07
P	0.006	0.100	0.009	0.006	0.002	0.021	0.003	0.002

[1] Percentage of clusters in each category from 10 clusters per vine on 8 vines for each plot. Ratings are 0 = no mealybug, 1 = honeydew only, and 2 = mealybug present

Means in a column followed by the same letter are not significantly different ($P > 0.5$, Fisher's protected LSD) after arc sine (x) transformation of the data. Untransformed means are shown.