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ORANGE: *Citrus sinensis* (L.) Osbeck, 'Valencia'

CONTROL OF ASIAN CITRUS PSYLLID AND CITRUS LEAFMINER WITH FOLIAR APPLICATIONS OF INSECTICIDES IN ORANGES DURING SUMMER, 2008

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Asian citrus psyllid (ACP): *Diaphorina citri* Kuwayama
Citrus leafminer (CLM), *Phyllocnistis citrella* Stainton

ACP vectors the bacterium *Candidatus* Liberibacter asiaticus causal organism of greening or Huanglongbing disease of citrus. Feeding damage from CLM facilitate the spread of citrus canker caused by *Xanthomonas axonopodis* pv. *citri*. Biological and chemical means of control and their compatibility is important in reducing the populations of both pests and for integrated pest management in Florida citrus. The experimental block at the Southwest Florida Research and Education Center, Immokalee, Florida consisted of 13-yr-old sweet orange 'Valencia' trees planted on double-row raised beds at a density of 132 trees/acre. Trees were irrigated by micro-sprinklers and subjected to conventional cultural practices. Swale sides of the trees were pruned manually to induce new flush and encourage ACP infestation. Seven treatments and an untreated check were randomly distributed across 4 replicates in 17 rows that included a buffer row after every treated row. Each replicate contained 8 plots of 5 plants each distributed across 8 treated rows. Treatments were applied on 22 May 2008 using a Durand Wayland 3P-10C-32 air blast speed sprayer with an array of six # 5 T-Jet stainless steel cone nozzles per side operating at a pressure of 200 psi delivering 150 gpa at a tractor speed of 1.5 mph. However, treatments were washed out due to a sever thunderstorm immediately after applications and were reapplied on 23 May. The low rate treatment of Micromite was planned for two applications and the second application was made on 12 Jun. Post treatment evaluations for adults were made on 28 May, 4, 11, 18, and 26 Jun, and 3 Jul. Evaluations for immatures were made through 11 Jun except low rate of Micromite and Danitol which were evaluated through 3 Jul. Three central trees in each plot were sampled. A "tap" sample made by striking with the hand a randomly chosen branch 3 times and counting adult ACPs falling on a clipboard covered with an 8 ½ × 11 inch white paper was used to estimate ACP adults. One tap sample on the first sampling, two on the second and third, and four on the fourth, fifth and sixth sampling dates were conducted per tree adjusted due to the low numbers of adults observed particularly on the treated trees. Three flushes suitable for ACP oviposition and nymphal development were tagged on each tree on 20 May. Eight of the nine tagged flushes were examined post treatment for presence or absence of ACP nymphs, and to record the oldest nymphal instar on each flush. These same eight flushes were also examined to count CLM larvae on five leaves per flush. Data were subjected to ANOVA to evaluate treatment effects on ACP and CLM and means separated using LSD (P = 0.05).

All treated trees had significantly fewer adults compared to untreated trees on all observation dates except on 26 Jun when the high rate of Micromite 80 WGS + 435 Oil was not different from untreated check (Table 1). The percentage of flush infested with ACP nymphs was significantly reduced by all treatments on 28 May, 4 and 11 Jun (Table 2). The high rate of Micromite 80 WGS + 435 Oil was better than the low rate + 435 Oil on 28 May and neither rate was effective after 18 Jun. Reapplication of the low rate of Micromite 80 WGS + 435 Oil on 12 Jun did not provide better control than the high rate applied once when evaluated on 18 Jun. At that time both rates resulted in significantly less infested flush compared to untreated check but were less effective compared to Danitol 2.4 EC which significantly reduced populations through 3 Jul. The application of low rate of Micromite on 12 Jun was not as effective as application on 23 May. All treatments caused significant mortality of young nymphs; therefore significantly fewer mature nymphs were seen on the treated trees compared to untreated tress on 28 May, 4 and 11 Jun (Table 3). Effects from both rates of Micomite on older nymphal instars were same on 18 Jun and the high rate was better than the low rate on the later two dates. All treatments reduced adults for six weeks and flush infestation with their progeny for two weeks. It appears that the one time application of the high rate of Micomite 80 WGS with 435 Oil was better than the low rate with 435 Oil applied twice during the same period. The Micromite treatments were less effective compared to all the other treatments. No significant improvement in performance of Actara 25 WG was observed in combination with Induce.

Significant effects of all treatments except Warrior and Actara 25 WG alone were observed on CLM populations on 28 May and 4 Jun (Table 4). Agri-Mek 0.15 EC + 435 Oil and Danitol 2.4 EC were the most effective treatments on 4 and 11 Jun. Actara 25 WG applied alone was not effective after 28 May, however, Actara 25 WG + Induce resulted in less number of CLM larvae compared to untreated check on 4 and 11 Jun.

Table 1

Treatment/ formulation	Rate amt product/ acre or % v/v	No. of applications	Adult ACP per tap sample					
			28-May	4-Jun	11-Jun	18-Jun	26-Jun	3-Jul
Untreated check	---	---	1.0a	0.29a	2.04a	0.85a	0.56a	1.23a
Danitol 2.4 EC	21.3 oz	1	0.00b	0.00b	0.04c	0.25bcd	0.10c	0.10b
Agri-Mek 0.15 EC + 435 Oil	20 oz + 2%	1	0.00b	0.00b	0.08c	0.29bcd	0.15c	0.17b
Warrior 1 SC	5.75 oz	1	0.00b	0.00b	0.04c	0.27bcd	0.08c	0.17b
Actara 25 WG	5.5 oz	1	0.17b	0.00b	0.04c	0.13cd	0.06c	0.08b
Actara 25 WG + Induce	5.5 oz + 0.1%	1	0.00b	0.04b	0.04c	0.04d	0.02c	0.19b
Micromite 80 WGS + 435 Oil	6.25 oz + 2%	1	0.00b	0.08b	0.54bc	0.50b	0.44ab	0.31b
Micromite 80 WGS + 435 Oil	3.125 oz + 2%	2	0.08b	0.04b	0.79b	0.40bc	0.21bc	0.33b

Means in a column followed by the same letter are not significantly different (*P* = 0.05, LSD).

Table 2

Treatment/ formulation	Rate amt product/ acre or % v/v	No. of applications	% flush infested with ACP nymphs					
			28-May	4-Jun	11-Jun	18-Jun	26-Jun	3-Jul
Untreated check	---	---	91.67a	82.29a	64.59a	55.20a	71.88a	72.92a
Danitol 2.4 EC	21.3 oz	1	0.00c	5.21cd	0.00c	7.29c	40.63b	46.88b
Agri-Mek 0.15 EC + 435 Oil	20 oz + 2%	1	8.33c	16.67bc	11.46c	---	---	---
Warrior 1 SC	5.75 oz	1	2.08c	0.00d	1.04c	---	---	---
Actara 25 WG	5.5 oz	1	5.21c	5.21cd	4.17c	---	---	---
Actara 25 WG + Induce	5.5 oz + 0.1%	1	1.04c	9.38cd	0.00c	---	---	---
Micromite 80 WGS + 435 Oil	6.25 oz + 2%	1	8.33c	12.5bc	44.79b	28.13b	52.08ab	54.17ab
Micromite 80 WGS + 435 Oil	3.125 oz + 2%	2	29.17b	22.92b	48.96b	23.96b	68.75a	68.75a

Means in a column followed by the same letter are not significantly different (*P* = 0.05, LSD).

Table 3

Treatment/ formulation	Rate amt product/ acre or % v/v	No. of applications	Mean of oldest nymphal instars observed					
			28-May	4-Jun	11-Jun	18-Jun	26-Jun	3-Jul
Untreated check	---	---	2.86a	3.90a	3.17a	1.80a	2.26ab	2.59a
Danitol 2.4 EC	21.3 oz	1	0.00c	0.10d	0.00d	0.11c	1.25c	1.34b
Agri-Mek 0.15 EC + 435 Oil	20 oz + 2%	1	0.08c	0.43bc	0.46c	---	---	---
Warrior 1 SC	5.75 oz	1	0.02c	0.00d	0.05cd	---	---	---
Actara 25 WG	5.5 oz	1	0.05c	0.18cd	0.09cd	---	---	---
Actara 25 WG + Induce	5.5 oz + 0.1%	1	0.01c	0.24cd	0.00d	---	---	---
Micromite 80 WGS + 435 Oil	6.25 oz + 2%	1	0.14c	0.48bc	2.30b	0.77b	1.85b	1.83b
Micromite 80 WGS + 435 Oil	3.125 oz + 2%	2	0.38b	0.74b	2.24b	0.59b	2.38a	2.61a

Means in a column followed by the same letter are not significantly different (*P* = 0.05, LSD).

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Table 4

Treatment/ formulation	Rate amt product/ acre or % v/v	CLM larvae per 5 leaves per flush		
		28-May	4-Jun	11-Jun
Untreated check	---	6.23a	3.35a	1.26a
Danitol 2.4 EC	21.3 oz	0.00c	1.94e	0.60b
Agri-Mek 0.15 EC + 435 Oil	20 oz + 2%	0.00c	0.96f	0.14c
Warrior 1 SC	5.75 oz	0.88b	3.47a	1.51a
Actara 25 WG	5.5 oz	0.07c	3.13ab	1.53a
Actara 25 WG + Induce	5.5 oz + 0.1%	0.00c	2.73bc	0.69b
Micromite 80 WGS + 435 Oil	6.25 oz + 2%	0.03c	2.24de	1.39a
Micromite 80 WGS + 435 Oil	3.125 oz + 2%	0.00c	2.59cd	1.39a

Means in a column followed by the same letter are not significantly different (*P* = 0.05, LSD).