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

SPRAYS OF GUAVA LEAF EXTRACT AND INSECTICDES TO CONTROL ASIAN CITRUS PSYLLID AND CITRUS LEAFMINER ON ORANGE, 2007

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Asian citrus psyllid (ACP): *Diaphorina citri* Kuwayama

Citrus leafminer (CLM), *Phyllocnistis citrella* Stainton

Management of ACP and CLM is critical for profitable orange production. Both insect pests are responsible for the spread of two devastating diseases. Huanglongbing or citrus greening is caused by the bacterium, *Candidatus* Liberibacter asiaticus vectored by ACP. Citrus canker is spread mainly by CLM larval feeding thus exposing leaf cuticle to infection by the bacterium, *Xanthomonas citri*. The experimental block at the Southwest Florida Research and Education Center (SWFREC), Immokalee, Florida consisted of 12-yr-old sweet orange *Citrus sinensis* (L) Osbeck '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 with a hand held tree trimmer to induce new flush and encourage psyllid infestation. Eight treatments and an untreated check were randomly distributed across 4 replicates in 23 rows that included a buffer row after every treated row. Each replicate contained 3 treated rows each consisted of 20 trees divided into three plots of 6 trees.

Treatments were applied on 25 Sept 2007 to the swale side of the trees using a tractor mounted Durand Wayland 3P-10C-32 air blast speed sprayer with an array of five # 5 T-Jet stainless steel cone nozzles per side operating in low range first gear at 1500 RPM delivering 200 gpa. A pre-treatment sampling was conducted on 24-Sept and treatment evaluations were made 3, 7, 14, and 21 DAT. One and four trees were observed per plot for pre- and post-treatment samplings, respectively. Adult psyllid density was estimated by counting the individuals falling on an 8 ½ × 11 inch white paper sheet (on a clipboard) placed at random under the branches which were then tapped three times. Ten randomly selected shoots were observed and the number infested with psyllid eggs or nymphs recorded. The abundance of ACP immatures on each shoot was rated on a 0 to 3 scale: 0 = none, 1 = eggs and first instars, 2 = second and third instars, 3 = fourth and fifth instars. One infested flush of these was collected and examined in the laboratory under a microscope to count eggs and different instars of *D. citri*. The number of ACP nymphs per flush was estimated by multiplying the proportion of 10 flush infested by the number counted from the collected flush. The number of larvae and adults of four predatory coccinellids, *Curinus coeruleus* Mulsant, *Olla v-nigrum* Mulsant, *Harmonia axyridis* Pallas and

Cycloneda sanguinea (L.) were recorded during one minute observation on each tree. A well developed shoot with pale green leaves was randomly selected and all live CLM larvae were counted on five expanded leaves. At 28 DAT, one shoot was observed per tree for damage by ACP and CLM and rated on 0 to 3 scale: 0 = none, 1 = low, 2 = medium, 3 = high. Shoots were examined in the laboratory to record number of leaves damaged by ACP and CLM. All data were subjected to ANOVA to evaluate treatment effects on ACP and CLM and means were separated using LSD (P = 0.05).

Most nymphal mortality was seen from Danitol + 435 oil at 3 DAT, although not different from both rates of Vydate and the low rate of QRD 416 with 435 oil. At 7 DAT, number of dead nymphs was still high in the Danitol + 435 oil treatment, although not significantly different from other treatments or untreated check. At 7 DAT, significant number of dead nymphs was seen only from Danitol + 435 oil treatment. There were significantly fewer live nymphs per shoot compared to untreated check on trees treated with Danitol + 435 oil, both rates of Vydate, and the low rate of QTD 416 alone or with 435 oil with no differences among treatments. However, the low rate of QRD 416 alone was not different from Guava leaf extract nor were QRD 400 treatments different from the high rate of QRD 416 and untreated check. Significantly fewer nymphs per shoot were again seen at 7 DAT on trees treated with Danitol + 435 oil, either rate of Vydate, and the low rate of QTD 416 + 435 oil compared to untreated check or other treatments with no differences among treatments. The same four treatments resulted in a significantly lower infestation rating than the untreated check at 3 DAT and 7 DAT. However, at 14 DAT a significantly low rating was seen only with the Danitol + 435 oil treatment. Fewer adults compared to the untreated check were seen from Danital + 435 oil and the high rate of Vydate at 3 DAT, although not different from the low rate of Vydate, the low rate of QRD 416 alone or with 435 oil, and QRD 400. At 7 DAT, Danitol + 435 oil, either rate of Vydate, and the low rate QRD 416 alone or with 435 oil had significantly fewer adults than the untreated check with no differences among treatments. There was no treatment effect after the dates reported or on leaf damage by ACP.

Significantly fewer CLM larvae than untreated check were seen with the low and high rates of Vydate, the only treatments resulting in significant reduction at 3 DAT, although not different from Danitol + 435 oil and QRD 416, treatments, themselves not different from untreated check. Leaf damage was significantly reduced with Danitol + 435 oil at 28 DAT, although not different from the high rate of Vydate, the low rate of QRD 416 + 435 oil, and QRD 400 treatments not different from untreated check. Few ladybeetles were observed in this trial and are not reported.

Treatment/ formulation	Rate amt product/ acre or % v/v	Dead nymphs/ Shoot (No.)		Live nymphs/ Shoot (No.)		Infestation rating*/shoot			ACP Adults/ tap sample (No.)	
		3 DAT	7 DAT	3 DAT	7 DAT	3 DAT	7 DAT	14 DAT	3 DAT	7 DAT
Untreated check	--	0.0 c	0.0 a	24.1 a	25.2 a	1.7 ab	2.1 bc	1.5 a	1.1 ab	1.4 a
Guava leaf extract	2%	0.0 c	0.0 a	19.6 ab	24.8 a	1.8 a	2.4 ab	1.6 a	1.4 a	1.1 ab
Danitol + 435 Oil	21.3 fl oz + 3%	5.9 a	2.9 a	3.1 e	2.9 b	0.9 c	1.2 d	1.0 b	0.2 c	0.0 d
Vydate	32 fl oz	5.6 a	0.8 a	10.1 cde	10.2 b	1.0 c	1.4 d	1.3 ab	0.4 bc	0.3 cd
Vydate	64 fl oz	4.6 a	0.2 a	6.6 de	7.4 b	1.0 c	1.3 d	1.5 a	0.3 c	0.4 bcd
QRD 416	96 fl oz	0.0 c	0.3 a	12.3 bcd	20.7 a	1.6 ab	1.9 c	1.6 a	0.8 abc	0.6 bcd
QRD 416 + 435 Oil	96 fl oz + 3%	3.5 ab	1.0 a	10.6 cde	7.2 b	1.0 c	1.2 d	1.2 ab	0.4 bc	0.5 bcd
QRD 416	192 fl oz	0.7 bc	0.0 a	23.5 a	21.5 a	1.6 ab	2.5 a	1.6 a	0.1 ab	0.8 abc
QRD 400	192 fl oz	0.1 c	0.0 a	16.2 abc	28.9 a	1.4 b	2.1 c	1.5 a	0.8 abc	1.1 ab

*0 = none, 1 = eggs and first instars, 2 = second and third instars, 3 = fourth and fifth instars
Means within columns not followed by the same letter are significantly different (LSD, $P < 0.05$).

Treatment/ formulation	**Rate amt product/ acre or % v/v**	**Damage rating*/ shoot**	**CLM Larvae/5 leaves**	**CLM damaged leaves (%)**
			3 DAT	28 DAT
Untreated check	--	2.8 a	0.9 abc	36.7 ab
Guava leaf extract	2%	2.6 abc	1.1 ab	38.6 ab
Danitol + 435 Oil	21.3 fl oz + 3%	1.8 d	0.3 cd	16.5 c
Vydate	32 fl oz	2.6 bc	0.0 d	43.8 ab
Vydate	64 fl oz	2.7 abc	0.1 d	30.6 bc
QRD 416	96 fl oz	2.7 abc	0.7 bcd	43.6 ab
QRD 416 + 435 Oil	96 fl oz + 3%	2.5 c	0.5 bcd	28.3 bc
QRD 416	192 fl oz	2.8 ab	0.4 bcd	48.0 a
QRD 400	192 fl oz	2.6 abc	1.4 a	31.9 abc

*0 = none, 1 = low, 2 = medium, 3 = high

Means within columns not followed by the same letter are significantly different (LSD, $P < 0.05$).

II. MATERIALS TESTED FOR ARTHROPOD MANAGEMENT

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Brand Name	Formulation	Common Name	Composition*	Manufacturer**
Danitol	2.4 EC	fenpropathrin	(alpha-Cyano-3-phenoxybenzyl-2,2,3,3-tetramethyl cyclopropanecarboxylate)	Valent USA Corporation P.O. Box 8025 Walnut Creek, CA 94596-8025
Vydate L	2 L	oxamyl	(Methyl N'N'-dimethyl-N-((methylcarbamoy)oxy)-1-	DuPont Company Stine-Haskell Research Center

			thiooxamimidate)	Dupont Crop Protection Newark, DE 19711
QRD 416			Experimental	Agraquest
QRD 400			Experimental	Agraquest
435 oil 98.8	98.8%L	horticultural spray oil	Refined petroleum distillate	Drexel Chemical Company P.O. Box 13327 Memphis, TN 38113-0327