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

FOLIAR APPLICATIONS OF BYI02960 COMPARED TO SOME COMMONLY USED INSECTICIDES FOR CONTROL OF ASIAN CITRUS PSYLLID AND CITRUS LEAFMINER IN ORANGES: SUMMER, 2010

Philip A. Stansly

University of Florida/ IFAS

Southwest Florida Res. and Ed. Center

2685 State Road 29 North

Immokalee, FL 34142-9515

Phone: (239) 658-3427

Fax: (239) 658-3469

Email: pstansly@ufl.edu

Jawwad A. Qureshi
Email: jawwadq@ufl.edu

Barry C. Kostyk
Email: bkostyk@ufl.edu

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

Citrus leafminer (CLM): *Phyllocnistis citrella* Stainton

ACP and CLM are two economically important pests of citrus due in large part to their role in the spread of greening disease or “huanglongbing” and citrus canker caused by *Xanthomonas axonopodis* pv. *Citri* respectively. Therefore, control of both ACP and CLM is critical in developing integrated management strategies to reduce the spread of the associated diseases in Florida citrus. The experimental block at the Southwest Florida Research and Education Center (SWFREC), Immokalee, Florida consisted of 15-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. Trees were pruned 3 weeks prior to application to encourage growth of new shoots essential for reproduction of ACP and CLM and infested shoots were tagged before treatment application.. Nine treatments and an untreated check were randomly distributed across 4 replicates in 2 rows separated by a buffer row. Each replicate contained 10 four-tree plots. Treatments were applied on 12 July 2010 using a Durand Wayland 3P-10C-32 air blast speed sprayer operating at 1500 RPM with 4 stainless steel T-Jet # 5 nozzles per side delivering 130 gpa. Evaluations were made at 3, 10, 17, 24, 31, 38, 45, and 52 days after treatment (DAT). Ten randomly selected shoots per plot were collected and examined under a stereomicroscope in the laboratory to count ACP nymphs. Three fully expanded leaves on each shoot were examined under the microscope to count CLM larvae and empty mines. Density of ACP adults and predators was estimated from three of the four trees in each plot by counting adult insects falling on a white clipboard placed under randomly chosen branches which were then struck 3 times with the PVC pipe to make a count for one “tap” sample. Four tap samples were conducted per tree. Data were subjected to ANOVA and means separated using LSD (P = 0.05) are presented.

Significantly more dead nymphs compared to all treatments were observed at 3 DAT in response to Delegate 25 WG plus 435 oil followed by the low and high rates of BYI02960 with no difference among the latter. The remaining treatments were not different from the untreated check. All treatments compared to untreated check were equally effective in reducing the number of live nymphs through 17 DAT except 435 Oil alone which did not differ from untreated check at 17 DAT and provided less reduction compared to all other treatments at 3 DAT. All treatments compared to untreated check provided significant reduction in adult numbers through 52 DAT except 435 Oil alone which reduced adults only at 17 DAT and 38 DAT, Movento 240 SC which did not differ from untreated check at 3 DAT and the medium and high rates of BYI02960 which did not differ from untreated check at 45 DAT. All treatments of BYI02960 were statistically similar in their efficacy against nymphs and adults of ACP although control at the 10.6 rate tended to be better when either 435 Oil or Induce. Efficacy of these treatments was similar to Delegate 25 WG and Movento 240 SC applied with 435 Oil and Provado 1.6 F applied with Induce.

Significantly fewer CLM larvae compared to untreated check were observed in all treatments at 3 DAT but only with Delegate 25 WG plus 435 oil at 10 DAT. However, significantly fewer CLM larvae than untreated check were seem at 17 DAT with all three rates of BYI02960, Delegate 25 WG, and Movento 240 SC all applied with 435 oil, but not with oil alone, BY102960 alone or with Induce. There was significant treatment effect on number of empty mines at 3 DAT but at 10 DAT fewest mines were seen from trees treated with Delegate with all treatments providing some control except for Movento and Provado. At 17 DAT, all treatments except BYI02960 applied alone and Provado 1.6 F with Induce resulted in significantly fewer empty CLM mines compared to untreated check. Spiders were the only common predators seen, averaging 0.7, 0.5, and 0.3 spiders per tap sample at 3, 10, and 17 DAT, respectively with no significant treatment effect observed.

Treatment/ formulation	Rate amt product/ acre or % v/v	Dead ACP nymphs/shoot/tree 3 DAT	Live ACP nymphs/shoot/tree 3 DAT	10 DAT	17 DAT	ACP Adults/tap sample/tree 3 DAT	10 DAT	17 DAT	24 DAT	31 DAT	38 DAT	45 DAT	52 DAT
Untreated check		0.08 d	27.15 a	18.03 a	6.38 ab	0.27 a	2.75 a	1.75 a	1.21 a	0.79 a	1.10 a	0.58 a	0.65 a
435 Oil	2%	1.25 cd	13.63 b	3.90 b	10.18 a	0.33 a	2.35 a	0.83 b	0.95 ab	0.63 ab	0.19 bc	0.32 ab	0.35 ab
BYI02960	10.26 oz	1.95 cd	3.65 c	0.45 b	1.33 c	0.00 c	0.42 b	0.67 bc	0.58 bc	0.31 bcd	0.27 bc	0.21 b	0.13 b
BYI02960 + 435 Oil	6.84 oz + 2%	9.13 b	2.13 c	0.20 b	3.58 bc	0.06 bc	0.63 b	0.36 cd	0.35 c	0.06 cd	0.06 bc	0.19 b	0.10 b
BYI02960 + 435 Oil	10.26 oz + 2%	2.63 cd	1.00 c	0.00 b	4.10 bc	0.02 c	0.33 b	0.23 cd	0.27 c	0.35 bc	0.04 c	0.29 ab	0.04 b
BYI02960 + 435 Oil	13.69 oz + 2%	6.25 bc	0.05 c	0.05 b	0.18 c	0.00 c	0.04 b	0.23 cd	0.10 c	0.08 cd	0.08 bc	0.29 ab	0.08 b
BYI02960 + Induce	10.26 oz + 0.25%	3.73 bcd	0.03 c	0.13 b	0.88 c	0.02 c	0.15 b	0.02 d	0.13 c	0.21 cd	0.13 bc	0.04 b	0.10 b
Delegate 25 WG + 435 Oil	5.0 oz + 2%	18.25 a	1.23 c	0.85 b	0.35 c	0.00 c	0.06 b	0.10 d	0.13 c	0.08 cd	0.21 bc	0.04 b	0.06 b
Movento 240 SC + 435 Oil	10.0 oz + 2%	4.53 bcd	0.43 c	0.08 b	1.33 c	0.23 ab	0.33 b	0.29 cd	0.35 c	0.19 cd	0.42 b	0.19 b	0.19 b
Provado 1.6 F + Induce	10.0 oz + 0.25%	3.98 bcd	0.15 c	0.00 b	1.18 c	0.06 bc	0.33 b	0.27 cd	0.27 c	0.02 d	0.15 bc	0.06 b	0.15 b

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

Treatment/ formulation	Rate amt product/ acre or % v/v	CLM larvae/3 leaves/shoot/tree 3 DAT	10 DAT	17 DAT	CLM empty mines/3 leaves/shoot/tree 3 DAT	10 DAT	17 DAT
Untreated check		0.43 a	0.23 bc	2.13 a	0.73 a	0.60 a	2.70 a
435 Oil	2%	0.15 bc	0.20 bcd	1.65 ab	0.60 a	0.28 bcd	1.43 b
BYI02960	10.26 oz	0.08 bc	0.55 a	1.60 ab	0.68 a	0.40 abc	2.08 ab
BYI02960 + 435 Oil	6.84 oz + 2%	0.08 bc	0.1 bcd	1.03 bc	0.55 a	0.13 cd	1.43 b
BYI02960 + 435 Oil	10.26 oz + 2%	0.08 bc	0.20 bcd	1.13 bc	0.53 a	0.28 bcd	1.80 b
BYI02960 + 435 Oil	13.69 oz + 2%	0.08 bc	0.08 cd	0.75 c	0.68 a	0.38 abc	1.43 b
BYI02960 + Induce	10.26 oz + 0.25%	0.08 bc	0.05 cd	1.48 ab	0.73 a	0.28 bcd	1.80 b
Delegate 25 WG + 435 Oil	5.0 oz + 2%	0.23 b	0.00 d	0.13 bc	0.45 a	0.05 d	1.35 b
Movento 240 SC + 435 Oil	10.0 oz + 2%	0.08 bc	0.15 bcd	1.33 bc	0.88 a	0.45 ab	1.83 b
Provado 1.6 F + Induce	10.0 oz + 0.25%	0.03 c	0.30 b	2.03 a	0.48 a	0.43 abc	2.10 ab

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

Part II: *Materials Tested for Arthropod Management*

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

FOLIAR APPLICATIONS OF BYI02960 COMPARED TO SOME COMMONLY USED INSECTICIDES FOR CONTROL OF ASIAN CITRUS PSYLLID AND CITRUS LEAFMINER IN ORANGES: SUMMER, 2010

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Email: pstansly@ufl.edu,

Brand name	Formulation	Common name	Composition	Manufacturer
435 oil	98.8%L	horticultural spray oil	Refined petroleum distillate	Drexel Chemical Company P.O. Box 13327 Memphis, TN 38113-0327
Induce	90%L	non-ionic adjuvant	Proprietary bland of Alkyl Aryl Polyoxylkane Ethers, Free Fatty Acids, and Dimothyl Polysiloxane	Helena Chemical Company 225 Schilling Blvd. Collierville, TN

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BYI02960	200 SL	Experimental product		Bayer CropScience LP P.O. Box 12014 1 T.W. Alexander Drive Research Triangle Park, North Carolina 27709
Movento	240 SC	spirotetramat	*cis*-4-(ethoxycarbonyloxy)-8-methoxy-3-(2,5-xylyl)-1-azaspiro[4.5]dec-3-en-2-one	Bayer CropScience LP P.O. Box 12014 1 T.W. Alexander Drive Research Triangle Park, North Carolina 27709
Delegate	1 WG	Spinetoram	1-H-as-Indaceno[3,2-d]o oxacyclododecin-7,15-dione, 2-[(6-deoxy-3-O-ethyl-2,4-di-O-methyl-a-Lmannopyranosyl)oxy]-13-[[(2R,5S,6R)-5-(dimethylamino) tetrahydro-6-methyl-2H-pyran-2-yl]oxy]-9-ethyl-2,3,3a,4,5,5a,5b,6,9, 10,11,12,13,14,16a,16b-hexadecahydro1 14-methyl-, (2R,3aR,5aR,5bS,9S,13S,14R,16aS,16bR) and 1H-as-Indaceno[3,2-d]oxacyclododecin-7,15-dione, 2-[(6-deoxy-3-O-ethyl-2,4-di-O-methyl-	Dow Agrosciences LLC Indianapolis IN 46288

			a-Lmannopyranosyl)oxy]-13-[[(2R,5S,6R)-5-(dimethylamino)tetrahydro-6-methyl-2H-pyran-2-yl]oxy]-9-ethyl-2,3,3a,5a,5b,6,9,10,11,12,13,14,16a,16btetradecahydro-4,14-dimethyl-, (2S,3aR,5aS,5bS,9S,13S,14R,16aS,16b	
Provado	1.6 F	Imidacloprid	1-[(6-Chloro-3-pyridinyl)methyl]-N-nitro-2-imidazolidinimine	Bayer CropScience LP P.O. Box 12014 1 T.W. Alexander Drive Research Triangle Park, North Carolina 27709