Development of a pesticide management program for control of pear psylla

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Objectives

Develop baseline tolerance levels for new psyllicides

Determine efficacy of new psyllicides at different timings throughout the season

Field Trials

Large plot trials: Large plots of greater than four acre treatments were established to examine the efficacies of various new psyllicides at several different timings. In these trials, one replication of each treatment was made to an orchard, with different orchards serving as blocks. Applications were made by airblast sprayer (grower applied), with 80-100 gpa spray volume. Sampling occurred weekly to biweekly, depending on the time of year. Standard sampling protocols were used. Data were analyzed using ANOVA; mean separation was by FPLSD.

Timings: Small plot (9-16 tree) and single-tree plots were established to examine the efficacies of various new psyllicides at several different timings. Applications were made by handgun, approximating 200 gpa spray volume. Sampling occurred weekly to biweekly, depending on the time of year. Standard sampling protocols were used. Data were analyzed using ANOVA; mean separation was by FPLSD.

Large Plots

Actara and Assail trial

Thiamethoxam (Actara) vs. Acetamiprid (Assail)	
CB	no differences
PF	no differences
CB vs. PF	no differences
w/ Surround	significant improvement
length of control	limited to 1st generation
residual activity	decrease in late-season apps.
other pests	no increase in mites relative to standard comparisons

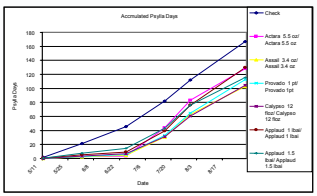
Azadirachtin and oil trial

Neemix Aza-Direct	
control	1st generation
applications	multiple
oil alone	moderate control
natural enemies	no differences (all very low)
no comparisons were made between azadirachtin materials	

Small Plots/ Single-Tree Plots

Summary of insecticide timings to optimize pear psylla control

Timings	effectiveness at CB	effectiveness at PF	CM timing (2 wks after PF)	other
Provado	yes (Not Legal)	yes		no synergism w/ Actara at ½ summer rate
Actara	yes	yes		no synergism w/Provado at ½ summer rate
Assail	more effective	yes	significantly less effective	
Calypso	yes	more effective	significantly less effective	
Applaud	yes: as good as chloronicotinyls, long residual—3 weeks		summer application does not compare to Agri-Mek or chloronicotinyls	
Dimilin	more effective	some	not effective	
Esteem	more effective	yes	some	
Surround/ Raynox	prebloom is best	postbloom associated with severe russeting of Bartlett	2 @ 50 lb = 3 @ 50 lb	psylla populations synchronized for 2 generations after use



Generally, the new insecticides (including the chloronicotinyls and Applaud) are effective in controlling pear psylla at approximately the same levels

Insecticide Bioassays of Pear Psylla

Bioassays of several new insecticides were conducted for pear psylla. Bioassays were conducted using several methods on different life stages of pear psylla. Adult pear psylla were bioassayed using a slide-dip method. Adult winterform or summerform were collected from the field by beat tray and aspirator. Psylla were anesthetized by CO_2 and placed dorsal side down on double-sided sticky tape affixed to microscope slides. Five to seven concentrations of a test insecticide were used in each bioassay, and distilled water only served as the control treatment. Slides were dipped into the appropriate concentration for 5 sec, allowed to air dry, and placed in a constant temperature and humidity.

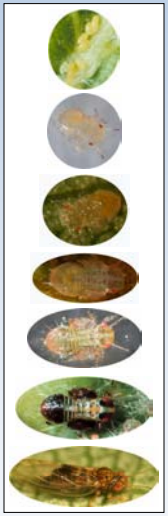
For bioassays of psylla nymphs, psylla were collected from infested pear leaves and put on pear leaf discs placed on moist cotton. Application method varied, including topical application on nymphs by Potter spray tower prior to placing them on leaf discs (topical-only treatment), topical application on nymphs by Potter spray tower after placing them on leaf discs (topical + residual), and placing nymphs on previously treated leaf discs (residual exposure only). Again, five to seven concentrations were used per insecticide, and four replications of 10 nymphs each.

For all bioassays, mortality was assessed at 48 and 96 hours, and was corrected for control mortality. Probit analysis was used to estimate population response to the insecticide treatments.

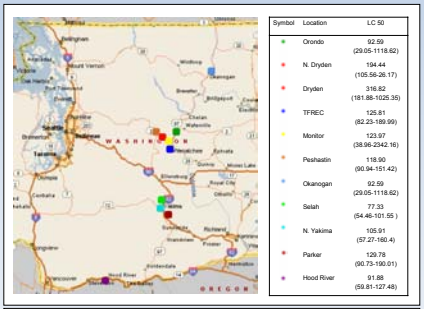
Baseline tolerances for pear psylla nymph bioassays

Compounds	LC 50 at 48 hrs	LC 50 at 96 hrs	geographic variation	potential resistance
Provado	13.69 (4.54 – 23.73)	17.03	high	high (already in field?)
Actara	9.52 (3.72 – 18.1)	2.67 (.92 – 5.37)	some	lower likelihood indicated
Assail	7.66 (3.39 – 15.23)	5.26 (3.82 – 7.08)	less	
Calypso	14.7 (6.3 – 27.21)	25.25 (15.86 – 33.96)		
Applaud	7.26 (5.5 – 9.53)	475.43 (217.46 – 993.5)		
Agri-Mek	.44 (.20 - .90)	.084 (.04 – 1.4)		
Pyramite	126.50 (85.05 – 168.61)	44.14 (22.24 – 74.7)		
Mesa	3665.17 (1641.74 – 12959.25)			

Bioassays of the chloronicotinyls established baseline data for tolerance to these compounds. These baseline data will provide a reference in the future to determine the first occurrences of insecticide resistance



Geographic variability of Provado tolerance in adult pear psylla, 2001, determined with bioassays of adult pear psylla

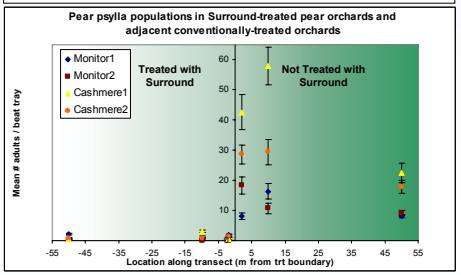


Symbol	Location	LC 50
	Orondo	92.59 (29.05-1118.62)
	N. Dryden	194.44 (105.56-26.17)
	Dryden	316.82 (181.88-1025.35)
	TFREC	125.81 (82.23-189.99)
	Monitor	123.97 (38.96-2342.16)
	Peshastin	118.90 (90.94-151.42)
	Okanogan	92.59 (29.05-1118.62)
	Selah	77.33 (54.46-101.55)
	N. Yakima	105.91 (57.27-160.4)
	Parker	129.78 (90.73-190.01)
	Hood River	91.88 (59.81-127.48)

The data for Provado bioassays on psylla populations from around Washington show a high level of variation among populations. This variation between populations indicates that there is a relatively higher risk of resistance evolution with this compound, and possibly with other related compounds (the other chloronicotinyls: Actara, Assail, Calypso, Clutch, flonicomid). Bioassays will continue to be conducted periodically on the populations with the highest LC50s to determine whether resistance may have already occurred, and to examine possible cross-resistance between Provado and the other chloronicotinyls.

Applications of Surround were most effective during the prebloom period. Surround appears to reduce adult psylla densities, and may repel psylla into adjacent orchards (Table 3). Mortality from Surround was greatly reduced once nymphs developed; the primary method of activity appears to be prevention of oviposition. Applications of Surround made in the previous November maintained enough residue to significantly reduce adult psylla densities and oviposition the following year. Raynox also reduced pear psylla, however we found that postbloom applications of Raynox were associated with high levels of fruit russeting. Raynox should therefore be only considered in the prebloom period for use as a control tactic of pear psylla.

Pear psylla populations in Surround-treated pear orchards and adjacent conventionally-treated orchards



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