Evaluating Insecticides for Control of Potato Insect Pests

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A study was established at the WSU Extension Research Farm in Pasco, WA to evaluate insecticides applied by overhead chemigation and foliar application and comparing them to an untreated check and an Admire applied at planting. Potatoes (cv. Ranger Russet) were planted on April 14, 2016. Plots were comprised of four rows that were 34 inch wide and 30 feet long, in a randomized complete block design, and with 4 replications of each treatment. The seed was spaced 11 inches apart within each row, and buried at the bottom of the potato hill. Seed pieces were untreated except for the Admire Pro treatment which was applied at 8.7 fl oz per acre. The soil texture is a Quincy Loamy Fine Sand series. Standard growing practices for the area were followed including soil fertility, fungicides, herbicides, and irrigation. A dry blend of the following nutrients was applied before disking and hilling (in lbs of nutrient per acre): 100 N, 250 P, 300 K, 100 S, 5 Zn, 15 Mg and 2 B. Nitrogen was also applied through the irrigation system, based on petiole tissue analysis, totaling 200 lbs per acre for the growing season. Potatoes were desiccated on September 21 with Reglone herbicide at 2 quarts per acre.

Foliar treatments were applied with a CO2 pressurized sprayer that is mounted on 3 pt platform to a tractor. Foliar insecticides were applied at 20 gallons of water per acre and included either a nonionic or methylated seed oil surfactant at 0.25% of the water volume. Chemigation applications were made on the same day as the foliar applications and were applied with an apparatus designed to mimic overhead irrigation, and the insecticides were injected into the water stream. Those applications were made with 0.1 acre inches of water per acre. The in furrow application was made at planting. The foliar and chemigation applications were made on July 6, July 19, and August 12 with the primary target of the trials being potato psyllids.

Adult potato psyllids were first detected in the experimental bock in late June. Adult psyllids had infested all potato plots by mid July. The initial application at July 6th was timely to determine efficacy, but probably too late to avoid colonization. Insecticide efficacy for psyllids is probably best determined by counting nymphs and eggs, as adult psyllids are highly mobile in comparison to the relatively small test plot size we use. On July 25th, 6 days after the second insecticide application, the plots treated with Exirel by chemigation had significantly fewer psyllid nymphs than the plots treated with Admire at planting (Fig. 1). On August 1st, there were no significant differences, but psyllid counts were numerically decreased in plots treated with Exirel and Movento by both application methods. Though numbers were not significantly different from the untreated check, the Exirel chemigation treated plots routinely contained fewer psyllid nymphs than other treatments in the experiment (Fig. 2).

The season totals for egg and nymph psyllids are illustrated in Figure 3. The same trend of Exirel reducing psyllid nymphs compared to other treatments was observed in the season summary data, in fact Exirel applied by chemigation contained significantly fewer psyllid nymphs than the Sivanto foliar applications (Fig.3). After fully reviewing the data for insect counts and plant health, Exirel was the superior treatment in this experiment in reducing psyllid numbers. Exirel applied by chemigation was superior to Exirel applied by foliar application.

Winged and wingless aphids were also enumerated as part of this project. Overall, very few aphids were found in the experimental plots, yet there were still some interesting trends to discuss. The season totals for wingless aphids by leaf sample are presented in Figure 4. This figure demonstrates that foliar application of Brigade caused a dramatic increase in colonizing aphids compared to all other treatments in the trial. This trend has been recognized previously, but it is important to note that the same trend was not evident for the same product applied by chemigation. A comparison was made of Sivanto and Brigade treatments in regards to wingless aphid populations. Although all plots had an increase in wingless aphids, the Brigade

applications (both foliar and chemigation) were higher than the untreated and Sivanto plots.The foliar applied Brigade plots continue to build aphid populations while the chemigation applied plots reduced over time, likely from natural enemies in those plots quickly re-establishing after application.

Colorado potato beetle, two spotted spider mites, and leafhoppers were also counted, but low numbers of those insects were found, and as such, no statistically significant data was noted. Lygus were also counted, but most of the insecticides tested have little to no efficacy documented on this pest, so that data will not be presented here. The seasonal summary showed that chemigation applications of Brigade, and chemigation applications of Sivanto reduced Lygus more than the other insecticides (data not shown).

Beneficial insects were also counted as part of this effort including minute pirate bugs, nabids, and big-eyed bugs, all generalist predators. Big-eyed bugs were rather common in the test plot, peaking in abundance in late June and early August. During several sampling points, significantly fewer big-eyed bugs were captured by vacuum sample in the plots treated with Exirel than the untreated check and the other insecticides used in the trial. The plots treated with Exirel also had fewer potato psyllids present. Nabids were also regularly collected in the plots, with significantly fewer of them being detected in plots treated with Brigade by foliar application (Fig. 5). This reduction in nabids could provide an explanation as to why more aphids were found in plot treated with Brigade by foliar application. Plots treated with Bridage by chemigation and both application methods of Exirel had numerically, but not statistically fewer than the untreated check (Fig. 5). Minute pirate bugs were also regularly captured, but populations were variable and no significant trends were noted by sampling date (data not shown), nor by season summary (Fig. 5).

Prior to vine desiccation, plant health ratings were conducted. The proportion of the plot area with necrotic tissue was scored on August 29th (Fig. 6). Plot treated with Exirel by chemigation had significantly more green leaf tissue than the other treatments and the untreated check. These were the plots that also contained significantly fewer potato psyllids. The plots in Pasco this season contained a large degree of premature die off and symptoms similar to that of BLTVA (swollen nodes, purpling of leaf tissue, necrosis on leaf margins and leaf death). The plots treated with Exirel by chemigation remained healthier much longer than the other plots. Yield and grade are presented in Figure 10. No significant differences were detected in terms of yield and grade.

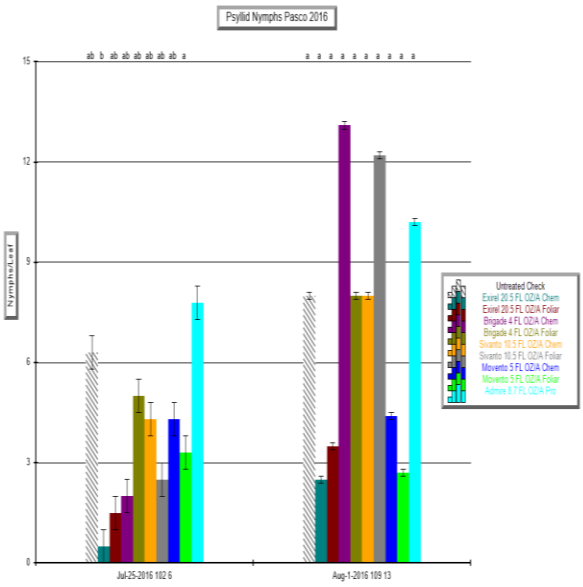

Figure 1. Nymph psyllid catches from leaf sampling. Letters that are the same indicate treatments that are not statistically significantly different from one another (p=0.05).

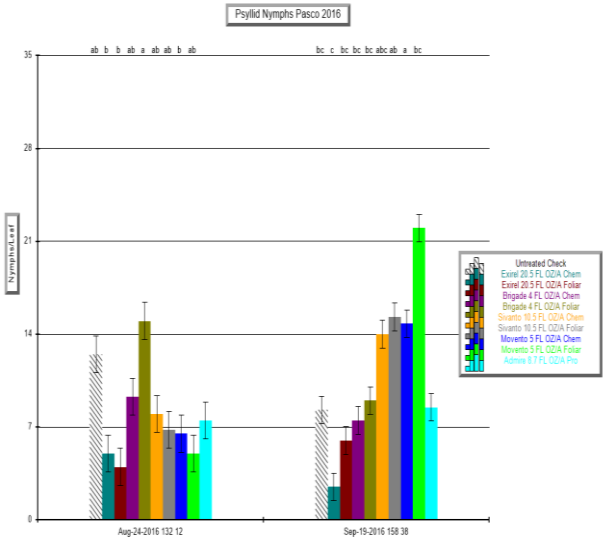

Figure 2. Nymph psyllid catches from leaf sampling. Letters that are the same indicate treatments that are not statistically significantly different from one another (p=0.05).

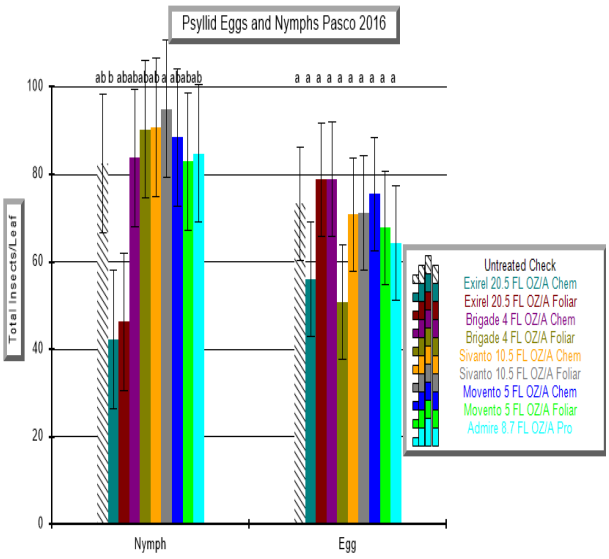

Figure 3. Nymph and egg psyllid catches from leaf sampling summary for the season. Letters that are the same indicate treatments that are not statistically significantly different from one another (p=0.05).

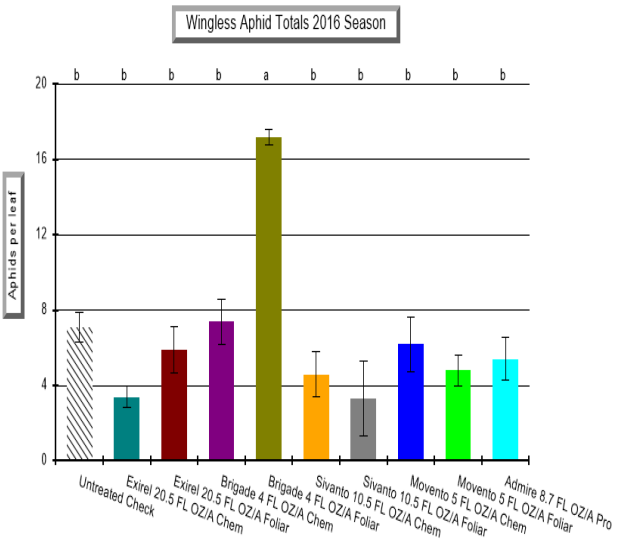

Figure 4. Wingless aphid catches from leaf sampling summary for the season. Letters that are the same indicate treatments that are not statistically significantly different from one another (p=0.05).

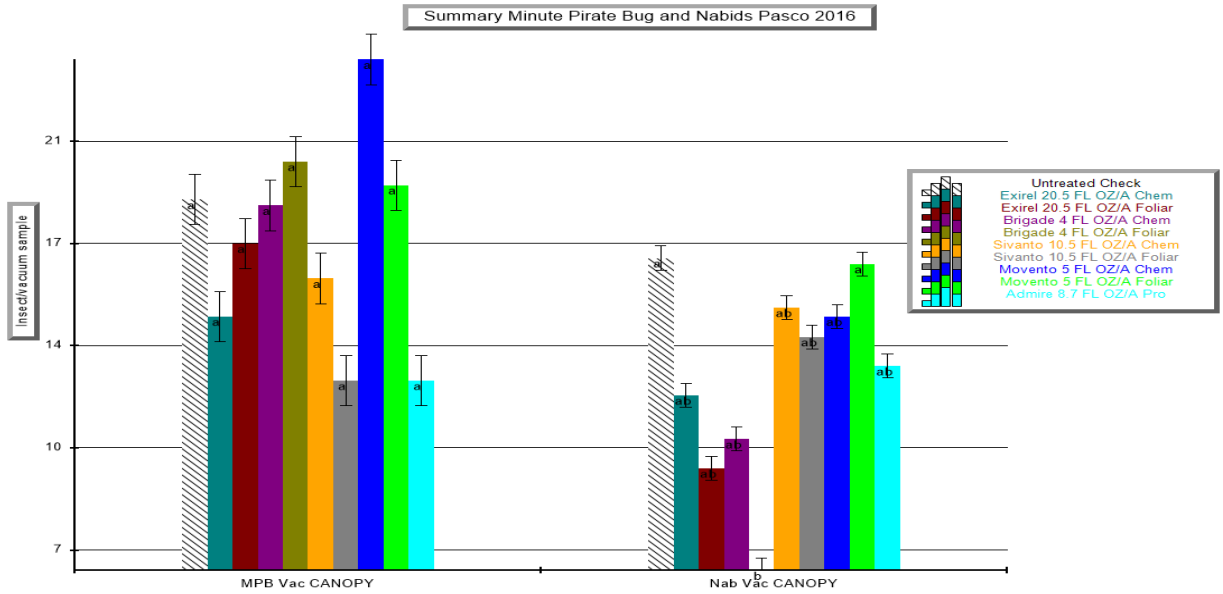

Figure 5. Season totals of minute pirate bug and nabids collected from plots by vacuum sampling. Letters that are the same indicate treatments that are not statistically significantly different from one another (p=0.05).

Treatment	Averages	
Untreated	5.05a	
Exirel Chemigation	4.34b	
Exirel Foliar	4.92a	
Brigade Chemigation	5.09a	
Brigade Foliar	5.25a	
Sivanto Chemigation	5.09a	
Sivanto Foliar	5.02a	
Movento Chemigation	5.00a	
Movento Foliar	5.13a	
Admire	4.81a	

Figure 6. Potato health rating by treatment. Lower numbers correspond to healthier plants as ratings are proportion of area of plot with necrotic tissue. Letters that are the same indicate treatments that are not statistically significantly different from one another (p=0.05).

Treatment	US #1	US#2	Tons/Acre	Cull Weight
Untreated	44.78 (a)	5.60 (a)	43.29 (a)	5.88 (a)
Exirel Chemigation	47.45 (a)	4.83 (a)	44.29 (a)	5.28 (a)
Exirel Foliar	51.40 (a)	6.53 (a)	47.25 (a)	3.48 (a)
Brigade Chemigation	52.25 (a)	5.73 (a)	49.12 (a)	5.85 (a)
Brigade Foliar	47.70 (a)	6.80 (a)	43.31 (a)	1.78 (a)
Sivanto Chemigation	49.05 (a)	5.68 (a)	45.08 (a)	3.85 (a)
Sivanto Foliar	45.65 (a)	4.95 (a)	41.56 (a)	3.40 (a)
Movento Chemigation	45.93 (a)	5.95 (a)	41.96 (a)	2.65 (a)
Movento Foliar	46.95 (a)	8.10 (a)	43.87 (a)	1.95 (a)
Admire	48.25 (a)	8.08 (a)	45.58 (a)	2.90 (a)

Figure 7. Potato yield and grade by treatment. Letters that are the same indicate treatments that are not statistically significantly different from one another (p=0.05)