SYSTEMIC CONTROL OF DROSOPHILA SUZUKII THROUGH NEONICOTINOID CHEMIGATION IN HIGHBUSH BLUEBERRY

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Neonicotinoid pesticides were tested as a systemic ovicide for SWD control. Chemigation trials were performed on blueberry bushes in the WSU NWREC experimental field. Neonicotinoids were shown to exhibit systemic entry into the blueberry leaf tissue, but no insecticides were found in the fruit tissue based on bioassays or laboratory residual tests.


Fig. 1. Drip line irrigation connected through PVC manifold.

A system of ½" drip lines was installed to deliver neonicotinoids to experimental plots in the field (Fig. 1). Two rows of mid-season 'Bluecrop' and two rows of late-season 'Elliot' were used. Each row contained four randomized plots of four bushes each. Separate lines were installed for each of the three treatments and the control. The nozzles were self-pressure regulating and dripped at a rate of ½ gph. A Y-filter, backflow inhibitor, and flow regulator were installed at the head of a four-arm ¾" PVC manifold. Insecticides were applied through a six-tank sprayer calibrated to run at 40 PSI. Multiple applications were made to 'Bluecrop' throughout the season, and a single high rate application was applied to 'Elliot' bushes. Insecticides used were Assail 30SG® (5.3 oz/A and 26.5 oz/A), Admire Pro® (imidacloprid, 7 fl oz/A and 14 fl oz/A), and Scorpion 35SL® (5 fl oz/A and 10.5 fl oz/A).

Ripe berries were collected from 1 DAT to 7 DAT, and 8 DAT to 28 DAT (the pre-harvest interval for Scorpion), twelve berries per plot. Single berries were then placed in arenas with mature lab-reared female SWD, which were allowed to oviposit for 48 hours. Eggs were counted and compared to number of emerged offspring after a two-week period to obtain the percent emergence data. Samples of blueberries and leaves for residual chemical analysis were taken at 27 DAT for Scorpion-treated plots from the 'Bluecrop' trials, and 26 DAT for all treatments from the 'Elliot' trials. These samples were sent to Cascade Analytical, Inc. (Wenatchee, WA).

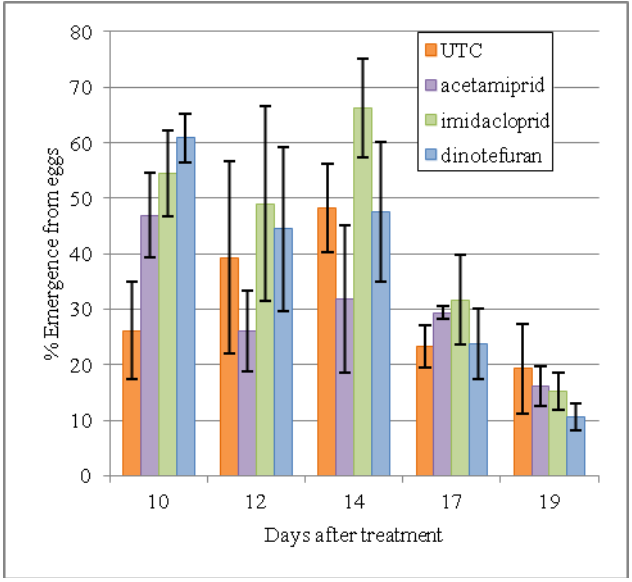

Fig. 2: SWD % emergence from eggs laid in chemigated 'Bluecrop' blueberries.

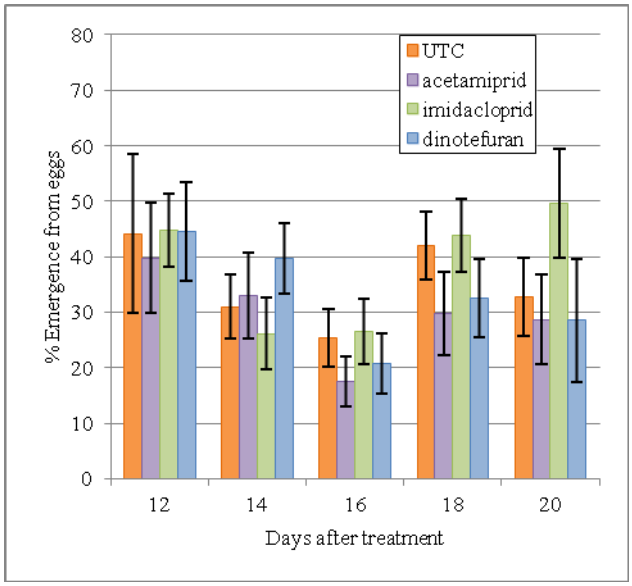

Fig. 3: SWD % emergence from eggs laid in chemigated 'Elliot' blueberries.

Oviposition in the Bluecrop variety was relatively low, and death of adults was frequent – however this occurred in controls as well as treatments and was likely due to the test arena, which was large, layered with sand, and allowed for desiccation. In light of this, 'Elliot' blueberries were placed in smaller arenas with more available water, and adults rarely died. The percent emergence of offspring from 'Bluecrop' samples was not found to be significant except in some cases where the control was lower than treatments (Fig. 2). There was no signficant differences in emergence found between treatments in the 'Elliot' fruit (Fig. 3). These results do not indicate any activity for neonicotinoids acting as ovicides. Residual data for the samples of Scorpion-treated bushes from the Bluecrop variety had 0.32 ppm (AI) of Scorpion found in sample of leaves, and not detected in the sample of berries. From samples of Elliot variety, the concentrations of Admire Pro and Scorpion (AI) were found at 0.12 ppm and 0.86 ppm in leaves respectively, and not detected in fruit samples. Assail was not detected in "Elliot' fruit or leaf samples (Table 1).

These data indicate that neonicotinoids are systemic within plants, but the insecticides do not appear to enter the fruit tissue. This may be caused by a specific barrier to entry, or be due to timing of application. At the end of ripening, xylem does not contribute as much to fruit mass increase, and pesticides entering from the roots during this period would not reach the fruit. Applying earlier could prove successful. However there could still be a barrier to entry, since that hypothesis does not account for the presence of neonicotinoids (specifically imidacloprid and dinotefuran) found in the leaves (Table 1). When blueberries are ripening, uptake from xylem is reduced, but uptake from phloem is increased, and pesticides could enter the fruit from that direction. Another chemigation trial will be needed to address these questions.

Table 1. Results of HPLC analysis for neonicotinoid residues in treated plots.

"Bluecrop"	Amount Detected	Limit of Quantitation
Dinotefuran fruit	*Not detected*	0.010 ppm
Dinotefuran leaves	0.32 ppm	0.020 ppm
"Elliot"	Amount Detected	Limit of Quantitation
Acetamiprid fruit	*Not detected*	0.010 ppm
Imidacloprid fruit	*Not detected*	0.010 ppm
Dinotefuran fruit	*Not detected*	0.010 ppm
Acetamiprid leaves	*Not detected*	0.029 ppm
Imidacloprid leaves	0.12 ppm	0.030 ppm
Dinotefuran leaves	0.86 ppm	0.030 ppm