Washington Blueberry Commission Research Proposal Format

Title: Resistance Detection Program for SWD in Berries

Year Initiated: 2024 **Current Year**: 2024 **Terminating Year**: 2024

Principal Investigator:
Louis Nottingham, Ph.D. fill this out
Alan Schreiber, Ph.D., 2621 Ringold Road, Eltopia, wa 99330, aschreib@centurytel.net, 509 266 4348

Justification and Background: Spotted wing Drosophila (SWD) appeared in Washington in 2009 and quickly became the most critical pest of berries. Initially the pest swamped the ability of growers to control the best. Eventually growers learned to control the pest through the heretofore unheard of levels of insecticide applications to blueberry and raspberry. A typical conventional SWD program will have six applications of insecticides with later season blueberries having as many as 12 applications in heavy pressure situations. Further, organic blueberries in high pressure situations can have even more applications than conventional blueberries. In one situation, Schreiber reviewed insecticide records for one organic late season blueberry field being produced for the export market that had 40 insecticide applications.

There is zero tolerance for the presence of SWD in fruit. A single detection can result in a semi load of blueberries being rejected. Blueberry growers producing for the export market face tremendous pressure to have no SWD in their fruit. Additionally, growers of berries destined for the export market have very limited selections of products to use due to maximum residue limits (MRLs). Conventional blueberry growers producing for the export markets rely on a limited number of insecticides. Organic blueberry growers rely on a single active ingredient, spinosad, which forms the basis for all of their SWD management programs. Widespread resistance in SWD to spinosad and malathion has been reported in California and to Exirel and deltamethrin in Italy. Anecdotal information exists for resistance to Mustang Maxx and other insecticides in berries in California.

A national effort exists to screen SWD for resistance to insecticides which has screened SWD populations in California, Florida, Georgia, Maine, Maryland, Michigan, New Jersey, and North Carolina. Washington and Oregon are not included in the survey. A recent effort to screen SWD for insecticide resistance in Washington berries by WSU's Elizabeth Beers was not successful.

A group of small fruit entomologists have developed a standard protocol for monitoring for insecticide resistance in SWD. The method is called Rapid Assessment Protocol for Identification of resistance in SWD (RAPID). It uses a single discriminating dose that can easily and quickly test field populations for the presence of resistance genes. The discriminating dose for malathion, methomyl (Lannate), spinetoram (Delegate), spinosad (Entrust) and zeta-cypermethrin (Mustang Maxx) have been developed for use in the test. This method provides results in 24 hours. This effort originated out of a Specialty Crop Research Initiative that seeks to advance the development of sustainable, integrated management strategies for spotted wing drosophila, SWD, based on biology. Schreiber is on the advisory board for the SCRI grant.

Additionally, Schreiber used a very similar method for monitoring resistance in field populations of insect pests for his Ph.D. dissertation.

WSU's Louis Nottingham and Alan Schreiber propose to screen organic and conventional SWD populations for insecticide resistance in eastern and western Washington. Western Washington produces roughly 55% of the state's blueberries with eastern Washington producing the rest. Roughly 95% of Washington's organic blueberries are produced in eastern Washington. SWD pressure is much higher in western Washington than in eastern Washington. These factors argue for a statewide monitoring program in both organic and conventional blueberries. This program could easily be expanded to raspberry, other berries and cherries.

The industry places a greater emphasis on the need for screening for spinosad resistance as the organic blueberry industry is heavily reliant on this active ingredient for SWD control. However, there is value in looking for resistance or elevation of tolerance to conventional insecticides. Early detection of resistance is critical if management of resistance is to occur.

WSU's Dr. Elizabeth Beers will serve as a project cooperator.

Relationship to WBC Research Priority(s):
This research project directly addresses priority number 7 below and additionally it was a topic that arose out of discussion with the WBC Research Committee's Washington Blueberry Research Review.

- Organic production and pest management systems including development of new SWD and mummy berry controls and development of resistance management strategies.

Objectives: Determine if resistance is present to malathion, methomyl (Lannate), spinetoram (Delegate), spinosad (Entrust) and zeta-cypermethrin (Mustang Maxx) in SWD collected from blueberry fields.

Procedures: In this project we will follow what is called the Michigan protocol for the RAPID test. 20 ml scintillation vials will be treated with 1 ml each of five formulated insecticides Malathion 8F, Lannate 2.4LV, Delegate, Entrust 22.5SC and Mustang Maxx 0.8EC. Recently produced insecticides less than one-year-old will be used in all bioassays.

To prepare for treating the vials, insecticides will be dissolved in acetone for malathion, methomyl, and zeta-cypermethrin, or if they did not dissolve in this solvent we used water with 1% v/v Induce spray adjuvant for spinetoram and spinosad. 10 adult *D. suzukii* flies from a single population will be placed in each vial and re-sealed with the cap. Wherever possible flies will be loaded in a humid environment, ideally >50% relative humidity, to reduce mortality. After 6 h in the vial (8 hours for spinosad), the number of flies that are alive, moribund, or dead will be counted.

The flies will be live trapped from blueberry fields. We plan to start sampling SWD as soon as they can be trapped with sampling continuing through harvest with a biased towards sampling more towards the end of harvest, when presumably resistant flies would be more prevalent if they are to be detected. We hope to sample more than 100 SWD populations using this method

over the course of the 2024 berry growing season across the state of Washington. Nottingham will have the lead on sampling NW populations. Schreiber will have the lead on sampling eastern and southwestern Washington.

Describe how this research will benefit Washington blueberry growers:
If SWD develops resistance to spinosad (Entrust) it would have devastating consequences to the $100 million Washington organic blueberry industry. Even if SWD could be controlled once resistance to Entrust had developed as it has in California, the cost of that control would be much much higher. It would likely compromise our ability to grow mid and late season organic blueberries in western Washington. It is less likely that resistance will develop in SWD to conventional insecticide as has happened in California, but if it did it would significantly increase our cost of control, reduce yields and threaten viability of our ability to export blueberries.

Budget: Depending on the results and successes/failures of the 2024 field season, we believe this project will last three years or less.

	2024	**2025**	**2026**
Salaries[1/]	$ 5, 755	$ 6,755	$ 6,755
Time-Slip	$	$	$
Operations (goods & services)	$ 1,000	$ 1,000	$ 1,500
Travel[2/]	$ 1,000	$ 1,000	$ 1,500
Meetings	$	$	$
Other	$10,000	$10,000	$10,000
Equipment[3/]	$	$	$
Benefits[4/]	$ 2,012	$ 2,362	$ 2,363
Total	**$19,787**	**$21,137**	**$22,137**

[1/]Type of Personnel, Agricultural Researcher

[2/] Travel to fields to collect samples

[3/] Other: the $10,000 is for Dr. Nottingham's program and is for ag technical salary.

[4/] Benefits 35%

The Co PI's have submitted a proposal to the Washington Commission on Integrated Pest Management for the same amount for 2024. The only in kind contribution is the value of the SWD that Washington blueberry growers will provide to the project for testing.