**AGRICULTURAL RESEARCH FOUNDATION**
**INTERIM REPORT**
**FUNDING CYCLE 2016 – 2018**

**TITLE:** Determining baseline levels of systemic insecticides in fruit, pollen and nectar of blueberry

**RESEARCH LEADER:** Vaughn Walton

**COOPERATORS:** Jennifer Field, Ramesh Sagili

**SUMMARY:** Pesticides were applied and tissue samples collected during 2016. The QuEChERS method developed for blueberry fruit. Additional tissue samples were collected for cherry and winegrape fruit. Currently the the QuEChERS method is being refined for the other two fruit types. Testing of the second season's fruit will commence at first color during 2017.

**OBJECTIVES:**

- To determine the levels of systemic insecticides and their metabolites in blueberry tissues during the season of application.
- To determine the levels of systemic insecticides and their metabolites in blueberry pollen and nectar during next season after application.

**Impact:**

Results from this study will illustrate the persistence of systemic insecticides and their metabolites in blueberry over two growing seasons. This information will help blueberry growers and beekeepers to apply integrated pest management methods by considering the long-term levels of systemic compounds in nectar and pollen. This study will help us to understand whether there is persistence of systemic compounds and their metabolites in pollen and nectar between growing seasons. Such information is currently scarce and critical in designing best management practices when using systemic insecticides. In addition, information gleaned from this project will be useful in leveraging additional funds from other funding agencies for future longterm extensive projects. Further, the information obtained from this study will be used synergistically with emerging information from Dr. Ramesh Sagili and Dr. Jennifer Field in larger interdisciplinary studies.

**Duration of study:**

Two years (2016, 2017)

**PROCEDURES:**

In this experiment systemic insecticides including neonicotinoids and their metabolites will be analyzed for blueberry fruit. All applications were conducted on blueberry, winegrape and cherry experimental fields located at the OSU Lewis-Brown research farm, OSU horticulture farm, and MCAREC research station in Hood River. Legacy blueberry plants were used in the study as it is a standard cultivar and is known to have a longer flowering period. The six insecticides that included in the experiment were imidacloprid, acetamiprid, thiamethoxam, spirotetramat, cyantraniliprole and spinosad. Spinosad, were used as the standard non-systemic insecticide for comparative purposes. Insecticides were applied on each of three plants (replicates) during the ripening period for (June-August) blueberry, cherry (June) and winegrape (June) during 2016. Each of the treated plants (18 plants used for data collection total) were flanked by a buffer plant in order to minimize possible contamination between treatments. Applications were applied at the registered field rate by using motorized backpack blower sprayer during year 1 in blueberry and winegrape, and Airpblast sprayer in cherry. All treatments were applied as it would be in a standard IPM system to manage *D.suzukii* during the first color of fruit during the growing season.

Fruit tissue samples were collected during the first season before application, as well as at day 1, 7, 14, 21, 28, and 35 days after the application. During season two, fruit will be collected from each sample plant and analyzed using the QuEChERS method. In each step of sample collection and process, separate tools were used in order to prevent possible contamination between treatments. Standard quality assurance measures were applied to minimize the cross-contamination between samples and the analysis process. The experiment will continue for two years and data will be analyzed using ANOVA to determine the difference between residues between seasons, fruit and treatments.

For the chemical analysis, the QuEChERS method were used to determine the respective systemic and other insecticide in the fruit. All samples will homogenized before the extraction process and weighed to 5g in 50 mL centrifuge tube. After this process, 5mL water and 10 mL ACN (acetonitrile) will be added to the respective tubes. All tubes will be shaken for 1 minute, after which 1g of sodium acetate, 4 g of $MgSO_4$ (magnesium sulfate and 100 µl of acetic acid will be added and the mixture will be shaked and centrifuged for 5 minutes at 3000U/min. The dispersive solid phase extraction (PSA and $C_{18}$, 25 mg/ml and $MgSO_4$, 150 mg/ml) will be applied to clean up the samples and centrifuged for an additional 5 minutes at 3000 U/min. The aliquot will be used to analyze in LC-MS/MS.

**SIGNIFICANT ACCOMPLISHMENTS TO DATE:**

- Pesticides were applied and tissue samples collected as described above.
- A visiting scientist, Dr. Jean Daniel Berset, developed the QuEChERS method for the determination of 16 systemic pesticides and their main plant metabolites in blueberry, winegrape and cherry. The blueberry method was initiated and adapted for the other two fruit.

- Dr. Berset trained an OSU graduate student, Serhan Mermer, to conduct the analyses. Mr. Mermer will conduct all subsequent analyses related to this project.
- OSU now possesses the capacity to analyze for 16 pesticides and their metabolites blueberry and the method will be adapted to cherries and winegrape fruit.

**ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:**

We received funding from the Oregon Blueberry Commission and United States Department of Agriculture National Institute for Food and Agriculture award #2015-51181-24252, USDA OREI #2014-51300-22238.

**FUTURE FUNDING POSSIBILITIES: None**

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