North Willamette Research and Extension Center (OSU Extension Program)

iPiPE and the Spotted Wing Drosophila

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What is NWREC?

The North Willamette Research and Extension Center (NWREC) is one of thirteen experiment stations of Oregon State University (OSU) designed to serve the region's agricultural industries. Since 1917, NWREC has partnered with the USDA-ARS in order to research and produce berry varieties (cultivars) that are well-suited for growing in the Pacific Northwest. This partnership has lead to the release of 18 new berry cultivars, including the widely popular 'marionberry.' Open houses – or "Field Days" – are held during each harvesting season for growers, scientists, researchers, and partners to observe and taste advanced berry selections as well as give input on the program's progress. The Extension Center also holds workshops throughout the year to educate growers on both crop production and pest management.

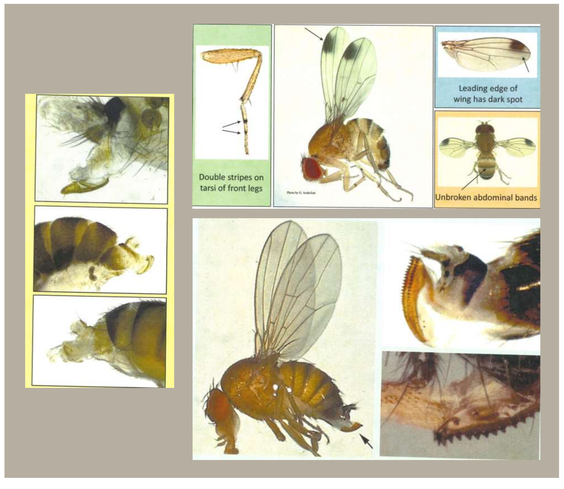
Spotted Wing Drosophila (SWD)

Spotted Wing Drosophila (SWD) is an invasive species of drosophila fly that affects a wide range of fruits and berries. The species is native to Asia but first appeared in the U.S. in 2008 and has since spread across the country. SWD are found in all the primary berry-growing regions of the United States. They are predominantly identified by their translucent-auburn color, as well as their larger 2-3mm size. Males, specifically, can be identified by the distinctive pair of black spots on the tip of their wings, which are usually visible to the naked eye (Figure 1). Females are more difficult to identify because they are distinctive only in their large saw-like ovipositors lined with individual teeth that can only be seen with intense magnification. This species of drosophila poses a particular threat due to their ability to overwinter as adults and re-emerge in the spring to continue breeding. During the breeding season, SWD will deposit their larvae into fruits and berries using their unique ovipositor, where the larvae will feed on the healthy, ripe fruit until ready to emerge as adults. This damage caused by the larvae is subtle until harvest, when growers are able to see that their 'ripe' fruits are wilted and possibly contaminated by other bacteria, fungi, and insects (Figure 2, top right).

iPiPE Implementation

This particular internship was created under the Blueberry program at NWREC, so our experiments and observations revolved around only the blueberry cultivars and SWDs in the Center's fields. To track the amount of SWDs present in our fields, we designed hand-made traps out of plastic cups and lids (Figure 2, left). By poking holes in the sides large enough for SWD, we filled the bottom of each cup with different types of vinegar to attract the pest(s). The first type was Apple Cider Vinegar (ACV), and the other type was Chinese Vinegar (CV). We dispersed 5 traps of each vinegar into two different fields (10 in each field, 20 traps total) on opposite sides of the property. Every 3-4 days, we would collect all the traps, separate the pests from the vinegar, and identify through a microscope the total amount of female and male SWDs; as well as total amount of other pest/insect species present. We then loaded this information into the iPiPE database by each trap's unique ID.

Figure 1: SWD Identification



Male SWD (top right) are most clearly identified by the distinctive black spot at the tip of their wings. For both male and female SWD, their slightly larger size, auburn color, and large red eyes make them identifiable against other drosophila species. Females (left and lower right) are distinguished by their ovipositor structure (shown in detail in lower right figure and compared to other drosophila in the figure to the left).

Figure 2: NWREC iPiPE Experiment Design

(Left) SWD trap in the blueberry field; (top right) up-close of an SWD larvae-infected blueberry; (bottom right) adult male SWD on a blueberry.

Figure 3: Prototype of the OXBO Over-the-Row Blueberry Harvester

In a study done by Takeda et. al., this machine harvester was developed to address the issues of increasing labor costs, decreasing labor availability, and fruit quality. Not only does it vastly decrease the amount of picking time versus hand-harvesting, but it increases the amount of viable fruit collected by 3.5-15 times (g/min) versus other machine harvesting methods.

Summary

Overall, we found that the ACV traps contained more SWDs than the CV traps, and that the SWD populations peaked around the hottest part of the summer – which also happened to be the ideal blueberry harvesting time. While the iPiPE program was the focus of my internship with OSU, the experience I gained working on the blueberry harvesting machine and other projects lead to great innovations on the berry front. Hand-harvesting blueberries is still the most effective way to preserve berry quality, but with the use of the harvesting machine that we tested, revolutions in the industry are bound to follow. Through my work as an intern with Oregon State University and the NWREC program, I have learned that along with its partnership with the USDA, the million-dollar berry industry of the Willamette Valley will continue to be preserved and advanced.

Other Activities

- Monitoring and data collection of blueberry diameters to track development.
- Sorting and analysis of blueberry plant roots.
- Soil core sample collection and pH analysis.
- Testing of the OXBP Over-The-Row Blueberry Harvesting Machine (Figure 3).
- Comparative berry quality analysis via FirmTech technology of hand-harvested and machine-harvested berries.
- Attending of "Field Day" meetings for a holistic berry-based learning experience.

References

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