

**AGRICULTURAL RESEARCH FOUNDATION  
FINAL REPORT  
FUNDING CYCLE 2015 – 2017**

**TITLE: Monitoring Local Parasitoids of Invasive Spotted Wing *Drosophila***

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**SUMMARY:** Spotted wing drosophila (SWD) *Drosophila suzukii* is an invasive fruit fly that has, since 2008, become a major pest of several fruit crops in the Pacific Northwest. The affected industries include cherries, caneberries, blueberries and strawberries, which had a combined value of over \$244 million and over 31,000 acres in production in Oregon in 2014. Fruit infested with developing larvae are unmarketable for fresh consumption and may result in downgraded or rejected loads at processing facilities. Pesticide applications have been the primary control tactic against SWD, however there are no registered products that control larvae within fruit, nor are there many effective organically approved products. Cultural management practices are timely and costly. Biological control organisms may play a key role in reducing populations of SWD, thereby improving the efficiency of these other management strategies. Parasitism rates as low as 5% may result in significant reductions of SWD populations during the season (estimated from Wiman et al. 2014). A number of parasitoids are known to attack SWD in southeastern Asia, its area of origin. To date, only one generalist parasitoid, *Pachycrepoideus vindemiae* has been reported to attack SWD in Oregon (Rossi Stacconi 2013).

Since 2012, we have surveyed parasitoids in the Willamette Valley as part of a multi-state federal SCRI grant to improve management of this new and destructive pest. The survey has two main purposes: 1) to determine what, if any, natural enemy activity in this region has the potential to contribute to biological control of SWD, and 2) establish a baseline level of parasitism as a point of comparison for future releases of imported parasitoids. In the last three years, we have consistently collected the previously mentioned *P. vindemiae*, and a larval parasitoid, *Leptopilina heterotoma*. However, the levels of parasitism shown in our studies were low enough to justify foreign exploration to South Korea, where SWD has been long established. In 2013 and 2014, we imported at least four different species of parasitoids into a quarantine facility at the University of California, Berkeley, where they are undergoing rigorous testing for their suitability as biological control agents in the Pacific Northwest. At least two of these species show promise in preliminary tests. If deemed suitable, they will be cleared for mass rearing and release into the landscape. If such is the case, the baseline data of parasitism rates that we are now collecting will be invaluable in determining the success of newly introduced parasitoids.

The SCRI funding that supported this work ended in February 2015. This ARF funding for the 2015 growing season was secured to maintain the continuity of our collected baseline data and to continue to monitor for adaptation of local parasitoids to the invasive SWD.

- OBJECTIVES:**
1. Survey baseline parasitoid activity in the Willamette Valley
  2. Monitor for adaptation of local parasitoids to utilize SWD as a host

**PROCEDURES:** *Sentinel Bait Trap Preparation* - To survey for parasitoids of SWD, we deploy sentinel bait traps. The trap consists of a 5.5 oz. plastic soufflé cup filled with organic raspberries that have been infested with an estimated number of lab-reared SWD larvae. We rinse the larvae from their food substrate in a sieve and weigh out 2 grams (approx. 750 larvae) for each cup of fruit. The cup is fitted with a lid (to exclude larger predators and scavengers) and entrance holes (to permit access to the fly larvae by parasitoids) and then placed inside of a tent trap to protect it from weather. Tent traps are then hung at shoulder height (1-2 meters) in the crop or surrounding vegetation.

*Placement of Traps* - We select trap locations based on diversity of landscape, presence of crops known to be susceptible to SWD, and preliminary data on percent parasitism from previous seasons. For the 2015 season, we placed the traps in three sites: 1) an organic blueberry farm (both in the crop and in surrounding vegetation), 2) a conventional blueberry farm (both in the crop and in surrounding vegetation), and 3) a diverse, unsprayed habitat. Traps were collected and replaced once a week from May to October.

*Rearing of Parasitoids* – All collected cups were placed in a sealed/vented container to prevent escape of insects. All containers are kept at room temperature and checked for emerging parasitoids once a week. Emerged parasitoids are counted to estimate the percent parasitism occurring in the sentinel traps (the percentage is based on original average numbers of fly larvae placed in each cup). Emerged parasitoids are either 1) collected into vials of 95% ethanol and sent to specialists for identification or confirmation of identification or 2) released into a laboratory colony to be used for controlled experiments.

**SIGNIFICANT ACCOMPLISHMENTS TO DATE:** We have completed the survey of parasitoids for 2015. Data from the survey indicate very low levels of SWD parasitism by indigenous natural enemies. Overall, rates of SWD mortality due to parasitoids were consistently below 3% across the season and across all sites. A majority of the samples indicated a range of zero to 1% percent parasitism. One of the most prevalent species, *Pachycrepoideus vindemiae*, recovered is a broad generalist on many types of insects and not a *Drosophila* specialist. However, biological control in the case of SWD will be best achieved with a host-specialist parasitoid. The most prevalent species, *Leptopilina heterotoma*, that we recovered among the known native parasitoids that are *Drosophila* specialists accounted for less than 1.5% of the overall mortality of SWD. These data were consistent with similar studies conducted from 2012-2015. Therefore, continued efforts to import exotic natural enemies are warranted. Understanding the (low) level of parasitism by our local natural enemy species provides a useful reference point for future studies following the importation of foreign biological control agents, as well as any future adaptation of the local species toward utilizing SWD.

**ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:** Our program reapplied for the SCRI funding that initially supported this work and secured an additional \$520,000 for work on SWD.

A portion of this funding was used to continue the survey of parasitoids in the Willamette Valley in 2016.

**FUTURE FUNDING POSSIBILITIES:** The above mentioned grant will provide funding for a minimum of three growing seasons. Given the impact of this pest on small fruit industries nationwide, it is projected that funding for this project will be available from multiple state and federal sources.

#### **REFERENCES CITED**

Rossi Stacconi M.V., Grassi A., Dalton D., Miller B., Ouantar M., Ioriatti C., Walton V., Anfora G. 2013. First field records of *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera Pteromalidae) as a parasitoid of *Drosophila suzukii* in European and Oregon Small fruit production areas. Entomologia 1: 11-16.

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