Project Title: *Ganaspis brasiliensis* for Biological Control of SWD
Report Type: Continuing Project Report

Primary PI: Christopher Adams
Organization: OSU
Telephone: 248-850-0648
Email: chris.adams@oregonstate.edu
Address: 3005 Experiment station drive
Address 2:
City/State/Zip: Hood River, OR 97031

Cooperators:
Mike Omeg, Stacey Cooper, Brian Nix

Project Duration: 3 Year

Total Project Request for Year 1 Funding: $10,120
Total Project Request for Year 2 Funding: $10,422
Total Project Request for Year 3 Funding: $10,922
Total Request: $31,464

Other related/associated funding sources: N/A

WTFRC Collaborative Costs:

Budget 1
Primary PI: Christopher Adams
Organization Name: OSU
Contract Administrator: Charlene Wilkinson
Telephone: 541-737-3228
Contract administrator email address: Charlene.wilkinson@oregonstate.edu
Station Manager/Supervisor: Brian Pearson
Station manager/supervisor email address: brian.pearson@oregonstate.edu

Item	2023	2024	2025
Salaries[1]	$5,794.00	$5,967.00	$6,147.00
Benefits	$4,326.00	$4,455.00	$4,775.00
Wages			
Benefits			
RCA Room Rental			
Shipping			
Supplies[2]			
Travel[3]			
Plot Fees			
Miscellaneous			
		*total	
Total	$10,120.00	$10,422.00	$10,922.00

Footnotes:
[1]FRA salary: $4,166 x 12 mo x 10% FTE = $5,794 for year 1 x 1.03 inflation rate /yr. Benefits at 73%

***Total - I have three copies of this document in my files. I have copies where this middle year is wrong at $4,000. Not sure which version you have on file at WTFRC, but if there is a discrepancy that is why.**

Objectives

1. Establish and increase a colony of *Ganaspis kimorum* (formally *G. brasiliensis*) wasps.

Deviations: As part of this project, we established colonies of three parasitoid wasps; *Ganaspis kimorum* (formally *G. brasiliensis*), *Leptopilina japonica,* and *Pachycrepoideus vindemmiae*. We struggled to maintain our target wasp, *G. kimorum*, and were unable to reestablish this colony after it collapsed.

2. Conduct releases at selected orchards (years 2 & 3)

Deviations: We were unable to release *Ganaspis kimorum*. However, we released both *Leptopilina japonica* and *Pachycrepoideus vindemmiae*.

3. Measure establishment of wasps (year 3)

Significant findings

- In our initial year zero surveys for SWD parasitoids we used infested fruit. Those surveys recovered *Leptopilina japonica,* an introduced SWD parasitoid, and *Pachycrepoideus vindemmiae,* a native generalist pupae parasitoid of several fly species including Drosophila and Tephritidae. Those insects were brought into our insectary and reared as additional biocontrol wasp species.
- We started three parasitoid wasp colonies, *Ganaspis kimorum, Leptopilina japonica,* and *Pachycrepoideus vindemmiae* in an effort to hedge our bets and increase our impact. While we struggled with *Ganaspis kimorum*, we have released 1075 *Leptopilina japonica* at 20 locations across Hood River and The Dalles OR, and 100 *Pachycrepoideus vindemmiae.*
- First release of *L japonica* was only done in 2025. Establishment of released wasp will need to be measured in 2026 with a no-cost extension

Methods

1. **Establish a colony of *Ganaspis kimorum* wasps**. Rearing protocols have been published by several authors (Rossi-Stacconi et al. 2022) and I have visited with ODA to see their colony rearing procedures (Figure 1). Fresh organic blueberries are purchased, washed in bleach water, and presented to SWD adults. Female flies are allowed to lay eggs in fruit. Fruit and developing larvae are then moved to a new container (Figure 1) with adult wasps. Female wasps must find developing larvae and inject and egg with their ovipositor (stinger). The SWD larvae continues to eat and grow, as the wasp larvae develops inside the SWD maggot. The wasp can take up to a month to develop.

2. **Conduct releases of *G. kimorum* at selected orchards**. Several orchard locations have been selected, and we are scouting for others. We have been collecting year zero data on the parasitoid wasp populations during the first year as we built the colony. Release sites will be selected based on suitable habitat outside cherry orchards where SWD populations are likely to escape pesticide sprays.

3. **Measure establishment of wasps**. In year three we will measure establishment of introduced wasps by collecting fruit from release locations. Fruit will be brought back to the lab and held to observe the emergence of flies and wasps. Emerged wasps will be sent for positive identification. We will describe the habitats where wasp establishment is most successful and report findings in extension and peer reviewed publications. The effectiveness of outside-orchard habitat supporting beneficial insects will be communicated to stakeholders at grower meetings.

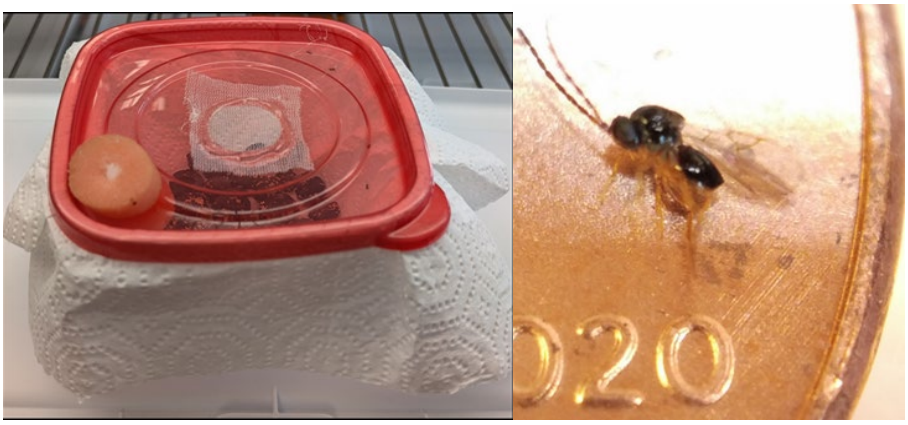

Figure 1. *Ganaspis kimorum* rearing container (left). Blueberries are placed in SWD colony to allow flies to lay eggs. Blueberries with eggs and young SWD larvae are placed in containers with newly emerged wasps, *Ganaspis kimorum* (right) on a penny for scale.

Results and Discussion

Rearing wasps. Because of the conditions in which SWD larvae live (rotting fruit) rearing wasps is difficult and often challenged with mold (Figure 2, right) and other arthropod pests like mites (Figure 3). Researchers around the country have had similar challenges. Both ODA and USDA have experienced similar struggles and loss of their *Ganaspis kimorum* colonies. Typically, we share insects with and between other labs as needed, to help start or augment insect colonies. However, because of these challenges, we have not been able to borrow wasps from others to restart our *Ganaspis kimorum* colony, because everyone is struggling to build and maintain this species.

The established methods for rearing this wasp requires using fresh blueberries. We had successfully started a colony of *Ganaspis kimorum*, however we lost our colony from excessive mold. Using fresh blueberries is a major bottleneck for this project because, even after bleach water washing, mold continually overtakes the berries and destroys fruit before wasps can emerge. Conversely, a slight decrease in humidity causes blueberries to desiccate and dry up (Figure 2, left) before SWD larvae and wasp parasitoids can develop. This balancing act is the biggest hurdle to scaling up this project. A regional working group is working on ways to improve rearing techniques and to develop an artificial diet to replace the need for fresh fruit.

New developments. To address the challenges of mold and desiccation and mites associated with fresh fruit, we developed a new SWD diet. Wasps appear to require the host volatile cues (smell) of infested blueberries during their search for SWD larvae and will not search for larvae in the standard SWD diet (starch and agar-based mix). Our lab has developed a new diet using frozen blueberries incorporated in the standard agar-based fly diet (Figure 4). *Leptopilina japonica* has been successfully reared on this new frozen blueberry and auger-based diet mix. Future research will look at rearing *Ganaspis kimorum* on this new diet.

Establishment. First releases of *L. japonica* were only done in 2025. Establishment traps will be measured in 2026 with a no-cost extension.

<u>Resulting peer reviewed publications from this study.</u>

Gariepy T.D., Abram P. K. Adams C., Beal D., Beers E., Beetle J., Biddinger D., Brind'Amour G., Bruin A., Buffington M., Burrack H., Daane K.M., Demchak K., Fanning P., Gillett A., Hamby K., Hoelmer K., Hogg B., Isaacs R., Johnson B., Lee J.C., Levensen H.K., Loeb G., Lovero A., Milnes J.M., Park K.R., Prade P., Regan K., Renkema J.M., Rodriguez-Saona C., Neupane S., Jones C., Sial A., Smythman P., Stout A., Van Timmeren S., Walton V.M., Wilson J.K., Wang X. Widespread establishment of adventive populations of *Leptopilina japonica* (Hymenoptera, Figitidae) in North America and development of a multiplex PCR assay to identify key parasitoids of *Drosophila suzukii* (Diptera, Drosophilidae)

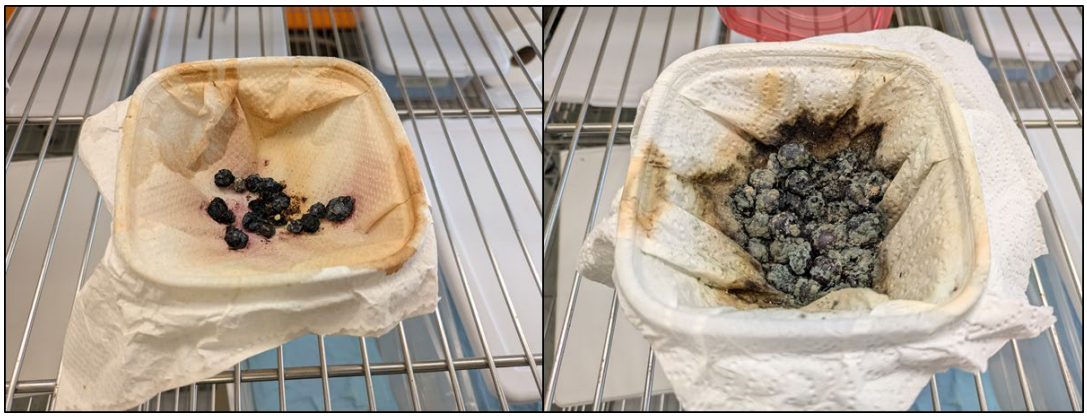

Figure 2. Blueberries experiencing both desiccation (left) and excessive mold (right). Because these wasps must be reared in fresh fruit, we struggle with both too much and too little humidity. Mold is the biggest challenge to rearing these wasps, followed by mites.

Figure 3. *Ganaspis kimorum* covered in mites. Photo courtesy Max Ragozzino ODA. Mites are a constant struggle in the insect colonies. Even with our bleach water washing protocol, fresh fruit from the grocery store seems to reintroduce mites.

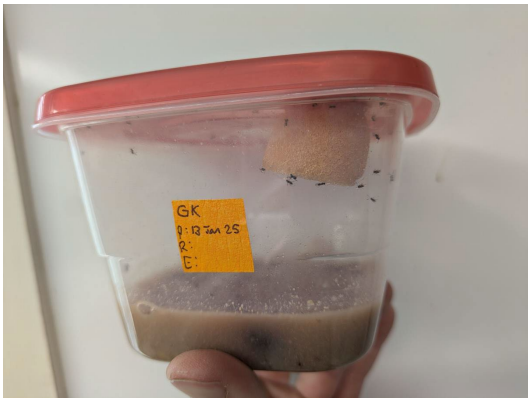

Figure 4. New frozen blueberry and artificial diet recipe.