2022 BIOAg Project Report

Report Type:
PROGRESS

Title:
Grower's perceptions of IPM in pear across regions in the Pacific Northwest

Principal Investigators:
Louis Nottingham, Robert Orpet, Molly Sayles

Abstract:
Integrated pest management (IPM) programs focusing on selective pesticides and cultural controls have been shown to manage the most challenging pear pest, pear psylla, better than conventional programs that rely on broad-spectrum insecticides. IPM programs in pear are also less expensive, safer for workers, and more environmentally responsible. Conventional Washington pear growers spray 10–15 broad-spectrum insecticides per season, costing around $1500/acre while achieving poor control. Conversely, Oregon growers manage pear psylla more successfully with an IPM program involving five selective sprays per season, at around $500/acre. The reported project, herein, is an Extension and sociology arm to ongoing entomology research evaluating IPM in pear. Our purpose is to provide stakeholder education services and conduct research into grower decision making. By understanding pear grower decision-making in two different regions and refining Extension work, we expect to facilitate increased adoption of pear IPM in Washington, leading to improved economic, environmental, and social conditions.

Project Description:
Pear psylla, *Cacopsylla pyricola*, is the most damaging pear pest in Washington, the top pear producer in the United States. The nymphal stage of pear psylla feeds on pear tree phloem and produces honeydew as a waste product. When honeydew drips onto the fruit, it causes russet that results in quality downgrading or culling. Out of the five major pear growing regions in the Pacific Northwest (PNW), it is commonly understood that the Wenatchee Valley has the most pear psylla pressure. The other major PNW pear-growing regions such as Hood River, OR, have more success at controlling pear psylla, likely due to wide-spread adoption of integrated pest management (IPM), a strategy that combines selective insecticides with cultural controls to maintain robust populations of beneficial predators and parasitoids (natural enemies of pests). In contrast, growers in the Wenatchee Valley widely rely on broad-spectrum insecticides that eradicate natural enemies. This leads to greater areawide populations of pear psylla in Wenatchee than in regions where natural enemies are conserved. Pear psylla has also evolved resistance to many of the conventional insecticides that Wenatchee pear growers rely on, causing the need to spray more often and therefore spend more on management.

Wenatchee pear growers spend an average of $1500 per acre on pear psylla management while still failing to effectively suppress the pest (DuPont et al. 2021). Additionally, the spraying of broad-spectrum insecticides poses increasing health risks to workers and consumers and other non-target organisms in pear growing areas. Therefore, IPM strategies that incorporate both selective conventional materials and organic materials where appropriate appear to be the most cost effective, sustainable, and effective approach.

Comparing management strategies and decision-making processes of stakeholders from each pear-growing region may inform how to increase IPM adoption in the Wenatchee Valley. Research over the past several decades has already demonstrated that using IPM is more effective than conventional approaches against pear psylla (Alway 2001, DuPont et al. 2021). An ongoing project in PI Nottingham's lab focuses on developing and testing an advanced IPM program with accompanying guidelines to help growers. However, many decision-makers are still reluctant to transition to IPM. To address this issue, the current project assesses roadblocks to IPM adoption by interviewing decision-makers. The goal of this project is to determine how and where pear psylla IPM is being used and how to improve pear psylla management in Washington.

Objectives:

Objective 1 (Research and Extension): Provide Extension to support the adoption of pear IPM via the pear psylla phenology model.

a) Communicate research findings and recommendations to grower cooperators testing model-based management to ensure proper implementation.

b) Document managers' perceptions, challenges and other overall experiences at the beginning and end of the project.

c) Increase knowledge of the IPM program to a broader grower community via web-based resources and field days.

Objective 2 (Research): Improve Extension strategies to increase pear IPM adoption through grower surveys.

a) Document pest management decision making processes in the larger population of Washington and Oregon pear orchards.

b) Understand what methods are effective and ineffective for disseminating knowledge and promoting adoption of new techniques

Outputs:

Overview of Work Completed and in Progress

Objective 1 (Research and Extension):

a) *Completed:* Grower cooperators implementing IPM in commercial orchards were sent a weekly e-mail with information on: 1. to-date pear psylla degree-day model graphic and written interpretation; 2. scouting updates with weekly densities of pear psylla and natural enemies in each pear orchard, 3. reminders for upcoming management actions based on degree days (e.g., "a kaolin spray should occur at 150DD, [either Wednesday or Thursday]."). The e-mail was sent to 20 cooperators trialing IPM guidelines in Wenatchee Valley pear. *In progress:* In 2023, we will expand the e-mail list to the entire pear industry by advertising a sign-up on existing Extension list-servs and at Extension events.

b) *Completed:* We documented current perceptions of pear IPM by interviewing 11 pear growers and consultants in 2022. *In progress:* Seven more interviews are scheduled. At the end of 2023, we will interview these individuals again to reflect on their experience following the second year of implementing our IPM program.

c) *Completed:* In addition to weekly newsletters for implementation support (objective 1a), we hosted a project field day, and wrote two articles for the Tree Fruit Matters webpage to increase knowledge on how IPM works in pear. *In progress:* these activities will be repeated in 2023.

Objective 2 (Research):

a) *Completed:* We have networked to develop initial contacts in Yakima, Hood River, Medford, and British Columbia to facilitate interviews to compare decision-making processes in Wenatchee vs. other pear growing regions. *In progress:* We will conduct interviews, similar to Objective 1b above, during a visit to the Orchard Pest and Disease Management Conference in Portland OR in 2023, visits to Yakima and Hood River during field days for other projects, and by teleconference for Medford and British Columbia.
b) *In progress:* Preliminary analysis is underway to understand roadblocks and compare IPM across pear growing regions. Analysis will be completed once the full set of interviews from objectives 1 and 2 are performed.

Methods and Results

Objective 1

Methods.

a) Implementation support activities in 2022 included weekly emailed newsletters that contained pear psylla adult, nymph and egg counts and natural enemy abundances alongside the pear psylla phenology model and accompanying management guidelines. These counts were made in 8 IPM, 8 conventional, and 3 organic pear orchards of cooperators trialing IPM for the first year. The newsletters were sent out via MailChimp.
b) To assess current perceptions of IPM, 11 interviews of Wenatchee Valley growers and field consultants were conducted in 2022. The interviews lasted from 1–2 hours and were recorded and transcribed for data analysis. Analysis will be conducted in 2023. The interview questions were a combination of open-ended questions for a more in-depth understanding of their perceptions and closed-ended questions (e.g., "On a scale of 1-3, how important is biocontrol in pear psylla management?"). Dr. Jessica Goldberger (WSU Crop and Soil Sciences) helped construct the interview questions.
c) In September 2022, we hosted a pear psylla field day at an orchard in Peshastin, WA, where attendees were able to visualize differences between a conventional and an IPM pear orchard right before harvest. The event hosted 29 pear stakeholders from the greater Wenatchee area. An evaluation survey was distributed after the event to improve future Extension efforts. We wrote two Fruit Matters articles this year, one in November that explained end-of-the-season outcomes of the IPM program and one that detailed observations from the entire season. We also plan to write an article about the pear psylla IPM program for Good Fruit Grower magazine, which will be included in the March IPM issue. This will allow us to reach an even broader audience.

Results. Preliminary analysis of interviews in Wenatchee indicate that barriers to IPM adoption include: lack of understanding of what IPM is and how it works, perception that IPM does not work due to various factors (inconsistency in biocontrol, excessive pear monoculture), perception of multi-year delay in establishing natural enemy populations, and decision-support needs to implement IPM are too labor-intensive. However, all interviewees were not full satisfied with conventional insecticide-reliant management, and most expressed a strong desire to move towards areawide adoption of IPM.

Objective 2

Methods

a) A Qualtrics survey to measure the current use of IPM in pear is currently being drafted and will be distributed in early 2023 after IRB review. The survey results will act as a baseline for IPM usage and subsequent annual surveys will measure the change in responses to document any increases in the use of pear psylla IPM. In addition, interviews, similar to those in Objective 1b will be conducted and analyzed in 2023.
b) With assistance from rural sociologist Dr Jessica Goldberger, we will analyze survey and interview data with a grounded theory approach to assess roadblocks to IPM adoption according to the adoption and diffusions of innovations theory (Rogers et al. 2008).

Results. None at present. Data will be collected in 2023 for analysis.

Publications, Handouts, Other Text & Web Products

- Web Page: http://treefruit.wsu.edu/crop-protection/pear-ipm/2022-pear-pest-scouting/
- Newsletter: Sayles, M, R Orpet, and L Nottingham. 2022. The first year of the pear psylla phenology-based management program exhibits IPM success. http://treefruit.wsu.edu/article/pear-psylla-phenology-program-success/
- Newsletter: McCullough, C, R Orpet, M Sayles, and L Nottingham. Reducing areawide pear psylla winterforms requires an areawide effort. http://treefruit.wsu.edu/article/reducing-areawide-pear-psylla-winterforms-requires-an-areawide-effort/

Outreach and Education Activities

- Weekly newsletter to 20 stakeholders in 2022
- Presentation: Orpet, RJ. 2022. Phenology-based integrated pear pest management step by step. WSU Extension Pear IPM Intensive, Wenatchee WA, Dec 14
- Presentation: Orpet, RJ. 2002. IPM in Pear. NW Hort Expo, Wenatchee WA, Dec 6.
- Project field day in Peshastin, WA, Sept 21 included 4 presentations, insect scouting activity, and 2 pesticide credits offered

Impacts:

Short term

We have increased awareness and interest in pear IPM. Additional cooperators are interested in trialing IPM in 2023 as a result of winter 2022 presentations. Some existing cooperators are planning to expand trials in 2022. We are currently organizing the 2023 field season and will document acreage impacted.

Medium term

Increased use of pear of IPM is expected to save farmers money, as we have documented that IPM in pear costs less in inputs. Increased adoption will also reduce pollution and increase worker safety. This will be documented by spray records collected from cooperating growers and consultants.

Long term

Measurement of long-term impacts are not under the scope of this project, but the overall goal is areawide adoption of pear IPM in the Wenatchee valley, leading to improved economic, environmental, and social sustainability due to stable and successful pear orchards that do not overuse pesticides.

Additional funding applied for:

Applications submitted

- Orpet. Supporting transition to integrated pest management in pear and apple with education and training in European earwig releases. Western SARE Research to Grassroots. $100,000. 2023–2025.
- Sayles, Nottingham, and Orpet. Overcoming roadblocks to IPM adoption in Washington Pears. Western SARE Graduate Student Grant. $29,000. 2023–2024.
- Sayles. Application of the diffusion of innovations theory to integrated pest management adoption. NSF Graduate Research Fellowship Program. $147,000. 2023–2025.

Applications in progress

- Orpet, Sayles, Schmidt-Jeffris, Adams, and Goldberger. Assessing and supporting effective areawide pear pest management. Fresh and Processed Pear Commission. $380,000. 2023–2025.
- Orpet. Facilitating Industry-Led Earwig Releases to Support Transition to IPM. Fresh and Processed Pear Commission. $100,000. 2023–2025.

Graduate students funded:

Molly Sayles, PhD student

Recommendations for future research:

Preliminary analysis indicates that future research should address the roadblocks to IPM implementation identified in interviews: lack of understanding of what IPM is and how it works, perception that IPM does not work due to various factors (inconsistency in biocontrol, excessive pear monoculture), perception of multi-year delay in establishing natural enemy populations, and decision-support needs to implement IPM are too labor-intensive. Understanding stakeholder perspectives learned from interviews was key to design the five grant proposals in progress or submitted to address these issues and complement current work.

References cited:

Alway, T. 2001. The Wenatchee Valley pear IPM project: 1999-2001: lessons learned from soft pest management programs. Report to Washington Tree Fruit Research Commission. URL: https://treefruitresearch.org/report/the-wenatchee-valley-pear-ipm-project-1999-2001-lessons-from-soft-pest-management-programs/ (accessed 27 October, 2022).

DuPont, ST, C Strohm, L Nottingham, D Rendon. 2021. Evaluation of an integrated pest management program for central Washington pear orchards. Biological Control 152: 104390.

Rogers, EM, A Singhal, and MM Quinlan. 2008. Diffusion of Innovations, *in* An Integrated Approach to Communications Theory and Research 2nd Edition, eds. Stacks, DW, and MB Salwen, New York: Routledge.