United States Department of Agriculture

Progress Report

Title:	Enhancing integrated insect pest management strategies for U.S. potato production systems		
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Program Code: SCRI **Program Name:** Specialty Crop Research Initiative

Project Director

Zsofia Szendrei

517-355-1855

szendrei@msu.edu

Recipient Organization

MICHIGAN STATE UNIVERSITY

426 AUDITORIUM RD RM 2

EAST LANSING, MI 488242600

DUNS No. 193247145

Performing Department

ENTOMOLOGY

Co-Project Directors

Douches, David

Departments

PLANT SOIL MICROBIAL

Non-Technical Summary

This proposal responds to the current crisis threatening potato production in the U.S. regarding insect management. The U.S. potato industry has been most commonly using neonicotinoid insecticides to target key insect pests, but this mode of action group is now increasingly under scrutiny by food / nursery retailers and regulators. The use of this product is therefore in jeopardy and the potato industry needs more robust and enduring alternatives that are environmentally sustainable and address consumer concerns. These alternatives will rely more heavily on biological, ecological and environmental information. We also address important social and economic impacts and facilitate the adoption of new strategies. Most of our objectives are focused on short-term deliverables that can respond to the U.S. potato industry's current crisis. The long-term goals are to continue adoption of strategies developed in this proposal long into the future and to continue to build on it. To address these issues, we developed the following objectives: (1.) Develop and evaluate non-neonicotinoid pest management programs; (2.) Develop pest prediction and decision-making tools; (3.) Evaluate the socioeconomic influences and impacts associated with the transition from neonicotinoids to new pest management strategies, (4) and Facilitate adoption of new pest management strategies. The outcomes of the project will 1) find immediate solutions for managing potato insect pests without using neonicotinoids, 2) create a healthy seed supply for U. S. seed markets, 3) identify less toxic pesticides with fewer negative impacts, and 5) increase reliance on decision support tools to reduce production costs.

Accomplishments

Major goals of the project

This proposal responds to a key crisis threatening potato production in the U.S. regarding insect management. The U.S. potato industry commonly uses neonicotinoid insecticides to target insect pests, but this group of pesticides is under scrutiny by food/nursery retailers and regulators. As the continued use of neonicotinoids is in jeopardy, the potato industry needs robust and enduring alternatives that are sustainable and address consumer concerns; these alternatives will need to rely on biological, ecological, and environmental information. Our project will develop and test such new strategies while also addressing social and economic impacts to facilitate the adoption of novel tactics. Most of our objectives are focused on short-term deliverables that respond to the U.S. potato industry's current crisis. Our long-term goals are to continue the adoption of strategies developed in this proposal by the U.S. potato industry long into the future. To address these issues, our project will achieve the following objectives:

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Objective 1. Develop and evaluate non-neonicotinoid pest management programs
Objective 2. Develop pest prediction and decision-making tools
Objective 3. Evaluate the socioeconomic influences and impacts associated with the transition from neonicotinoids to new pest management strategies
Objective 4. Facilitate adoption of new pest management strategies among growers

What was accomplished under these goals?

The coordinated common garden experiment between WA, WI, ME, MI, and NY to test non-neonicotinoid pest management programs ran for a second year. Data indicates that the alternative chemistrie treatments can manage CPB but tend to have a much shorter residual and do not necessarily result in more beneficial insects than the neonicotinoid treatment. Alternative products that do not harm beneficials can control CPB but take more applications to achieve season long control. Producers will be made aware of these results and thereby empowered to deploy the use of new insecticides if that becomes a necessity. Production of seed potatoes with and without neonicotinoids was evaluated experimentally as well, and the effectiveness of treatments for mitigating the spread of PVY will be evaluated. A field trial was conducted in MI to screen potato germplasm and wild Solanum species for resistance to Colorado potato beetle feeding. The trial contained selections that were determined to be resistant in the previous year and new germplasm. The Cry3A Bt gene has been validated and provides complete control of the insect, and a breeding line has been developed that combines this beetle resistance with PVY resistance.
The WSU-run Decision Aid System (DAS) website has added virtual weather stations for all of the target states and extended the mapping platforms to other collaborators in preparation for expanding DAS in 2026. There has also been collaboration between states to share pest data and refine phenology models for each of the key pests affecting potatoes across different regions; in each region we will not only estimate when pests first arrive in potato but when key life stages that are targets for management will be present.
The sociologists conducted four focus groups and seven interviews with key stakeholders in the potato production supply chain over the reporting period, as well as a survey of consumers. The conversations with farmers, agronomists, and other potato industry stakeholders illuminate why neonics are valuable to their operations (because of economics, product safety, and efficacy) and this information is being shared with all collaborators to ensure that the research conducted is relevant to growers' needs.
To facilitate adoption of new pest management strategies, we have developed training materials, extension bulletins and plans for scientific publications that will be made available at local, regional and national grower and industry meetings, field days, and at scientific meetings. Because there is no formal training modules or exercises for seed potato certifiers in the US, we plan to provide national training and training materials for potato virus management through field days and training/demonstration workshops within seed production areas. To determine the effects of adopting new management systems, partial budget analysis is being conducted with the two years of common garden experiment data. Within CO, data summaries, identification tools/keys, and in-person identification trainings were given to collaborators and data was disseminated via our industry collaborator, Agro Engineering and their newsletter listserv that reaches over 200 potato growers. In WA, workshops were conducted to train growers and crop consultants on how to use DAS.

What opportunities for training and professional development has the project provided?

Technicians and undergraduates are gaining experience in insect identification, insect scouting, and other field research skills, as well as attending extension and outreach activities. One undergraduate was also co-mentored in a research project studying the effects of insect-vectored pathogens on potatoes.
Graduate students are being trained in electropenetrography to monitor and analyze insect vector behavior, and both a student and post-doc in WA completed an advanced time-series analysis course. A post-doc served on a sustainability panel focused on collaborating with farmers to improve pollinator habitat and pollinator-friendly practice. Graduate students and postdocs presented at several extension meetings, as well as regional and national conferences, including conferences for the Entomology Society of America, the American Agricultural Economics Association, the North Central Breeding and Genetics Technical Meeting, and the Potato Sustainability Alliance's Summer Symposium.

How have the results been disseminated to communities of interest?

Research has been presented at extension meetings and field days in all participating states and published in grower-focused extension publications and newsletters, and results have been shared at national scientific conferences.
We have also published a research report summarizing the survey of WA potato growers and their adoption and perception of DAS and conducted outreach events and training clinics in WI to train seed producers and certification agencies on performing virus identification in susceptible potato cultivars. Growers are also contacted directly with data updates and information through listservs and websites hosting pest models in WA and CO.

What do you plan to do during the next reporting period to accomplish the goals?

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We will summarize the data collected in 2025 aimed at evaluating non-neonicotinoid pest management programs. We will publish results from the non-neonicotinoid pest management programs study and continue research on PVY management without neonicotinoids. We will be conducting behavioral assays on leaf discs to quantify relative rates of intoxification, attraction, and repellence of non-neonicotinoids by winged green peach aphids. We will also begin testing transmission of PVY by the potato aphid following various non-neonicotinoid foliar treatments. We are continuing to make crosses to introgress the Colorado potato beetle resistance into cultivated backgrounds, and we are planning a study to evaluate how leptine-based resistance can be used within insecticide prescriptions. We have seed for a breeding line that combines PVY and PLRV resistance so it can be used in aphid management trials.
We plan on surveying aphid and leafhopper populations within CO in 2026 and uploading the sampling data on a weekly basis, so that growers can use this data in real time to make informed decisions regarding their insecticide spraying regimes. The pest forecasting models in DAS will be tested and validated using field-collected and sentinel plot data from 2024 and 2025, then finalized and prepared for publication.
To continue gathering survey information from potato growers, we will submit IRB paperwork for upcoming survey and finalize the survey instrument for upcoming surveys. We will complete qualitative data collection with key PNW potato industry stakeholders. We will also develop IPM cost analyses and the environmental impact quotients (EIQ) for the insect management systems studied by this project to explain the economic impact on stakeholders.
We plan to continue conducting outreach to growers, which will be accomplished by working with industry and extension partners, presenting at future field days and conferences, and developing extension materials and seminars. We also plan to continue drafting manuscripts and presenting at conferences to share results with the academic community.

Participants

Actual FTE's for this Reporting Period

Role	Non-Students or faculty	Students with Staffing Roles			Computed Total by Role
		Undergraduate	Graduate	Post-Doctorate	
Scientist	0.8	1.3	3.5	6	11.6
Professional	0	0	0	0	0
Technical	6.7	0	0	0	6.7
Administrative	0	0	0	0	0
Other	0	0	0	0	0
Computed Total	7.5	1.3	3.5	6	18.3

Student Count by Classification of Instructional Programs (CIP) Code

Undergraduate	Graduate	Post-Doctorate	CIP Code
6	5	7	01.00 Agriculture, General.

Target Audience

The target audience reached during this reporting period are organic and conventional potato growers, seed potato growers, crop consultants, agri-business personnel, IPM professionals, university cooperative extension educators, and the scientific community. They have been reached through field days, workshops, focus groups, and extension meetings, as well as meetings targeted at research and industry professionals. We have also have digital outreach products like listservs and newsletters, as well as peer-reviewed scientific literature.

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Products

DR 1020-006 Certification Statement

Yes, any applicable scholarly publications have been submitted to the National Agricultural Library's (NAL) PubAg and any applicable data assets have been submitted to NAL's Ag Data Commons. These submissions included the NIFA grant or accession number and digital persistent identifiers for the publication or data asset (such as DOI) and the authors (such as ORCID).

Type

Peer Reviewed Journal Articles

Status

Published

Year Published

2025

NIFA Support Acknowledged

YES

Digital Object Identifier (DOI)

10.1002/ps.70126

Author ORCID(s)

Citation

Dentzman, K., Franklin, D., Avemegah, E., & Goldberger, J. R. (2025). An overview of agricultural neonicotinoid regulation in the EU, Canada, and the United States. Pest Management Science, 81: 7593-7601.

Accession No. 1031438 **Project No. MICL20053**

Other Products

Type
Databases

DOI or Other Persistent Identifier

Associated Publication DOI(s)

Author ORCID(s)

Description
Wisconsin Seed Potato Certification Program (WSPCP) post-harvest Potato virus Y infection data. The WSPCP records provide substantial data, collected through both the certification program and the Wisconsin Starks Farm, on pest and pathogen trends in potato over 62 years (1957-2025).

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Type

Data Asset

DOI or Other Persistent Identifier

10.32614/CRAN.package.sequential.pops

Associated Publication DOI(s)

Author ORCID(s)

Description

An R package that creates a statistical framework framework to optimize data collection in pest management decision-making

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Type

Databases

DOI or Other Persistent Identifier

Associated Publication DOI(s)

Author ORCID(s)

Description

i) Wisconsin Pest Pros scouting data spanning 17 years (2008-2025) to include count data for insects (CPB, PLH, colonizing aphids) and major foliar pathogens (A. solani). The project leverages existing metadata housed and maintained in a GeoDatabase Format (.gdb) format for the proposed project.

Changes/Problems

{Nothing to report}