

FY 23 Progress Report

Status: APPROVED

Project Director

Jon Clements

Organization Project Number

Accession Number

7002070

Start & End Date

10/01/2020

Organization

University of Massachusetts

To Project / Program

"Extension Sustainable Fruit Production and Marketing"

Primary Critical Issue

Sustainable Agriculture and Food Systems

Fiscal Year

2023

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Fruit farms and vineyards contribute to the local economy and food security, and maintain open space which supports scenic vistas, rural character, environmental conservation, and biodiversity. To remain a vital part of the Massachusetts landscape and economy, both new and established fruit growers must learn to produce crops sustainably and to adapt production systems to changing climate, invasive pests, and new market opportunities. Delivering appropriate research-based information on new and alternative fruit species and varieties, advanced horticultural management techniques, marketing and business management strategies, and Integrated Pest Management (IPM), are the mission of the UMass Extension Fruit team. Research on pest ecology and best management practices informs approaches that optimize pest control, reduce chemical use, and increase fruit quality and productivity.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

- Integrated Pest Management - the fruit team delivers current IPM information and training via publications, newsletters, twilight meetings, educational programs, and other outputs to promote IPM. Specifically, one-on-one assistance to growers and on-farm demonstrations and applied research are integral to achieving further IPM adoption.
- Economically Viable Food Production - the fruit team helps growers achieve more economically viable production practices by presenting research-based information on new production practices, new crops or varieties, season extension practices, etc. via publications, newsletters, twilight meetings, educational programs, and other outputs.
- Environmentally Sustainable Food Production - the fruit program delivers information and training in environmentally sustainable production practices (beyond IPM) via publications, newsletters, twilight meetings, educational programs, and other outputs.
- Student Engagement and Education - the fruit program provided training on applied research and Extension to nine undergraduate students (three of them attend community colleges in Western Massachusetts). This internship trains the next generation of young experts committed to helping farmers and others maintain sustainable models of production. By bringing together a multidisciplinary team of researchers and professionals from UMass Extension, the internship trains students in technology-enhanced agricultural sciences.
- In various MA orchards, we received reports of injury to the base of trees. Upon observation, there were darkened cambial areas under the bark and uncommon instances of insect frass and lepidopteran pupal casings. We conducted assessments in 7 blocks in 3 commercial orchards and recorded the information. Insect damage doesn't seem to be the main culprit of tree bark cracking and damaged vascular tissue. Wood-boring insects may be responding to plant volatiles emitted by already damaged and/or stressed trees. Winter injury exacerbated by climate change is most likely the main cause.
- Japanese beetle activity was moderate in 2023. Some feeding damage observed on Honeycrisp in 3-4 orchards. Research involving mass trapping was conducted in grape and blueberry blocks at the UMass Cold Spring Orchard (CSO) in Belchertown, Ma. A single mass trapping system provided effective control of Japanese beetles in blueberry, but multiple perimeter traps were required to avoid beetle resurgence on grapes. Mass trapping may offer berry growers in MA a new tool to combat the Japanese beetle under low or no insecticide

Briefly describe how your target audience benefited from your project's activities.

The primary target audience for this project is represented by hundreds of fruit farmers located in Massachusetts and neighboring states. We generate research-based information that will help fruit growers, including under-represented, low-income farmers, and beginning farmers, to improve management of important pests (insect, disease, weed) that threaten fruit production. The Massachusetts Fruit Growers' Association is an industry partner that provides advisory guidance on issues that affect the fruit industry and how our research and Extension activity will be the most beneficial to their livelihood. Through collaborative efforts with grower associations, researchers, Extension specialists and our host farms, we can most effectively deliver our programming. Through our on-farm demonstrations and applied research and Extension projects, our ECOstacking message is reaching out to the broader public. Customers, students, and the public are learning that on-farm biodiversity is key to sustainable fruit farming.

From 2019 to 2021, apple growers who participated in IPM research concerning apple maggot fly management **reduced** their insecticide use **between 75% and 82%**.

The implementation of the odor-baited trap-tree approach for plum curculio control can lead to **70% reduction** of insecticide compared with post-petal-fall perimeter-row sprays and **93% reduction** of insecticide compared with standard full-block sprays.

Briefly describe how the broader public benefited from your project's activities.

Increasing fruit farm productivity, fruit quality, and food safety clearly benefit the broader public by making Massachusetts fruit farm sustainable. Both farmers and consumers benefit from IPM implementation by (a) improving crop yield and quality with less pesticide residues, (b) reducing potential human health risks from pests and related pest management practices, and (c) minimizing adverse environmental effects from pests and excessive pesticide use.

Comments (optional)

Continued need to solicit funding to maintain adequate staffing and materials/supplies/travel to achieve our mission takes time and resources.

On-farm Demonstrations (12)

one to one consultations (350)

Farm visits 100+ (estimated)

UMass Extension Fruit Program website, <https://ag.umass.edu/fruit>: 101,400 Page Views; 58,489

New England Tree Fruit Management Guide website, netreefruit.org: 13,918 Page Views; 454

Twilight/grower meetings during the growing season, seven total, circa. 350 total attendees

Open Office Hour timely growing season management considerations, Tuesday's at noon, April-May-June via Zoom, app. 25 attendees per meeting (11 meetings)

Apple maturity reports Tuesday's at noon beginning August 23 and continuing weekly through October 10. Via Zoom. (20-25 attendees per Zoom meeting)

Piñero, J.C., D. Cooley, D. Greene, J. Clements, and K. Leahy. 2023. 31st Annual March Message to Massachusetts Tree Fruit Growers <https://ag.umass.edu/fruit/publications/march-message>.

Regmi, P., Leskey, T.C., and Piñero, J.C. 2023. Methyl salicylate improves the effectiveness of the odor-baited trap tree approach for adult plum curculio, *Conotrachelus nenuphar* (Coleoptera: Curculionidae) monitoring and attract-and-kill. *Journal of Economic Entomology* 116: 1171–1177, <https://doi.org/10.1093/jee/toad11082>.

Kassoy, J., Garofalo, E., and Piñero, J.C. 2022. Insect pest-suppressive soils. IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPMG-002.

Rull-Garza, M. and Piñero, J.C. 2023. Parasitic wasps: effective biological agents to control invasive agricultural pests. IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-005.

Rull-Garza, M. and Piñero, J.C. 2023. What is Biological Control? IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-004.

Rull-Garza, M. and Piñero, J.C. 2023. The Samurai Wasp (*Trissolcus japonicus*): an egg parasitoid of the Brown Marmorated Stink Bug. IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-003.

E. Petit, A. Ali, S. Schloemann, J. Ellis, M. Resnick, and Z. Robinson. Spring 2023. 2021 New England and New York Grape Production Survey. Fruit Notes.

Petit, A. 2023. Grape Notes (26 issues, 200 subscribers).

Clements, J., J. Piñero, D. Greene, D. Cooley, and M. Bley. 2023. Healthy Fruit. Vol. 31, Nos. 1-19. <https://ag.umass.edu/fruit/publications/healthy-fruit> (185 subscribers)

Piñero, J.C., D. Cooley, D. Greene, J. Clements, and K. Leahy. 2023. 31st Annual March Message to Massachusetts Tree Fruit Growers <https://ag.umass.edu/fruit/publications/march-message>.

Giri, A.P., Short, B.D., and Piñero, J.C. Male and female tortricid moth response to non-pheromonal semiochemicals. *Entomologia Experimentalis et Applicata* (submitted).

Chen, M., Tang, H., Zhou, Y., Zuo, J., Wang, Y., Piñero, J.C. and Peng, X. 2023. Voltage-gated sodium channel gene mutation and P450 gene expressions are associated with the resistance of *Aphis citricola* (Hemiptera: Aphididae) to lambda-cyhalothrin. *Bulletin of Entomological Research* (accepted).

Regmi, P., Leskey, T.C., and Piñero, J.C. 2023. Methyl salicylate improves the effectiveness of the odor-baited trap tree approach for adult plum curculio, *Conotrachelus nenuphar* (Coleoptera: Curculionidae) monitoring and attract-and-kill. *Journal of Economic Entomology* 116: 1171–1177, <https://doi.org/10.1093/jee/toad11082>.

Su, S., Zuo, Y., Zhang, X., Jian, C., Peng, X., Piñero, J.C., and Chen, M. 2022. Efficient CRISPR/Cas9-mediated white gene editing in the global tortricid fruit pest *Grapholita molesta*. *Entomologia Generalis* 42: 987-996. DOI: 10.1127/entomologia/2022/1563.

Wang, S., Tang, H., Huang, W., Liu, X., Hou, W., Piñero, J.C., Peng, X., and Chen, M. 2022. Octopamine receptor genes are involved in the starvation response of *Rhopalosiphum padi* (Hemiptera: Aphididae). *Insect Molecular Biology* 1–11, <https://doi.org/10.1111/imb.12773>.

Clements, J. 2023. Apple blossom Density Mapping Using a UAV (aka Drone). *Fruit Notes*, Volume 88, Summer, 2023.

Cowgill, W. and J. Clements. Freeze Injury to Apples in Northern New Jersey, New York, and New England. *Fruit Notes*, Volume 88, Summer, 2023.

Clements, J. 2023. FRUIT GROWTH ‘Apple Fruit Set Predictor’ app. *Fruit Notes*, Volume 88, Winter, 2023.

Cooley, D., J. Clements, and A. Madeiras. Southern blight on apples – a new root disease problem for apples in the Northeast. *Fruit Notes*, Volume 88, Winter 2023.

Clements, J. 2023. Highlights of IFTA Italy Study Tour, November 2022. *Fruit Notes*, Volume 88, Winter, 2023.

Piñero, J., J. Clements, D. Greene, and D. Cooley. Massachusetts Fruit IPM Report for 2022. *Fruit Notes*, Volume 87, Fall, 2022.

Francke, M., Rull-Garza, M., Garofalo, E., and Piñero, J.C. 2023. Can Watersprout Pruning Reduce Pear Psylla Abundance? *Fruit Notes* 88(3): 5-9.

Kassoy, J., Junejo, H., Godoy-Hernandez, H., and Piñero, J.C. 2023. Response of Adult Pear Psylla to Plant-Derived Volatiles. *Fruit Notes* 88(3): 17-18

Rull-Garza, M., Robinson, Z., and Piñero, J.C. 2022. Monitoring egg parasitoids of the brown marmorated stink bug in Massachusetts. *Fruit Notes* 87(4): 22-24.

Piñero, J.C., Akotsen-Mensah, C., Giri, A., Godoy-Hernández, H., Rull-Garza, M., and Delisle, J. 2022 Sunflower and buckwheat enhance the performance of an attract-and-kill system for the brown marmorated stink bug. *Fruit Notes* 87(4): 16-20.

Piñero, J.C., Clements, J., Greene, D., and Cooley, D. 2022. Massachusetts Fruit IPM Report for 2022. *Fruit Notes* 87(4): 1-7.

Giri, A. and Piñero, J.C. 2022. Response of Oriental fruit moth to benzaldehyde and other plant volatile compounds. *Fruit Notes* 87(3): 1-3.

Kassoy, J., Garofalo, E., and Piñero, J.C. 2022. Insect pest-suppressive soils. IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPMG-002.

Rull-Garza, M. and Piñero, J.C. 2023. Parasitic wasps: effective biological agents to control invasive agricultural pests. IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-005.

Rull-Garza, M. and Piñero, J.C. 2023. What is Biological Control? IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-004.

Rull-Garza, M. and Piñero, J.C. 2023. The Samurai Wasp (*Trissolcus japonicus*): an egg parasitoid of the Brown Marmorated Stink Bug. IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-003.

Simisky, T., Piñero, J.C., Barnes, E., Forman Orth, J., and LaScola-Miner, T. 2022. Spotted lanternfly management. University of Massachusetts Extension Landscape, Nursery and Urban Forestry Program. Fact Sheet .

Kassoy, J. and Piñero, J.C. 2022. Stink bugs. IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-002.

Kassoy, J., Garofalo, E., and Piñero, J.C. 2022. What are Entomopathogenic Nematodes? IPM Fact Sheet Series, University of Massachusetts Extension, Fact Sheet # IPM-001.

Wallis, A., J. Clements, M. Miranda Sazo, C. Kahlke, K. Lewis, T. Kon, L. Gonzalez, Y. Jiang, and T. Robinson. 2023. Digital Technologies for Precision Apple Crop Load Management (PACMAN) Part I: Experiences with Tools for Predicting Fruit Set Based on the Fruit Growth Rate Model. *Fruit Quarterly*, Vol. 31, No., 1, Spring 2023.

Jiang, Y., Wallis, A., Clements, J., Miranda Sazo, M., Kahlke, C., Lewis, K., Basedow, M., Robinson, T. 2023. Digital Technologies for Precision Apple Crop Load Management (PACMAN) Part II: An Overview of Digital Technologies Currently Available for PACMAN. *Fruit Quarterly*, Vol. 31, No, 2, Summer 2023.

Clements, J. 2023. The FRUIT GROWTH (FG) app. *jmcextman* blog post, January 13, 2023, <https://jmcextman.blogspot.com/2023/01/the-fruit-growth-fg-app.html>

Clements, J. 2023. PACMAN: Malusim vs. Fruit Growth model app vs. Farm Vision. *jmcextman* blog post, January 16, 2023, <https://jmcextman.blogspot.com/2023/01/intro-precision-apple-crop-load.html>

Clements, J. 2023. Apple blossom density mapping using a UAV (aka drone). *jmcextman* blog post, June 26, 2023, <https://jmcextman.blogspot.com/2023/06/apple-blossom-density-mapping-using-uav.html>

Larson, J., D. Greene, J. Schupp, J. Clavet, and T. Kon. 2023. Bloom and post-bloom effects and interactions on 'Gala' fruit growth rate and yield responses at three locations. *HortScience* 58(11) 1418-1426.

