New USDA Research Collaboration: Pecan Processing Technology

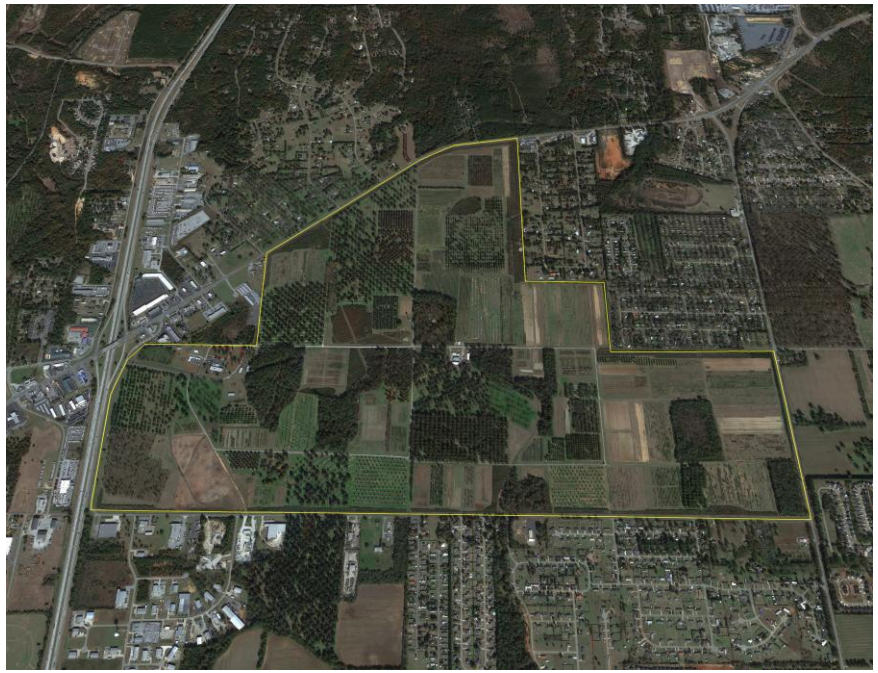
USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

1785
GEORGIA

1895
FORT VALLEY STATE UNIVERSITY
EMPOWER *the* POSSIBLE.

Southeastern Fruit and Tree Nut Research Station (Byron, GA):

- Enhancing the productivity, value and safety of stone fruit and pecan crops
- Serving the US Pecan Industry



Pecan Research

- Entomology (Drs. Ted Cottrell & David Shapiro-Ilan)
- Horticulture (Dr. Cristina Pisani)
- Plant Pathology (Vacant Vice-Bock, Dr. Jordan Brungard, Postdoc)
- Pecan Safety (Dr. Cameron Bardsley)
- Small Ruminant Grazing (FVSU coop)
- New: Pecan Quality (Dr. XiuXiu Sun)
- New: Pecan Genomics (Dr. Karl Fetter)

Highly Productive!

Total for Byron Station This Year

- Refereed scientific papers submitted: 43 (avg ~6.1 per scientist per year)
- Patents/inventions applied for/issued: 4
- Grower talks & trade articles: 31

Mandated Research Objective

Current Objectives: Develop new and improved pecan processing technologies, such as pasteurization and cracking/shelling, for improved storage, food safety, nutrition, and marketability.

- **Sub-objective 3.A.** Determine factors that influence the growth and/or survival of foodborne pathogens on the surface of whole and cracked pecans (USDA & FVSU)
- **Sub-objective 3.B.** Evaluate the efficacy of novel technologies as mitigation strategies to reduce foodborne pathogens on pecans (FVSU & USDA)
- **Sub-objective 3.C.** Identify, characterize, and model pecan and machine factors to improve halves yields in pecan cracking and shelling (UGA lead)

Project Plan Review

- Congressionally funded research must be peer-reviewed
- Current Project Plan was reviewed (2022) – an excellent score was received with only minor revision recommended!
- The New Project Plan proposal will be submitted sometime in the coming year.
- We are seeking stakeholder input, which is critical!

Proposed New Objectives

- Objective 1 (Bardsley/Mahapatra): Determine factors and approaches that impact pecan safety and quality and identify, develop, and implement novel mitigation strategies to reduce foodborne pathogens contamination

- Objective 2 (Sun): Develop advanced packaging and processing methods, such as edible coatings/films and modified atmosphere packaging techniques, to extend the storage life and improve marketability of pecans.

- Objective 3 (Morkos): Identify, characterize, and model pecan and machine factors to improve halves yields in pecan cracking and shelling.

USDA-ARS Team: Pecan Processing

- Southeastern Fruit and Tree Nut Research Station, Byron GA Team:

- 1 Postdoc on Food Safety (Dr. Cameron Bardsley)
- 1 Research Scientist, Food Safety (Vacant)
- 1 Research Scientist Pecan Quality (XiuXiu Sun)
- 2 Support Scientists hired (CAT III), FY23 (Kaicie Chasteen and Samantha Sherman)
- Additional Postdocs will be hired (2).

- Other team members: USDA-ARS, Wyndmoor, PA (Dr. Niemira), Cooperators: FVSU & UGA

Major Accomplishments: USDA-ARS & FVSU

- 1) Compared the reduction and cross-contamination of Salmonella on inshell pecans that were conditioned with a water, sodium hypochlorite, or peracetic acid solutions.

- 2) Determined effective sanitizers that could be used to reduce pathogen load and prevent contamination on inshell pecans during washing and conditioning. These results provide insights into effective sanitizers that can be utilized to reduce pathogen load and prevent cross-contamination for inshell washing and conditioning of pecans.

- 3) Evaluation of atmospheric cold plasma and pulsed UV light as a control for microbial contamination on pecan kernels. Pecan kernels were evaluated for shelf life and quality parameters and the treatments had no adverse effect on these parameters. These results provide a potential treatment that could reduce microbial contamination while maintaining pecan quality

Scientific Publications (over past year): Processing Team

1. Arthur, V., Degala, H. L., Gyawali, R., Chasteen, K., Sherman, S. H., Souza, P. M., Kumar, G. D., Niemira, B. A., Bardsley, C. A., Mahapatra, A. K. 2025. Inactivation efficacy of intense pulsed light and cold atmospheric plasma on spot-inoculated *Escherichia coli* on pecan halves. *International Journal of Food Science and Technology*

2. Bardsley, C. A., Acuff, J. C., Kane, S. P., Arnold, N. L., Hamilton, A., Dunn, L. L. 2024. Food Safety Needs Assessment for North American Pecan Shellers. *Food Protection Trends*, *44*(5), 336–343.

3. Bardsley, C.A., Chasteen, K.S., Sherman, S.H., Arthur, V., Mahapatra, A.K., Niemira, B.A., Shapiro Ilan, D.I. 2025. Paracetic Acid Washes Reduce Salmonella Load on the Surface of In-shell Pecans and Prevents Cross-Contamination Between Pecans During Conditioning. *Food Control*. 111248.

4. Follette, P., Sun, X., and Walse, S. Non-host status of green lemon fruit (*Citrus* × *limno* (L.) Burman f. cv. Lisbon) to oriental fruit fly, mediterranean fruit fly, and melon fly (Diptera: Tephritidae) in Hawaii. Insects. 2025, 16 (5), 447.

5. Jackson, M. W., Langston, C. M., Madsen, L. E., Davis, R. B. 2025. The effect of impactor geometry on end-to-end pecan cracking. *AgriEngineering 2024, 6, 2470–2480.*

6. Kharel, K., Bardsley, C.A., Appolon, C.B., Dunn, L.L., Dev Kumar, G., Krishna, P., Sharma, M., Danyluk, M.D., Schneider, K.R. 2025. The effect of heat-treated poultry pellets and composted poultry litter on E. coli survival in Southeastern US soils: Florida and Georgia. *Journal of Food Protection*. 88(1).

7. Movvaa, V., Shrestha, B., Hesler, S., Sun, X., Zhu, J., Loeb, G., Tay, J., and Cha. D. Oviposition deterrent as a component of a push–pull management approach for *Drosophila suzukii*. Environmental Entomology. 2025, 1-8.

8. Murphy, C. M., D.L. Weller, C. A. Bardsley, D. T. Ingram, Y. Chen, D. Oryang, S. L. Rideout, L. K. Strawn 2024. Survival of twelve pathogenic and generic *Escherichia coli* strains in agricultural soils as influenced by strain, soil type, irrigation regimen, and soil amendment. *Journal of Food Protection*, 100343.

9. Ramsay, E. W., C. Bardsley, K. Desiree, P. Rubinelli, S. Fernandes, J.C. Acuff 2024. The use of antimicrobial washes to inactivate Shiga toxin-producing *Escherichia coli* from in-shell pecans and wash water contaminated by different inoculation routes. *Journal of Food Protection*, *87*(9), 100332. https://doi.org/10.1016/j.jfp.2024.100332. LOG NO. 414761

10. *Shu, C.*, Yusufali, Z., Ho, K., and Sun, X. Nanoencapsulated cinnamaldehyde@β-cyclodextrin inclusion complexes as a sustained release strategy for postharvest rambutan preservation. Food Hydrocolloids. 2025; 159, 110724

11. *Shu, C.*, Bai, J., Lincoln, N., and Sun, X. Fatty acid coating reduces weight loss and inhibits browning of breadfruit. HortScience. Accepted, In Press.