

Understanding and predicting food safety risks posed by wild birds



Contact

Nikki Shariat, PhD
Department of Population Health
The University of Georgia
nikki.shariat@uga.edu

Authors

Nikki W. Shariat, Laurel L. Dunn (Co-PI), William E. Snyder (Co-PI), Michael J. Rothrock, Jr., Sonia M. Hernandez, Jared C. Smith, Sofia A. Varriano

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Summary

Co-existence of fresh produce with animal agriculture is a significant problem for produce growers. There is a need to understand how pathogens move from animals and their environments to fresh produce. To understand risks posed by wild birds and how their fecal pathogen content is influenced by nearby animal agriculture, we will examine the role of animal agriculture in influencing *Campylobacter* and *Salmonella* deposited onto fresh produce by wild birds. Mapping and modeling will be used to develop risk profiles resulting from links between proximal animal agriculture and wild bird feces containing viable pathogens that are deposited on produce foliage. Genomic tools will be used to generate pathogen population profiles and to identify potential sources linked to animal agriculture.

Objectives

1. Assess the risk posed by wild bird feces on fresh produce plants, and the influence of proximal animal agriculture on pathogen presence in wild bird feces.
2. Determine the diversity of *Campylobacter* and *Salmonella* in wild bird feces and perform fine-scale tracking and source attribution using whole genome sequencing.

Methods

Each farm will be sampled before harvest and visits will be performed in the early morning during highest bird activity. Bird counts will be done at each site, and weather and mapping data collected for landscape modeling. Fecal deposits will be collected from produce leaves, and up to two plants downwind will be sampled, plus any produce directly below the fecal matter (Figure 1). Viable *Salmonella* and *Campylobacter* will be isolated using established protocols, and COI sequencing used to determine the bird species. Molecular tools will be used for assessing *Salmonella* and *Campylobacter* population profiles, and the relative frequencies of serotypes and species of interest, respectively, will be matched to those found in food animals.

Results to Date

On the west coast, we found less *Campylobacter* in feces from farms surrounded by natural habitats (Figure 2). We will assess whether these trends occur in the southeast, where it is more humid, and animal agriculture is largely driven by poultry production. We have identified 20 farms to participate in this study, from Florida to Tennessee, which allows us to assess the impact of birds on fresh produce on across a span of diverse climates in the southeast (Figure 3). These farms grow peppers (bell, jalepeno, banana) and tomatoes, among other fresh produce. The farms range in size from 0.5 to >10 acres and include farms embedded (on-site or proximal) in animal agriculture (cattle and poultry) and farms within more natural habitats.

Benefits to the Industry

With 14,790 produce farms encompassing over 800 thousand acres across Florida, Georgia, and Tennessee, this research has significant implications for a substantial number of produce growers. Growers throughout the southeast will have region-specific data to facilitate decision making when contamination events are identified through the growing season and during pre-harvest risk assessments. The data gleaned through this work will address the relevance of current GAPs associated with wild bird presence in produce fields. Tools and data generated in this study will be made available to producers via UGA Extension and via Produce Safety Rule Grower trainings.

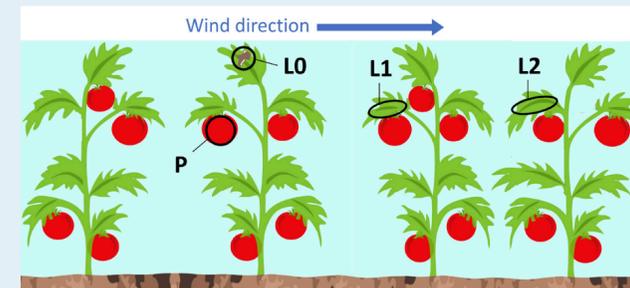


Figure 1. Sampling strategy. Fecal samples (L0) will be scraped off the leaf and placed in a plastic bag. Up to two plants downwind and within five feet will be swabbed (L1, L2), plus any produce directly below the bird feces (P).

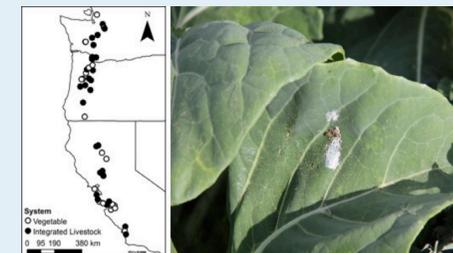


Figure 2. Recent work from our group on farms spanning the west coast shows fewer wild bird feces contaminated with *Campylobacter* in farms surrounded by more natural habitat rather than conventional farms. Conversely, conventional livestock increased this risk. Wild bird feces were collected on or near broccoli foliage.

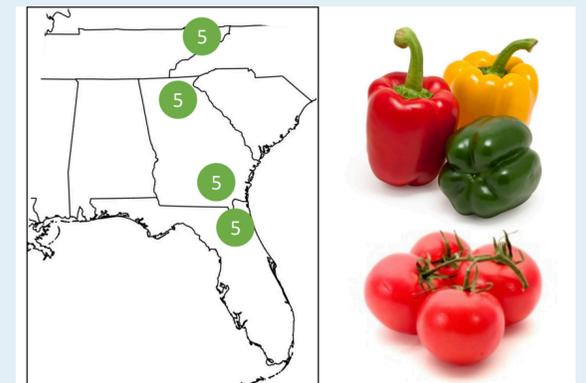
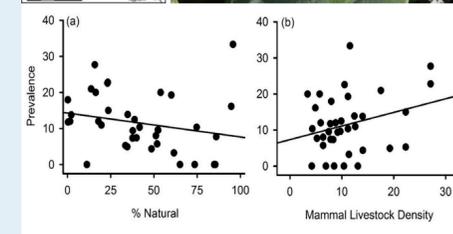


Figure 3. 20 farms have been identified, from Tennessee to Florida, that will participate in this study. Our study separates the farms into four zones, each with five farms: north Florida, south Georgia, north Georgia, and east Tennessee. These farms grow peppers and tomatoes, among other produce.