Paul C. And Edna H. Warner Endowment Fund for Sustainable Agriculture

Report Form

Project Title: Prevalence of Streptomycin-resistant *Erwinia amylovora* in Ohio Apple Orchards
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Producer(s) and Location of Farm(s): Apple orchards in Wayne and Medina counties

Summary:
Fire blight of apple, caused by the bacterium *Erwinia amylovora,* is among the most devastating and difficult apple diseases to manage in Ohio. The use of antibiotics, predominately streptomycin, is the most effective approach for managing Fire blight; however antibiotic resistance in *E. amylovora* and epiphytic bacterial populations in orchards across the country are emerging. The emergence of antibiotic resistant strains of *E. amylovora* has not only destabilized fire blight control in apple orchards it has escalated the antibiotic resistance crisis in medicine, as there is a compelling link between antibiotic use in agriculture and resistance development in human pathogens. An essential step toward addressing the public health and food security threat of antibiotic resistance is to determine the resistance burden from different ecological niches in the entire food chain. Within five orchards with chronic fire blight, streptomycin resistant strains of *E. amylovora* were not detected. A more comprehensive survey of orchards in Ohio is underway in order to establish a statistically significant baseline for streptomycin resistance prevalence in Ohio.

What was done?
The goal of this project was to begin to collect the necessary data required to establish a baseline for streptomycin resistance prevalence in Ohio orchards. Ultimately, data collected from this study will contribute to our understanding of the epidemiology of streptomycin resistance in Ohio orchards and allow us to offer apple growers alternative, more sustainable approaches to effectively manage fire blight. Samples of fire blight on apple were collected from orchards across the apple-growing regions of Ohio. Samples were processed and classical isolation procedures for *E. amylovora* were conducted. Isolates with the expected morphology on selective medium were selected, purified and their identity was confirmed using PCR. All of the strains were then screened for the presence of streptomycin resistant genes using plating techniques, PCR and gene sequencing.

What were the results?
Through this grant we collected and confirmed the identity of five strains of *Erwinia amylovora* from five orchards in Ohio. Four of the strains were collected from orchards in Wayne county and one strain was from an orchard in Medina county. All of the strains

were sensitive to streptomycin at 100 and 2500 µg/µl and none tested positive for the strA/strB gene. The rspL gene, which also confers resistance to streptomycin if there is a mutation at codon 43 was amplified in all five strains and is being sequenced by the Molecular and Cellular Imaging Center, The Ohio State University-Wooster Campus.

How have the results contributed or will they contribute to sustainable agriculture?
The use of antibiotics, to control fire blight is not a sustainable agricultural practice. It is imperative that we address gaps in antibiotic resistance knowledge via the food chain in order to lessen the public health and food security threat of antibiotic resistance. Knowledge of the presence (or absence) of streptomycin resistant strains on *E. amylovora* in Ohio orchards will allow growers to make more informed decisions on how to best manage fire blight. It will also improve our understanding of the mechanisms of antibiotic resistance within *E. amylovora* populations and flow of resistant genes within the food chain, which will allow for the establishment of an Antibiotic Stewardship Program for apple producers in OH.