Specialty Crop Competitive Grant
Federal Fiscal Year 2016
Abstracts / Project Summaries

Project Title
Building Capacity to Meet Virginia Produce Grower Needs for FSMA Water Testing Compliance

Project Partner and Summary
Virginia Polytechnic Institute and State University - Amber D. Vallotton, Fresh Produce Food Safety Team Coordinator, Department of Horticulture

The Project Team (PT) consists of the following faculty from Virginia Tech: PI, Amber Vallotton, M.S., Fresh Produce Food Safety Team Coordinator, Virginia Tech Horticulture Dept.; Co-PI, Erin Ling, M.S., Sr. Extension Associate and Program Coordinator Virginia Household Water Quality Program, Virginia Tech Biological Systems Engineering Dept.; Co-PI, Dr. Renee Boyer, Associate Professor & Extension Specialist in Food Microbiology and Consumer Food Safety, Virginia Tech Food Science Technology Dept.; and Co-PI, Dr. Laura Strawn, Assistant Professor & Extension Specialist in Produce Food Safety, Eastern Shore AREC, Virginia Tech Food Science Technology Dept. Vallotton, Strawn, and Boyer have extensive statewide field experience working with training agents and growers in on-farm food safety risk assessment, Good Agricultural Practices (GAP), and best handling practices. Ling has extensive experience in leading statewide efforts for homeowner private well water testing and education. Additionally, ten trainers (nine key Virginia Cooperative Extension field agents and Local Food Hub Director of Grower Services) will work closely with the PT to achieve project objectives.

The Virginia Tech Project Team will create and pilot test the Produce-Source Water Assessment Program (P-SWAP), which will build capacity to assist Virginia's produce growers in meeting the Produce Safety Rule (PSR) under the Food Safety Modernization Act (FSMA). Our specific outcomes are to enhance the competitiveness of specialty crops through 1) increasing the number of viable technologies available to improve food safety and 2) improving understanding of the ecology of threats to food safety from microbial and chemical sources. Building on the success of the Virginia Household Water Quality Program, and food-safety education efforts in Virginia Cooperative Extension, the pilot testing of the P-SWAP will result in lasting capacity to assist Virginia produce growers in meeting the FSMA PSR. Guidelines and resources will be developed to train trainers in each of the four Virginia Cooperative Extension (VCE) districts. These trainers will work with growers in the source water sampling process, data interpretation, and understanding treatment options when needed. Further, baseline water profiles will be established to aid in understanding and evaluating the readiness of Virginia produce growers to comply with FSMA requirements. Based on feedback from trainers and growers, guidelines and recommendations will be refined to maximize the capacity of VCE, grower groups, and water testing laboratories to scale up this program to meet the needs of Virginia growers for compliance and economic sustainability.

Project Title
Internalization of Salmonella in Commercial Cultivars of Tomato and Pepper Plants

Specialty Crop Competitive Grant
Federal Fiscal Year 2016
Abstracts / Project Summaries
Project Partner and Summary
Virginia Tech - Dr. Laura Strawn, Assistant Professor and Produce Safety Extension Specialist and Co-PI: Dr. Steve Rideout, Associate Professor and Plant Pathology Extension Specialist

Virginia Tech will evaluate scientific data that suggest Salmonella may internalize into tomato plants through the roots. A study performed by the Food and Drug Administration showed that tomato plants within 3 d of transplant had an increase in observable internalized Salmonella. This research finding has prompted discussion by regulators, industry, and state departments of agriculture that only potable water (with zero detectable generic Escherichia coli) should be used in tomato production. While several of Virginia's largest tomato producers are already using potable or treated water during tomato production, many tomato producers are not. Additionally, if it is validated that internalization of pathogens may occur in tomato plants, it would greatly affect many food safety practices. For example, the Food Safety Modernization Act's Produce Safety Rule only targets agricultural production water that comes in contact with the harvestable portion of the produce commodity. Furthermore, other specialty crops are commonly transplanted (e.g., peppers, cantaloupes) and may be susceptible to internalization of pathogens, similar to tomato plants. It is vital to determine if this research on internalization of Salmonella in tomato plants is a product of laboratory and growth chamber conditions, or a valid food safety concern to the specialty crop industry, especially the Virginia tomato industry. Therefore, different commercial cultivars of Virginia tomato and pepper plants will be grown in a greenhouse using common practices to determine the possible internalization routes of tomato-associated Salmonella serovars (e.g., Salmonella Newport, which has been reportedly linked to five tomato-borne outbreaks traced back to Virginia).

Project Title
Risk of Sand Filtration Systems to Act as a Reservoir and Transmission Vehicle for Pathogens

Project Partner and Summary
Virginia Tech - Dr. Laura Strawn, Assistant Professor and Produce Safety Extension Specialist and Co-PI: Dr. Steve Rideout, Associate Professor and Plant Pathology Extension Specialist

Virginia Tech will investigate the risk of commercial agricultural sand filtration systems to act as a reservoir and transmission vehicle for human- and plant- pathogens. The data generated will allow growers to implement targeted mitigation strategies, if necessary, when using sand filtration systems. The Food Safety Modernization Act's Produce Safety Rule (PSR) sets science-based standards for the growing, harvesting, packing and holding of produce for human consumption. The standards (e.g., testing frequencies, microbial quality metrics) for untreated surface water that contact the harvestable portion of produce are more stringent than any current food safety audit program, thus many growers wish to transition away from applications where water may contact the harvestable portion of the produce. One option is to use drip irrigation methods; however, these drip lines can become clogged if water is not filtered to remove sediments (e.g., organic matter, leaves). Thus, the majority of growers who employ drip irrigation use sand filtration systems. The sand filters out sediments and prevents clogged lines.

However, several human- and plant-pathogens are naturally found in produce production environments including the sediments and water that pass through these sand filters. It is unknown whether increased use of sand filtration has food safety consequences. Therefore, this proposed project aims to address the data gaps related to the potential for sand filtration systems to harbor Salmonella, Pythium, and Escherichia coli and aid in their transmission to produce.

Project Title
Impact of Site Selection on Cultivar Performance and Flavor Profile of Hops (Humulus lupulus L.)

Project Partner and Summary
Virginia Polytechnic Institute & State University (Virginia Tech), Holly Scoggins, Associate Professor, Department of Horticulture

Project Summary: Virginia Tech will develop a site assessment tool for prospective hop growers in Virginia that is coupled with a hop varietal database containing flavor and aroma profiles. These tools will enhance the competitiveness of the hop industry in Virginia as well as mitigate risk by potential growers when deciding site suitability.

Project Title
Making Food Safety Certification Attainable for Virginia Farmers While Preparing for Potential Market Changes

Project Partner and Summary
Appalachian Sustainable Development - Kathlyn Terry

Appalachian Sustainable Development (ASD) will enhance the competitiveness of fresh fruits and vegetables by providing training and one-on-one technical assistance to specialty crop farmers across Virginia. Produce farmers will be prepared to obtain USDA GAP and Harmonized GAP with Global Addendum certification and will be prepared for Global GAP should the markets make such a change necessary. This project will involve an additional educational component of exposing growers to the potential market transition from buyers (e.g. Ahold and Walmart) who do not support the FSMA and require GFSI audits for any fruit and vegetable wholesale to retail sales.

Project Title
Developing and Promoting a Multi-pest Scouting Program for Sweet Corn in Virginia

Project Partner and Summary
Virginia Polytechnic Institute and State University - Dr. Thomas P. Kuhar, Professor and Vegetable Entomology Specialist, Department of Entomology

Virginia Tech and Virginia Cooperative Extension will improve pest management for sweet corn producers in Virginia by developing and implementing a multi-pest scouting program where Extension agents will monitor relative pest densities of pests: corn earworm, European corn borer, fall armyworm, and stink bugs as well as monitor the presence and activity levels of

pollinators and ladybeetles on the corn on 30 commercial farms. Agents will use scientifically-based action threshold levels to guide pest management decision-making for growers. Pest sampling results will be disseminated to individual growers in a timely manner to enable them to make educated practical IPM decisions, and will also be posted electronically on various crop/pest advisories and disseminated annually to stakeholders through grower meetings and field days. Pest scouting will provide a more economical and environmentally sound approach to pest management in commercial sweet corn.

Project Title
Sampling for Trissolcus japonicus, a New Asian Egg Parasitoid of Brown Marmorated Stink Bug

Project Partner and Summary
Virginia Polytechnic Institute and State University - Christopher Bergh

Brown marmorated stink bug has been a major invasive pest of many US specialty crops since about 2010. Recently, an Asian parasitoid of brown marmorated stink bug eggs, Trissolcus japonicus, was detected in the mid-Atlantic region, including near Winchester, VA. Biological control of brown marmorated stink bug, particularly by Trissolcus japonicus, is widely considered to be the ultimate solution to its suppression across the landscape. Virginia Tech will generate the baseline information necessary to efficiently and effectively sample and monitor the presence and abundance of Trissolcus japonicus and its impact on the brown marmorated stink bug population. At the detection site near Winchester VA, a combination of pheromone traps, sentinel egg masses, and destructive tree sampling will be used to quantify the vertical distribution of the pest, its egg masses, and the parasitoid in the canopy of Tree of Heaven, a very common and important host of brown marmorated stink bug. Expected outcomes are an improved understanding of where the host and the parasitoid occur in nature and therefore an improved capacity to sample the parasitoid, to track its spread, its establishment, and its effects on brown marmorated stink bug. Ultimately, understanding and promoting biological control of brown marmorated stink but is expected to enhance the competitiveness of vulnerable specialty crops through a resumption of sustainable crop production practices, reduced insecticide inputs, increased management efficiency, and increased economic returns from reduced crop losses to this pest.

Project Title
New Technology and Techniques for Weed Control in Virginia Vegetable Crops

Project Partner and Summary
Virginia Polytechnic Institute and State University; Virginia Cooperative Extension - Charles W. Cahoon & Stephanie Romelczyk

One of the greatest hurdles vegetable producers face is weed control. Weed removal is often time consuming and labor intensive. If left uncontrolled, weeds can significantly reduce yield and quality of vegetables. To provide vegetable producers with weed control solutions, Virginia Tech and Virginia Cooperative Extension will develop innovative weed management techniques for broccoli, potato, pumpkin, watermelon, and general plasticulture systems. The objectives of

this project include: 1) Determine the interaction of living mulches and herbicides for weed suppression in a plasticulture system; 2) Evaluate common purslane control by various herbicide programs in direct-seeded broccoli; 3) Evaluate new residual herbicides for use in potato production; 4) Determine tolerance of direct-seeded watermelon and pumpkin to encapsulated acetochlor and fluridone; and 5) Disseminate results to specialty crop producers via field days and production meetings. For the living mulch study, plastic mulch will be laid and annual ryegrass (living mulch) sowed between rows. At different timings, herbicides will be applied and evaluated for annual ryegrass tolerance and weed control. Purslane control by residual herbicides applied preemergence and postemergence will be evaluated for the broccoli project. On coarse-textured soils typical of Virginia, potato tolerance and weed control by recently labeled residual herbicides will be evaluated for the potato study. Lastly, for the pumpkin and watermelon project, research will be conducted to determine tolerance of direct-seeded pumpkin and watermelon to acetochlor and fluridone. Our mission is to enhance specialty crops production by providing growers with efficacious, economical, and environmentally sound weed control solutions.

Project Title
Cider Production from Virginia-Grown Apples: Research-based Processing and Fermentation Strategies

Project Partner and Summary
Virginia Tech, Department of Food Science & Technology – Amanda Stewart

The Virginia Tech Department of Food Science and Technology Enology and Fermentation group will develop research-based apple processing and fermentation strategies for production of hard cider and disseminate results to stakeholders through state and regional workshops and industry-led field days.

Project Title
Evaluating Viral Disease in Honey- and Mason- Bees on Small Strawberry Farms in Virginia

Project Partner and Summary
Old Dominion University Research Foundation - Lisa Horth

ODU Research Foundation (through Dr. Lisa Horth's laboratory in the Biology Department at ODU) will test honeybees for three viral diseases from three small strawberry farms in Virginia. Honey bees colonies have been collapsing in Virginia. Since mason bees can successfully be added to small berry farms to improve crop yield, mason bees will also be tested for the same three viral diseases. The presence of virus and the quantity of virus can be compared between the two bee species. If mason bees have higher viral load then honey bees, this is important information for future use of these native bees on small farms. If they have lower viral load or are virus free, this is also important information with respect to their continued use on small farms. In this work, we will test for three devastating bee viruses in these two bee species to evaluate the health of these bee species on small berry farms in VA. The three viral species have all been associated with debilitating impact on honeybees and they are 1) Israeli acute paralysis

virus, 2) deformed wing virus and 3) varroa destructor virus. Results will prove informative for honey bee health and for decisions regarding future use of mason bees on berry farms.