SAES-422 Multistate Research Project W-4008:
Integrated Onion Pest and Disease Management

State report on activities from January 1, 2024 to December 30, 2024.

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Accomplishments

Objective 1. Evaluate onion germplasm for resistance to pathogens and insects.

California: None

Georgia: None

Idaho: Onion bulbs from a total of 10 cultivars grown in the Onion Variety Trial at the OSU Malheur Experiment Station were inoculated with a spore suspension of *Botrytis allii*. Onion bulbs were cured and stored for 4 months. Onion bulbs were cut down the center and evaluated for the amount of rot the pathogen caused. It appears that cultivars respond differently to the neck rot pathogen suggesting that they have the ability to resist the pathogen to some degree. Further investigation with larger sample sizes is planned now that we know that there is a differential resistance response to *B. allii* across the cultivars.

New Mexico: When inoculated with the disease-causing pathogen, NMSU breeding lines exhibited a lower Fusarium basal rot (FBR) incidence and severity than an FBR-susceptible and an FBR-resistant cultivar. Our breeding efforts have shown a reduction in FBR disease severity and incidence with selection. When exposed to high onion thrips pressure, conditions conducive for Iris yellow spot (IYS) disease development, other NMSU breeding lines exhibited fewer thrips per plant and a lower disease severity early in the growing season, and greater bulb size at harvest than a commercial cultivar grown under the same conditions.

New York: None

Oregon: None

Pennsylvania: None

Utah: None

Washington: Bulbs for the 2023-24 Washington State University (WSU) Onion Cultivar Trial were evaluated in Feb. 2024 after 5 months in storage, for quality and bulb rots. Results were summarized and shared with onion stakeholders on the WSU Onion Alerts (>600 subscribers), demonstrating how 51 cultivars fared under Columbia Basin production conditions. The 2024 WSU Onion Cultivar Trial was planted in April 2023 near Prosser, WA, with three replicate plots of each of 47 cultivars submitted by onion seed companies. The plots were evaluated regularly for diseases and pests. Bulbs were harvested in September to assess yield, and 50 bulbs/plot were placed in storage to evaluate for storage quality and bulb rots in Feb. 2025. The WSU Onion Field Day, at which stakeholders could look at the plots and hear presentations on onion research and other issues, was held on August 29 in-person, and was well attended (>100 attendees).

Objective 2. Investigate the biology, ecology and management of onion insect pests.

California: Robert Wilson evaluated insecticide seed treatments for management of seedcorn maggot in onions.

Georgia: None

Idaho: None

New York: Surveys of maggot species infesting onions continued across northern production regions of North America and continued to indicate that seedcorn maggot is the dominant pest of onion in the Klamath and Columbia Basins, while onion maggot is the dominant pest of onion in the Treasure Valley and Great Lakes regions. This information may be valuable for determining which insecticide seed treatment should be considered in regions dominated by each species. In New York in 2024, we confirmed that one onion

maggot population in New York had developed practical resistance to spinosad seed treatment. We also observed that spinosad seed treatment (Lumiverd) performed poorly in Oregon, but performed well in CA. In New York in 2024, onion thrips infestations were inadequately managed using spinetoram in several onion fields in western New York. While resistance to spinetoram has not been confirmed in those populations, it is suspected. Syngenta's new insecticide, isocycloseram (PLINAZOLIN® technology), was evaluated as a seed treatment for maggot control and as a foliar spray for onion thrips control. Isocycloseram in combination with either thiamethoxam (Cruiser 5FS) or clothianidin + imidacloprid (Sepresto) provided protection of the crop against onion maggot and seedcorn maggot. Onion maggot control using isocycloseram alone was inadequate. Isocycloseram also was one of the most effective products for protecting onions from onion thrips, including locations where onion thrips populations were not controlled effectively by spinetoram. Tank mixes of methomyl (Lannate LV), lambda-cyhalothin (Warrior II with zeon technology) and abamectin (Agri-Mek SC) significantly reduced populations of onion thrips and provided an equivalent level of control as isocycloseram (PLINAZOLIN) and cyantraniliprole (Exirel).

Oregon: Insecticides remain the cornerstone for management of insect pests of onion. In 2024, we demonstrated that yield and size profiles of onions increase with shorter intervals between insecticide applications. In general, tank-mixing insecticides does not improve thrips management and reduces insecticide options for growers. New insecticide chemistries show promise for managing onion and seedcorn maggots.

Pennsylvania: None

Utah: None

Washington: Insecticide efficacy trials were conducted in the Columbia Basin in 2024 to evaluate control options for onion thrips (*Thrips tabaci*) management. One trial featured a new insecticide set to be registered for use in 2025, plinazolin. The efficacy was similar to Radiant (spinetoram), currently the most effective insecticide available to onion producers in WA. We also evaluated application of this insecticide via chemigation, since that is the preferred method for growers to use, and it worked well applied in that manner.

Objective 3. Investigate the biology, epidemiology and management of onion plant pathogens.

California: Robert Wilson and Brenna Aegerter conducted studies of onion bacterial diseases under the "Stop the Rot" USDA NIFA SCRI project. Alex Putnam, Pastrana Leon, and Ali Montazar investigated the epidemiology and management of Downy Mildew in onions. Cassandra Swett investigated the epidemiology and management of *Fusarium* spp. in onions.

Georgia: *Pantoea stewartii* subspecies *indologenes* (Psi) isolates can cause disease in several Poaceae hosts, including millets and rice and were recently known to cause foliar and bulb symptoms characteristic of center rot in onions. Cover crops such as millet and cash crops like corn are commonly grown in the summer after onion harvest in Vidalia, Georgia, USA. However, the risk of pathogen transmission to onions in the cropping systems where summer crops precede onion planting is mostly unknown. We evaluated the survivability of Psi in foliage and residue of corn and pearl millet as well as their colonization ability on onion roots and shoots transplanted in the infested soil. Our microplot study showed that crop residue can support Psi survival for at least 58 days and the presence of the pathogen in the soil coincided with onion transplanting. However, despite planting onion seedlings in Psi-infested soil, no bacterial colonization was observed in the rhizosphere or foliar surfaces of onion seedlings. Moreover, no visible symptoms of center rot were observed in onion foliage and bulbs, indicating a lesser risk of vertical transmission of Psi to onions in the Poaceae-Allium cropping system. We further investigated genetic determinants for bacterial survival in millet residue and bare soil by creating deletion mutants of the genes responsible for exopolysaccharides, flagellar motility, quorum sensing and pathogenicity in a Psi pathovar cepacicola strain PNA14-12. All mutant strains survived for at least 24 days in millet residue at high populations and bacterial colonies of all the tested strains were detectable until 44 days in bare soil, similar to the wild-type strain. Exopolysaccharide seemed to play a minor role in pathogen survival, but none of the other targeted genes contributed to the bacterial survival in millet residue and bare soil. Overall, our findings suggest that crop residue may play an important role in Psi survival in fields with onion-millet/corn cropping scheme, but bacterial transmission to onion crops from millet/corn residue was not observed. Despite this observation, crop residue should be incorporated into the soil to facilitate decomposition prior to onion transplanting.

Onion is a widely cultivated crop that suffers from substantial losses due to *Pantoea ananatis* infection, a bacterial pathogen responsible for onion center rot disease. The virulence of the pathogen is driven by the chromosomally located HiVir gene cluster, which produces the phytotoxin ‘pantaphos’, causing extensive necrosis in infected tissues. Despite its economic importance, Allium genotypes with resistance against *P. ananatis* are unknown. In this study, we conducted a comprehensive screening across 982 Allium genotypes to evaluate resistance against *P. ananatis*. Only one *A. cepa* genotype, DPLD 19-39, demonstrated a consistent resistant phenotype by exhibiting lower foliar necrosis and bulb rot. Moreover, we also performed in vivo transcriptome sequencing and analysis of onion plants infected by *P. ananatis* under distinct conditions and identified several mis-regulated pathways involved with plant resistance, including cell wall reinforcement, oxidative stress regulation, and programmed cell death. Our findings indicate a potential mechanism for resistance against *P. ananatis* in *A. cepa* and suggest that future efforts should focus on these defense pathways to develop *P. ananatis* - resistant onion genotypes.

Pseudomonas alliivorans, first identified on onion foliage in Georgia, has emerged as a pathogen that also infects cucurbits in Florida and Alabama (2020-2023). To assess whether *P. alliivorans* diversity is influenced by host and geographic locations, and to

identify genetic traits related to host adaptability and pathogenicity, we conducted comparative genomics, pathogenicity and growth curve assays on filtered-onion juice for strains isolated from both hosts. The core proteome-based phylogeny revealed that *P. alliivorans* strains cluster according to their host of isolation and geographic location. Pathogenicity assays demonstrated that strains isolated from cucurbits (n=10) exhibited a wide range of symptoms on onion tissues; additionally, strains isolated from onions (n=40) could induce leaf spot on watermelon leaves. The allicin tolerance (*alt*)-like cluster, which confers bacterial tolerance to thiosulfinate 'allicin' in onion tissues particular in bulbs, was present in most of the onion strains. In contrast, all cucurbit strains lacked this gene cluster and displayed compromised growth in filtered half-strength onion juice, indicating its role in bacterial survival and growth in thiosulfinate-rich onion environment. This was further confirmed by the bacterium's ability to induce bulb rot: approximately 80% of the onion isolates caused significant rotting of yellow onion bulbs and red scale necrosis, while less than 50% of the cucurbit isolates caused similar symptoms. Additionally, onion isolates were able to grow in half-strength onion juice at 25º C and 30º C whereas cucurbit isolates had compromised growth at these temperatures. Since onions and cucurbits are commonly grown in rotation in Georgia, we assessed whether *P. alliivorans* from either host could survive on crop debris. Both onion and cucurbit isolates could survive in cucurbit debris up to 72 h post-incorporation under greenhouse conditions. Moreover, isolates from both hosts survived better on cucurbit debris than on onion debris. Subsequently, onion seedlings exposed to *P. alliivorans*-contaminated cucurbit debris developed foliar symptoms, indicating a potential risk of cross-contamination between the two crops.

Postharvest rots are major concern for Vidalia onion production in Georgia. Fungal rots due to black mold (*Aspergillus niger*) are common postharvest due to logistical delays. This results in extended suboptimal storage conditions prior to curing and refrigeration. Although not yet reported on onions, *A. niger* is also capable of producing mycotoxins such as ochratoxins and fumonisins. This study focuses on investigating the genetic diversity and mycotoxin production potential of Vidalia onion-associated *Aspergillus* section Nigri isolates. A total of 156 isolates were collected over two years from four locations within the Vidalia onion production zone of Georgia. PCR analysis on the first year's 55 isolates revealed 42% had the fumonisin biosynthesis gene *fum10* and 5% had the ochratoxin A gene *ota1*. Of the isolates with the *fum10* gene, 70% were isolated from culls and only 1 also had ochratoxin genes amplified. Initial whole genome sequencing (WGS) studies of the first 55 isolates generated 35,717 SNPs using the *A. niger* KJC3 genome as reference. Structure and DAPC analyses revealed that isolates separated based on sample location and onion source. WGS is in progress for all isolates. Continuing analyses of the complete collection will focus on species identification, genomic structural variation, mycotoxin biosynthetic cluster comparisons, quantification of mycotoxin production, and fungicide sensitivity assays. Findings from this investigation will help develop informed extension recommendations to growers on methods of preventing black mold issues in postharvest storage.

Idaho:

A. Determine the impact temperature and curing parameters on progress of *Rahnella* spp. in onion bulbs during storage.

To determine the impact of temperature on bulb rot caused by *Rahnella* spp., bulbs were inoculated with *Rahnella* spp. and incubated at various temperatures (25, 30 and 35°C). Bulbs were assayed weekly to evaluate disease progress to determine how *Rahnella* spp. is impacted by temperature. Bulb rot caused by *Rahnella* spp. is exacerbated by incubation time as bulb rot increased over time. It was observed that the bulb rot decreased as the temperature increased. To determine the impact of temperature and curing on bulb rot caused by *Rahnella* spp., bulbs will be inoculated with *Rahnella* spp. and incubated at various temperatures (25, 30 and 35°C) bulbs were assayed weekly to evaluate disease progress and determine how *Rahnella* spp. is impacted by temperature. Bulbs were cured at either 25, 30 or 35°C for each of two durations (2 days vs. 2 weeks) and placed in storage at 5°C. Bulbs were cut down the center and evaluated for severity of storage rot after 4 and 6 months in storage. A water-inoculated control treatment and a non-inoculated control treatment were included for comparison. The amount of bulb rot observed was reduced at the higher temperatures for both the two day and two-week curing periods.

B. Determine the genetic diversity present in *Rahnella* spp. and potentially identify the species of *Rahnella* isolated from infected onion in Idaho.

Genetic characterization of *Rahnella* spp. included genomic DNA extraction. PCR amplification and sequencing of the 16S rRNA, *gyrB*, *infB*, *rpoB*, and atpD genes from the Idaho strains of *Rahnella* spp. Strains were obtained from onion bulb rot in the Treasure Valley. Phylogenetic analysis of these sequences along with the respective sequences downloaded from GenBank and analysis was completed using Geneious software. It appears that *Rahnella aceris* is the primary species present in the Tresure Valley along with *R. perminowiae* and *R. aquatilis*.

C. Field plots were established to evaluate the relationship between soil temperature at bulb initiation and yield and bulb size at harvest. Treatments that cool the soil (straw mulch or Surround) increase yield and size, while treatments that heat the soil (biochar) have the opposite effect. The field treatments continue to have an effect after harvest. The biochar treatment resulted in an increase in decay after 3 months of storage.

D. Field plots were established to evaluate a new group 7 fungicide from BASF (Tesaris) for pink root management. It appears to be as effective as Fontelis (another group 7) in suppressing disease when applied through drip at the 2-leaf stage.

New York: Using an intensive insecticide program (multiple weekly applications of methomyl [Lannate LV]) during the first half of the season significantly reduced thrips populations, symptoms of IYS, and incidence IYSV later in the season compared with those following a standard insecticide program. Bulb yields also were numerically greater in three of four field pairings treated with the intensive insecticide program compared with the standard program. The extra cost of the Lannate LV applications was minimal compared with the remarkable increases in profit from the higher yields. Twenty five fungicide treatments were evaluated for efficacy on Botrytis leaf blight (BLB) and Stemphylium leaf blight (SLB) in an on-farm small-plot trial. Each treatment was applied weekly for 7 weeks

beginning at first onset of disease until 50-70% lodging. In the untreated, 41% of the plants "died standing up" due to BLB and SLB. At plant health assessments made 16 days after the last treatment, Amara (FRAC BM 02, a.i. *Bacillus velenzensis*), Badge (FRAC M1, copper bactericide), Velum Prime (FRAC 7, a.i. that is in Luna-brand fungicides), Miravis (FRAC 7, a.i. that is in Miravis brand products), Rampart (FRAC P07) and Tilt (FRAC 3, a.i. propiconazole) were not significantly different than the untreated and had only 0-8% green foliage/plot at this time. Proline (FRAC 3, a.i. prothioconazole) and Viathion (FRAC 3 a.i. tebuconazole + P07) + Tilt (FRAC 3) + Bravo (FRAC M5) had the healthiest plants in the trial with 68% and 63% green foliage/plot due. Green foliage increased by ~ 10% for every 2 additional sprays of FRAC P07 fungicide applied earlier in the spray program. Oso (FRAC 19) + Rampart (FRAC P07) + Bravo was as good as Viathon + Tilt + Bravo. There was a general trend that plant health improved as the number of products in the tank mix increased. Oso, FRAC P07 fungicides and double-product FRAC 3 combinations with Tilt were the only treatments with activity on SLB. BLB data analysis is underway.

As part of on-going monitoring of fungicide resistance, isolates of *Stemphylium vesicarium* were collected from NY onion fields and tested for sensitivity to DMI fungicide active ingredients propiconazole, tebuconazole and prothioconazole. Insensitivity of *S. vesicarium* to propiconazole continues to develop slowly over time. The percentage of isolates of *S. vesicarium* with EC_{50} between 1-10 µg propiconazole/ml was 82.5% in 2024, compared to 94.8% in 2018. The percentage of isolates of *S. vesicarium* with EC_{50}>10.0 ug propiconazole/ml was 14.0% in 2024, compared to 1.0% in 2018. By contrast, insensitivity to tebuconazole has increased rapidly with the percentage of isolates of *S. vesicarium* with EC_{50}>10.0 ug tebuconazole/ml being 4.1% in 2018, and 83.3% in 2024. The differences in the change in sensitivity do not seem to be related to use patterns, as fungicides containing either propiconazole or tebuconazole are utilized commonly in NY onion production. Differences in the developmental rate of insensitivity are indicative of an incomplete cross resistance occurring between DMI active ingredients. However, careful resistance management strategies are required in order to slow resistance development in all DMI's.

Prothioconazole, a DMI active ingredient not registered for onion, was tested for the first time in 2024 and also displayed incomplete cross resistance to other DMI's. In 2024, 67.1% of isolates of *S. vesicarium* were sensitive to prothioconazole with E_{50}<1.0 ug/ml, compared to only 3.5% and 0% for propiconazole and tebuconazole respectively. However, 6.4% of S. vesicarium isolates were highly insensitive (EC_{50}>10 ug prothioconazole/ml), indicative of prior exposure of *S. vesicarium* in some fields perhaps through historical application to crops grown in rotation with onion. This indicates that prothioconazole would require careful resistance management if it were to be registered for onion in the future.

Oregon: Using data from field experiments conducted in the Tulelake Basin of California, Ordinary Least Squares regression was used to develop a model to improve understanding of factors that impact disease-free yield of onion produced in fields that have been naturally infected with the white rot pathogen *Sclerotium cepivorum*. Variables included fumigants, germination stimulants, fungicides, onion stand, and sclerotia counts. Onion stand at the two-to-four leaf stage served as a good predictor of disease-free yield. Findings indicated a significant positive relationship between stand and disease-free bulb

yield. Treatment with fungicides applied in furrow at planting also had a significant and strong positive impact on disease free yield. Treatment with fumigants and germination stimulants did not have a significant impact on disease free yield. The responsiveness of yield to reductions in sclerotia populations was incremental; results indicated that every one percent decrease in sclerotia populations resulted in a 0.07 percent increase in disease free yield. None of the treatments in our analysis increased yields to the estimated 58.4 metric tons per hectare that would be required to break even on total production costs. However, the responsiveness of yield to fungicide use indicates that fungicides may be an economically viable component of future white rot integrated management programs.

Natural products derived from Allium spp., such as garlic oil, garlic powder, and diallyl disulfide (DADS), are strong elicitors of sclerotia germination in the fungus *Sclerotium cepivorum*, the causal agent of Allium white rot. However, these compounds can also have broad antimicrobial activity against a wide range of bacteria, oomycetes, and other fungi when they are applied to soil. DADS was applied to two soil types and incubated under aerobic and anaerobic conditions. Metabarcodes for bacterial, fungal, and oomycete communities were analyzed to identify changes. A significant effect of DADS treatment on the overall compositions of bacterial, fungal, and oomycete communities was observed compared to the mock-inoculated treatment. Soil type and incubation conditions did not have a significant effect on soil microbial communities and significant interactions were not observed with DADS treatment in this study. These results suggest that potential changes in soil microbial communities should be considered when applying DADS to field soils.

Pennsylvania: From the large multi-state survey conducted as part of the USDA NIFA SCRI Stop the Rot project, a previously undescribed *Burkholderia* species causing bulb rot in onion was identified in Pennsylvania and pathogenicity testing determined that both strains were pathogenic on onion. Based on their phenotypic, genotypic, and phylogenomic characteristics as well as comparative analysis, the two strains represent an uncharacterized *Burkholderia* species pathogenic to onion. This research was published in the journal Plant Disease as a First Look in Dec 2024 (https://doi.org/10.1094/PDIS-12-24-2675-SC). The phylogenic analysis using *recA* genes and disease severity assessment of 89 *Burkholderia* strains isolated from symptomatic onion leaves and bulbs in Pennsylvania and New York has been completed and the manuscript is in the final stages of preparation. Five *Burkholderia* species and two *Paraburkholderia* species were identified. *Burkholderia cepacia* and *B. orbicola* were predominant in New York, while *B. gladioli* was only identified in Pennsylvania. Interestingly, *B. gladioli* isolates were significantly more aggressive in whole bulb pathogenicity tests compared to all the other species identified. Additionally, a subset of *Burkholderia* strains from Pennsylvania and New York was selected for copper tolerance screening. In total, 116 *Burkholderia* strains were tested for copper tolerance using plate assays. Over 85% of the strains exhibited copper insensitivity at 200 ppm of copper sulfate pentahydrate in the plate assay.

Utah: We conducted a small trial for *Fusarium proliferatum* to determine if we can get infection using inoculum in the soil. We were not able to. The only time we had successful infection was when the inoculum was applied to the neck. The resulting symptoms matched symptoms in the field.

Washington: For the 'Stop the Rot' USDA NIFA SCRI Project No. 2019-51181-30013, we continued identifying and characterizing bacterial strains from a survey over 3 seasons in 11 states across the USA to determine the diversity and prevalence of bacteria associated with onion diseases. For the WA and CA strains, the WSU regional lab finished testing 100's of isolates for pathogenicity to onion using scale, foliar, and bulb assays; and sequencing for genus and species identification. Results from 3 field trials in 2023-24 were finalized after rating bulbs in storage in Feb. 2024, to evaluate timing of topping onion bulbs, effect of chemigated vs. spray boom applications of pesticides on bacterial diseases, and postharvest application of disinfectants on control of bacterial bulb rots in storage. In the bactericide trial, five weekly applications of Badge SC, ManKocide, or Lifegard WG by chemigation or by spray boom did not have any effect on marketable bulb yield or the incidence of bulbs that developed bacterial rot. Spray boom applications of the two copper products, Badge and ManKocide resulted in significantly more phytotoxicity (injury) to the onion leaves than chemigated applications. The timing of topping trial demonstrated a very steep decrease in amount of bacterial bulb rot (at harvest + in storage) the lower the moisture content in the necks at the time of topping, i.e., the drier the necks at the time of topping, the lower the risk of bacterial bulb rot. For the trial evaluating postharvest applications of disinfectants to bulbs placed in storage, none of the disinfectants reduced the incidence of bacterial bulb rot, as demonstrated in the 3 previous years of trials. Field research trials also were carried out in 2024-25 to investigate the impacts of irrigation and nitrogen management on onion bacterial diseases. Results were presented at the Tri-Societies Annual Meeting in fall 2023 and fall 2024. Increasing N application rates increased total yield for the later-maturing cv. Calibra, not the earlier-maturing cv. Highlander, but also increased the incidence of bacterial bulb rot for Calibra. Conversations about these results will help producers understand the disadvantages of tailoring N application rates to maximize total bulb yield. The irrigation frequency trials demonstrated that longer and less frequent irrigation can reduce losses to bacterial bulb rots without reducing marketable yield.

Objective 4. Investigate the biology, epidemiology and management of weedy plant species that impact onion production.

California: Robert Wilson researched alternative herbicide options to replace Dacthal for summer annual weed control in direct seeded onions.

Georgia: None

Idaho: None

New Mexico: A post planting, delayed preemergence application of pendimethalin did not reduce onion stand or bulb yield and did not result in bulbs with pendimethalin residues greater than U.S. federal tolerances. Compared to the nontreated control and preemergence applications of bensulide, a delayed preemergence application of pendimethalin reduced both densities of annual weeds and the amount of time for one individual to hand weed onion at 85 days after onion seeding. These results suggest a delayed preemergence application of pendimethalin is a promising option for controlling annual weeds in New Mexico onion.

New York: Two on-farm trials were conducted to evaluate late-season applications of preemergent herbicides for extended weed control through harvest. Yield data indicated that single, double and triple late-season applications of Dual Magnum and Prowl EC were safe on onion. Weed pressure was unfortunately very low, but data is trending that double-applications of Dual Magnum late mat reduce yellow nutsedge and pigweed at harvest. More studies are planned for 2025.

Oregon: None

Pennsylvania: None

Utah: None

Washington: None

Impacts

California: Tulelake grower adoption of insecticide seed treatment for the management of seedcorn maggot has increased over 50% in the last five years. Use of chlorpyrifos dropped 100% while growers obtained improved suppression of seedcorn maggot compared to chlorpyrifos. Tulelake growers also have adopted irrigation management practices for reducing the severity of bacterial diseases.

Georgia: Onions with neck-length of 2-inches or more has become a common practice for Vidalia onion growers to reduce bacterial internal rot. This slight modification in harvesting practice has been widely adopted in Georgia and beyond. LifeGard is used in rotation with Copper products. A thrips management program is now a cornerstone for the center rot management used by both organic and conventional onion growers. Use of copper products have reduced to 15% (conservative estimates) in onions grown in Georgia.

Idaho: None

New Mexico: Our research demonstrated that our evaluation method was successful in reliably producing disease symptoms which is essentially for disease resistance

development. Germplasm has been developed that expresses lower disease severity as a result of selection. Our target audience can use this information and germplasm to develop disease resistant onion cultivars. A post planting, delayed preemergence application of pendimethalin could provide comparable or better control of annual weeds as currently used herbicides in autumn-sown and winter-sown onions in New Mexico while reducing herbicide costs by 92-95% ($99-$156/acre) and reducing the legacy costs on the environment by 74-88%. This simple switch could save the NM onion industry $1 million per year.

New York: 2024 Success Stories including the following:

"Muck Onion Growers Enjoy Control of Troublesome Weeds with New Herbicide"

Executive Summary

Cornell Vegetable Program (CVP) Onion Specialist figured out how a new and novel herbicide, Optogen would be most beneficial in muck onion production and was instrumental in getting it registered for this use in New York. In 2024, on one farm, for every $1 spent on Optogen to control troublesome weed perennial sowthistle, they saved $13.64 in hand weeding expenses for a total of $48,650, which would have otherwise eaten up 7% of their profit.

Issues/Needs and Audiences

Herbicides are the first line of defense for weed control in muck-grown onion. Strategic programs include 5-8 applications of both pre- and post-emergent herbicides with five active ingredients that belong to 4 different modes of action. Despite this, ragweed and perennial sowthistle remained troublesome weeds that needed to be hand weeded at an added average expense of $250 per acre. Onions are one of the most valuable vegetable crops grown in New York with a farmgate value of $68.9 million in 2023. Pungent dry bulb cooking onions are grown predominantly on muck soils that are high in organic matter where production is unique and intensive. Approximately 165,000 tons are produced on 7,900 acres of which ~ 60% are produced on 16 farms within the CVP region.

Extension Responses

CVP Onion Specialist, Christy Hoepting helps her muck onion growers to improve their weed management through on-farm research trials including evaluation of pipeline products. She conducted her first experiment with the active ingredient bicyclopyrone in 2015. Although underwhelming when used alone, she noticed that it had post-emergent activity on ragweed. So, in 2016, she experimented with bicyclopyrone and several herbicide tank mix partners and discovered that bicyclopyrone + bromoxynil provided phenomenal control of ragweed while not hurting the onions. She consequently shared her results with Syngenta, the company that makes bicyclopyrone, and fortunately, they agreed to pursue the use of this herbicide in onion. Hoepting continued her collaboration with Syngenta and conducted another 25 on-farm onion herbicide trials with bicyclopyrone, which included both pre- and post-emergent applications, different rates, crop timings, spray volumes, tank mix partners and sequences. She studied the safety on the onion crop and evaluated the effectiveness of dozens of bicyclopyrone treatments for their ability to control 7 types of broadleaf weeds, 2 grasses, yellow nutsedge, and even

volunteer potato and perennial sowthistle. It took Hoepting 4 years of trial and error and not giving up to figure out how bicyclopyrone could be helpful for controlling perennial sowthistle. The successful program included a tank mix of bicyclopyrone, which was to be followed by Stinger herbicide 2 weeks later. Hoepting kept the muck onion growers informed of her research developments regarding bicylopyrone and sought their input on the practicality of the use patterns she was proposing: From 2017 to 2024, she gave 10 tours of her herbicide trials and presented the research results at 7 winter educational meetings to 365 and 285 growers and allied industry representatives, respectively.

Accomplishments and Impacts

On May 17, 2024, the eager anticipation was lifted when bicyclopyrone was finally registered for use in onion in New York, under the trade name Optogen. The research data that Hoepting generated guided the use instructions for onion on the Optogen label. Optogen arrived in New York just in time for growers to use it to effectively control ragweed and perennial sowthistle. Hoepting advised them to be cautious as they tried for the first time a new herbicide with a completely different mode of action than anything they had used before in onion. In 2024, 4 out of the 6 farms in the CVP region where ragweed is troublesome were able to try Optogen + bromoxynil. All farms were impressed with the ability of this dynamic combination to control ragweed with 2 farms reporting nearly 100% control. None of these farms reported any issues with crop injury. Plans are in place for the all 6 farms to achieve near-100% control of ragweed with Optogen + bromoxynil in 2025. In 2024 in Elba, where perennial sowthistle is especially problematic, one grower successfully implemented Hoepting's herbicide strategy with Optogen + bromoxynil and Stinger under her careful guidance. Eventually, 70 acres of heavily infested onion fields were treated. Although the treatment did not kill the thistle outright, it injured it so badly that it remained mostly inactive until the end of July, which allowed the onion crop to grow as if it were free of weeds. Thus, the grower decided to not hand weed the thistle. At the end of the season, it was estimated that the addition of Optogen + bromoxynil ($55/A) saved the grower $750/A in hand weeding expenses, because it would have taken 3-times longer than average to weed these heavily infested fields, for a total of $48,650 in savings, which would have otherwise eaten up 7% of their profit. For every $1/A invested in Optogen + bromoxynil herbicide treatment, $13.64/A was saved in hand weeding expenses.

Collaborators:

Larissa Smith, Syngenta Crop Protection

"Just One More Trial" Yielded the Winning Insecticide "Trifecta" for Thrips Control in Onion"

Onion thrips are tiny insect pests that feed on the leaves of onion plants. They also vector a destructive disease, iris yellow spot virus (IYSV). When uncontrolled the onion thrips/IYSV complex can reduce onion yields by 30-50%, costing growers $2,900 to $5,700 per acre. Thrips/IYSV is the worst in the Elba muck land, where over a million pounds of onions are produced annually, about 30% of the New York onion industry. Insecticides are the first line of defense for controlling onion thrips, and the growers diligently follow research-based recommendations developed by CVP Onion Specialist, Christy Hoepting and Cornell

Entomologist, Brian Nault, to prevent insecticides from developing resistance. But in 2022, it looked like one of the top-performing insecticides, Radiant was starting to slip. According to data collected via the CVP Onion Scouting Program, Radiant could easily knock back high thrips populations of 3 to 6 onion thrips per leaf to below the spray threshold of 1 thrips/leaf. But in 2022, as an example, thrips increased from 1.7 to 4.2 thrips/leaf after two consecutive applications of Radiant. Was it because onion thrips were developing insecticide resistance to Radiant? Or was there another explanation? Hoepting was determined to get to the bottom if it. She devised a plan to track the effectiveness of Radiant across the 2023 growing season in the Elba muck through a series of on-farm research trials. Unfortunately, it was clear that thrips had indeed developed insecticide resistance to Radiant after Hoepting completed the first trial when the 1x and 1.5x rates had as many thrips as the nontreated controls and the 2x rate reduced thrips by only 50%. When Nault's on-farm insecticide trial in Elba corroborated Hoepting's results, she knew that she did not want to be facing the Elba muck onion growers in 2024 and not have a recommendation for an insecticide treatment to use instead of Radiant. So, she added "just one more" field trial to her plate at the end of the 2023 growing season. Hoepting's last-ditch efforts paid off and she found a tank mix combination that was as good as the top-performing insecticides: Agri-Mek + Warrior + Lannate. Each of these insecticides belong to different modes of action than the other main insecticides used in the onion thrips management program, which is crucial for resistance management. Onion thrips were atrocious in 2024, and the Elba onion growers were thrilled with the effectiveness of Agri-Mek + Warrior + Lannate. It annihilated high populations of 4.2 to 7.8 thrips/leaf with reductions of 66-95% after one application and 97-99% after two applications. They nick-named Hoepting's Radiant-replacement "Trifecta".

Oregon: Results from these research and Extension projects have allowed growers to improve their pest management decisions and make more efficient use of pesticides. Encapsulated sclerotia germination stimulants are easier to apply and just as effective at reducing soilborne white rot inoculum than their non-encapsulated counterparts. The public benefits from access to more reliable and sustainable food supplies that have lower chemical inputs and reduced input costs.

Pennsylvania: None

Utah: None

Washington: Outreach to growers and onion industry stakeholders, field representatives and extension staff occurred through informal visits with growers, grower meetings, and field days. The 'Stop the Rot' video playlist contains videos for growers and the industry (https://www.youtube.com/playlist?list=PLajA3BBVyv1zf2obB16bNEdQPQeLW_XB_). Outreach and dissemination of preliminary results to onion stakeholders and the industry has been conducted through informational articles in trade publications and extension

newsletters (see publications) and websites/online alerts. A new video on diagnosing onion bacterial diseases in the field was produced by C. Hoepting at Cornell Extension, with review/edits on the video provided by Tim Waters and Lindsey du Toit from WSU, and was posted on Alliumnet in April 2024. Growers have indicated they are incorporating recommendations from the trial results into their production practices, particularly late-season irrigation and cultural practices that minimize the risk of bacterial rots. Visits to the Alliumnet website with results from the project have increased significantly.

Publications (January 1, 2024 to December 30, 2024)

a) Publications in scientific journals

de Jesus, H.I., Cassity-Duffey, K., Dutta, B., da Silva, A.L.B.R., Coolong, T. 2024. Influence of Soil Type and Temperature on Nitrogen Mineralization from Organic Fertilizers. Nitrogen 5: 47–61. https://doi.org/10.3390/nitrogen5010004.

Greenway, G., B., Nault, S. Rondon, and S. Reitz. 2024. Extension impacts on onion IPM: Current perspectives from the industry. The Journal of Extension, 62(3), Article 21. https://open.clemson.edu/joe/.

Hua, G.K.H., Wilson, R.G., and Dung, J.K.S.. 2024. Evaluation of bait crops for the integrated management of white rot (Sclerotium cepivorum) in Allium crops. Plant Disease 108(1):118-124. https://doi.org/10.1094/PDIS-04-23-0688-RE.

Hoepting, C.A, S.K. Caldwell and S.L. Mertson. 2024. Evaluation of fungicide tank mixes for control of Botrytis leaf blight and Stemphylium leaf blight in onion, Elba, NY, 2023. Plant Disease Management Reports, 18: V114. https://doi-org.proxy.library.cornell.edu/10.1094/PDMR18.

Hoepting, C.A, S.K. Caldwell and S.L. Mertson. 2024. Evaluation of FRAC 3 fungicides for control of Botrytis leaf blight and Stemphylium leaf blight in onion, Elba, NY, 2023. Plant Disease Management Reports, 18: V114. https://doi-org.proxy.library.cornell.edu/10.1094/PDMR18.

Hoepting, C.A, S.K. Caldwell and S.L. Mertson. 2024. Evaluation of FRAC 3 fungicides for control of Botrytis leaf blight and Stemphylium leaf blight in onion, Wolcott, NY, 2023. Plant Disease Management Reports, 18: V116. https://doi-org.proxy.library.cornell.edu/10.1094/PDMR18.

Hoepting, C.A, S.K. Caldwell and S.L. Mertson. 2024. Evaluation of fungicide tank mixes for control of Botrytis leaf blight and Stemphylium leaf blight in onion, Wolcott, NY, 2023. Plant Disease Management Reports, 18: V118. https://doi-org.proxy.library.cornell.edu/10.1094/PDMR18.

Hoepting, C.A. and S.K. Caldwell. 2024. Effect of pulling onions early and fast curing with artificially heated forced air on a drying wall in a box storage on bacterial bulb rot in onion, 2023. Plant Disease Management Reports, 18: V113.

Hoepting, C.A., N.K. Gropp and S.K. Caldwell. 2024. Evaluation of two phenotypic screening assays for bacterial bulb rot of onion, Elba, NY, 2022-2023. Plant Disease Management Reports, 18: V112.

Koirala, S. Shin, G. Y., Kvitko, B., and Dutta, B. 2024. Integrating biocontrol agents with copper for center rot management in onion. Crop Protection (in press)

Komondy, L., M. Fuchs, and B. A. Nault. 2024. Localization of Iris yellow spot virus in naturally infected onion plants: A sampling approach for reliable diagnosis. Plant Health Progress https://doi.org/10.1094/PHP-05-24-0046-RS.

Komondy, L., C. Hoepting, S. J. Pethybridge, M. Fuchs, and B. A. Nault. 2024. Development of a sequential sampling plan for classifying Thrips tabaci (Thysanoptera: Thripidae) populations in onion fields. J. Econ. Entomol. https://doi.org/10.1093/jee/toae161.

Lenon, K.M., Dutta, B., Coma, M. Q., Johnson, W., and Schmidt, J. 2024. From weeds to natural enemies: implications of weed cultivation and biopesticides for organic onion production. Journal of Economic Entomology (in press)

Liakos, C., Ibanez, V., Lebre, P.H., Derie, M.L., van der Waals, J., du Toit, L.J., Dutta, B., Kvitko, B., Cowan, D.A., and Coutinho, T.A. 2024. The bacterial and viral communities associated with onion bacterial bulb rot. Phytobiomes Journal: accepted 14 May 2024.

Liakos, C., Ibanez, V., Lebre, P. H., Derie, M. L., Waals, J. L., duToit, L., Dutta, B., Kvitko, B., Cowan, D.A., and Coutinho, T.A. 2024. The bacterial and viral communities associated with onion bacterial bulb rot. Phytobiomes (in press).

Paudel, S., Zhao, M., Dutta, B., and Kvitko, B. 2024. Thiosulfinate tolerance gene clusters are common features of Burkholderia onion pathogens. Molecular Plant Microbe Interactions (first look) (Editor's Pick)

Paudel, S., Franco, Y., Zhao, M., Dutta, B. , Kvitko, B.H. 2025. Distinct Virulence Mechanisms of Burkholderia gladioli in Onion Foliar and Bulb Scale Tissues. Molecular Plant-Microbe Interactions https://doi.org/10.1094/MPMI-10-24-0129-R.

Paudel, S., Dutta, B., and Kvitko, B. 2024. Onion pathogenic Burkholderia species: Role and regulation of characterized virulence determinants. Plant Pathology (in press)

Qian, Y., Hua, G.K.H., Dung, J.K.S., and Qian, M. 2024. Encapsulation of garlic oil and diallyl disulfide with β-cyclodextrin for white rot control in Allium crops. Crop Protection 178:106597. https://doi.org/10.1016/j.cropro.2024.106597.

Racine, J., Nerney, A., Kilgore, S., Waters, T., Critzer, F., Harris, L. J., Reitz, S., and Waite-Cusic, J. 2024. Escherichia coli Survival on Dry Bulb Onions Treated with Crop Protection Sprays Prepared using Contaminated Water in the Treasure Valley Growing Region. Journal of Food Protection. 87: 100373 https://doi.org/10.1016/j.jfp.2024.100373.

Salgado, L. D., L. A. Rosen, O. Vetrovec, N. Hessler, P. Wang, A. G. Taylor, and B. A. Nault. 2025. Practical resistance to spinosad in an onion maggot (Diptera: Anthomyiidae) population in New York. J. Econ. Entomol., toaf057, https://doi.org/10.1093/jee/toaf057.

Sharma, S. and C.S. Cramer. 2024. Validating single nucleotide polymorphism markers for Fusarium basal rot resistance in short-day onion cultivars through kompetitive allele-specific PCR. Crop Breed. Genet. Genom. 6(3):e240006. https://doi.org/10.20900/cbgg20240006.

Sharma, S., S. Mandal, and C.S. Cramer. 2024. Recent advances in understanding and controlling Fusarium diseases of Alliums. Horticulturae 10:527. https://doi.org/10.3390/horticulturae10050527.

Shin, G.Y., Asselin, J.A., Smith, A., Aegerter, B., Coutinho, T., Zhao, M., Dutta, B. , Mazzone, J., Neupane, R., Gugino, B., Hoepting, C., Khanal, M., Malla, S., Nischwitz, C., Sidhu, J., Burke, A.M., Davey, J., Uchanski, M., Derie, M.L., Toit, L.J.D., Stresow-Cortez, S., Bonasera, J.M., Stodghill, P., Kvitko, B. Plasmids encode and can mobilize onion pathogenicity in Pantoea agglomerans. The ISME Journal 19:1

Thapa S., du Toit L., Waters T., Derie M., Schacht B., and G.T. LaHue. Effects of irrigation frequency on onion bacterial bulb rot in the Columbia Basin of Washington State, 2023-24. Plant Disease Management Reports. 18:CF075.

Thapa S., du Toit L., Waters T., Derie M., Schacht B., and G.T. LaHue. Effects of nitrogen management on onion bacterial bulb rot in the Columbia Basin of Washington State, 2023-24. Plant Disease Management Reports. 18:CF076.

Valenzuela, M., MacLellan, M.P., Guajardo, J., Dorta, F., Seeger, M., and Dutta, B., 2024. First Report of Erwinia aphidicola causing bulb rot of Onion in Chile. Plant Disease 108(9): 2915.

Wilson, R. G., Aegerter, B. J., & LaHue, G. (2024). The Influence of Sprinkler and Drip Irrigation on the Incidence and Severity of Bacterial Disease in Onions Grown in Northeast California. Plant Health Progress, PHP-01. https://doi.org/10.1094/PHP-01-24-0002-RS

b) Abstracts and Papers at International/National Professional Meetings

Komondy, L., and B. A. Nault. 2024 Improving onion thrips management: Developing machine learning-enhanced, spatially optimized sequential sampling plan. In Member Symposium: Metamorphosis- From John Henry Comstock Award Winners to Future Leaders in Entomology. Entomological Society of America Annual Meeting, Phoenix, AZ, November 12, 2024.

Komondy, L., and B. A. Nault. 2024. Development of a sequential sampling plan for surveilling onion thrips in onion to reduce sampling effort involved in management decision-making. XXVII International Congress of Entomology, Kyoto, Japan. August 25–30.

Komondy, L., and B. A. Nault. 2024. Optimizing early-season control of iris yellow spot virus transmission: A targeted spray program for enhanced efficacy against adult onion thrips. Entomological Society of America Eastern Branch Meeting, Morgantown, West Virginia, USA. March 10, 2024. (Note: Awarded First Place in the Ph.D. Student Competition 10-minute paper).

Neupane, R., J.D. Mazzone, C.A. Hoepting, B.K. Gugino. 2024. Peeling the rotten onion: A three-year bacterial survey of onion fields across Pennsylvania and New York. (Abstr.) Phytopathology 114:S1.148.

Pineros-Guerrero, N., Hay, F. S., Heck, D. W., Klein, A., Hoepting, C., and Pethybridge, S. J. 2024. Determining the contribution of onion volunteers to the population

genetics of Stemphylium vesicarium in New York, USA, using microsatellite markers. Proc. APS North-East Division Meeting, Ithaca, NY. Pp. 10. 6 March 2024.

Salgado, L. D, A. G. Taylor, R. G. Wilson, and B. A. Nault. 2024. Performance of insecticide seed treatments for managing Delia spp. (Diptera: Anthomyiidae) in onion fields (poster). XXVII International Congress of Entomology, Kyoto, Japan. August 25–30.

c) Presentations at Grower Meetings and Field Days

Cramer, C.S. Onion leaf wax and thrips feeding preference. 2024 NMSU Onion Research Workshop, Las Cruces, NM, 5 June 2024.

Dung: Evaluation of Encapsulated Sclerotial Germination Stimulants for White Rot Management. California Garlic and Onion Symposium, 2024. February 12, 2024. Tulare, CA.

du Toit, L.J. 2024. Soilborne plant disease control – Best practices. Invited presentation, Pest Management Session, Pacific Northwest Vegetable Association Annual Convention & Trade Show, 13-14 Nov. 2024, Kennewick, WA (~250 people)

du Toit, L.J. 2024. Stop the Rot: Overview of the national onion bacterial project. Invited presentation, Onion Session, Pacific Northwest Vegetable Association Annual Convention & Trade Show, 13-14 Nov. 2024, Kennewick, WA (~250 people)

du Toit, L.J. 2024. Stop the Rot: 2023-24 Trial results for Columbia Basin onion growers. Invited presentation, Onion Session, Pacific Northwest Vegetable Association Annual Convention & Trade Show, 13-14 Nov. 2024, Kennewick, WA (~250 people)

du Toit, L.J. 2024. Black mold. Invited presentation to KORKOM onion growers' association in Western Cape, South Africa. 20 Sep. 2024, online (35 people)

du Toit, L.J. 2024. "Stop the Rot": Grower-relevant results from a national onion bacterial project. Invited 2-h presentation and discussion with Wisconsin muck onion growers, 25 Mar. 2024, online, OR (10 people)

du Toit, L.J. 2024. Conquering recalcitrant diseases using the art and science of plant pathology. Invited seminar to Dept. of Plant Pathology, The Ohio State University, 12 Feb. 2024, Columbus, OH. (~60 people)

du Toit, L.J. 2024. Applied outcomes and practical solutions from emerging from the 'Stop the Rot' onion bacterial project. Invited presentation, Wisconsin Muck Farmers' Association Annual Research Meeting and Wisconsin Potato and Vegetable Growers' Annual Meeting, 7 Feb. 2024, online presentation. (22 people)

du Toit, L.J. 2024. "Stop the Rot": Grower-relevant results from a national onion bacterial project. Invited presentation, Annual Meeting of Idaho-Malheur Co. Onion Grower Association, 6 Feb. 2024, Ontario, OR (~150 people)

du Toit, L.J. 2024. Stop the Rot: A national effort to minimize the impact of onion bacterial diseases. Invited presentation to vegetable seed industry personnel, followed by discussions on disease management in vegetable seed crops, 31 Jan. 2024, Oudtshoorn, South Africa. (70 people)

du Toit, L.J. 2024. Stop the Rot: A national effort to minimize the impact of onion bacterial diseases. Invited presentation to du Toit Farms production team, followed

by general discussion on onion disease management, 30 Jan. 2024, Ceres, South Africa. (20 people)

du Toit, L.J. 2024. Stop the Rot: A national effort to minimize the impact of onion bacterial diseases. Invited presentation to KORKOM Onion Producers', followed by general discussion on disease management in onion crops, 30 Jan. 2024, Ceres, South Africa. (25 people)

du Toit, L.J. 2024. Stop the Rot: A national effort to minimize the impact of onion bacterial diseases. Invited presentation to Northern Cape Onion Producers' Association, followed by general discussion on disease management in onion crops, 29 Jan. 2024, Kimberly, South Africa. (60 people)

du Toit, L.J. 2024. Stop the Rot: A national effort to minimize the impact of onion bacterial diseases. Invited presentation to ZZ2 Farms production team, followed by general discussion on vegetable disease management, 27 Jan. 2024, Mooketsi, Limpopo Province, South Africa. (15 people)

du Toit, L.J. 2024. Conquering recalcitrant diseases using the art and science of plant pathology. Keynote presentation, 53rd Congress of the Southern African Society of Plant Pathology, 22-25 Jan. 2024, Golden Gate National Park, South Africa. (150 people)

du Toit, L.J. 2023. 'Stop the Rot' and other onion disease research at WSU. Invited presentation to AusVeg and HortInnovation meeting with onion growers/stakeholders in South Australia, 27 Nov. 2023, Murray Bridge, Australia. (35 people)

du Toit, L.J. 2023. Stakeholder engagement in research and extension programming: An essential aspect of management recalcitrant plant diseases. Invited presentation, 2023 Conference of the Australasian Plant Pathology Society, Adelaide, Australia, 20-24 Nov. 2023. (~250 people)

du Toit, L.J. 2023. Late season fungal and bacterial diseases of onion. Invited presentation, Onion Session, Pacific Northwest Vegetable Association Annual Convention & Trade Show, 15-16 Nov. 2023, Kennewick, WA. (~250 people)

du Toit, L.J. 2023. Stemphylium leaf blight of onion – Biology and control. Invited presentation, Onion Session, Pacific Northwest Vegetable Association Annual Convention & Trade Show, 15-16 Nov. 2023, Kennewick, WA. (~250 people)

du Toit, L.J. 2023. Environmental influences on plant diseases in the Pacific Northwest. Invited presentation, WSU Research Symptosium on "Integrated Pest Management in a Changing Climate", Tilth Conference, 26-28 Oct. 2023, Port Townsend, WA. (~70 people)

Field Day: Snake River Weed Control Tour, June 19, 2024. Ontario, OR.

Field Day: Malheur Experiment Station Summer Field Day, July 10, 2024. Ontario, OR.

Field Day: Malheur Experiment Station Onion Field Day, August 28, 2024. Ontario, OR.

Hay, F.S., Hoepting, C., Grundberg, E., Klein, A. 2024. Assessing and reducing the impact of plant-parasitic nematodes on onion production in New York. Feb. 26, 2024. Presentation to Onion Research Development Program Committee. Speaker, 20 minutes. Attendees: 10.

Hay, F.S. 2024. Agriculture in New York State. Invited speaker Onions, N.Z. Pukekohe Research Station, Pukekohe, New Zealand. Jan. 17, 2024. Speaker 20 minutes. Attendees: 20.

Hay, F.S., Hoepting, C., Heck, D., Klein, A., Pethybridge, S.J. 2024. Stemphylium leaf blight – a continually evolving problem for onion growers in New York. Invited speaker Onions, N.Z. Pukekohe Research Station, Pukekohe, New Zealand. Jan 17, 2024. Speaker, 60 minutes. Attendees: 20.

Hay, F.S., Hoepting, C., Heck, D., Klein, A., Pethybridge, S.J. 2024. Stemphylium leaf blight – a continually evolving problem for onion growers in New York. Invited speaker Onions, N.Z. Ashburton Hotel. Jan 19, 2024. Speaker, 60 minutes. Attendees: 20.

Hoepting, C.A. 2024. Finishing strong: Harvest practces that reduce bacterial bulb rot. Empire State Producers Expo, Syracuse, NY. January 24, 2024 (30 minutes) – 24 attendees.

Hoepting, C.A. 2024. Managing Stemphylium leaf blight of onion with emerging fungicide resistance in New York. Wisconsin Onion Muck Meeting. Virtual Zoom: February 7, 2024 (30 minutes) – 22 attendees.

Hoepting, C.A. 2024. Refining fungicide programs for Stemphylium leaf blight management in onion. Orange County Onion School. Pine Island, NY: February 28, 2024 (30 minutes) – 50 attendees.

Hoepting, C.A. 2024. Stop the Rot Finale: Progress towards understanding and managing bacterial bulb rot in onion. Orange County Onion School. Pine Island, NY: February 28, 2024 (30 minutes) – 50 attendees.

Hoepting, C.A. 2024. Preparing for Optogen herbicide in New York: A review of bicyclopyrone weed control in onion. Orange County Onion School. Pine Island, NY: February 28, 2024 (30 minutes) – 50 attendees.

Hoepting, C.A. 2024. Stop the Rot Finale: Progress towards understanding and managing bacterial bulb rot in onion. Oswego Muck Onion Pre-Season Meeting, Phoenix, NY: March 20, 2024 (45 minutes) – 24 attendees.

Hoepting, C.A. 2024. Stop the Rot Finale: Progress towards understanding and managing bacterial bulb rot in onion. Elba muck Onion Pre-Season Meeting, Elba, NY: March 29, 2024 (45 minutes) – 13 attendees.

Hoepting, C.A. 2024. 2023 research highlights and new recommendations for Stemphylium leaf blight and Botrytis leaf blight in onion. Annual Muck Onion Twilight Meeting in Oswego Co. Oswego, NY: June 20, 2024 (45 minutes) – 69 attendees.

Hoepting, C.A. 2024. Onion herbicide trial tour featuring pre- and post-emergent control of marsh yellowcress, Lamb's quarters and ragweed2023 research highlights and new recommendations for Stemphylium leaf blight and Botrytis leaf blight in onion. Annual Muck Onion Twilight Meeting in Oswego Co. Oswego, NY: June 20, 2024 (60 minutes) – 69 attendees.

LaHue, G.T., Thapa, S., du Toit, L.J., and Waters, T. 2024. Irrigation management impacts on onion bacterial bulb rot. WSU Onion Field Day, Prosser, WA, August 29th, 2024.

Nault, B.A. 2024. Onion maggot management update. Oswego Onion Growers Winter Meeting. Oswego, NY. December 12, 2024. Speaker, 20 minutes. Attendees: 25.

Nault, B. A., and L. Salgado. 2024. Onion insect pest management update featuring seed treatment combinations for onion maggot control. 2024 Muck Onion Growers Twilight Meeting in Oswego. Cornell Cooperative Extension, Cornell Vegetable Program. Oswego, NY. June 20, 2024. Speaker, 40 minutes. Attendees: 75.

Nault, B.A. 2024. Controlling onion maggot with seed treatments. Muck Grower Information Days (Ontario, Canada). Virtual. April 4, 2024. Speaker, 25 min. Attendees: N/A

Nault, B. A., and L. Komondy. 2024. Onion thrips and IYSV management update. Elba Onion Growers Preseason Meeting. Cornell Cooperative Extension, Cornell Vegetable Program. March 29, 2024. Speaker, 60 minutes. Attendees: 12.

Nault, B. A. 2024. Seedcorn maggot, onion maggot, and onion thrips management updates for 2024. 2024 Orange County Onion School. Cornell Cooperative Extension Eastern New York Commercial Horticulture Program. Pine Island, NY. February 28, 2024. Speaker, 60 minutes. Attendees: 60.

Nault, B.A. 2024. Insect management (Onion Session). Empire State Producer's EXPO. New York Vegetable Growers Association. Syracuse, NY. January 24, 2024. Speaker, 30 minutes. Attendees: 35.

Nault, B. A. 2024. Seeking alternatives to neonicotinoid insecticides for insect pest management in vegetable crops. New York State Agriculture and Markets Review of CALS Research. Geneva, NY, Speaker, 15 minutes.

Neupane, R.C, and Gugino, B. 2024. Peeling the rotten onion: Bacterial diseases and copper bactericides. Mid-Atlantic Fruits and Vegetable Growers Convention, 31 January 2024, Hershey, Pennsylvania.Putman, A.I. Evaluation of weather-based models for management of onion downy mildew. California Garlic and Onion Symposium, UC Cooperative Extension, February 12 2024, Tulare, CA.

Putman, A.I. Downy mildew diseases of vegetables. Vegetable Production and IPM Workshop, UC Cooperative Extension Imperial County, February 28 2024, Imperial, CA.

Putman, A.I. Overview of onion and garlic diseases. Onion and Garlic Production Meeting, UC Cooperative Extension Riverside County, October 17 2024, Blythe, CA.

Reitz: Thrips Management and the Impact of Thrips on Stemphylium Leaf Blight and Bulb Rots. Idaho-Malheur County Onion Growers Meeting, February 6, 2024. Ontario, OR.

Reitz: What you cannot see is harming your onions: Wireworms, Maggots, and Bulb Mites. Idaho-Malheur County Onion Growers Meeting, February 6, 2024. Ontario, OR.

Reitz: Onion Thrips Management in Dry Bulb Onions. Pacific Northwest Vegetable Association, November 13, 2024. Kennewick, WA.

Schutte, B. Improving weed control programs for onions. 2024 NMSU Onion Research Workshop, Las Cruces, NM, 5 June 2024.

Sharma, S. and C S. Cramer. Breeding for Fusarium basal rot resistance. 2024 NMSU Onion Research Workshop, Las Cruces, NM, 5 June 2024.

Thapa, S., du Toit, L.J., Waters, T., and LaHue, G.T. 2024. Irrigation management: An inexpensive way to reduce the risk of bacterial rot of onions grown in the Columbia Basin of Washington State. Oral and poster presentation at the 2024 ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX, November 12th, 2024.

Thapa, S., du Toit, L.J., Waters, T., and LaHue, G.T. 2024. Stop the Rot: Revisiting nitrogen fertility practices in onion production in the context of bacterial diseases. Oral and poster presentation at the 2024 ASA, CSSA, SSSA International Annual Meeting, San Antonio, TX, November 11th, 2024.

Thapa, S., du Toit, L.J., Waters, T., and LaHue, G.T. 2024. Nitrogen management impacts on onion bacterial bulb rot. WSU Onion Field Day, Prosser, WA, August 29th, 2024.

Waters, T. D. 2024. Seedcorn Maggot Control in Onions. Pacific Northwest Vegetable Association Annual Meeting, Kennewick, WA. (November 13, 2024). Invited.

Waters, T. D. 2024. Potato and Onion Insect Management Update. Agrinorthwest Agronomy Update, AgriNorthwest Farms, Plymouth, WA. 14 Feb. 2024. Invited.

Waters, T.D., and du Toit, L.J. 2023. 'Stop the Rot' onion bacterial project: Grower-relevant results. Invited presentation, Onion Session, Pacific Northwest Vegetable Association Annual Convention & Trade Show, 15-16 Nov. 2023, Kennewick, WA. (~250 people)

Woodhall, J., Onion diseases update. Idaho Onion Growers Association and Malheur County Onion Growers Association conference. Ontario, OR. Feb. 6, 2024

Woodhall, J., Updates on Stemphylium leaf blight. Idaho Onion Growers Association and Malheur County Onion Growers Association conference. Ontario, OR. Feb. 6, 2024

Woodhall, J., Fungicide resistance. Idaho IPM webinar. 2024.

d) Newsletter Articles

du Toit, L.J. Abnormal onion development from the wide temperature swing in April 2023, resembling herbicide injury. Veg Edge 20(13):5 (26 Jun. 2024).

Hoepting, C.A. 2024. Controlling volunteer potato in onion: Start Early! Cornell Cooperative Extension – Cornell Vegetable Program Extension Grower newsletter, Veg Edge, 20(7): 1, 3-4 (cover story) (May 15, 2025).

Hoepting, C.A. and F.S. Hay. 2024. Stemphylium leaf blight (SLB) of onion 2023 research highlights and implications for management in 2024: Part I – The FRAC 3 situation. Cornell Cooperative Extension – Cornell Vegetable Program Extension Grower newsletter, Veg Edge, 20(14): 8-10 (July 10, 2024).

Hoepting, C.A. and F.S. Hay. 2024. Stemphylium leaf blight (SLB) of onion 2023 research highlights and implications for management in 2024: Part II – Piecing together tank mixes with low-risk mediocre products (FRAC M5, 2, 12, 19, P07). Cornell Cooperative Extension – Cornell Vegetable Program Extension Grower newsletter, Veg Edge, 20(15): 9-10 (July 17, 2024).

Hoepting, C.A. and F.S. Hay. 2024. Botrytis leaf blight (BLB) necrotic spots of onion are driving us crazy! But they are important and can be controlled with fungicides.

Cornell Cooperative Extension – Cornell Vegetable Program Extension Grower newsletter, Veg Edge, 20(16): 8-10 (July 24, 2024).
Hoepting, C.A. 2024. How much rot you got? Pre-harvest assessment of bacterial bulb rot in onion and management options. Cornell Cooperative Extension – Cornell Vegetable Program newsletter, Veg Edge, 20(20): 6-8 (August 21, 2024).
Neupane, R., J.D. Mazzone, and B.K. Gugino. 2024 Rotten to the Core: The Center Rot Disease of Onion. Penn State Extension. https://extension.psu.edu/rotten-to-the-core-the-center-rot-disease-of-onion

e) Other (e.g. Youtube videos etc.)

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W4008 2025 Annual Meeting Notes
Tuesday, February 11th, 2025 (11:30 AM – 2:00 PM Pacific Time)
Notes taken by Rob Wilson (Vice Chair)

- General business:
  - New Member: Eunsook Park new W4008 member from Wyoming
  - Update from Emmanuel (National leader for NIFA group) - Really no updates at this time due to government review. Waiting for updates and collaboration. There is a link that can provide updates on the review. Link sent to Gabe. Gabe shared link in chat. No updates on status of SCRI new proposal deadlines and review process. Review panels are suspended.
- CA Update - Wilson and Putnam
  - Insect pests
    - Seedcorn maggot research in Tulelake, Wilson UC IREC (new active ingredients and new company products)
    - Reports of maggot and thrips problems in Low Desert Imperial Valley production Region
    - Reports of bulb mites in onions in Central Valley
  - Disease
    - Wrapping up Stop the Rot bacterial disease project (statewide)
    - Downy Mildew research by Dr. Putnam, UC Riverside and Dr. Pastrana Leon, UCCE in low desert
    - Fusarium in Onion and Garlic led by Dr. Swett, UC Davis (preliminary identification investigations and start of management work)
    - Impact of irrigation on downy mildew management in the low desert Dr. Montazar, UCCE
  - Weeds
    - Alternative herbicide options to replace Dacthal , Wilson, UC IREC (Tulelake)
- Georgia Update - Bhabesh Dutta
  - Botrytis leaf blight widespread- screen fungicides; loss efficacy of merivon and scala; recommending luna flex for resistant management
  - Downy mildew was found but managed well by growers. Several fungicides were effective in trial.
  - 100% of soil samples had *Burkholderia* species but not all species are pathogenic.
  - Copper products are equally effective in reducing center rot but not sour skin
  - Lifegard can be rotated with copper to reduce center rot severity
  - Dr. Jake Fountain working on black mold in Vidalia onions
  - New Horticulture extension agent McAvoy working on cultural management for management of bacterial disease

    - Luan Pereira de Oliveira, working on precision agriculture work with pest management in onions
    - New vegetable entomologist, thrips and insecticide efficacy trials
- Jane Davy, Colorado Update
    - Not much work in the last 12 months; some screening of Fusarium bulb rot from CO onions in storage; Onion acreage down
- Brenda Schroeder, Idaho Update
    - Reporting for James Woodhall and Mike Thornton
    - Brenda working on post harvest bulb rot and coinfection studies on how pathogens work together and individually and big picture of how storage curing affects disease.
    - Mike worked on how soil temperature affects bulb size and yield; treatments that cool the soil increase yield and size; treatments that cool soil have less decay. Biochar increased soil temp. and increased decay
    - Fungicide work on pink root;
    - James is looking at chemical and biological control of bacterial pathogens
- Michigan - No rep.
- New Mexico, Chris Cramer
    - Cramer looking at thrips and iris yellow spot and variety susceptibility
    - Cramer working on fusarium basal rot and variety resistance; some varieties appear to have resistance/less severe infection severity
    - Brian Schrudy and Cramer looking use of pendimethalin at 75% radical emergence; good crop safety and good weed control
- New York, Chisty Hoepting
    - Weed control of volunteer potatoes
    - Thrips pressure and quick accumulation of degree days
    - Got rain that can increase bacterial rot
    - Nault evaluated insecticide seed treatments for control of maggots
    - Nault evaluated insectides for onion thrips management
    - Carbon robotic laser weeder testing
    - Onion disease research Stemphylium leaf blight fungicide spray trials;
    - Optogen 3.5 fl oz post + buctril providing good control of emerged weeds; Hoepting
- Oregon, Jeremiah Dung
    - Ontario crop report, lower yields, low levels of thrips, some bacterial problems, wildfire smoke affected production
    - Gina Greenway looking at factors affecting disease free yield of white rot; fungicides seem to be most effective factor to increasing disease free yield
    - Dung, impact of DADS on soil microbial communities
    - Joel Felix, Carbon robotic laser weeder; comparison of herbicide with laser weeder; observation laser worked well on broadleaf weeds; laser did work well on high weed density; Optogen caused a lot of injury; delayed preemergent with Optogen seems to work ok; ET defoliant using it on onions

    - at the 2-leaf stage; Nimitz application before nutsedge emerges gave good control; Nimitz will not be labeled on onions according to Adama;
    - Rob made the suggestion of trying to do some regional evaluations of herbicides in onions.
    - Tim mentioned the evaluation of Eco robotic machines and smart sprayers
- Pennsylvania - Beth Gugino
    - Revising Stop the Rot survey
- Subas - Texas update
    - Thrips studies on identification and insecticide efficacy
    - Pink root screening
- Claudia Nischwitz - Utah update
    - Hail damage on onions
    - Little research update
- Tim Waters- Washington
    - Fusarium, onion thrips management
    - Directed sprays with robotic weeders and delayed pre-emergent herbicides
    - Plant pathogen research with onion bacterial diseases
    - Mike Derie retired
- Eunsook Park
    - No onions in Wyoming
    - Cell biologist
    - Update on research related to onions
- Nominations for Secretary
    - Subas Malla nominated as secretary
    - Hawaii possible meeting location for 2025 and NOAA NARC