International Congress of Plant Pathology
21-25 August 2023, Lyon, France

Stop the Rot

Combating Onion Bacterial Diseases with Pathogenomic Tools and Enhanced Management Strategies

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https://alliumnet.com/projects/stop-the-rot/
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USDA NIFA SCRI Project No. 2019-51181-30013

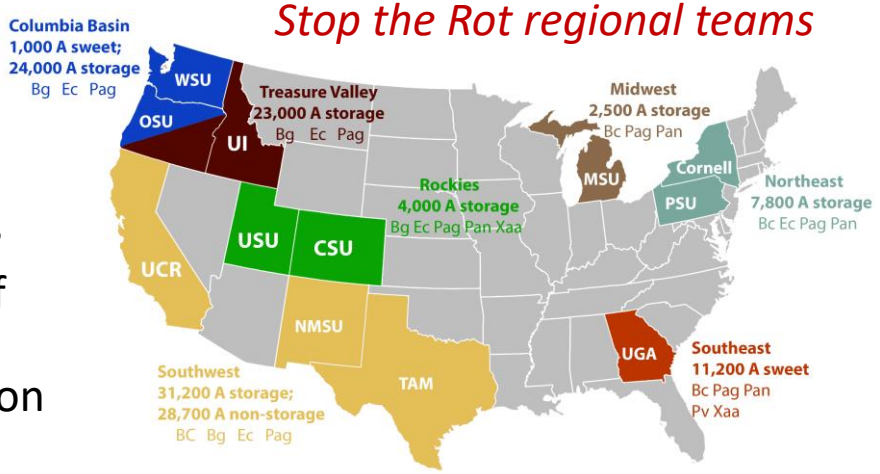
United States Department of Agriculture | National Institute of Food and Agriculture

Onions in the USA

- ~56,600 ha; farmgate value of ~$925M
- Bacterial diseases occur across regions of onion production in the USA
- Onion bacterial diseases are difficult to manage:
  - Lack of effective, rapid detection methods
  - Poor understanding of the genetic basis of pathogenicity, and the epidemiology of complexes of bacteria associated with onion
  - Few/no resistant onion cultivars
  - No systemic, curative, highly effective bactericides

~$60 million in losses to bacterial diseases of onion annually in USA

Stop the Rot regional teams



Stop the Rot Project Overview

Objective A: Onion bacterial disease characterization

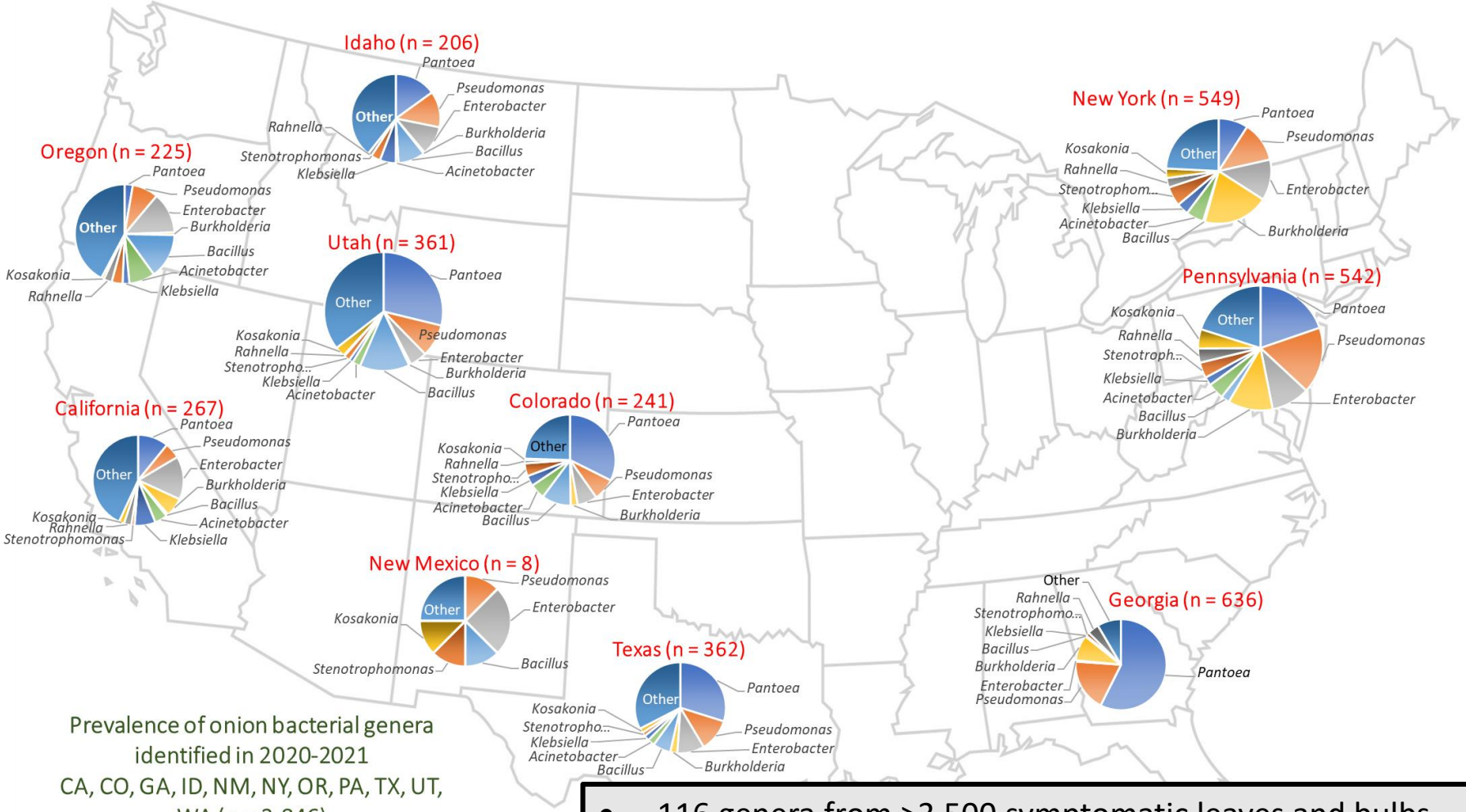
National survey & comparative genomics of onion bacterial pathogens

- Identify virulence factors of strains pathogenic on onion
- Develop practical, molecular diagnostic tools
- Develop phenotypic resistance screening methods
- Build and curate a National Onion Bacterial Strain Collection to support research and diagnostics

Objective B: Onion bacterial disease management

Identify onion production practices, environmental factors, & inoculum sources that impact bacterial diseases

- Use this knowledge to develop effective, practical solutions to manage bacterial diseases & predict the risk of bacterial bulb rot
- Economic assessment of management practices & recommendations – **Stakeholder Advisory Panel**
- Extension & outreach strategy – share the knowledge



- 116 genera from >3,500 symptomatic leaves and bulbs.
- Prevalent genera: *Pantoea*, *Pseudomonas*, *Burkholderia*, *Enterobacter*, and *Bacillus*.
- Strains of very few genera are pathogenic to onion.
- HiVir gene cluster correlated with pathogenicity to onion in *Pantoea* spp.
- Copper tolerance genes detected in ~50% of *Pantoea agglomerans* strains

Stop the Rot: Enhanced Management Strategies

Irrigation Trials

- Drip irrigation decreased bulb rot by 97% vs. sprinkler irrigation
- Late termination of irrigation increased bacterial bulb rot by ~20%

Fertility Trials

- Applying nitrogen after bulb initiation increased bacterial bulb rot
- Rates of nitrogen application did not affect bacterial bulb rot

Chemical Trials

- Cu bactericides had good efficacy in Georgia but poor efficacy in western states
- Copper tolerance genes detected in ~50% of *Pantoea agglomerans* strains from western states
- Postharvest applications of peroxyacetic acid + hydrogen peroxide or ozone to bulbs did not control bacterial rot in storage

Cultural Practices

- Harvest with a chain digger reduced bulb rot 56-88% vs. a blade undercutter
- Mechanical harvest reduced bulb rot 50-90% vs. manual harvest
- Topping bulbs with longer necks reduced bulb rot ~80% compared to short necks when the necks are still green and moist
- Late topping of bulbs decreased bulb rot by ~30% compared to early topping
- Early undercutting of bulbs decreased bulb rot by ~12% vs. late undercutting