

## Soilborne Disease Research Program

### A. Mission

To provide research information to New Mexican producers and processors for minimizing the impact of soilborne diseases and maintaining sustainable and profitable crop production.

### B. Justification and Objectives

Cash crops such as chile, onion, peanut, cucurbits, and cotton generate annually more than \$200 millions dollars to the state of New Mexico. Currently, production is significantly reduced by soilborne diseases such as Phytophthora blight, Verticillium wilt, and bacterial leaf spot on chile pepper; Verticillium wilt and rust on cotton, bulb basal rot, pink root, and black mold on onion; Sclerotinia blight and pod rot on peanut; and bacterial wilt on cucurbits. These soilborne diseases can wipe out crops and reduce yield up to 100%, therefore limiting monetary returns to producers and revenues to New Mexico.

It is imperative to mitigate these disease problems in order to maintain a viable vegetable and field crop production systems in New Mexico. The Soilborne Disease Program is at the forefront of tackling soilborne disease problems in New Mexico crops. The research approach used is tailored towards a better ecological understanding of soilborne diseases and their causal agents, and the utilization of ecological-based knowledge to reduce damages caused by soilborne pathogens.

Very little is known about the collective biology and management of soilborne diseases of crops grown in New Mexico. Basic knowledge on diversity of pathogenic populations, responses to abiotic factors, and interspecific microbial interactions is needed in order to enhance or develop management strategies of soilborne diseases in New Mexico crops. Elucidation of diversity in pathogenic populations will be of benefit in identifying sources of resistance and breeding cultivars for resistance to soilborne diseases. Ecological studies on the response of soilborne pathogens to physical and biological factors will provide a solid foundation for designing efficient methods for managing soilborne diseases. The Soilborne Disease Research Program is focused on three objectives:

- 1) To characterize populations of microorganisms associated with fungal and bacterial diseases of vegetable crops and field crops
- 2) To assess the effect of physical and biological factors on mycelial and bacterial plant pathogens.
- 3) To develop/evaluate management strategies for mycelial and bacterial plant pathogens.

### C. Examples of Past Projects

- Effects of edaphic factors such as salinity, soil water saturation, and soil chemical composition on the phenology of *P. capsici* and infection of pepper.
- Biological interactions of *P. capsici* with other pathogenic microorganisms such as *Verticillium dahliae* and their impact on pepper.
- The relationship between heat level and Phytophthora blight on pepper.
- Weeds as hosts of *Verticillium dahliae*.
- Utilization of swine manure and rice residues for suppression of Phytophthora fruit rots in vegetables in Nueva Ecija, Philippines.
- Incidence of Phytophthora blight and Verticillium wilt in chile pepper fields in New Mexico.

- Efficacy of biorationals in control of *Phytophthora* blight of chile pepper and peanut pod rot.
- Etiology of head rot of sunflower, and *Sclerotinia* blight of Valencia peanut in New Mexico.
- Characterization of bacterial leaf spot and fruit spot of chile pepper.

#### **D. Current Projects**

- Characterization of race structure of *Phytophthora capsici* in chile pepper.
- Use of green manures from graminaceous crops for control of *Phytophthora* blight and *Verticillium* wilt on chile pepper.
- Chile pepper yield decline and subclinical fungal infections.
- Interactions between *Verticillium dahliae* and root-knot nematode on chile pepper and weeds.
- Etiology of bacterial wilt and anthracnose of cucurbits, pepper anthracnose, and soft rot of onion.
- Chemo-fumigation and biofumigation for control of *Verticillium* wilt and *Phytophthora* blight on chile pepper.
- Evaluation of Valencia peanut germplasm for resistance to pod rot and *Sclerotinia* blight.
- Identification of microorganisms associated with alfalfa root rot.
- Use of botanical extracts for control of soilborne diseases.

#### **E. Outcomes/Impacts**

The outcome of the Soilborne Disease Research Program is to provide New Mexico producers with tools and knowledge to preserve the integrity of the environment in identifying optimal timing of control interventions. The impact of the research is to lessen damage by soilborne diseases which will trickle into securing greater crop yield and revenues. Additional impact of this research is its contribution to fostering a climate of improved social welfare for producers and consumers in New Mexico and the U.S. In addition to benefiting New Mexico agricultural producers and industries, the Soilborne Research Program has a seamless impact on teaching and education of high school, undergraduate, and graduate students by providing training materials and projects to students.