Northern NY Agricultural Development Program
2017-2018 Project Report

Diagnosis and Assessment of Diseases of Field Crops in Northern New York

Project Leader:
- Michael Hunter, Regional Field Crops Specialist, Cornell University Cooperative Extension Northern New York Regional Ag Team, 203 North Hamilton Street, Watertown, NY 13601; meh27@cornell.edu; 315-788-8450

Collaborators:
- Gary Bergstrom, Department of Plant Pathology and Plant-Microbe Biology, Cornell University, Ithaca, NY 14853
- Kitty O'Neil, Cornell University Cooperative Extension, North Country Regional Ag Team
- Amanda Bond, Cornell University student intern

Cooperating Producer(s):
- **Clinton County:** Adirondack Farms, Miner Institute, Lance Rovers
- **Essex County:** Lee Garvey, George Sayward,
- **Franklin County:** Dick Eakins, Meiers Farm
- **Jefferson County:** Mike Gracey, North Harbor Farm, Dodge Farm, Hancor Farms, H. Wood Farm, Dale Morse, Fairlawn Farm, Morning Star Farm, Steve Lee, Lucky 7 Livestock Farm, Murrock Farm
- **Lewis County:** Beller Farms, Bob Martin, Terry Pominville, Conway Farms, Mike Nemuth, East View Grain, Peter Burkholder, Tim Brubaker, Emmanuel Widrick
- **St. Lawrence County:** Andy Hurlbut, Dave Stout, Loren Ortman, Ken Wilson, McKnight Farm

Background:
Corn for silage and grain is a foundational crop for the economic wellbeing of Northern New York (NNY) dairy and cash grain farms. Soybean shows great economic promise in NNY and the acreage of soybean in the region has expanded over the last decade.

Emerging and re-emerging plant diseases are a continual threat to the sustainability of these crops and the profit margin for crop producers is often a narrow one. Production of both corn and soybean is expanding to include more marginal, poorly drained soils in NNY and this raises questions about the impact of diseases in stressful environments.

New diseases arise and formerly minor diseases become more damaging on a regular basis. **Frogeye leaf spot**, **sudden death syndrome**, **brown stem rot**, and **soybean vein necrosis virus** were each confirmed in individual soybean fields in NNY in 2012, and **northern stem canker** in 2014 for the first time, yet we have no idea how widespread or severe these diseases may be across the breadth of NNY farms.

Gray leaf spot has become a highly damaging disease of corn in humid valleys in the Southern Tier and Hudson Valley regions of New York State; there are similar environments in parts of NNY yet gray leaf spot occurrence has not been detected. In 2013-2016, **northern corn leaf blight** was the dominant disease in corn fields throughout northern NY, indicating that it is widespread and undermanaged on many farms. However, in 2017, **northern corn leaf spot** was more commonly found than northern corn leaf blight. **Corn head smut** is a re-emerging disease of concern, which was identified in 2014, 2015, 2017 and 2018 in Jefferson County for the first time in the region since the 1980s. **Fusarium root rot** and **wilt of soybeans** was identified for the first time in 2015 and again in 2016. Potentially serious soilborne diseases of soybean, including **Phytophthora root rot** and **charcoal rot** were each confirmed for the first time in northern NY in 2016. In 2018, **downy mildew** and **septoria brown spot** were the most commonly identified diseases of soybeans throughout the region.

Prior to the inception of this survey in 2013, no systematic assessment of corn and soybean diseases had been made in NNY in recent decades and was long overdue. We proposed to the Northern New York Agricultural Development Program to continue this proactive disease assessment program to help protect the security and profitability of corn and soybean production in NNY. Results of this research are being used to map the distribution of corn and soybean diseases in NY and are made available to NY growers through extension outreach to aid in their management decisions. Educational materials on disease management are posted at fieldcrops.org.

This project has led to increased local knowledge of crop diseases by NNY growers. Northern NY farmers are increasingly faced with important management decisions that require knowledge of plant diseases, including:
1) What corn hybrids and soybean varieties should I grow? For what diseases do my crops need genetic resistance and at what levels in the hybrid or variety?
2) Should I apply a foliar fungicide(s)? Does the disease pressure in my field or in the general area warrant a chemical application?
3) What crop rotation sequences and tillage practices makes most sense for my farm?
4) Are plant disease organisms building up in my soil or crop debris such that I need to change my cropping sequence or tillage practices in particular fields?

The greatest needs for disease assessment and proper disease identification concern leaf blights, ear rots, and stalk rots of corn; and foliar blights, stem and root rots, pod rots and other systemic diseases of soybean.

Methods:
Disease symptoms were noted and quantified with representative diseased samples collected and submitted to the Bergstrom pathology lab at Cornell University by Cornell University Regional Field Crop Specialists Mike Hunter and Kitty O'Neil whenever the symptoms were found during routine visits to farms in Jefferson, Lewis, Clinton, Essex, Franklin, and St. Lawrence counties.

In addition, an intensive field survey/assessment was conducted for disease detection and diagnosis in 19 sentinel fields of corn and 18 sentinel fields of soybean, chosen to maximize diversity of environment and cropping practices in each county. Each sentinel field was assessed one to three times during the growing season to include various growth stages of the crop. The sentinel fields were monitored by Amanda Bond, Cornell University student intern, as well as Mike Hunter and Kitty O'Neil throughout the growing season.

In the Bergstrom Lab, samples were cultured for pathogen isolation, examined microscopically, and pathogens were identified. Results were collated and summarized and shared with individual producers via CCE educators and extension meetings. Important new disease findings are published through national databases and publications; pathogen isolates are archived in the Cornell University Field Crop Pathogen Culture Collection; and DNA sequences submitted to GenBank.

Results:
In 2018, seven corn diseases and six soybean diseases in total were identified and diagnosed among farm fields from the six counties surveyed.

Many growers are successfully growing varieties and hybrids with some level of disease resistance and have adopted fungicide programs to combat a number of foliar diseases. The variability of weather conditions from year to year underscores the need for multiyear surveys to better understand the breadth of diseases potentially present to affect growers in NNY. An example of a disease that caught many growers off guardacross New York State, including NNY, was **Anthracnose top dieback**. While we are familiar with **Anthracnose leaf blight** and **Anthracnose stalk rot**, we found a fair amount of Anthracnose top dieback, caused by the same fungal pathogen *Colletotrichum graminicola,* in corn fields in NNY in 2018.

Northern corn leaf blight was observed, though not universal and at low levels, in Northern New York corn fields in 2018. **Head smut** was observed again in 2018, and NNY growers should be aware of a potential resurgence of this disease which hasn't been a major concern for northern NY growers in almost three decades. **Eyespot**, caused by the fungus *Kabatiella zeae,* is a common corn disease and was observed in NNY corn fields. While not nearly as prevalent as 2017, we did observe **common rust** scattered

throughout the region. This season we also monitored corn fields later in the growing season for the occurrence of ear rots. In 2018, we identified **fusarium ear rot**, **penicilium ear rot** and **cladosporium ear rot**. These ear rots were found on corn ears that had feeding damage caused by the Western Bean Cutworm.

Sudden Death Syndrome (SDS), first found in NNY in 2012, was confirmed again in 2018 in a soybean field in Jefferson County. SDS is a fungal disease that also occurs in a disease complex with **Soybean Cyst Nematode** (SCN). Anytime we confirm SDS in a field we follow up with soil samples looking for the presence of SCN. Despite six years of surveying for the soybean cyst nematode, it has not yet been confirmed in the NNY counties. If soybean cyst nematode is confirmed in the region, this will have important implications for soybean production in NNY. More intense nematode assay survey will be warranted and affected farms will need to plant soybean varieties with resistance to the nematode if it is discovered. Other soybean diseases identified in 2018 **include downy mildew**, **white mold**, **septoria brown spot**, **anthracnose** and **phomopsis seed decay**. We continued to monitor a few soybean fields right up to harvest and this is how we confirmed the presence of phomopsis seed decay. Phomopsis seed decay, which wasn't unexpected given the rain as beans were drying down. This pathogen is related to those that cause northern stem canker and pod and stem blight. The disease can be enhanced by potassium deficiency in a field and insect feeding damage to pods followed by a delayed harvest.

Outreach:
The results from this on-farm research trial are being disseminated to crop growers, crop consultants, agribusinesses, and extension field crops staff members throughout Northern New York and through the CCE NCRAT agricultural newsletter and local crop meetings hosted by Cornell Cooperative Extension and agribusinesses.

For More Information:
- Mike Hunter, Regional Field Crops Specialist, Cornell University Cooperative Extension Northern New York Regional Ag Team, 203 North Hamilton Street, Watertown, NY 13601; meh27@cornell.edu; 315-788-8450

- Kitty O'Neil, Regional Field Crops Specialist, Cornell University Cooperative Extension Northern New York Regional Ag Team, 2043B State Hwy 68, Canton, NY 13617; kao32@cornell.edu; 315-379-9192