Northern New York Agricultural Development Program
2013 FINAL REPORT

Diagnosis and Assessment of Diseases of Corn and Soybean in Northern New York

Project Leader(s):

Gary C. Bergstrom, Department of Plant Pathology and Plant-Microbe Biology, Cornell University, 334 Plant Science Building, Ithaca, NY 14853-5904

Collaborator(s):

Mike Hunter, Cornell Cooperative Extension of Jefferson and Lewis Counties
Kitty O'Neil, CCE field crop extension specialist covering Clinton, Essex, Franklin, St. Lawrence counties
Xiaohong Wang, USDA-ARS and Cornell Department of Plant Pathology and Plant-Microbe Biology, Ithaca
Jaime Cummings, Research Support Specialist, Department of Plant Pathology and Plant-Microbe Biology, Cornell University, Ithaca.

Cooperating Producers:

Clinton County: Tetreault, Rovers
Essex County: George Sayward, Lee Garvey
Franklin County: Randy Ooms, Dick Eakins, Steve Gokey, Gary Monica, Fox
Jefferson County: North Harbor Farms, Fairlawn Farm, Darryl Murrock, Mike Gracey, Plessis Farm, Reedhaven Farm, Jeff Rudd, Morning Star Farm, H. Wood Farm
St. Lawrence County: Lee Garvey, Joe Hostetler, Decker

Background:

Corn for silage and grain is a foundational crop for the economic wellbeing of NNY dairy and cash grain farms. Soybean shows great economic promise in NNY and the acreage in the region is expanding rapidly. 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 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 NYS; there are similar environments in parts of NNY yet gray leaf spot occurrence and potential have not been assessed in NNY.

No systematic assessment of corn and soybean diseases has been made in NNY in recent decades and one is long overdue. We propose a proactive disease assessment program that will help protect the security and profitability of corn and soybean production in NNY. Results of this research will be used to start mapping the distribution of corn and soybean diseases in NY and will be made available to NY growers through extension outreach to aid in their management decisions. All educational materials will also be posted on the disease management section of fieldcrops.org.

Increased local knowledge of crop diseases is the main benefit expected from this project. Northern NY farmers are increasingly faced with important management decisions that require knowledge of plant diseases such as:

1) What corn hybrids and soybean varieties should I grow? What diseases do I need genetic resistance to 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? Are plant disease organisms building up in my soil or crop debris that suggests 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 rots, pod rots, viruses and other systemic diseases of soybean.

Methods:

Disease symptoms were noted and quantified, and representative diseased samples were collected and submitted to the Bergstrom lab, by CCE field crop educators and other collaborators whenever they were found during routine visits to farms by Mike Hunter in Jefferson and Lewis Counties, and by Kitty O'Neil in Clinton, Essex, Franklin, and St. Lawrence Counties.

In addition, an intensive field survey/assessment was conducted for disease detection and diagnosis in 14 sentinel fields of corn and 10 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.

Soil samples were collected at the end of the season from the majority of the sentinel fields and analyzed for presence of the soybean cyst nematode in Dr. Wang's USDA Laboratory at Cornell. Additional soil samples from other soybean fields in NNY were solicited and collected for analysis for presence of the soybean cyst nematode.

In the Bergstrom Lab at Cornell, samples were cultured for pathogen isolation, examined microscopically, and pathogens were identified. Results have been collated and

summarized and will be shared with individual producers via CCE educators and extension meetings. Important new disease finds will be published through national databases and publications; pathogen isolates archived in the Cornell University Field Crop Pathogen Culture Collection; and DNA sequences submitted to GenBank.

Results:

Figure 1 illustrates the locations of the fields inspected for this survey, and Table 1 summarizes the diseases found in each county. One corn disease and four soybean diseases in total were identified and diagnosed among farm fields from the five counties surveyed. No disease occurred at high severity. Northern corn leaf blight was observed in 8 of the 14 corn fields surveyed during August through October, though only at low to moderately low levels. White mold was identified in only one soybean field and at low levels. The other foliar soybean diseases identified are common and only occurred at low levels. Nematode analyses are currently being conducted and results will be available in April 2014. If the soybean cyst nematode is detected, confirmation tests will be conducted and positive results will be reported and published.

Table 1. Diseases identified by county from the 2013 NNYADP soybean and corn disease survey.

County	Crop	Disease	Pathogen
Clinton	Corn	Northern Corn Leaf Blight	*Exserohilum turcicum*
Essex	Corn	Northern Corn Leaf Blight	*Exserohilum turcicum*
Franklin	Corn	Northern Corn Leaf Blight	*Exserohilum turcicum*
Jefferson	Corn	Northern Corn Leaf Blight	*Exserohilum turcicum*
St. Lawrence	Corn	Northern Corn Leaf Blight	*Exserohilum turcicum*
Franklin	Soybean	Bacterial pustule	*Xanthomonas campestris pv. glycines*
Franklin	Soybean	White mold	*Sclerotinia sclerotiorum*
Jefferson	Soybean	Bacterial pustule	*Xanthomonas campestris pv. glycines*
Jefferson	Soybean	Brown spot	*Septoria glycines*
Jefferson	Soybean	Downy mildew	*Peronospora manshurica*

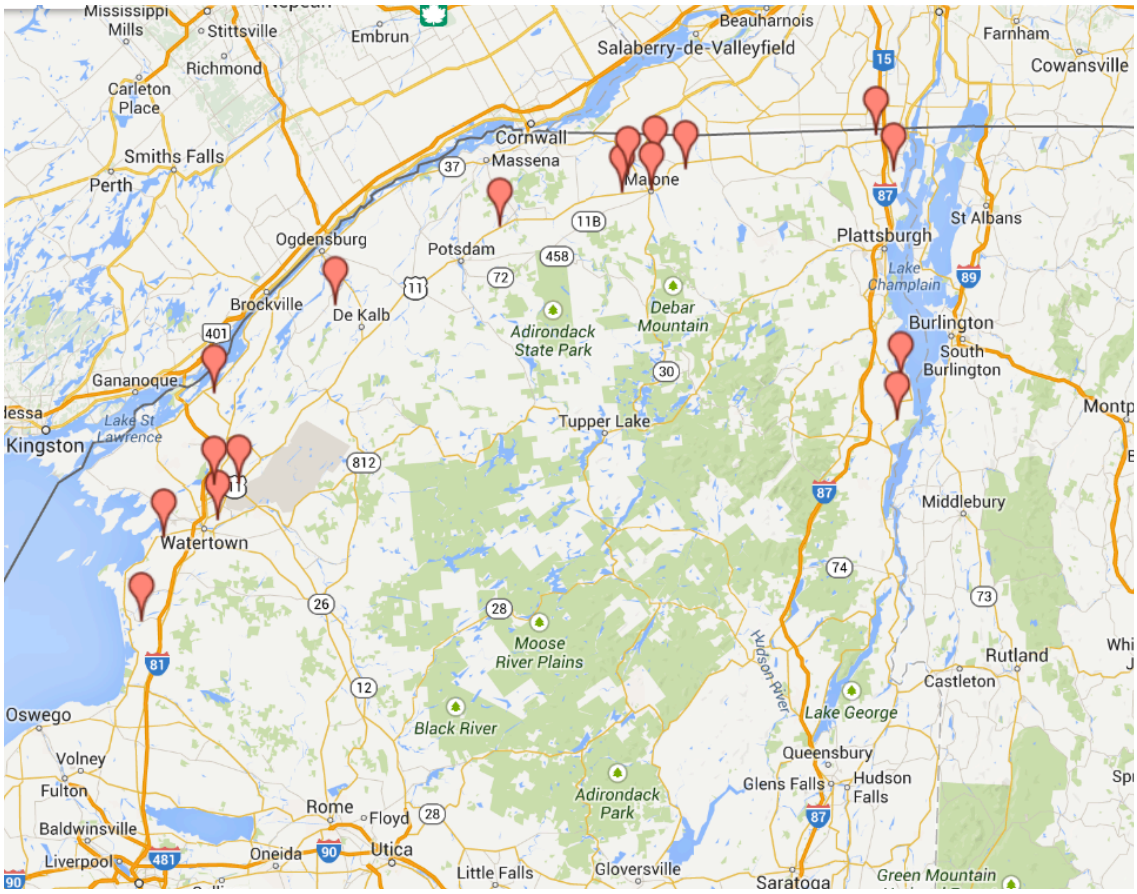

Figure 1. Locations of fields scouted during this survey.

Conclusions/Outcomes/Impacts:

Northern corn leaf blight was widespread, though not universal, in northern New York corn fields in 2013. Because of the lateness of the epidemic, significant yield losses were unlikely and application of foliar fungicides at tassel emergence would not likely have resulted in an economical return on investment. The amount of fungal inoculum in corn debris will be elevated in the region for 2014, so farmers are urged to plant corn hybrids with moderate resistance to NCLB in 2014. Brown midrib corn hybrids were not included among the fields surveyed in 2013, yet some BMR hybrids showed severe damage from NCLB in the region in 2013. Fungicide application may be especially warranted for BMR corn in 2014 and BMR fields should be included in the 2014 survey. None of the soybean fields surveyed in 2013 showed significant disease development and therefore foliar fungicides would not likely have contributed to economical yield enhancement in those fields. We have no indication that the bacterial pustule or downy mildew observed warrant altered management practices for control. Septoria brown spot can cause yield losses if it is severe during early pod-filling, which was not the case in 2013. White mold is a potentially serious disease with long-term implications for crop rotation sequence and this disease deserves further assessment in the region. If soybean cyst nematode is confirmed in the region, this will have important implications for soybean production in NNY. More intense nematode assay will be warranted and affected farms will need to

plant soybean varieties with resistance to the nematode. Results of 2013 nematode assay will be available later in 2014.

Outreach:

Results of the survey are being shared with growers and CCE educators via extension meetings. Three meetings in particular, hosted by Mike Hunter and Kitty O'Neil, are scheduled for February 27, March 27 and 28, 2014 in northern New York where results will be presented and discussed. A database of corn and soybean diseases diagnosed by county will be made available via appropriate websites as we begin to map out the occurrences of various corn and soybean diseases in the region.

Next steps if results suggest continued work is needed in the areas of research, demonstration and/or education.

Multiyear surveys better capture the reality of disease occurrences in the region due to the variation in weather from year to year, because each disease may be favored by specific weather conditions. We will continue the corn and soybean disease survey in 2014 to expand our database of which diseases exist in the counties of northern NY.

Acknowledgments:

We sincerely appreciate the support from NNYADP, and also funds from the NY soybean check-off that supported the soybean cyst nematode laboratory analyses for this project.

Reports and/or articles in which results of this project have been published.

If the presence of the soybean cyst nematode is confirmed in soil samples collected from this project, then those results will be published and reported appropriately.

Person(s) to contact for more information (including farmers who have participated:

Clinton County: Tetreault Farm, 248 Dubois Rd Champlian, NY 12919, 518-298-4083; Rovers Farm, 394 N Farm Rd, Chazy, NY 1292,1 518-846-7513
Essex County: George Sayward, 528 Angier Hill Rd, Essex, NY 12936, 518-963-7355; Lee Garvey in Willsboro
Franklin County: Randy Ooms Farm, 221 Powers Rd Constable, NY 12926, 518-483-0820; Dick Eakins in Malone; Steve Gokey in Burke; Gary Monica Farm, Premo Rd., North Bangor, NY 12966, 518-483-1467; Fox Farm in North Bangor
Jefferson County: North Harbor Farms, 14471 County Route 145, Sackets Harbor, New York, 13685, Fairlawn Farm P.O. Box 108, Ellisburg, NY 13636, Darryl Murrock, 24518 NYS Route 283, Watertown, NY 13601, Mike Gracey, 27275 Five Corners Road, Calcium, NY 13616, Plessis Farm, 25603 State Route 26, Redwood, NY 13679, Reedhaven Farms, 17410 Cady Road, Adams Center, NY 13606, Jeff Rudd, 19973 Morse Lane, Watertown, NY 13601, Morning Star Farms, 13143 County Route 75, Adams, NY 13605, H. Wood Farm, 34941 McKeever Road, Clayton, NY 13624
St. Lawrence County: Joe Hostetler in Deypester; Decker Farm in Stockholm

Photos

Fig. 1. Late season epidemic of northern corn leaf blight (NCLB) in Clinton Co. NCLB was the most prevalent disease found in northern New York in 2013.