Northern NY Agricultural Development Program
2013-14 Project Report

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

Project Leader:
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Collaborator(s):
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- Kitty O'Neil, CCE field crop and soil extension specialist covering Clinton, Essex, Franklin, St. Lawrence counties
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Cooperating Producers:
- Clinton County: Lance Rovers, Dan Tetreault
- Essex County: Lee Garvey, George Sayward,
- Franklin County: Dick Eakins, Jason Fox, Steve Gokey, Gary Monica, Randy Ooms
- Jefferson County: Fairlawn Farm, Mike Gracey, Morning Star Farm, Darryl Murrock, North Harbor Farms, Plessis Farm, Reed Haven Farms, Jeff Rudd, H. Wood Farm
- Lewis County: Hancor Farm, Robert Martin, Mike Nemeth
- St. Lawrence County: Conrad Cook, Mark Decker, Joe Hostetler, Travis McKnight, Ben Stauffer

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.

In 2013, northern corn leaf blight was the dominant disease in corn fields throughout northern NY, indicating that it is widespread and undermanaged on many farms.

Prior to the inception of this survey in 2013, no systematic assessment of corn and soybean diseases has been made in NNY in recent decades and was long overdue. We propose to continue this 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 make 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 and root 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 7 sentinel fields of corn and 13 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 28 fields across the region and analyzed for presence of the soybean cyst nematode in Dr. Wang's USDA Laboratory at Cornell.

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.

Figure 1. Locations of fields scouted during the 2014 survey. Green balloons represent corn fields, and red balloons represent soybean fields.

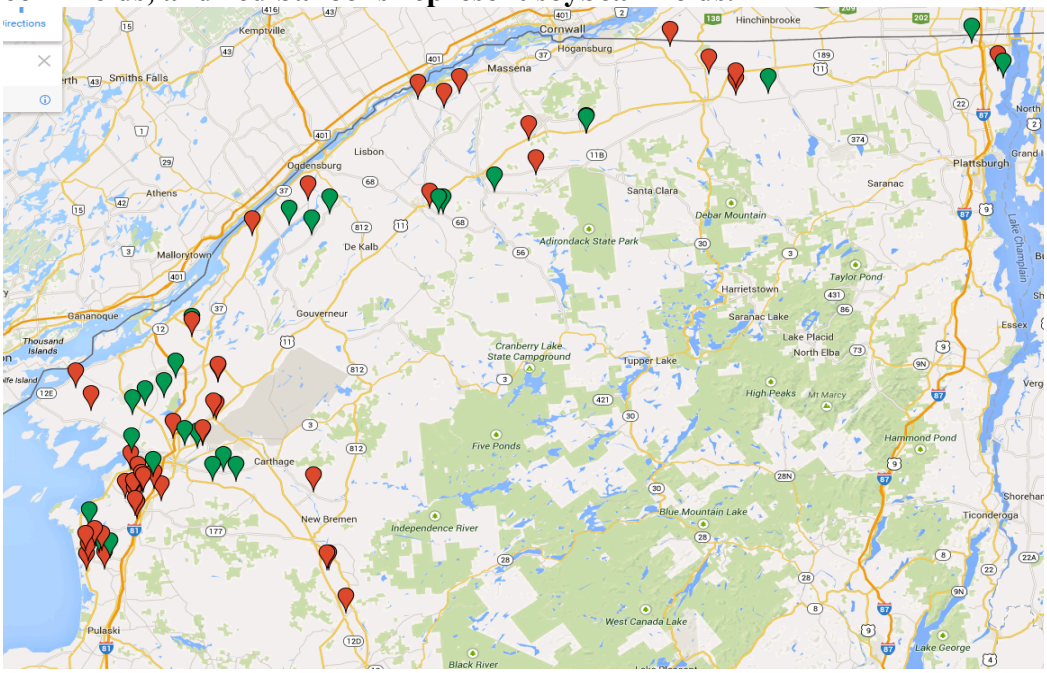

Table 1. Diseases identified by county from the 2014 NNYADP soybean and corn disease survey.

County	crop	disease
Clinton	soy	white mold
Jefferson	soy	**northern stem canker**
Jefferson	soy	white mold
Jefferson	soy	bacterial pustule
Jefferson	soy	Septoria brown spot
Jefferson	soy	soybean vein necrosis
Jefferson	soy	downy mildew
Jefferson	soy	Cercospora leaf blight
Jefferson	soy	frogeye leaf spot
Lewis	soy	downy mildew
Lewis	soy	Septoria brown spot
Lewis	soy	bacterial pustule
St. Lawrence	soy	downy mildew
St. Lawrence	soy	white mold

County	crop	disease
Jefferson	corn	northern corn leaf blight
Jefferson	corn	common rust
Jefferson	corn	eyespot
Jefferson	corn	**head smut**
Lewis	corn	northern corn leaf blight
St. Lawrence	corn	northern corn leaf blight

Four corn diseases and nine soybean diseases in total were identified and diagnosed among farm fields from the five counties surveyed. No disease occurred at high severity in 2014. Northern corn leaf blight was observed in 7 of the 7 corn fields surveyed during August through October, though only at low to moderately low levels (See Photos: Fig. 2).

The other corn foliar diseases, common rust and eyespot, are fairly common and widespread and only occurred at low levels in the fields they were found.

The important finding on corn in 2014 was head smut in Jefferson County, which hasn't been identified in NY since the 1980's (See Photos: Fig. 3).

White mold was identified in 9 out of 13 soybean fields at moderately low levels. The foliar soybean diseases identified are common and only occurred at low levels.

The important finding on soybean in 2014 was northern stem canker, which has never previously been identified or documented in NY (See Photos: Fig. 4). Northern stem canker was also identified in 9 other soybean fields across western NY in 2014, indicating that this previously unknown disease may be widespread and undermanaged throughout soybean production areas of NY.

Soybean cyst nematode was not confirmed to be present in any of the 28 soil samples collected in the region. Nematode scouting will continue in 2015.

Conclusions/Outcomes/Impacts:

Northern corn leaf blight was widespread, though not universal, in northern New York corn fields in 2014. 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 2015, so farmers are urged to plant corn hybrids with moderate resistance to NCLB in 2015.

Brown midrib corn hybrids were not included among the fields surveyed in 2014, yet some BMR hybrids showed severe damage from NCLB in the region in 2014. Fungicide application may be especially warranted for BMR corn in 2015 and BMR fields should be included in the 2015 survey.

It was surprising to find head smut because it has not been reported in the state in nearly three decades.

None of the soybean fields surveyed in 2014 showed significant foliar 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 2014.

White mold and northern stem canker are potentially serious soilborne diseases with long-term implications for crop rotation sequence and these diseases deserve 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.

Outreach:

Results of the survey are being shared with growers and CCE educators via extension meetings. Results of this project were presented to growers and discussed at meetings hosted by the Northern New York Agricultural Development Program in Watertown (January 30, 2015) and Chazy (February 27, 2015). A database of corn and soybean diseases diagnosed by county will be made available via appropriate websites as we 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 2015 to expand our database of which diseases occur in the counties of northern NY.

Acknowledgments:
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Reports and/or articles in which project results have already been published:
Cummings, J.A., and G.C. Bergstrom. 2014. Northern stem canker: A new challenge for New York soybean producers. What's Cropping Up? Volume 24, No. 5:47-48 (css.cals.cornell.edu/extension-outreach/whats-cropping-up)

For More Information:

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- Essex County: Lee Garvey, Willsboro; George Sayward, Essex

- Franklin County: Dick Eakins, Norco Farms, Malone; Jason Fox, North Bangor; Steve Gokey, Stargo Dairy Farm, Burke; Gary Monica, Monica Farm, North Bangor; Randy Ooms, Ooms Farm, Constable

- Jefferson County: Fairlawn Farm, Ellisburg; Mike Gracey, Calcium; Morning Star Farms, Adams; Darryl Murrock, Watertown; North Harbor Farms, Sackets Harbor; Plessis Farm, Redwood; Reed Haven Farms, Adams Center; Jeff Rudd, Watertown; H. Wood Farm, Clayton

- Lewis County: Hancor Farm, Castorland; Robert Martin, Turin; Mike Nemeth, Martinsburg

- St. Lawrence County: Conrad Cook, Parishville; Mark Decker, Decker's Family Farm, Winthrop; Joe Hostetler, Heuvelton; Travis McKnight, McKnight's River Breeze Farm, Waddington; Ben Stauffer, Stauffer Farms, LLC, North Lawrence

Photos

Fig. 2. Northern corn leaf blight was the most prevalent corn disease found in northern New York in 2014, but it was not present in every field. (Photo courtesy of G.C. Bergstrom)

Fig. 3. Corn head smut identified in Jefferson Co. in 2014. (Photo courtesy of J. Cummings)

Fig. 4. Northern stem canker identified in Jefferson Co. in 2014. This soilborne soybean disease had never previously been identified in NY. (Photo courtesy of J. Cummings)