Northern NY Agricultural Development Program
2015-2016 Project Report

Evaluating Industry-Recommended Corn Hybrids for Grain Production and Leaf Disease Severity in Northern New York

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Cooperating Producers:

- St. Lawrence County: Jon Greenwood, Greenwood Dairy
- Clinton County: William H. Miner Agricultural Research Institute

Background:

Corn is the primary row crop grown in northern New York (NNY), harvested from about 144,000 acres (13% of the state's total corn acreage) when averaged over the past three years. It provides essential feed for the dairy industry. About 50,000 acres of this total were harvested as grain over the same three-year period, representing 35% of NNY's total corn acreage. The dairy industry and ethanol production facilities both contribute to strong demand for corn grain in NNY and marketing opportunities for NNY farmers.

The grain produced by any given corn hybrid is a major contributor to its silage yield potential, so grain yield evaluation provides an indication of which hybrids would be good candidates for silage use. It is important to evaluate silage quality on these hybrids as well, but seed companies typically test their hybrids in grain evaluation trials as a first step in determining what is worth marketing in the region. Thus, grain yield evaluations of commercial hybrids provide essential comparative information to farmers interested in grain

production in NNY and to seed companies who make marketing decisions based initially on performance in grain yield trials, and may or may not do subsequent silage evaluations.

Given current high corn seed prices, it is critically important to provide growers with information that allows them to choose hybrids that are well adapted and likely to be productive in the NNY region.

Methods:
Corn hybrids were solicited from seed companies in the early maturity (1400-1900 growing degree days, 70-85 days to relative maturity) and medium-early maturity (1900-2300 growing degree days, 85-100 days to relative maturity) categories. We evaluated early maturing hybrids at Chazy, Clinton County, and both early and medium-early maturing hybrids at Greenwood Dairy in Madrid, St. Lawrence County. All hybrids were compared for grain yield, maturity, stalk and root quality, and reaction to any uniform pest pressures seen in the fields.

Each hybrid was planted in three replications per location, with each replication consisting of a 1/500-acre plot (two rows, 17.5' long). All sites were machine-planted. Madrid was combine-harvested and Chazy was hand-harvested. Each plot's grain weight and grain moisture percentage at harvest were measured. Grain yields were calculated in bushels per acre at 15.5 percent moisture. Yield:moisture ratio (a measure of hybrid efficiency in producing high yield under short-season conditions) was calculated as grain yield in bu/acre divided by the percentage grain moisture at harvest. Some breeders use this number as an estimate of hybrid efficiency. Hybrids that show high yields and earlier maturity (lower grain moistures) have higher Y/M ratios.

At harvest time, we counted the number of stalks broken (or lodged) below the ear. This number was expressed as a portion of the total number of plants in the plot (% stalk lodging).

We also counted plants leaning over from the base at more than a 45 degree angle as root-lodged, and then expressed this number as a proportion of the total number of plants in the plot (% root lodging).

Early vigor was evaluated at knee-high stage or a bit earlier, with 5 = excellent vigor and 1 = very poor vigor.

Stay-green and plant health were rated in September (1 = green plants, 5 = leaves dead). No significant leaf disease or insect pressure was observed at either site in 2016.

We use three statistics to evaluate the quality of the data from these experiments. The coefficient of variation (CV) is a measure of the amount of uncontrolled variability due to differences in the soil, microclimate, fertility, etc. Grain yield CVs below 12 are excellent and those around 15 are acceptable. Grain moisture CVs below 5 are excellent. The least significant difference (LSD) is computed at the 5% level of probability. If a difference between two hybrids is larger than the LSD listed for the trial, then the odds are at least 95 to 5 (or 19 to 1) that there is true varietal difference between the hybrids, or, as the statisticians

say, the difference between the two hybrids is "significant."

As a cautionary note, growers should choose hybrids based on multi-year and multi-location data whenever possible, since any hybrid can have a “banner year” or “banner environment” but not necessarily hold up over a range of different locations and growing seasons.

Results:

Crop development was excellent at Madrid and very good at Chazy, but generally dry conditions led to little leaf disease development. Thus, no disease rating data could be collected at our evaluation sites this year.

Table 1 shows the hybrid evaluation results for early maturity hybrids at both sites.

Since interactions between hybrids and locations were statistically significant for the early maturity hybrids, Tables 2 and 3 show the data for each location individually.

Table 4 shows results for medium-early maturity hybrids evaluated at Madrid only.

Data quality from all trials was excellent this year, with coefficients of variability for yield below 10%.

NOTE: See Tables in separate file online at www.nnyagdev.org, Field Crops/Corn. Tables should not be reproduced if any portion is omitted or if data order is changed.

Conclusions/Outcomes/Impacts:

For the early maturity hybrids, yields were generally good and ranged as high as 235 bu/acre when averaged across both testing locations. Grain moisture at harvest showed a 7.7% spread from the driest to the wettest hybrids, indicating that the hybrids tested encompassed a fair range of maturities.

The yield:moisture ratio provides an indication of hybrid efficiency in producing high yield under short-season conditions. This ratio is one of the best guides to choosing a hybrid with excellent yield potential and appropriate maturity. The absolute value of the yield:moisture ratio is not as important as the relative values of the hybrids tested. The hybrids listed in this report are noted as examples of those that showed the traits being discussed. Note that all hybrids in these tables had strong performance, and growers will need to choose hybrids based on the mix of traits that best fits their individual operations and needs.

For early maturing hybrids analyzed at both Chazy and Madrid (Table 1), the high yield:moisture ratio of hybrids like Albert Lea 81-82N, Pioneer P7632AM, Pioneer P8639AM, and Axis 85EXP indicate that they had high yields for their relative maturities. There was some stalk lodging among these hybrids (primarily observed at Chazy, where animal damage can contribute to this problem) but no root lodging at these locations.

Standability is an important trait for hybrid adaptation, especially when rainy fall weather can delay harvest operations. Among the hybrids that had highest yield:moisture ratio values, Albert Lea 81-82N and Pioneer P8639AM also showed low stalk lodging (good standability).

Low values for stay green reflect plants that maintained green leaf area well into the grain filling period – a plus for filling out a good crop. An example hybrid that combined good yield:moisture ratio, standability, and stay green would be Albert Lea 81-82N.

Since hybrid performance for grain yield showed statistically significant interactions with testing locations (in other words, the relative performance of the hybrids differed between Madrid and Chazy), data from each individual test site are provided. Table 2 shows the results from our trial at Madrid. Yields at this site were quite high (average of 211 bu/acre for all the varieties tested) and there was very little pressure on plant standability (no root lodging and a test average of less than 0.5% stalk lodging across all hybrids evaluated). Hybrids with top values for the yield:moisture ratio at Madrid only included Seedway SW 2359-3000GT and Axis 89EXP. Both of these hybrids also had excellent standability and high values for early vigor. The Axis hybrid had particularly good stay green during grain filling as well. Again, all hybrids in this table had strong performance, and growers should choose hybrids based on the mix of traits that best fits their individual operations and needs.

Hybrid evaluation results for Chazy alone are in Table 3. Stalk lodging at Chazy was much more prevalent, and ranged from a low of 2% to a high of 21% of the plants harvested. Hybrids that appeared to combine good yield for their maturity, stalk strength, and good stay green included Albert Lea 81-82N and Dairyland DS 9079 SSX. Note that most hybrids identified in the cross-location analysis were also quite good at each individual location. Those mentioned here and in the preceding paragraph are examples of hybrids that stood out at one location but not necessarily the other. All hybrids in this table had strong performance, giving growers the option to choose hybrids with the mix of traits that best fits their needs.

Table 4 shows the hybrid data for medium-early maturity hybrids from Madrid. Average yield of these hybrids was high (235 bu/acre) and individual hybrids yields ranged up to 259 bu/acre. The 5% spread in grain moisture values at harvest reflects a bit of a range in maturity for this set of hybrids. When maturities within a trial vary, the yield:moisture ratio is a particularly valuable indicator of which hybrids are producing the most for a given maturity. Hybrids like Albert Lea 68-86 Art, Albert Lea 51-95N, Doebler's RPM 3316 AM , and Dyna-Gro D37VC60 all performed well as reflected by this index. Many hybrids in this test had relatively good early vigor, as reflected by scores close to 5 for this trait. They all tended to retain green leaf area into September (scores near 1 for stay green), which helps to support good grain fill and retain stalk and root health and strength. Almost all hybrids in this evaluation had good standability, reflected in their zero or near-zero values for stalk and root lodging at harvest time. Albert Lea 51-95N and Dyna-Gro D37VC60 combined strong performance for all of these traits, as did a number of the other hybrids tested. Note that all hybrids in this table had strong performance, and growers will need to choose hybrids based on the mix of traits that best fits their individual operations and needs.

As a reminder, **growers should choose hybrids based on multi-year and multi-location data whenever possible**, since any hybrid can have a "banner environment" but not necessarily hold up as strongly over a range of different locations and growing seasons. Much of this data will be incorporated into hybrid performance tables in the upcoming Cornell Guide for Integrated Field Crop Management, which provides that multi-year data summary.

Outreach:

Results from 2016 medium-early maturity trials, harvested in late fall, will soon be available in the 2016 Hybrid Corn Grain Performance Trials report (Plant Breeding Mimeo 2017-1) and on the web at http://plbrgen.cals.cornell.edu/research-extension/crop-variety-trials/corn-variety-testing. These results will be incorporated into the multi-year tables of recommended hybrids in the 2018 Cornell Guide for Integrated Field Crop Management (published by Cornell University in fall 2017).

This report shows single year data for early maturity hybrids and the 2016 Hybrid Corn Grain Performance Trials report shows single year data for medium-early maturity hybrids, but recall that hybrid choices should always be made based on multi-year data. Results of 2015 Northern New York Agricultural Development Program testing of medium-early maturity hybrids were incorporated into the multi-year tables of recommended corn grain hybrids in the 2017 Cornell Guide for Integrated Field Crop Management (Cornell University, 2016). These results are available for farmer and seed company use in selecting hybrids best adapted to the challenging soils and climates of NNY. The publications are distributed through extension offices and at various extension and outreach meetings.

Next Steps:

Provided that funding is available, we will plan to continue testing hybrids in NNY to ensure that farmers and seed companies have a solid basis for their choices of corn grain hybrids for this important region of the state. We hope to add silage testing in NNY to our activities in 2017 as well, provided funding is available.

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

Smith, M.E. 2017. 2016 New York Hybrid Corn Grain Performance Trials. Cornell University, Cornell Cooperative Extension, Plant Breeding and Genetics 2017-1. 11 pp.

Smith, M.E. and J. Singer. 2016. Corn grain hybrid selection. pp. 53-54. In: Thomas-Murphy, J. (ed.) 2017 Cornell Guide for Integrated Field Crop Management. Pesticide Management Education Program, Cornell University, Ithaca NY. 160 pp.

The 2016 New York Hybrid Corn Grain Performance Trials with medium-early hybrid testing results from NNY and other sites statewide will be posted at http://plbrgen.cals.cornell.edu/research-extension/crop-variety-trials/corn-variety-testing.

For More Information:

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