Northern NY Agricultural Development Program
2015 Project Report

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

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Background:
Corn is the primary row crop grown in northern New York (NNY), harvested from about 145,000 acres (12% of the state's total corn acreage) when averaged over the past three years. It provides essential feed for the dairy industry. About 59,000 acres of this total were harvested as grain over the same three-year period, representing 41% of NNY's total corn acreage.

With ethanol production facilities in NY on-line, there are new grain production and marketing opportunities for NNY farmers and increased interest in corn production for grain in this region.

The grain produced by corn hybrids also is a major contributor to silage yield, 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 will often enter their hybrids into 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.

As corn seed prices continue to climb, it becomes more and more important to provide the information that allows growers 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 in Clinton County, and both early maturing hybrids and medium-early hybrids at Greenwood Dairy in Madrid in St. Lawrence County. The hybrids were compared for:

- grain yield,
- maturity,
- stalk quality,
- root quality,
- disease resistance, and
- insect resistance.

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; 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.

Leaf disease severity was judged by stay-green and plant health, rated in September (1 = green plants and no disease, 5 = leaves dead or leaves completely diseased).

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; those around 15 are acceptable. Grainmoisture 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, but field variability resulted in unusable data from our site in Chazy. Thus only data from the early and medium-early hybrid trials at Madrid is presented in this report.

Table 1 shows the hybrid evaluation results for early maturity hybrids; Table 2 shows results for medium-early maturity hybrids. Both trials had excellent data quality, reflected in the very low coefficients of variation for yield – both around 7% (for corn grain yield trials, coefficients of variation below 10% are an indicator of excellent data quality).

NOTE: Tables should not be reproduced if any portion is omitted or if data order is changed.

Conclusions/Outcomes/Impacts:

For the early maturity hybrids at Madrid, yields were high on average and ranged as high as 279 bu/acre.

Grain moisture at harvest showed a 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 high yield:moisture ratio of hybrids like Doebler’s® RPM®2415HXR™, T A Seeds TA255-18, and Master’s Choice MC-3220 indicate that they were especially good, showing high yields for their relative maturity. There was little stalk lodging in general and no root lodging among these hybrids, although higher stalk lodging values for a few hybrids suggest concern.

Standability is an important trait for hybrid adaptation, especially when rainy fall weather can delay harvest operations. High values for early vigor reflect plants that showed strong early season growth – a plus for taking best advantage of the available sunlight during the growing season. Smaller values for stay green indicate hybrids where leaves remained greener later in the season, which is a plus for continuing to fill the ear and keep the plant strong until harvest.

Table 2 shows the hybrid data for medium-early maturity hybrids from Madrid. Again, average yield of these hybrids was high and individual hybrids yields ranged up to 252 bu/acre.

As with the early hybrids, the 7% spread in grain moisture values at harvest reflects 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 Syngenta N29T, Doebler's® RPM®2415HXR™, and T A Seeds TA266-22DP performed well as reflected by this index.

The hybrids in this test all 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 (seen as scores near 1 for both stay green and plant health), which helps to support good grain fill and retain stalk and root health and strength.

All hybrids in this evaluation had good standability, reflected in their zero or near-zero values for stalk and root lodging at harvest time.

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 summary.

Outreach:

Results from 2015 trials, which were harvested in late fall, are available in the 2015 Hybrid Corn Grain Performance Trials report (Plant Breeding Mimeo 2016-1, and available 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 2017 Cornell Guide for Integrated Field Crop Management (to be published by Cornell University in fall 2016).

The 2015 Hybrid Corn Grain Performance Trials report shows single year data, but recall that hybrid choices should always be made based on multi-year data. Results of 2014

Northern New York Agricultural Development Program testing were incorporated into the multi-year tables of recommended corn grain hybrids in the 2015 Cornell Guide for Integrated Field Crop Management (Cornell University, 2014). 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.

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

Smith, M.E. 2016. 2015 New York Hybrid Corn Grain Performance Trials. Cornell University, Cornell Cooperative Extension, Plant Breeding and Genetics 2016-1. 12 pp.

Smith, M.E. and J. Singer. 2015. Corn grain hybrid selection. pp. 51-53. In: Cox, W.J. and J. Thomas-Murphy (eds.) 2016 Cornell Guide for Integrated Field Crop Management. Pesticide Management Education Program, Cornell University, Ithaca NY. 158 pp.

For More Information:

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The complete 2015 New York Hybrid Corn Grain Performance Trials with results from NNY and other sites statewide is posted at http://plbrgen.cals.cornell.edu/research-extension/crop-variety-trials/corn-variety-testing.