Northern NY Agricultural Development Program
2007-2008 Project Report

Corn Hybrids for Grain and Ethanol Production in Northern New York

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Ron Robbins, Jefferson County

Background

Corn is the primary row crop grown in northern New York (NNY), harvested from about 120,300 acres (24% of NY's total corn acreage) and providing essential feed for the dairy industry. Roughly 45,000 acres of this total were harvested as grain in 2007 – up 10,000 acres from the 2006 total and representing 37% of NNY's total corn acreage last year. With ethanol production facilities in NY now 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 at all 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. Starch content analysis of commercial hybrids, together with information about their grain yield, provides comparative information regarding ethanol production potential that will be of use in choosing hybrids for this new corn market.

Methods:

During 2008, we summarized the results of early and medium-early maturity corn grain testing done in 2007 and tested a new set of hybrids in each of these maturity groups at NNY locations. Seed companies marketing corn in New York were contacted to request entry of commercial and near-commercial hybrids into these evaluation tests. We evaluated 12 early maturing hybrids from seed companies (1400-1900 growing degree days, 70-90 days relative maturity) and three Cornell-developed experimental hybrids in this same maturity range at two locations in NNY: one at the Miner Institute's research farm in Chazy, Clinton County, and one at Jon Greenwood's farm in Madrid, St. Lawrence County. In addition, we evaluated 30 medium-early maturing seed company hybrids (1900-2400 growing degree days, 85-100 days relative maturity) at Ron Robbins's farm in Sackets Harbor, Jefferson County. These evaluations were designed to identify hybrids that can meet the grain and silage needs of farmers in the region.

Each hybrid was planted in three replications per location, with each replication consisting of a two-row plot, 17.5' long and thinned to a density of 28,000 to 30,000 plants/acre. Data was collected at thinning time (late June to early July) on plant counts and unusually good or poor plant vigor. In September, plots were evaluated for reaction to any disease or insect pests that occur at each site, for unusually tall or short plants (indicative of potential value as a silage hybrid), and for early-season stalk lodging, root lodging, and animal damage. At harvest time (November), data was collected on final stalk and root lodging, animal damage, grain weight, grain moisture, and test weight. These data were used to calculate grain yield per acre and yield:moisture ratio (a measure of hybrid efficiency in producing high yield under short-season conditions). In addition, a grain sample was taken from each replication of each hybrid and analyzed for starch content, as an indicator of ethanol yield potential per unit of grain.

Results of 2007 testing were published in the 2007 Hybrid Corn Grain Performance Trials report (Plant Breeding Mimeo 2008-1) and were incorporated into the tables of recommended hybrids in the 2009 Cornell Guide for Integrated Field Crop Management (Cornell University, 2008). These results are available for farmer and seed company use in selecting hybrids best adapted to the challenging soils and climates of NNY. Results from 2007 trials, which were harvested during October and November, will soon be available in the 2007 Hybrid Corn Grain Performance Trials Report (Plant Breeding Mimeo 2008-1) and will be incorporated into the tables of recommended hybrids in the 2009 Cornell Guide for Integrated Field Crop Management (to be published by Cornell University in fall 2008). Results of 2008 testing are currently in preparation for publication in the 2008 Hybrid Corn Grain Performance Trials report and are presented below.

Results:

The 2008 planting season in northern New York had average or cool temperatures and was average to dry in moisture, with our corn evaluation plots planted in a timely manner between May 4 and 6. There was some early cutworm damage at Madrid. The summer

months of the growing season (June through September) tended to be warmer than long-term averages at all three sites, except for slightly cooler temperatures in August at Sackets Harbor. Precipitation during this time was close to normal or a bit below, except for a period of wet weather at each location. In Chazy, this was during June and July; at Madrid the wet month was August; and at Sackets Harbor it was wet in July and August. On 18 July at Chazy, a devastating rain and wind storm with winds up to 60 mph passed through the area. Hundreds of trees (some over 4 feet in diameter) were snapped off or uprooted. The storm was highly localized and included our corn trial, resulting in shredded leaves, a lot of early root lodging, and some lost plots where trees fell on the corn. Consequently, we were unable to collect enough replications of data on four varieties in the Chazy plot to publish results for them. In general, however, all three plots looked good in September.

In October, temperatures were close to normal but precipitation was well above normal in Madrid and Sackets Harbor due in part to Hurricane Ike, which came through the area early in the month. It laid down most of the corn at Sackets Harbor, but did not cause this degree of lodging in Madrid. The 12" of snow that fell in this region in late October caused significant losses in Sackets Harbor, where many plants were already lodged. As a result, we were unable to collect enough replications of data on six varieties in the Sackets Harbor plot to publish results for them. Informal reports are that the combination of Hurricane Ike and this snowstorm caused major production losses of corn for many fields in the Sackets Harbor area, and significantly slowed harvest operations due to the extensive lodging. These two events contributed to the 25 inches of precipitation in Sackets Harbor in October (as compared to a long-term average of 18 inches).

Despite delayed harvest in many areas of the state due to slow maturity and drydown combined with difficult weather conditions during harvest season, state average yields of 144 bu/acre were reported – well above the previous state record (129 bu/acre). This was the sixth year in a row that NY corn yields have topped 100 bu/acre. At our NNY locations, average yields for our hybrid tests were excellent and ranged from 192 bu/acre to 221 bu/acre.

Results from the three hybrid evaluation trials are shown in Table 1 (Chazy), Table 2 (Madrid), and Table 3 (Sackets Harbor). The quality of our testing data this year was excellent, as reflected in the low coefficients of variation (CVs) for yield in the trials (9% at Chazy, 7% at Madrid, and 10% at Sackets Harbor). These low CVs indicate that the values in these tables are quite reliable and not overly influenced by random variation in the testing fields. Generally, a yield CV below 15% is considered evidence of high quality data, and ours were considerably better than that.

Hybrids showed highly significant variation for all traits except starch content at Madrid and Sackets Harbor, and for all traits except yield, stalk lodging, and starch content at Chazy. Although starch content variation was not significant, at all three locations some of the highest yielding hybrids also had the higher starch content values, suggesting that they would be higher overall in ethanol yield per acre due to the combination of these two traits. High stalk lodging pressure at all three trial locations revealed some notable

differences in standability among the hybrids evaluated, which should be an important consideration for choosing hybrids specifically adapted to NNY. Lastly, the three Cornell experimental hybrids evaluated all showed some promise for NNY. The lowest yielding of the three was the double cross, but seed of this hybrid also could be produced at considerably lower cost than seed of the other hybrids tested, which are single crosses. So even at this lower yield, the double cross may have an economic advantage.

The results in the tables provide information on a broad array of commercially available hybrids, allowing farmers and seedsmen to compare productivity and adaptation of hybrids from various seed companies. Information about the three experimental Cornell hybrids will help seed growers who have just begun producing seed of these hybrids to decide whether they are worthy of marketing in NNY.

Conclusions/Outcomes/Impacts: (Recommendations, guidelines, application[s] to NNY agriculture etc, including **negative results**. Production guidelines/suggested management practices etc. that flow from the research. If farmers are involved in the research or demonstration, provide information on their impressions on the importance of the work its usefulness at the farm level and benefits they are seeing.)

Data in the hybrid production tables in this report shows a number of hybrids that had excellent performance in NNY in 2008. However, hybrid choices should always be made based on the most comprehensive data available, usually multi-year and/or multi-location data. Multi-year data is available in the Cornell Guide for Integrated Field Crop Management and this publication should be consulted, in combination with the individual test data presented here, when making hybrid choices.

Outreach:

Results of 2007 testing were published in the 2007 Hybrid Corn Grain Performance Trials report (Plant Breeding Mimeo 2008-1) and were incorporated into the tables of recommended hybrids in the 2009 Cornell Guide for Integrated Field Crop Management (Cornell University, 2008). 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. Results from 2008 trials, which were harvested during October and November, will soon be available in the 2008 Hybrid Corn Grain Performance Trials report (Plant Breeding Mimeo 2009-1) and will be incorporated into the tables of recommended hybrids in the 2010 Cornell Guide for Integrated Field Crop Management (to be published by Cornell University in fall 2009).

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

In future years, we will plan to continue testing hybrids in the NNY region 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 will continue to monitor starch content of different hybrids grown in these trials to assess the potential ethanol yield from each hybrid.

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

Smith, M.E. 2008. 2007 New York Hybrid Corn Grain Performance Trials. Cornell University, Cornell Cooperative Extension, Plant Breeding and Genetics 2008-1. 14 pp.

Cox, W. and L. Smith (eds). 2008. 2009 Cornell Guide for Integrated Field Crop Management. Cornell University Cooperative Extension. 155 pp.

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Table 1. 2008 Early Maturity Hybrids, Chazy, Clinton County.

Brand	Hybrid	Yield, bu/acre	% Grain Mois-ture	Yield: Moist. Ratio	% Stalk Lodging	Early Vigor Rating, 1-6 scale*	Plant Height, 1-6 scale*	Starch, % of dry matter
Hyland	HLCVR48	206	25.6	8.0	4	4.7	5.3	66.2
Hyland	HLR230	235	25.7	9.1	2	4.2	4.0	68.6
Hyland	HLB263RR	187	25.8	7.2	6	5.0	6.0	68.1
T A Seeds	TA290-19	232	26.1	8.9	13	5.0	3.7	66.7
Hyland	HLCVR44	217	26.2	8.3	1	4.7	3.0	64.9
T A Seeds	TA370-00	235	26.8	8.8	3	4.0	4.5	69.1
Growmark FS	3968VT3	213	26.8	7.9	2	4.7	5.0	65.5
Dekalb	DKC38-89(VT3)	230	29.0	7.9	1	5.0	3.7	67.1
Growmark FS	3989VT3	233	30.4	7.7	6	4.0	4.3	66.6
Cornell Exp.	Double Cross	224	30.6	7.3	10	4.7	4.0	64.0
	Mean	221	27.3	8.1	5	4.6	4.4	66.7
	CV, %	9	3.4		105	8.2	16	3.2
	LSD	34	1.6		9	0.6	1.2	3.7
	SD	20	0.9		5	0.4	0.7	2.1

*Ratings for early vigor and plant height are on a scale where 6=big vigorous or tall plants and 1=small weak or short plants.

Table 2. 2008 Early Maturity Hybrids, Madrid, St. Lawrence County.

Brand	Hybrid	Yield, bu/acre	% Grain Mois-ture	Yield: Moist. Ratio	% Stalk Lodging	% Root Lodging	Early Vigor Rating, 1-6 scale*	Plant Height, 1-6 scale*	Starch, % of dry matter
Cornell Exp.	EX8102	173	23.1	7.5	11	1	3.3	4.5	66.8
Cornell Exp.	07-5:67x54	216	23.6	9.2	3	2	4.7	6.0	65.4
Hyland	HLCVR44	199	23.6	8.4	2	1	4.8	3.0	68.3
T A Seeds	TA370-00	228	24.0	9.5	13	3	3.5	5.7	69.6
Doebler's	372XRR	207	24.0	8.6	1	0	4.7	5.3	67.9
Hytest	HT7220Bt/RR	216	24.2	8.9	1	1	3.2	6.0	67.0
Hyland	HLCVR48	202	24.2	8.3	0	0	3.8	5.3	65.7
Growmark FS	3968VT3	193	24.5	7.9	3	0	4.2	5.3	66.9
Growmark FS	4282VT3	207	24.7	8.4	9	1	4.0	5.3	67.6
T A Seeds	TA290-19	188	24.7	7.6	10	0	4.5	4.0	66.2
Cornell Exp.	Double Cross	156	25.1	6.2	18	1	3.8	4.2	68.1
Growmark FS	3989VT3	199	25.4	7.8	1	0	5.2	5.3	67.4
Dekalb	DKC38-89(VT3)	197	25.5	7.7	0	1	4.8	4.3	67.6
Hyland	HLR230	189	25.7	7.4	0	0	4.2	4.3	68.6
Hyland	HLB263RR	176	26.3	6.7	1	0	5.3	5.7	66.2
	Mean	196	24.6	8.0	5	1	4.3	5.0	67.3
	CV, %	7	4.0		108	135	13.2	12.8	3.7
	LSD	21	1.6		8	2	0.9	1.0	4.1
	SD	13	1.0		6	1	0.6	0.6	2.5

*Ratings for early vigor and plant height are on a scale where 6=big vigorous or tall plants and 1=small weak or short plants.

Table 3. 2008 Medium-early Maturity Hybrids, Sackets Harbor, Jefferson County.

Brand	Hybrid	Yield, bu/acre	% Grain Mois-ture	Yield: Moist. Ratio	% Stalk Lodging	% Root Lodging	Early Vigor Rating, 1-6 scale*	Starch, % of dry matter
Hyland	HLCVR54	196	21.0	9.3	35	1	4.2	66.7
T A Seeds	TA451-11	168	21.7	7.7	63	3	4.0	72.1
Dekalb	DKC43-27(VT3	207	21.8	9.5	10	1	3.9	71.9
N K	N27B-CB/LL/RW	182	21.8	8.3	32	2	4.8	65.7
Growmark FS	4465VT3	204	22.3	9.1	19	0	4.7	71.3
Dyna-Gro	CX08097	201	22.3	9.0	16	3	3.7	67.6
Hyland	HLCVR64	228	22.5	10.1	10	4	4.9	67.0
Growmark FS	4373VT3(4373XRR)	203	23.0	8.8	12	5	5.2	67.7
Dekalb	DKC46-60(VT3	174	23.0	7.6	14	2	3.8	69.8
Dyna-Gro	55V18	221	23.2	9.5	10	2	4.8	68.8
Dekalb	DKC50-44(VT3	225	23.3	9.7	31	5	4.7	71.5
BGI	VPC847	106	23.4	4.5	58	5	3.3	64.0
Hytest	HT7428	207	23.5	8.8	22	4	4.3	68.1
Hytest	HT7398TS	184	23.6	7.8	46	2	4.3	66.8
Growmark FS	4819XRR	173	23.7	7.3	7	35	5.3	66.6
T A Seeds	TA497-11	212	23.8	8.9	28	0	3.8	70.6
Growmark FS	4861VT3	207	24.1	8.6	20	3	5.0	69.0
Hyland	HLCVR72	198	24.2	8.2	28	2	4.0	67.6
LICA	1898CB/LL	222	24.4	9.1	60	6	5.0	71.0
LICA	9707BT/LL	166	24.6	6.7	42	1	3.3	70.0
Hyland	HLCVR74	214	24.8	8.6	9	11	5.0	68.9
Hyland	HLB49R	221	25.1	8.8	19	4	4.5	68.0
T A Seeds	TA500-16	209	25.3	8.3	10	5	4.0	69.2
Growmark FS	5484VT3	215	26.1	8.2	9	17	3.2	69.1
	Mean	198	23.4	8.4	25	5	4.3	68.7
	CV, %	10	3.6		59	79	104	4.0
	LSD	32	1.4		24	7	0.7	4.5
	SD	20	0.9		15	5	0.4	2.8

*Ratings for early vigor are on a scale where 6=big vigorous plants and 1=small weak plants.