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Michigan Corn Production Hybrids Compared  
Michigan State University Extension Service  
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# CORN HYBRIDS COMPARED IN THE 1999 SEASON



**Extension Bulletin E-431 January 1999**

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# 1999 GRAIN PERFORMANCE TRIALS

## INTRODUCTION

Hybrid corn trials are conducted each year by the Department of Crop and Soil Sciences in cooperation with MSU Extension, seed corn companies, and farmers.

## ENTRIES

Each year seed companies are invited to enter hybrids in the trials. A fee is charged to cover expenses.

The indexes (grain on page 22 and silage on page 35) present a list of all hybrids planted in the 1999 trials. At 12 grain and 7 silage locations, 281 hybrids from 32 seed companies were tested for yield as 1,297 entries. Company names used in association with hybrid numbers refer to the brand. The numbers are the company's designations.

## METHODS

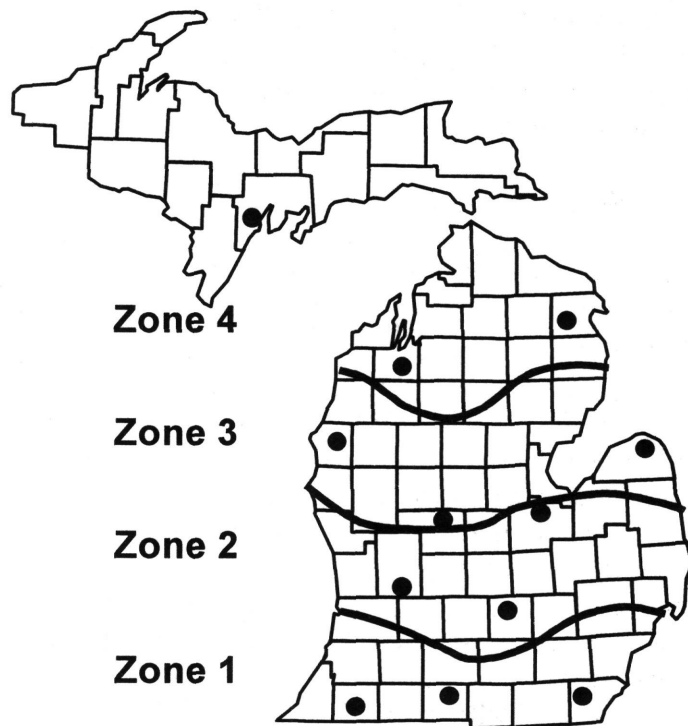
Grain trials contained 250 hybrids from 31 companies consisting of 1,076 trial entries. Three trial locations were planted in each of four maturity zones. These zones are based on available growing-degree-day units established from long-term weather records. Hybrids entered in each zone are all tested in the three designated locations. The Delta County grain trial does not test hybrids with a maturity later than 90 day. Entries for zones 1, 2, and 3 are divided into two maturity groups (early and late) based on maturity ratings provided by the seed companies. Zone 4 tests all hybrids in one group.

Four-row plots were used at all grain locations. The two center rows were harvested for yield. Plots were 22-feet long with a 30-inch row spacing.

Experimental design, data acquisition, analysis of variance, and data summarization were facilitated in part by ADaM, a software package developed jointly by MSU, CIMMYT (Mexico), and the Scottish Agricultural Statistics Service. The field research layout is a four-replication, lattice design. A hybrid's performance is reported as the adjusted mean averaged

together from four replicated plots.

## 1999 GRAIN LOCATIONS



All hybrids were grown under similar conditions at each location. They were grown in farmers' fields with equal fertilizer, population, date of planting, and other management practices. Trials in Branch, Cass, Montcalm, and Mason counties were irrigated. In the field, hybrids were identified only by a plot number to assure unbiased comparisons.

Stand counts were recorded in June. Plots with stand counts higher than the desired population were thinned at this time. Desired population rates are listed in Table B (grain, page 7) and Table C (silage, page 34). Lodging measurements were made at harvest, counting all plants broken below the ear. Plots were harvested mechanically for both grain and silage. Moisture content and field weight were measured by the GrainGage™, a HarvestData System™ mounted on the plot combine using the grain sample provided. Grain yields are reported at a standard 15.5 percent moisture. Test weights are

reported at harvest moisture. Automated test weight equipment loses some accuracy as harvest moisture increases. Test weight values should be used to determine relative rank and not as a precise weight.

Replicated grain samples were collected from one location in each zone and were tested for protein, starch and oil content. Funding was split between the Corn Marketing Program of Michigan and entry fees. The results are presented in the corresponding tables following the yield results.

## **GROWING CONDITIONS**

All yield trials were planted between April 28 and May 19. Mild weather and dry field conditions made for excellent conditions throughout the planting season. Timely rains throughout most of the state in June and July resulted in excellent plant growth and a well conditioned crop at pollination. Dry weather in August and September did not adversely affect yields but resulted in early drydown with harvest starting in September and early October in most parts of Michigan. Most parts of the state had very favorable yield results with excellent grain quality, however parts of southern Michigan were hurt by dry weather patterns that existed throughout the whole growing season. This resulted in reduced yields in those areas.

## **HOW TO USE THIS BULLETIN**

Tables have hybrids listed alphabetically. One-, two-, and three-year averages (1999, 1998, 1997) averaged over three locations are presented for all hybrids wherever data are available. Results for individual locations in 1999 are also included in the same table. One-year single site results are less reliable than two- or three-year and multiple location averages and should be interpreted with more caution. Confidence in corn performance data increases with the number of years and locations of testing. For complete two- and three-year single site data, visit our web site at:

[www.css.msu.edu/varietytrials/](http://www.css.msu.edu/varietytrials/)

The tables report the following information about the hybrids tested:

1. Average moisture content at harvest.

2. Average test weight at harvest moisture. Average yield (in bushels per acre) of shelled corn at 15.5 percent moisture.
3. Average percent of stalk lodging (plants broken below the ear at harvest).
4. Percent stand of target population.
6. Percent protein, starch, and oil content.

The results shown are the average of four replications grown in close proximity to each other. Two or more plots of the same hybrid in the same field may produce somewhat different results because of uncontrolled variability in the soil and other environmental factors. Replication and randomization of the entries are two methods used to reduce these errors. Because these methods do not eliminate all of these variables, the magnitude of difference necessary for statistical significance has been calculated for yield, moisture content, and test weight. The value calculated as the "least significant difference" or "LSD" is the amount that an individual hybrid would have to differ from another hybrid in the same test to be significantly different from that hybrid.

Hybrids which are not significantly different from the highest yielding hybrid are marked with an asterisk (\*) in each table. Other agronomic information relative to each trial is given in Tables B and C. Fertilizer amounts are shown as total pounds per acre of nitrogen, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O applied during the season.

## **HOW TO CHOOSE A HYBRID**

### ***Adaptation***

The map on page 2 shows the locations of the grain trials, and divides Michigan into four generalized maturity zones. Local variations in weather, soil type and fertility, time of planting, and other conditions all affect adaptation. Corn hybrids are often adapted to more than one zone.

In the selection of a hybrid there is no real substitute for observing individual characteristics while plants are growing. The best time to compare plants is usually in late August or early September as they approach maturity. Each year, at a limited number of locations, demonstration plantings of each hybrid are planted at the front of the test field. In 1999, four locations had demonstration plantings. A field day plot tour was scheduled and the public was invited to observe

the hybrids. Examining plant and ear characteristics can help in selecting hybrids suitable for your production operation. Yield results are not taken from the demonstration plot.

### **Planting Rate**

The number of seeds sown per acre in Michigan has increased steadily over the past several years. Increased planting rates are not a guarantee of increased yields. Check with your seed dealer for information on which hybrids perform better at the higher populations when grown on your soil type.

### **Maturity**

Early-maturing hybrids are generally lower in moisture content than later-maturing hybrids at harvest. Differences among hybrids in rate of dry down in the field also affect moisture content at harvest but usually do not greatly disturb the relative maturity ratings as determined by moisture content.

One percent more moisture at harvest reflects a delay in maturity of about two days. Another estimate of corn maturity is when a black layer of cells forms at the base of the kernel. This black layer is an indication of the end of active growth processes. At this time, kernel moisture will be between 32 and 35 percent.

### **For Grain**

When selecting a hybrid, yield should not be the only consideration. Identifying hybrids with lower moisture but above average yield will often have higher net returns than top yielding hybrids with higher moisture. One point higher moisture requires about two more bushels in yield to breakeven. It is often better to choose earlier hybrids (below average moisture content) than later hybrids for grain. Data in the tables show that good yields do not totally depend on later maturity.

Advantages of early-maturing hybrids are:

- They usually mature before killing frost
- Adapted early hybrids can generally yield as much as late hybrids in most areas of Michigan.
- Early hybrids with lower moisture content at harvest reduce drying time and market discounts for moisture.
- Test weights are generally higher resulting in reduced market discounts.
- Mature, dry corn makes a superior feed grain when used in swine or poultry rations
- Harvest can take place earlier in the fall when weather conditions are most favorable. Early harvest may reduce corn losses resulting from broken stalks and dropped ears.
- Fall tillage of corn stubble can be more timely on land not subject to erosion.

# 1999 GROWING SEASON WEATHER SUMMARY

The winter of 1998/1999, influenced by the presence of a moderate to strong La Nina event in the equatorial Pacific, was characterized by large swings in temperature and very winter-like conditions during the month of January. Precipitation totals during the off season remained near to below normal, which continued a drier than normal trend that began during the 1998 growing season. As a result of the persistent dryness, lake, pond, and soil moisture levels across much of the state fell to much below normal levels by the beginning of the 1999 growing season. Climatologically, dry subsoil conditions in the late winter and early spring are uncommon in Michigan and are associated with increased risk of subsequent water/moisture shortages for crops during the growing season.

For precipitation to occur in Michigan, two meteorological conditions are necessary: 1) a supply of water vapor from a large water source (usually the Gulf of Mexico) from which precipitation can form, and 2) an atmospheric lifting mechanism, such as a front or an area of low pressure, to lift the water vapor high enough into the atmosphere for condensation/precipitation formation to occur. During the spring of 1999, jetstream steering currents were predominantly from the west/northwest or northwest, which provided a number of lifting mechanisms but very little transport of water vapor into the region. As a result, rainfall totals during much of April and May remained well below normal. The drier than normal conditions early in the season, most acute in northern sections of the state, greatly favored spring fieldwork activities but also slowed crop germination and early vegetative growth, and delayed the activation of many herbicides. Another result of the milder than normal temperatures as well as the lack of late winter season snowpack in northern sections of the state was an unusually small difference in growing-degree-day accumulations between northern and southern growing areas in the state, a phenomenon known as growing-degree-day compression. The degree-day compression resulted in relatively small differences in crop and insect phenology across the state for much of the early part of the growing season.

During June, the jetstream shifted to a southwesterly orientation across the region, with low-level southerly flow bringing hot, muggy conditions and almost daily scattered showers and thunderstorms. Some of the thunderstorms brought localized severe weather, with damaging hail reported in western sections of the state on June 11, 12. More importantly, the new jetstream pattern and associated rainfall led to a replenishment of topsoil moisture just in time for summer crops entering their periods of maximum water usage. July was similar to June, with mean temperatures for the month generally ranging 2 to 6 degrees F. above normal. July precipitation, usually a key variable in determining summer crop yield potential, ranged from much above normal in northern sections (some northern locations received in excess of 200% of normal rainfall) to below normal in the southern Lower Peninsula, which was on the fringes of a large area to our east and south experiencing prolonged heat, dryness, and drought. Drier and cooler than normal weather returned in August and continued into September. The first killing freeze of the season in many sections of the Lower Peninsula occurred during the last week in September, at least one week earlier than normal. However, due to the advanced phenological stage of most crops, little if any damage or problems were reported. For the second consecutive year, fall harvest activities were greatly favored by abnormally mild, dry weather in late September and October which led to rapid field drydown rates, reduced drying costs, and trafficable fields. As was the case in 1998, subsoil moisture at the end of the growing season remains at abnormally low levels in many areas of the state (especially in the south), with above normal off-season precipitation needed to replenish soil moisture reserves prior to the 2000 growing season.

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# TEMPERATURE, PRECIPITATION, AND GROWING-DEGREE-DAY SUMMARY 1999 GROWING SEASON

COUNTY	MAY			JUNE			JULY			AUGUST			SEPTEMBER			SEASON			
	OBS	NORM	DEV	OBS	NORM	DEV	OBS	NORM	DEV	OBS	NORM	DEV	OBS	NORM	DEV	OBS	NORM	DEV	
MONROE Zone 1	TEMP	63.0	58.3	4.7	71.9	67.8	4.1	77.6	71.7	5.9	69.6	69.9	-0.3	66.1	62.6	3.5	69.6	66.1	3.6
	PPT	3.53	3.04	0.49	2.02	3.30	-1.28	2.00	3.73	-1.73	1.26	3.20	-1.94	1.02	2.62	-1.60	9.83	15.89	-6.06
	GDD	437	353	84	645	542	103	811	658	153	617	616	1	503	432	71	3013	2601	412
ST. JOSEPH (Branch & Cass)	TEMP	62.6	59.2	3.4	71.3	68.4	2.9	76.8	71.9	4.9	68.8	70.1	-1.3	64.6	63.3	1.3	68.8	66.6	2.2
	PPT	2.55	3.12	-0.57	5.51	3.95	1.56	2.96	3.79	-0.83	3.24	3.16	0.08	2.16	3.01	-0.85	16.42	17.03	-0.61
	GDD	420	381	39	633	564	69	798	670	128	591	628	-37	463	454	9	2905	2697	208
KENT Zone 2	TEMP	61.4	57.4	4.0	69.9	67.1	2.8	74.9	71.2	3.7	68.5	69.5	-1.0	63.0	61.9	1.1	67.5	65.4	2.1
	PPT	2.50	2.86	-0.36	4.02	3.68	0.34	2.91	2.95	-0.04	3.23	3.14	0.09	3.21	3.24	-0.03	15.87	15.87	0.00
	GDD	403	335	68	601	530	71	752	654	98	580	610	-30	430	412	18	2766	2541	225
INGHAM	TEMP	60.1	57.5	2.6	69.4	67.0	2.4	76.1	70.7	5.4	67.7	69.0	-1.3	61.4	62.0	-0.6	66.9	65.2	1.7
	PPT	2.14	2.73	-0.59	1.96	3.54	-1.58	4.07	3.02	1.05	2.11	3.12	-1.01	2.03	2.50	-0.47	12.31	14.91	-2.60
	GDD	399	338	61	595	530	65	740	640	100	555	598	-43	415	418	-3	2704	2524	180
SAGINAW	TEMP	60.4	58.6	1.8	70.2	68.2	2.0	72.7	72.1	0.6	67.0	70.2	-3.2	62.4	62.9	-0.5	66.5	66.4	0.1
	PPT	2.29	2.49	-0.20	1.92	3.09	-1.17	4.52	2.83	1.69	1.84	3.29	-1.45	3.15	2.76	0.39	13.72	14.46	-0.74
	GDD	378	367	11	600	555	45	700	670	30	540	623	-83	423	438	-15	2641	2653	-12
HURON Zone 3	TEMP	58.2	55.2	3.0	69.5	64.9	4.6	72.5	69.3	3.2	66.5	67.8	-1.3	63.0	61.0	2.0	65.9	63.6	2.3
	PPT	2.41	2.58	-0.17	2.70	2.88	-0.18	6.46	2.93	3.53	1.70	3.01	-1.31	3.53	2.67	0.86	16.80	14.07	2.73
	GDD	343	298	45	590	479	111	697	602	95	520	569	-49	426	387	39	2576	2335	241
MONTCALM	TEMP	60.0	57.7	2.3	68.9	67.1	1.8	73.4	71.0	2.4	66.6	69.3	-2.7	60.6	61.6	-1.0	65.9	65.3	0.5
	PPT	5.07	2.88	2.19	5.82	3.43	2.39	4.30	2.50	1.80	5.46	3.84	1.62	4.03	3.12	0.91	24.68	15.77	8.91
	GDD	374	351	23	574	536	38	706	646	60	531	603	-72	382	414	-32	2567	2550	17
MASON	TEMP	59.0	54.4	4.6	65.6	63.6	2.0	71.2	68.5	2.7	66.1	67.2	-1.1	60.3	60.2	0.0	64.4	62.8	1.7
	PPT	3.81	2.48	1.33	2.29	2.93	-0.64	3.79	2.18	1.61	2.12	3.79	-1.67	3.62	3.25	0.37	15.63	14.63	1.00
	GDD	346	273	73	497	450	47	657	587	70	521	552	-31	363	365	-2	2384	2227	157
ALPENA Zone 4	TEMP	54.7	52.0	2.7	65.6	61.7	3.9	70.5	66.6	3.9	64.4	64.9	-0.5	59.1	57.2	1.9	62.9	60.5	2.4
	PPT	1.13	2.78	-1.65	3.29	3.12	0.17	2.01	3.11	-1.10	1.34	3.23	-1.89	2.40	3.08	-0.68	10.17	15.32	-5.15
	GDD	299	251	48	495	413	82	628	534	94	480	496	-16	355	317	38	2257	2011	246
GRAND TRAVERSE	TEMP	59.1	53.5	5.6	67.2	63.7	3.5	72.1	68.8	3.3	67.1	67.3	-0.2	61.6	59.3	2.3	65.4	62.5	2.9
	PPT	2.96	2.48	0.48	2.66	3.15	-0.49	8.87	2.88	5.99	1.48	2.93	-1.45	3.11	3.60	-0.49	19.08	15.04	4.04
	GDD	351	273	78	532	454	78	685	587	98	540	552	-12	369	348	21	2477	2214	263
MENOMINEE (Delta)	TEMP	55.9	53.6	2.3	63.9	62.7	1.2	70.1	67.4	2.7	64.0	65.5	-1.5	57.7	57.0	0.7	62.3	61.2	1.1
	PPT	5.69	3.57	2.12	3.45	3.72	-0.27	6.75	3.63	3.12	2.94	3.86	-0.92	1.84	3.60	-1.76	20.67	18.38	2.29
	GDD	311	285	26	471	438	33	615	559	56	458	513	-55	339	319	20	2194	2114	80

TEMP = Mean temperature (°F)  
PPT = Precipitation (inches)  
GDD = Growing Degree Days calculated at base 50°F, with 50°F and 86°F cutoffs  
OBS = Totals observed in 1999  
NORM = Normals calculated over 30 year period (1951-1980)  
DEV = Deviation of observed from normal  
Table courtesy of MSU Agricultural Weather Office (517/355-0231)

**TABLE B AGRONOMIC TABLE - GRAIN TRIALS**

COUNTY	PLANTING/ HARVEST DATES	SOIL TYPE	PREVIOUS CROP	PLANTING RATE/ AVG. STAND	FERTILIZER	SOIL TEST	FARM COOPERATOR	LOCATION
MONROE - Zone 1	May 5 Oct 11	Pewamo Clay Selfidge Loamy Sand	Soybeans	28,512 27,913	175 - 50 - 160	ph 6.1 P 26, K 274	Gary Kreps	Temperance
BRANCH	April 28 Sept 9	Fox Sandy Loam	Corn Silage	30,096 29,750	162 - 0 - 0	ph 7.2 P 315, K 553	Remus Riggs	Coldwater
CASS	May 1 Oct 8	Kalamazoo Loam	Corn	30,096 29,013	130 - 30 - 4	ph 6.6 P 162, K 395	Dave & Mel Cripe	Cassopolis
KENT - Zone 2	May 1 Oct 10	Theftod & Spinks Loamy Sand	Corn	28,512 27,842	142 - 42 - 42	ph 6.6 P 37, K 216	Pleasant Acres Farm Gerald Kayser	Caledonia
INGHAM	May 6 Oct 1	Capac Loam	Soybeans	28,512 27,828	187 - 69 - 0	ph 6.4 P 99, K 305	Jorgensen Farms	Williamston
SAGINAW	April 30 Oct 6	Mistequay Silty Clay	Soybeans	28,512 28,156	170 - 0 - 0	ph 7.1 P 74, K 586	Saginaw Bean & Beet Research Farm	Saginaw
HURON - Zone 3	April 30 Oct 6	Kilmanagh Loam	Soybeans	28,512 28,184	144 - 38 - 38	ph 6.8 P 89, K 316	Wil-Le Farms William, Ron & Ed McCrea	Bad Axe
MONTCALM	May 7 Oct 10	McBride Loam	Wheat	28,512 28,383	208 - 56 - 90	ph 6.3 P 661, K 791	Troy Sackett	Edmore
MASON	May 15 Oct 18	Ogemaw Sandy Loam	Snap Beans Rye Cover	28,512 28,227	138 - 38 - 38	ph 6.4 P 292, K 595	Robert & August Oshe	Scottville
ALPENA - Zone 4	May 19 Oct 19	Selkirk Loam	Dry Beans	26,928 26,766	121 - 67 - 67	ph 7.1 P 169, K 395	Allen Schiellard	Hubbard Lake
GRAND TRAVERSE	May 13 Oct 18	Karlin Sandy Loam	Pine Trees 40 yrs. Sod	28,512 27,714	188 - 67 - 67	ph 6.8 P 50, K 50	Richard Dennett	Buckley
DELTA	May 12 Oct 19	Onaway Fine Sandy Loam	Alfalfa	27,720 27,332	130 - 38 - 38	ph 7.1 P 107, K 415	Benny Herioux	Bark River















TABLE 2L.

## AVERAGE OF KENT, INGHAM &amp; SAGINAW COUNTY TRIALS - LATE (102 Day and later)

BRAND	HYBRID VARIETY	1999								2 YEAR AVG (98 / 99)							3 YEAR AVG (97 - 99)				
		% H2O	Bu/A	Test WT	% SL	% prot	% oil	% starch	% STD	% H2O	Bu/A	Test WT	% SL	% prot	% oil	% starch	% H2O	Bu/A	Test WT	% SL	% prot
BAYSIDE	Super 104	20	196	56	1	8.1	4.1	60.1	96	--	--	--	--	--	--	--	--	--	--	--	--
BIO GENE	BG 103	19	173	56	0	7.5	3.9	60.8	100	--	--	--	--	--	--	--	--	--	--	--	--
BROWN	BR 6850	21	213	54	1	7.7	3.7	60.7	98	23	185	54	1	8.0	3.5	61.0	25	184	53	1	8.2
BROWN	BR 6895	24	207	54	1	8.0	3.8	60.3	99	--	--	--	--	--	--	--	--	--	--	--	--
CALLAHAN	C7942	21	197	57	0	7.8	3.8	60.7	100	21	189	57	0	8.2	3.7	60.8	--	--	--	--	--
CALLAHAN	C7944	21	191	56	2	8.2	4.1	59.9	98	--	--	--	--	--	--	--	--	--	--	--	--
CALLAHAN	EX5350	19	194	55	1	8.1	3.6	60.5	100	--	--	--	--	--	--	--	--	--	--	--	--
CARGILL	6431IMI	25	200	53	1	8.1	3.9	60.2	98	--	--	--	--	--	--	--	--	--	--	--	--
CORN BELT	C567	21	*218	54	1	7.6	3.6	61.0	95	23	188	54	1	7.8	3.5	61.1	25	187	53	2	7.8
DAIRYLAND	STEALTH-1404	23	193	53	1	8.4	3.9	59.9	97	--	--	--	--	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1406	21	210	54	1	7.4	3.5	61.3	98	23	186	54	1	7.9	3.4	61.1	25	187	53	2	8.0
DAIRYLAND	STEALTH-1410	24	212	53	1	7.4	3.8	60.9	99	25	187	53	1	8.1	3.7	60.5	28	187	52	1	8.0
DEKALB	DK537	20	194	56	1	8.0	3.9	60.5	99	20	170	56	1	8.1	3.7	61.2	--	--	--	--	--
DEKALB	DK539	21	192	58	1	7.9	4.0	60.5	99	--	--	--	--	--	--	--	--	--	--	--	--
DEKALB	DK551BY	22	210	55	1	8.1	4.0	60.2	99	22	177	55	2	8.3	3.9	60.4	--	--	--	--	--
DEKALB	DK567	23	*219	54	1	7.9	3.8	60.5	100	--	--	--	--	--	--	--	--	--	--	--	--
DEKALB	DK585	22	199	53	2	7.5	3.9	60.7	100	23	175	53	2	7.7	3.8	61.0	--	--	--	--	--
GARST	8590	22	*216	55	2	7.1	4.1	61.0	98	--	--	--	--	--	--	--	--	--	--	--	--
GARST	8707	18	198	55	1	8.5	3.8	59.8	100	--	--	--	--	--	--	--	--	--	--	--	--
GEERTSON	GS1067	22	203	54	1	7.4	3.9	60.8	99	23	183	54	2	7.8	3.8	60.8	--	--	--	--	--
GEERTSON	GS1099	25	209	54	1	7.6	4.1	60.7	95	--	--	--	--	--	--	--	--	--	--	--	--
GOLDEN HARVEST	H-8250	22	200	56	1	7.8	4.1	60.4	100	--	--	--	--	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex98590	22	209	54	1	7.8	3.8	60.5	90	--	--	--	--	--	--	--	--	--	--	--	--
GREAT LAKES	5322	23	191	55	1	7.6	3.8	60.8	100	23	166	56	1	7.9	3.6	61.0	--	--	--	--	--
GREAT LAKES	5456	22	198	53	1	7.7	3.5	61.0	93	--	--	--	--	--	--	--	--	--	--	--	--
GRIES	GSFX300	23	204	54	1	8.2	3.8	60.1	94	--	--	--	--	--	--	--	--	--	--	--	--
HIGH CYCLE	HC7529Bt	22	195	56	1	8.4	4.2	59.7	100	--	--	--	--	--	--	--	--	--	--	--	--
HYTEST	BH4602	21	208	54	1	7.3	3.6	61.1	98	23	184	54	2	7.8	3.5	61.0	--	--	--	--	--
JUNG	2510A	19	188	57	1	8.3	4.0	59.9	100	--	--	--	--	--	--	--	--	--	--	--	--
JUNG	2706	24	211	53	1	7.6	3.9	60.7	100	--	--	--	--	--	--	--	--	--	--	--	--
LG SEEDS	LG2544	21	209	54	1	7.6	3.7	60.9	90	--	--	--	--	--	--	--	--	--	--	--	--
MYCOGEN	2652	22	203	53	2	7.9	3.6	60.6	100	--	--	--	--	--	--	--	--	--	--	--	--
MYCOGEN	2717IMI	23	208	54	0	7.7	3.9	60.8	99	--	--	--	--	--	--	--	--	--	--	--	--
NOSCO CLASSIC E	NCE5001	23	198	54	2	7.5	3.8	60.9	100	--	--	--	--	--	--	--	--	--	--	--	--
NOSCO CLASSIC E	NCE5401	23	209	53	1	7.9	3.6	60.6	99	24	178	54	1	8.3	3.5	60.6	--	--	--	--	--
NOSCO CLASSIC E	NCE5507	23	205	53	2	8.0	3.8	60.2	100	--	--	--	--	--	--	--	--	--	--	--	--
NOSCO CLASSIC E	NCE5801	24	210	54	1	7.4	3.9	60.7	99	--	--	--	--	--	--	--	--	--	--	--	--
NOVARTIS	N4640Bt	20	195	57	0	8.3	4.0	60.1	99	20	171	58	0	8.4	3.8	60.8	22	168	56	1	--
NOVARTIS	N48-K2	21	191	56	1	8.2	4.1	60.2	97	--	--	--	--	--	--	--	--	--	--	--	8.4
NOVARTIS	N57-E3	25	209	54	0	7.4	3.9	61.0	100	24	183	55	0	7.8	3.8	61.0	--	--	--	--	--
NOVARTIS	N65-A1	23	213	54	0	7.4	3.5	61.4	99	--	--	--	--	--	--	--	--	--	--	--	--
PIONEER	34G82	23	207	55	1	7.6	3.7	61.0	100	--	--	--	--	--	--	--	--	--	--	--	--
PIONEER	36G12	21	213	56	1	7.6	4.0	60.6	97	--	--	--	--	--	--	--	--	--	--	--	--
PIONEER	36D14	21	199	56	3	9.0	3.5	59.9	99	--	--	--	--	--	--	--	--	--	--	--	--
RENK	RK648	20	187	56	1	8.1	4.1	60.1	100	--	--	--	--	--	--	--	--	--	--	--	--
RENK	RK648Bt	21	186	56	1	8.0	4.1	60.1	100	--	--	--	--	--	--	--	--	--	--	--	--
RENK	RK706	21	198	54	1	7.5	3.8	61.0	93	--	--	--	--	--	--	--	--	--	--	--	--
RENK	RK706Bt	22	186	53	1	7.5	3.7	61.0	95	--	--	--	--	--	--	--	--	--	--	--	--
RENK	RK778	22	206	53	2	8.0	3.9	60.3	100	24	187	53	2	8.5	3.7	60.3	--	--	--	--	--
RENK	RK864	25	**228	53	1	7.3	4.0	60.9	99	26	197	53	1	7.7	3.9	60.9	28	196	52	1	7.8
RUPP	XR 1682	23	205	53	1	8.2	4.0	59.9	97	--	--	--	--	--	--	--	--	--	--	--	--
RUPP	XR 8104 Bt	23	183	56	1	8.2	4.0	60.2	100	--	--	--	--	--	--	--	--	--	--	--	--
TRELAY	7002	22	204	55	1	7.8	3.8	60.4	99	23	177	55	1	8.2	3.6	60.8	--	--	--	--	--
AVERAGE		22	202	55	1	7.8	3.9	60.5	98	23	180	55	1	8.0	3.7	60.8	25	185	53	1	8.0
HIGHEST		25	228	58	3	9.0	4.2	61.4	100	26	197	58	2	8.5	3.9	61.2	28	196	56	2	8.4
LOWEST		18	173	53	0	7.1	3.5	59.7	90	20	166	53	0	7.7	3.4	60.3	22	168	52	1	7.8
LSD .05%		2	14	2		0.4	0.2	0.5													
CV		5	4	2		3.3	3.9	0.6													

\*\*HIGHEST YIELDING HYBRID

\* NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID



TABLE 3E.

## AVERAGE OF HURON, MONTCALM &amp; MASON COUNTY TRIALS - EARLY (97 Day and earlier)

BRAND	HYBRID VARIETY	1999								2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% H2O	BU/A	Test WT	% SL	% prot	% oil	% starch	% STD	% H2O	BU/A	Test WT	% SL	% H2O	BU/A	Test WT	% SL
BAYSIDE	Super 88	20	174	55	2	8.7	4.4	58.9	100	21	167	55	2	22	163	54	3
BAYSIDE	Super 90	21	183	54	2	7.6	4.3	60.1	99	--	--	--	--	--	--	--	--
BAYSIDE	Super 91	21	178	55	1	8.0	4.0	60.2	100	22	172	55	1	--	--	--	--
BAYSIDE	Super 93	20	188	54	2	7.8	4.0	60.3	93	22	178	54	1	--	--	--	--
BAYSIDE	Super 94	21	*194	54	1	8.0	4.0	60.1	100	--	--	--	--	--	--	--	--
BAYSIDE	Super 97	22	180	57	2	7.4	3.8	61.0	98	24	173	56	2	--	--	--	--
BAYSIDE	1792	22	180	53	1	7.3	4.2	60.5	100	23	179	53	1	24	178	52	2
BIO GENE	BG 079	20	150	58	1	8.2	4.3	59.8	100	--	--	--	--	--	--	--	--
BIO GENE	BG 085	20	158	56	2	7.8	4.0	60.5	100	--	--	--	--	--	--	--	--
BIO GENE	BG 090	23	184	56	1	7.7	3.8	60.9	100	23	171	55	1	--	--	--	--
BROWN	BR 4641	23	*198	54	1	8.1	4.0	60.2	99	--	--	--	--	--	--	--	--
CALLAHAN	C7737	23	*199	53	1	8.4	4.0	59.9	100	23	185	53	1	25	183	52	1
CALLAHAN	C7936X	23	187	56	2	7.5	3.8	60.9	97	--	--	--	--	--	--	--	--
CARGILL	2777	22	176	59	1	7.6	3.8	61.0	100	--	--	--	--	--	--	--	--
CORN BELT	C49R9	22	185	53	2	7.6	3.8	60.8	92	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1297	22	*193	55	2	8.8	3.8	59.8	100	24	184	55	2	25	180	53	3
DAIRYLAND	STEALTH-1496	20	184	54	3	7.5	4.1	60.5	100	22	180	54	2	24	178	53	2
DEKALB	DK355	18	161	56	1	8.2	4.4	59.6	99	19	157	56	1	--	--	--	--
DEKALB	DK389BtY	21	145	57	1	7.8	4.3	60.1	100	--	--	--	--	--	--	--	--
DEKALB	DK405	20	180	55	2	7.4	3.8	60.9	100	20	170	55	2	--	--	--	--
DEKALB	DK427	21	185	56	2	7.1	3.7	61.4	100	--	--	--	--	--	--	--	--
DEKALB	DK440	21	*196	55	2	6.9	4.0	61.2	100	21	187	54	2	--	--	--	--
DEKALB	DK477	22	*193	54	0	7.3	3.9	60.7	100	22	185	54	1	24	178	53	2
DYNA-GRO	DG-5228	22	177	53	1	7.9	4.4	59.8	93	--	--	--	--	--	--	--	--
DYNA-GRO	DG-5345	22	185	53	2	7.7	4.0	60.5	100	--	--	--	--	--	--	--	--
GARST	8820	22	178	55	2	8.5	3.8	59.9	100	--	--	--	--	--	--	--	--
GARST	8830	22	*190	54	2	7.1	4.3	60.5	100	23	184	53	2	24	181	52	2
GENESIS	1996	21	*193	54	2	7.7	4.1	60.4	100	--	--	--	--	--	--	--	--
GENESIS	4M88	22	163	53	1	8.0	3.5	60.8	93	--	--	--	--	--	--	--	--
GOLDEN HARVEST	H-6726	20	179	54	2	8.3	3.9	59.9	100	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex787	21	186	54	2	7.5	4.0	60.7	100	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex96608	22	174	58	1	8.5	4.3	59.5	95	--	--	--	--	--	--	--	--
GREAT LAKES	4526	21	*190	54	2	7.7	4.0	60.5	100	22	183	54	2	--	--	--	--
GREAT LAKES	4758	23	180	55	2	7.7	4.0	60.5	97	24	176	54	2	--	--	--	--
HYTEST	HT4310	21	*196	55	3	7.7	4.0	60.5	99	23	184	54	3	--	--	--	--
LG SEEDS	LG2411	22	182	53	2	7.8	4.2	60.0	100	--	--	--	--	--	--	--	--
LG SEEDS	LG2421	23	186	55	2	7.8	3.8	60.7	100	23	182	56	2	--	--	--	--
LG SEEDS	LG2442	20	186	54	2	8.0	4.1	60.0	100	22	182	54	2	23	178	53	2
LG SEEDS	LG2473	23	*197	53	2	7.8	4.0	60.5	99	23	185	54	2	25	184	53	2
MIDWEST SEED	G6956	21	*191	54	2	7.7	4.1	60.4	98	--	--	--	--	--	--	--	--
MYCOGEN	2424	22	182	58	1	8.6	3.6	60.3	97	--	--	--	--	--	--	--	--
NOVARTIS	MAX86	22	188	59	1	8.4	3.7	60.4	100	23	181	59	1	--	--	--	--
NOVARTIS	N2555Bt	22	*195	57	1	7.8	4.2	60.3	100	--	--	--	--	--	--	--	--
NOVARTIS	N3030Bt	23	*198	55	1	7.8	4.1	60.4	100	23	191	55	2	--	--	--	--
PIONEER	37J99	22	*195	53	2	8.2	4.1	60.0	100	--	--	--	--	--	--	--	--
PIONEER	38P05	22	*192	57	1	8.1	3.8	60.3	98	22	185	57	1	--	--	--	--
PIONEER	38P06	23	*195	55	0	8.6	4.0	59.6	97	--	--	--	--	--	--	--	--
PIONEER	38D66	20	177	55	2	8.3	4.3	59.7	100	--	--	--	--	--	--	--	--
RENK	RK546	22	187	53	2	7.5	4.4	59.9	100	22	174	53	2	24	173	52	2
RENK	RK552	21	*190	54	2	7.5	4.0	60.7	100	22	182	54	1	24	178	53	2
RENK	RK569	23	**201	54	2	7.8	3.9	60.5	99	--	--	--	--	--	--	--	--
RUPP	XR 1357	20	173	55	1	8.2	4.0	60.1	100	21	168	55	1	23	161	54	2
TRELAY	3002	20	176	56	1	7.7	3.8	60.8	100	--	--	--	--	--	--	--	--
TRELAY	3700	21	177	53	2	7.3	4.1	60.7	100	22	170	54	2	--	--	--	--
TRELAY	4001	21	*197	54	2	7.6	4.1	60.4	99	--	--	--	--	--	--	--	--
TRELAY	4002	21	*197	54	3	7.6	4.2	60.3	97	22	189	54	2	23	183	52	3
AVERAGE		21	184	55	2	7.8	4.0	60.3	99	22	179	54	2	24	177	53	2
HIGHEST		23	201	59	3	8.8	4.4	61.4	100	24	191	59	3	25	184	54	3
LOWEST		18	145	53	0	6.9	3.5	58.9	92	19	157	53	1	22	161	52	1
LSD .05%		2	11	1		0.4	0.2	0.6									
CV		4	4	1		3.4	3.3	0.5									

\*\*HIGHEST YIELDING HYBRID

\* NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID



TABLE 3L.

## AVERAGE OF HURON, MONTCALM &amp; MASON COUNTY TRIALS - LATE (98 Day and later)

BRAND	HYBRID VARIETY	1999								2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% H2O	% BU/A	Test WT	% SL	% prot	% oil	% starch	% STD	% H2O	% BU/A	Test WT	% SL	% H2O	% BU/A	Test WT	% SL
BAYSIDE	Super 100	23	184	53	0	7.7	3.9	60.7	99	25	173	52	2	--	--	--	--
BROWN	BR 6574	24	191	52	1	8.0	3.6	60.5	99	--	--	--	--	--	--	--	--
CALLAHAN	C7738	23	187	53	1	7.5	4.0	60.7	99	--	--	--	--	--	--	--	--
CALLAHAN	C7741	24	197	53	1	9.1	3.9	59.4	100	27	183	52	1	29	179	51	2
CALLAHAN	C7942	25	* 201	54	2	7.7	3.8	60.6	100	--	--	--	--	--	--	--	--
CALLAHAN	EX5350	22	193	53	2	7.8	3.6	60.6	100	--	--	--	--	--	--	--	--
CARGILL	4111	22	196	55	2	7.6	4.0	60.4	100	--	--	--	--	--	--	--	--
CORN BELT	C499	22	179	57	3	7.1	3.8	61.3	97	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1402	24	196	53	1	9.1	3.7	59.6	100	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1403	23	175	54	3	8.9	4.0	59.3	100	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1499	21	179	53	1	8.1	4.0	60.0	98	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1501	22	173	54	3	8.1	4.2	59.8	100	--	--	--	--	--	--	--	--
DEKALB	DK493BtX	22	196	53	2	7.0	4.2	60.8	100	23	182	53	1	--	--	--	--
DEKALB	DK507	23	* 203	54	2	7.9	4.1	59.9	100	--	--	--	--	--	--	--	--
DEKALB	DK537	25	* 203	53	1	7.2	3.9	61.1	100	25	199	53	2	--	--	--	--
DEKALB	DK539	25	195	54	1	7.6	4.0	60.7	100	--	--	--	--	--	--	--	--
DEKALB	DK551BtY	26	* 200	53	1	7.5	4.0	60.7	100	28	194	52	1	--	--	--	--
DEKALB	DK567	27	* 208	52	1	7.4	4.0	60.7	100	--	--	--	--	--	--	--	--
GARST	N8701Bt	26	188	52	1	7.7	4.1	60.2	100	--	--	--	--	--	--	--	--
GARST	8780HpH	24	189	53	1	8.3	3.9	59.9	100	26	185	53	1	27	179	52	2
GOLDEN HARVEST	H-2398	24	195	53	2	8.5	3.9	59.8	99	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex97877	25	187	52	2	7.8	4.0	60.2	99	--	--	--	--	--	--	--	--
GREAT LAKES	4848	23	178	53	2	7.8	4.0	60.3	100	24	172	53	2	26	170	52	2
GRIES	GSFX300	27	196	52	1	8.4	3.9	59.9	97	--	--	--	--	--	--	--	--
HIGH CYCLE	HC7529Bt	25	193	53	1	8.2	4.3	59.6	100	--	--	--	--	--	--	--	--
HIGH CYCLE	HC7534RR	22	181	53	2	7.7	3.9	60.6	100	--	--	--	--	--	--	--	--
HYTEST	HT7415	23	177	56	2	7.4	3.8	61.1	100	--	--	--	--	--	--	--	--
LG SEEDS	LG2499	24	194	53	1	8.8	4.0	59.4	100	26	188	52	1	28	179	51	1
MYCOGEN	2545IMI	22	180	54	2	7.5	4.1	60.5	100	--	--	--	--	--	--	--	--
MYCOGEN	2566	24	* 201	53	0	8.6	3.7	59.9	100	--	--	--	--	--	--	--	--
NOVARTIS	N48-K2	24	187	54	1	8.4	3.9	60.2	97	--	--	--	--	--	--	--	--
PIONEER	36B08	26	197	54	1	8.4	3.7	60.1	99	--	--	--	--	--	--	--	--
PIONEER	36G12	24	**210	54	1	7.8	3.8	60.7	100	--	--	--	--	--	--	--	--
PIONEER	36D14	25	194	53	2	8.6	3.7	60.0	99	--	--	--	--	--	--	--	--
PIONEER	37M34	23	197	55	1	8.5	3.7	60.2	99	--	--	--	--	--	--	--	--
PIONEER	37R71	23	188	53	1	8.2	4.1	59.9	100	23	182	53	1	--	--	--	--
RENK	RK606	23	181	57	2	7.2	3.8	61.1	100	--	--	--	--	--	--	--	--
RENK	RK611	23	187	54	2	7.7	3.9	60.5	99	24	187	54	1	--	--	--	--
RENK	RK659	21	190	55	3	8.6	3.9	59.9	99	--	--	--	--	--	--	--	--
RUPP	XR 1583	23	185	52	2	8.0	3.6	60.5	100	--	--	--	--	--	--	--	--
TRELAY	5600	23	179	56	4	7.3	3.9	61.0	100	--	--	--	--	--	--	--	--
TRELAY	5700	23	184	54	2	7.6	4.1	60.6	99	--	--	--	--	--	--	--	--
AVERAGE		24	190	54	2	8.0	3.9	60.3	99	25	184	53	1	27	177	51	2
HIGHEST		27	210	57	4	9.1	4.3	61.3	100	28	199	54	2	29	179	52	2
LOWEST		21	173	52	0	7.0	3.6	59.3	97	23	172	52	1	26	170	51	1
LSD .05%		1	11	1		0.5	0.3	0.6									
CV		4	4	2		3.6	4.0	0.6									

\*\*HIGHEST YIELDING HYBRID

\* NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

## Variety Testing Personnel Gather at MSU

In August, Michigan State University hosted the 1999 meeting of the North Central Crop Evaluation Committee (NCCEC). The NCCEC consists of university personnel from the North Central Region involved in variety testing of any grain or forage crop. As a group, they have worked to standardize information from state-to-state, and have established a web site with links to all the North Central States, in order to assist seed companies and growers in obtaining and evaluating available yield data. The site is:

<http://www.ksu.edu/kscpt/nccec/>

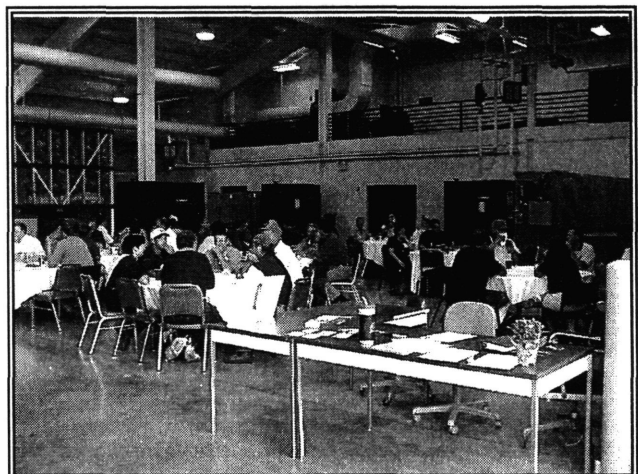


TABLE 3L (cont.)

BRAND	HYBRID VARIETY	HURON (Late)						MONTCALM (Late)						MASON (Late)								
		% H2O	Bushels / Acre 1999	2yr	3yr	Test WT	% SL	% STD	% H2O	Bushels / Acre 1999	2yr	3yr	Test WT	% SL	% STD	% H2O	Bushels / Acre 1999	2yr	3yr	Test WT	% SL	% STD
BAYSIDE	Super 100	21	186	160	--	56	1	100	20	196	173	--	54	0	100	28	172	187	--	50	0	98
BROWN	BR 6574	20	179	--	--	55	2	97	21	194	--	--	53	2	100	30	201	--	--	50	0	99
CALLAHAN	C7738	20	178	--	--	56	1	98	21	196	--	--	54	0	100	28	186	--	--	49	0	100
CALLAHAN	C7741	21	173	164	160	55	3	100	22	*213	180	177	54	1	100	29	*207	204	201	49	0	100
CALLAHAN	C7942	23	186	--	--	56	2	100	23	210	--	--	55	2	100	29	*207	--	--	52	1	100
CALLAHAN	EX5350	19	180	--	--	55	1	100	19	200	--	--	54	3	100	29	197	--	--	50	0	100
CARGILL	4111	19	182	--	--	57	3	100	20	202	--	--	56	4	100	27	*204	--	--	51	0	100
CORN BELT	C499	20	164	--	--	60	4	98	21	197	--	--	57	4	94	26	175	--	--	53	3	99
DAIRYLAND	STEALTH-1402	21	174	--	--	55	2	98	21	207	--	--	54	1	100	29	*207	--	--	50	1	100
DAIRYLAND	STEALTH-1403	20	167	--	--	56	6	100	21	181	--	--	55	2	100	28	179	--	--	51	0	100
DAIRYLAND	STEALTH-1499	19	173	--	--	56	2	98	20	182	--	--	54	1	99	25	181	--	--	50	0	98
DAIRYLAND	STEALTH-1501	21	161	--	--	55	4	100	21	191	--	--	54	2	100	24	167	--	--	52	2	100
DEKALB	DK493BIX	20	*187	162	--	56	4	100	20	199	180	--	55	1	100	28	202	204	--	50	2	100
DEKALB	DK507	20	186	--	--	58	3	100	20	208	--	--	55	2	100	29	*214	--	--	50	1	99
DEKALB	DK537	21	*189	181	--	56	1	100	22	208	189	--	54	3	100	30	*212	226	--	50	0	100
DEKALB	DK539	22	185	--	--	58	1	100	24	202	--	--	55	2	100	29	199	--	--	51	1	100
DEKALB	DK551BIY	22	179	177	--	55	0	100	26	*215	191	--	52	2	100	30	*206	214	--	51	2	100
DEKALB	DK567	24	**197	--	--	54	1	100	25	*219	--	--	51	2	100	31	*208	--	--	50	1	100
GARST	N8701Bt	24	180	--	--	55	1	99	25	191	--	--	52	1	100	30	193	--	--	50	0	100
GARST	8780HpH	22	172	170	161	55	3	100	22	202	182	180	54	0	100	29	195	203	195	50	0	98
GOLDEN HARVEST	H-2398	22	173	--	--	54	3	99	21	208	--	--	54	2	97	29	*203	--	--	50	1	100
GOLDEN HARVEST	Ex97877	22	178	--	--	54	5	98	23	194	--	--	52	1	99	30	189	--	--	49	0	100
GREAT LAKES	4848	20	175	156	155	57	3	100	21	182	173	172	54	2	100	27	176	186	184	49	0	100
GRIES	GSFX300	25	186	--	--	53	2	97	25	209	--	--	52	2	99	31	192	--	--	50	0	96
HIGH CYCLE	HC7529Bt	22	*187	--	--	55	2	100	22	195	--	--	53	0	100	30	198	--	--	51	0	100
HIGH CYCLE	HC7534RR	19	177	--	--	56	1	100	21	186	--	--	54	2	100	25	182	--	--	50	2	100
HYTEST	HT7415	20	164	--	--	58	4	100	21	192	--	--	56	1	100	27	174	--	--	53	1	100
LG SEEDS	LG2499	22	178	169	160	55	2	100	22	204	181	176	53	1	100	29	199	213	199	49	0	100
MYCOGEN	2545IMI	20	177	--	--	58	3	100	20	190	--	--	56	2	100	26	174	--	--	50	0	100
MYCOGEN	2566	21	*193	--	--	55	1	100	22	208	--	--	54	1	100	29	*203	--	--	50	0	100
NOVARTIS	N48-K2	22	176	--	--	55	0	97	23	191	--	--	54	0	100	29	195	--	--	51	1	94
PIONEER	36B08	24	181	--	--	55	0	97	24	211	--	--	55	1	100	30	198	--	--	51	1	100
PIONEER	36G12	21	*187	--	--	56	1	99	23	**226	--	--	55	2	100	27	**217	--	--	52	1	99
PIONEER	36D14	23	178	--	--	54	1	100	23	209	--	--	53	4	100	28	195	--	--	51	0	98
PIONEER	37M34	21	186	--	--	57	1	99	22	205	--	--	57	1	100	28	201	--	--	52	1	97
PIONEER	37R71	21	*189	178	--	55	1	100	21	187	173	--	54	1	100	28	188	195	--	49	1	100
RENK	RK606	20	167	--	--	59	2	100	20	192	--	--	58	2	100	27	183	--	--	53	1	100
RENK	RK611	20	175	178	--	58	2	100	21	188	174	--	55	2	100	29	199	208	--	50	0	99
RENK	RK659	20	181	--	--	57	6	100	20	199	--	--	56	3	98	25	190	--	--	51	1	100
RUPP	XR 1583	20	176	--	--	53	1	100	20	187	--	--	53	2	99	27	193	--	--	50	3	100
TRELAY	5600	20	167	--	--	59	4	100	20	185	--	--	57	5	100	28	183	--	--	52	3	100
TRELAY	5700	20	175	--	--	56	3	98	21	192	--	--	56	2	100	29	184	--	--	50	0	100
AVERAGE		21	179	170	159	56	2	99	22	199	179	176	54	2	100	28	193	204	195	51	1	99
HIGHEST		24	197	181	161	60	6	100	26	226	191	180	58	5	100	31	217	226	201	53	3	100
LOWEST		19	161	156	155	53	0	97	19	181	173	172	51	0	94	24	167	186	184	49	0	94
LSD .05%		1	10			1			1	13			1			2	14			1		
CV		4	4			2			4	5			2			5	5			1		

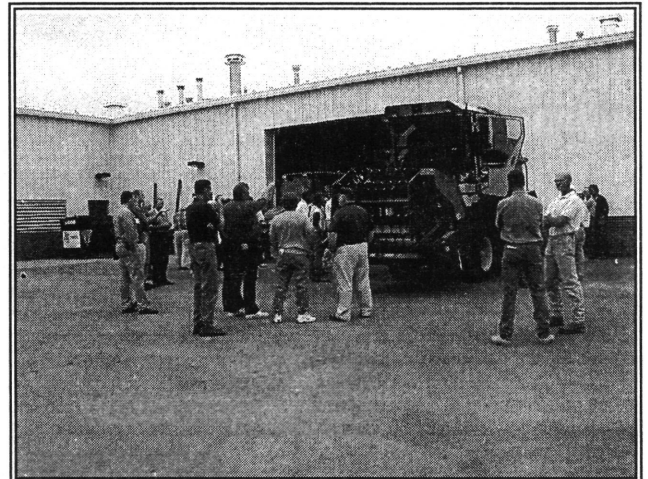
\*\*HIGHEST YIELDING HYBRID

\* NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

**Variety testing personnel,**  
continued from page 18

Universities attending the 1999 meeting included: Illinois, Iowa State, Kansas State, Michigan State, Nebraska, Ohio State, Penn State, South Dakota State, and Wisconsin.

Crops tested by this group include: corn, soybeans, wheat and other cereal grains, grain sorghum, corn silage, alfalfa and other grass forages.



Continued on page 20

TABLE 4.

AVERAGE OF ALPENA & GRAND TRAVERSE COUNTIES

BRAND	HYBRID VARIETY	H2O	BU/A	Test WT	1999					2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
					% SL	% prot	% oil	% starch	% STD	H2O	BU/A	Test WT	% SL	H2O	BU/A	Test WT	% SL
BAYSIDE	Super 75	20	126	56	1	9.6	4.0	58.9	100	23	110	55	1	--	--	--	--
BAYSIDE	Super 88	20	123	51	1	9.7	4.2	58.3	99	--	--	--	--	--	--	--	--
CARGILL	1877	20	124	57	2	9.2	3.6	59.8	98	22	109	57	2	25	108	55	1
CARGILL	2610	25	125	52	1	8.7	3.4	60.2	100	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1493	24	125	50	2	8.8	3.8	59.7	99	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1496	21	116	50	1	9.3	3.7	59.4	98	25	107	51	1	28	108	49	1
DEKALB	DK355	18	132	55	1	9.5	4.2	58.7	99	23	108	54	1	--	--	--	--
DEKALB	DK389BtY	21	121	56	1	9.1	3.9	59.4	100	--	--	--	--	--	--	--	--
DEKALB	DK405	19	* 137	53	1	8.6	3.5	60.1	98	24	128	52	1	--	--	--	--
DEKALB	DK427	21	**146	53	1	8.5	3.8	59.9	99	--	--	--	--	--	--	--	--
DEKALB	DK440	20	* 138	51	3	8.4	3.7	59.9	96	26	128	51	2	--	--	--	--
GENESIS	4M88	24	122	50	1	8.8	3.5	60.0	91	--	--	--	--	--	--	--	--
LG SEEDS	LG2333	19	116	57	1	9.6	3.7	59.2	96	--	--	--	--	--	--	--	--
LG SEEDS	LG2367	21	* 136	55	1	9.5	3.6	59.5	99	26	114	54	1	--	--	--	--
MYCOGEN	2242	20	132	54	2	8.7	3.9	59.8	101	--	--	--	--	--	--	--	--
MYCOGEN	2250IMI	20	131	54	2	9.7	4.1	58.7	100	24	116	54	1	28	112	52	1
PIONEER	38P05	21	* 134	53	3	9.0	3.4	60.0	95	--	--	--	--	--	--	--	--
PIONEER	38D66	20	* 141	52	2	9.1	3.7	59.6	99	24	127	52	2	--	--	--	--
PIONEER	39F06	21	130	54	0	9.3	3.7	59.2	98	--	--	--	--	--	--	--	--
RENK	RK232	19	125	54	2	9.7	3.4	59.4	100	--	--	--	--	--	--	--	--
RENK	RK277	19	127	53	0	8.7	3.7	60.1	100	23	122	54	1	--	--	--	--
RENK	RK386	20	121	55	2	10.0	3.4	59.0	97	--	--	--	--	--	--	--	--
TRELAY	1001	19	118	56	1	9.2	4.1	59.2	100	--	--	--	--	--	--	--	--
TRELAY	1007	20	* 135	54	1	8.5	4.1	59.8	100	23	123	53	1	--	--	--	--
TRELAY	2008	22	128	54	2	9.5	3.7	59.3	98	--	--	--	--	--	--	--	--
AVERAGE		20	128	53	1	9.1	3.8	59.5	98	24	117	53	1	27	109	52	1
HIGHEST		25	146	57	3	10.0	4.2	60.2	100	26	128	57	2	28	112	55	1
LOWEST		18	116	50	0	8.4	3.4	58.3	91	22	107	51	1	25	108	49	1
LSD .05%		2	13	2		0.7	0.3	0.7									
CV		4	5	2		4.4	4.0	0.7									

\*\*HIGHEST YIELDING HYBRID

\* NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

Variety Testing Personnel,  
continued from page 19

The 1999 meeting was used as a demonstration forum for manufacturing companies who build and supply planting, harvest and data collection equipment used in conducting research trials. The knowledge and use of the latest equipment, available for such research, is vital in giving the growers the best possible information for selecting hybrids and/or varieties for use in their farming operations. Six companies

participated in the meeting. Each company representative was given the opportunity to make a formal presentation on their company and its equipment line. Secondly, companies had the opportunity to demonstrate equipment in the field. A collection of planters, combines and forage harvesting equipment, with mounted electronic data collection systems, were all on hand for demonstration purposes.



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TABLE 4 (cont.)

BRAND	HYBRID VARIETY	% H2O	ALPENA						GRAND TRAVERSE						DELTA							
			Bushels / Acre			Test		%	%	Bushels / Acre			Test		%	%	Bushels / Acre			Test		%
			1999	2yr	3yr	WT	SL	STD	H2O	1999	2yr	3yr	WT	SL	STD	H2O	1999	2yr	3yr	WT	SL	STD
BAYSIDE	Super 75	20	132	124	--	57	1	100	19	119	97	--	55	1	100	32	*187	172	--	55	0	100
BAYSIDE	Super 88	21	*137	--	--	53	1	100	19	109	--	--	49	2	97	33	*185	--	--	52	3	100
CARGILL	1877	20	120	120	121	59	3	100	19	*127	98	95	56	2	97	31	162	161	140	56	2	91
CARGILL	2610	26	125	--	--	53	1	100	24	125	--	--	51	1	99	32	*189	--	--	55	2	100
DAIRYLAND	STEALTH-1493	24	134	--	--	52	0	100	24	116	--	--	49	4	98							
DAIRYLAND	STEALTH-1496	23	130	130	125	52	0	100	18	101	84	91	49	2	95							
DEKALB	DK355	19	*135	120	--	58	1	99	18	*130	95	--	52	2	99	30	*188	177	--	51	2	100
DEKALB	DK389BtY	22	128	--	--	58	1	100	20	114	--	--	53	1	100	32	*191	--	--	54	1	100
DEKALB	DK405	19	*143	147	--	55	2	100	19	*130	109	--	51	0	97	32	*195	182	--	50	4	98
DEKALB	DK427	22	**152	--	--	55	0	100	20	*139	--	--	51	1	97							
DEKALB	DK440	21	*144	146	--	53	4	100	20	*132	110	--	48	2	93							
GENESIS	4M88	23	129	--	--	52	1	91	25	115	--	--	49	1	90	34	180	--	--	53	2	92
LG SEEDS	LG2333	20	115	--	--	57	1	97	19	118	--	--	56	0	95	31	183	--	--	55	2	100
LG SEEDS	LG2367	22	*144	129	--	57	1	100	20	*127	100	--	53	1	98	33	*199	184	--	54	3	98
MYCOGEN	2242	20	*135	--	--	56	2	100	20	*130	--	--	52	1	101	33	*194	--	--	54	1	98
MYCOGEN	2250IMI	20	*136	130	125	55	1	100	19	*127	--	--	53	2	99	34	*197	183	155	53	5	100
PIONEER	38P05	22	*141	--	--	53	1	99	20	*126	--	--	52	5	90							
PIONEER	38D66	20	*142	136	--	54	2	99	20	**141	119	--	50	3	99							
PIONEER	39F06	22	131	--	--	55	0	100	20	*129	--	--	53	0	96							
RENK	RK232	19	130	--	--	55	1	100	19	120	--	--	53	2	100	31	*194	--	--	52	2	100
RENK	RK277	20	126	131	--	54	0	100	19	*128	112	--	53	0	99	33	*190	176	--	53	1	100
RENK	RK386	19	130	--	--	58	0	100	20	111	--	--	51	3	95	32	*191	--	--	53	2	100
TRELAY	1001	19	130	--	--	57	1	100	18	106	--	--	55	0	99	32	*187	--	--	54	1	100
TRELAY	1007	21	*141	134	--	56	1	100	19	*129	112	--	52	0	100	32	*187	176	--	54	2	100
TRELAY	2008	24	131	--	--	56	2	100	21	*126	--	--	53	2	95	33	**202	--	--	53	3	100
AVERAGE		21	134	132	124	55	1	99	20	123	103	93	52	1	97	32	192	180	155	53	2	99
HIGHEST		26	152	147	125	59	4	100	25	141	119	95	56	5	100	34	202	184	155	56	5	100
LOWEST		19	115	120	121	52	0	91	18	101	84	91	48	0	90	30	162	161	140	50	0	91
LSD .05%		1	17			3			1	15			2			1	17			2		
CV		5	9			3			4	8			2			3	6			3		

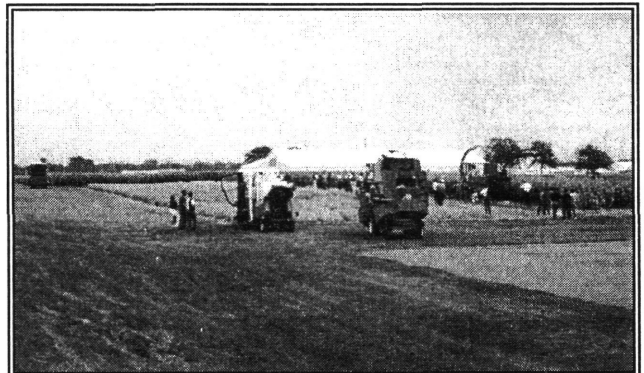
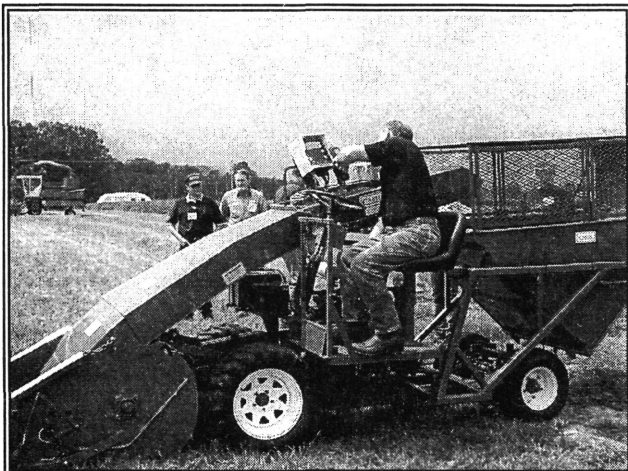
\*\*HIGHEST YIELDING HYBRID

\* NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

\*\*\* HYBRIDS WITH LATER THAN 90 DAY MATURITY RATING WERE NOT TESTED FOR GRAIN YIELD IN DELTA COUNTY

**Variety Testing Personnel,**  
continued from page 20

Participating companies included: Almaco, Carter, HarvestMaster, Hege, Kincaid and Winterstieger. Thank you to these companies for their assistance in making the 1999 meeting a success.





# GRAIN INDEX FOR 1999 CORN HYBRIDS COMPARED

There were 250 hybrids from 31 seed companies entered in 1076 county tests in the 1999 Michigan Corn Performance Trials. Numbers within parentheses refers to the Table in which the hybrid appears. The map shows the zones where the hybrids were entered. Early and late hybrids are designated by an E or L respectively. Company names used in association with hybrid numbers refer to the brand and the numbers are the variety (hybrid) designation. Hybrids with 4L designations are in Alpena and Grand Traverse Counties only.

## Table 1E / 1L

Monroe  
Branch - Irrigated  
Cass - Irrigated  
Average

## Table 2E / 2L

Kent  
Ingham  
Saginaw  
Average

## Table 3E / 3L

Huron  
Montcalm - Irrigated  
Mason - Irrigated  
Average

## Table 4

Alpena  
Grand Traverse  
Delta Grain  
Average

### AgriPro Seeds, Inc.

AGRIPRO AP9313 (1E,2E)  
AGRIPRO AP9340 (1E,2E)  
AGRIPRO AP9355Bt (1E)  
AGRIPRO AP9466 (1L)  
AGRIPRO AP9520 (1L)

### Bayside Seeds

BAYSIDE Super 75 (4)  
BAYSIDE Super 88 (2E,3E,4)  
BAYSIDE Super 90 (2E,3E)  
BAYSIDE Super 91 (3E)  
BAYSIDE Super 93 (2E,3E)  
BAYSIDE Super 94 (2E,3E)  
BAYSIDE Super 97 (2E,3E)  
BAYSIDE Super 99 (2E)  
BAYSIDE Super 100 (2E,3L)  
BAYSIDE Super 104 (2L)  
BAYSIDE Super 105 (1E)  
BAYSIDE Super 109 (1L)  
BAYSIDE 1792 (2E,3E)

### Beck's Superior Hybrids

BECK'S 4805 (1E)  
BECK'S 5105 (1E)  
BECK'S 5283Bt1 (1L)  
BECK'S 5305 (1L)

### Bio Gene

BIO GENE BG079 (3E)  
BIO GENE BG085 (3E)  
BIO GENE BG090 (3E)  
BIO GENE BG094 (2E)  
BIO GENE BG095 (2E)  
BIO GENE BG098 (2E)  
BIO GENE BG103 (2L)  
BIO GENE BG104 (1E)  
BIO GENE BG105 (1E)  
BIO GENE BG307 (1L)  
BIO GENE BG309 (1L)

### Brown Seed Farms

BROWN BR 4641 (3E)  
BROWN BR 5341 (2E)  
BROWN BR 6574 (3L)  
BROWN BR 6850 (2L)  
BROWN BR 6895 (2L)  
BROWN BR7050Bt (1L)

### Callahan Seeds

CALLAHAN C7658 (1L)  
CALLAHAN C7737 (2E,3E)  
CALLAHAN C7738 (2E,3L)  
CALLAHAN C7741 (2E,3L)  
CALLAHAN C7936X (2E,3E)  
CALLAHAN C7942 (2L,3L)  
CALLAHAN C7944 (2L)  
CALLAHAN C7946 (1E)  
CALLAHAN C7947X (1E)  
CALLAHAN EX5350 (2L,3L)

### Cargill Hybrid Seeds

CARGILL 1877 (4)  
CARGILL 2610 (4)  
CARGILL 2777 (3E)  
CARGILL 3677 (2E)  
CARGILL 4111 (3L)  
CARGILL 4220Bt (1E)  
CARGILL 6431IMI (2L)  
CARGILL 6888 (1L)

### Corn Belt Hybrids

CORN BELT C 499 (3L)  
CORN BELT C 49R9 (3E)  
CORN BELT C 528 (2E)  
CORN BELT C 567 (2L)  
CORN BELT C 578 (1E)  
CORN BELT C 588 (1L)  
CORN BELT C 58R9 (1E)  
CORN BELT C 59B8 (1L)

### Crow's Hybrid Corn Company

CROW'S 200 (2E)  
CROW'S 363 (1E)

### Dairyland Seed Company, Inc.

DAIRYLAND STEALTH-1297 (3E)  
DAIRYLAND STEALTH-1401 (2E)  
DAIRYLAND STEALTH-1402 (3L)  
DAIRYLAND STEALTH-1403 (3L)  
DAIRYLAND STEALTH-1404 (2L)  
DAIRYLAND STEALTH-1406 (1E,2L)  
DAIRYLAND STEALTH-1410 (2L)  
DAIRYLAND STEALTH-1412 (1L)  
DAIRYLAND STEALTH-1493 (4L)  
DAIRYLAND STEALTH-1496 (2E,3E,4L)  
DAIRYLAND STEALTH-1499 (3L)

### Dairyland (cont.)

DAIRYLAND STEALTH-1501 (3L)  
DAIRYLAND STEALTH-1504Bt (1E)  
DAIRYLAND STEALTH-1506Bt (1E)  
DAIRYLAND STEALTH-1507 (1E)

### Monsanto

DEKALB DK355 (3E,4)  
DEKALB DK389BtY (2E,3E,4)  
DEKALB DK405 (2E,3E,4)  
DEKALB DK427 (2E,3E,4L)  
DEKALB DK440 (1E,2E,3E,4L)  
DEKALB DK477 (1E,2E,3E)  
DEKALB DK493BtX (1E,2E,3L)  
DEKALB DK507 (1E,2E,3L)  
DEKALB DK537 (1E,2L,3L)  
DEKALB DK539 (1E,2L,3L)  
DEKALB DK551BtY (1E,2L,3L)  
DEKALB DK567 (1E,2L,3L)  
DEKALB DK585 (1L,2L)  
DEKALB DK589BtY (1L)  
DEKALB DK595BtY (1L)  
DEKALB DK607 (1L)  
DEKALB DK621BtY (1L)

### UAP Great Lakes

DYNA-GRO DG5228 (2E,3E)  
DYNA-GRO DG5258 (2E)  
DYNA-GRO DG5309 (1E,2E)  
DYNA-GRO DG5322 (1E)  
DYNA-GRO DG5345 (2E,3E)  
DYNA-GRO DG5352 (1L)

### Garst Seed Co.

GARST 8464 (1L)  
GARST 8541IT (1L)  
GARST 8590 (1E,2L)  
GARST 8640 (1E)  
GARST N8701Bt (3L)  
GARST 8707 (2L)  
GARST 8780 HpH (2E,3L)  
GARST 8820 (3E)  
GARST 8830 (2E,3E)

### Geertson Seed Farms

GEERTSON GS1067 (1E,2L)  
GEERTSON GS1099 (2L)  
GEERTSON GS1117 (1L)

**Genesis Ag Ltd.**

GENESIS 1904Bt (1E)  
 GENE SIS 1996 (2E,3E)  
 GENESIS 1M98 (2E)  
 GENESIS 2M06 (1E)  
 GENESIS 2M99 (2E)  
 GENESIS 2M100 (2E)  
 GENESIS 4M88 (3E,4)

**Golden Harvest/Sommer Bros. Seed Co.**

GOLDEN HARVEST H-2398 (2E,3L)  
 GOLDEN HARVEST H-6726 (2E,3E)  
 GOLDEN HARVEST H-8250 (2L)  
 GOLDEN HARVEST Ex787 (2E,3E)  
 GOLDEN HARVEST EX96608 (2E,3E)  
 GOLDEN HARVEST EX97877 (3L)  
 GOLDEN HARVEST EX98590 (1L,2L)  
 GOLDEN HARVEST EX98602 (1L)  
 GOLDEN HARVEST EX98777 (1L)

**Great Lakes Hybrids, Inc.**

GREAT LAKES 4526 (3E.)  
 GREAT LAKES 4758 (2E,3E)  
 GREAT LAKES 4848 (2E,3L)  
 GREAT LAKES 5322 (2L)  
 GREAT LAKES 5456 (2L)  
 GREAT LAKES 5675 (1E)  
 GREAT LAKES 5816 (1L)

**Gries Seed Farms, Inc.**

GRIES X-300 (2L,3L)  
 GRIES GSF-4200E (1E)  
 GRIES GSF-4203 (1E)

**Trelay Seed Company**

HIGH CYCLE HC7529Bt (1E,2L,3L)  
 HIGH CYCLE HC7534RR (2E,3L)  
 HIGH CYCLE HC7634RR (1E)  
 HIGH CYCLE HC7734RR (1L)

**AgriBiotech, Inc.**

HYTEST HT4310 (3E)  
 HYTEST BH4602 (1E,2L)  
 HYTEST HT7415 (2E,3L)

**Jung Seed Genetics, Inc.**

JUNG 2440 waxey (1E,2E)  
 JUNG 2510A (1E,2L)  
 JUNG 2706 (1L,2L)

**LG Seeds**

LG SEEDS LG2333 (4)  
 LG SEEDS LG2367 (4)  
 LG SEEDS LG2411 (3E)  
 LG SEEDS LG2421 (3E)  
 LG SEEDS LG2442 (3E)  
 LG SEEDS LG2473 (2E,3E)  
 LG SEEDS LG2481RR (2E)

**LG Seeds (cont.)**

LG SEEDS LG2484 (2E)  
 LG SEEDS LG2499 (2E,3L)  
 LG SEEDS LG2530 (1E)  
 LG SEEDS LG2544 (2L)  
 LG SEEDS LG2582RR (1L)  
 LG SEEDS LG2583 (1L)

**Midwest Seed Genetics**

M/W GENETICS G6956 (3E)  
 M/W GENETICS G7010 (2E)  
 M/W GENETICS G7711 (1L)

**Mycogen Plant Sciences**

MYCOGEN 2242 (4)  
 MYCOGEN 2250IMI (4)  
 MYCOGEN 2424 (3E)  
 MYCOGEN 2545IMI (2E,3L)  
 MYCOGEN 2566 (3L)  
 MYCOGEN 2652 (1E,2L)  
 MYCOGEN 2717IMI (1L,2L)

**The Andersons, Inc.**

NOSCO CLASSIC ELITE 4089 (1E,2E)  
 NOSCO CLASSIC ELITE 4099Bt (1E,2E)  
 NOSCO CLASSIC ELITE 5001 (1E,2L)  
 NOSCO CLASSIC ELITE 5401 (1E,2L)  
 NOSCO CLASSIC ELITE 5507 (1E,2L)  
 NOSCO CLASSIC ELITE 5707RR (1L)  
 NOSCO CLASSIC ELITE 5801(1L,2L)

**Novartis Seeds, Inc.**

NOVARTIS MAX86 (3E)  
 NOVARTIS N2555Bt (3E)  
 NOVARTIS N3030Bt (3E)  
 NOVARTIS N4424 (2E)  
 NOVARTIS N4640Bt (2L)  
 NOVARTIS N48-K2 (2L,3L)  
 NOVARTIS N57-E3 (2L)  
 NOVARTIS N58-D1 (1E,2L)  
 NOVARTIS N59-Q9 (1E)  
 NOVARTIS N65-A1 (1L)  
 NOVARTIS N70-D5 (1L)

**Pfister Hybrid Corn Co.**

PFISTER 2015 (1E)  
 PFISTER 2024 (1E)  
 PFISTER 2025 (1E)  
 PFISTER 2123 (1L)

**Pioneer Hi-Bred International, Inc.**

PIONEER 33J24 (1L)  
 PIONEER 33G27 (1L)  
 PIONEER 33T90 (1L)  
 PIONEER 34B23 (1L)  
 PIONEER 34G82 (1L,2L)  
 PIONEER 34G82 (1L,2L)

**Pioneer (cont.)**

PIONEER 36B08 (3L)  
 PIONEER 36G12 (1E,2L,3L)  
 PIONEER 36D14 (1E,2L,3L)  
 PIONEER 3730 (2E)  
 PIONEER 37M34 (2E,3L)  
 PIONEER 37R71 (2E,3L)  
 PIONEER 37J99 (2E,3E)  
 PIONEER 38P05 (3E,4L)  
 PIONEER 38P06 (2E,3E)  
 PIONEER 38D66 (3E,4L)  
 PIONEER 39F06 (4L)

**Renk Seed Company, Inc.**

RENK RK232 (4)  
 RENK RK277 (4)  
 RENK RK386 (4)  
 RENK RK546 (2E,3E)  
 RENK RK552 (2E,3E)  
 RENK RK569 (2E,3E)  
 RENK RK606 (2E,3L)  
 RENK RK611 (3L)  
 RENK RK648 (1E,2L)  
 RENK RK648Bt (1E,2L)  
 RENK RK659 (3L)  
 RENK RK706 (2L)  
 RENK RK706Bt (1L,2L)  
 RENK RK778 (1L,2L)  
 RENK RK856 (1L)  
 RENK RK864 (1L,2L)

**Rupp Seeds, Inc**

RUPP XR 1357 (3E)  
 RUPP XR 1583 (1E,2E,3L)  
 RUPP XR 1682 (1E,2L)  
 RUPP XR 1733 (1L)  
 RUPP XR 8104Bt (1E,2L)  
 RUPP XR 8108Bt (1L)

**Sunstar Hybrids**

SUNSTAR EX1200 (1E)  
 SUNSTAR 4407 (1L)  
 SUNSTAR 4706A (1E)

**Trelay Seed Company, Inc.**

TRELAY 1001 (4)  
 TRELAY 1007 (4)  
 TRELAY 2008 (4)  
 TRELAY 3002 (3E)  
 TRELAY 3700 (3E)  
 TRELAY 4001 (2E,3E)  
 TRELAY 4002 (2E,3E)  
 TRELAY 5600 (2E,3L)  
 TRELAY 5700 (2E,3L)  
 TRELAY 7002 (1E,2L)  
 TRELAY 9095 (1L)

# 1999 SILAGE PERFORMANCE TRIALS

## INTRODUCTION

Seven locations (see map) containing 11 silage tests were harvested. The index on page 35 contains a list of all hybrids planted in the 1999 silage trials. The 11 silage tests included 69 hybrids from 19 seed companies comprising 221 entries. Company names used in association with hybrid numbers refer to their brands. The numbers are the company's designations.

Trials conducted in Ionia, Ingham, and Huron counties contain two maturity groups with yield data presented in Table 5. Delta County has two silage trials in 1999. Table 6 compares a later maturity group of hybrids in Delta County with trials from Alpena and Missaukee counties, Table 7 compares an earlier maturity group of hybrids in Delta County with a trial in Alger County.

### **Harvesting and Handling Silage Data**

Silage plots are harvested with a single row, side-mounted forage chopper. Plot weights are measured by electronic scales mounted on the tractor and chopper. After weighed samples are dumped, subsamples are collected for use in determining percent dry matter and quality analysis. A second sample is collected and ensiled in a PVC mini silo to ferment.

### **Methods**

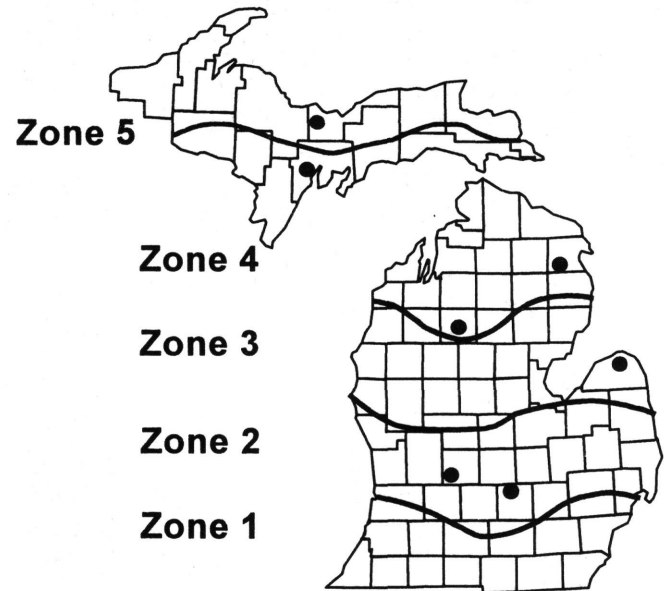
Testing procedures (randomization, replication, planting rates, etc.) for silage evaluation are the same as used in the grain trials except for the use of 2-row plots. Silage tables are arranged by company order.

The chopped silage (fodder plus grain) samples are weighed, oven dried until weight loss is zero, then weighed again to determine the percent dry matter. After 30 days the mini silos are opened, oven-dried and finely ground for further evaluation by means of in-vitro silage digestibility analysis conducted by the MSU Department of Animal Science.

### **In-Vitro Silage Analysis**

In-vitro analysis is an in-the-laboratory (literally in glass) system to estimate the actual

## 1999 SILAGE LOCATIONS



nutrient content of a silage sample.

1. A sample of the rumen contents of a cow are removed, blended, and filtered to extract fiber.
2. Measured amounts of rumen fluid and media are added to weighed amounts of the ground silage sample.
3. This media and silage are incubated in a heated water bath at 40°C for 30 hours. In this step, the microbes from the rumen sample attack the ground silage sample in a process similar to the digestive processes of the ruminant animal. Following this digestion step, the undigested materials can be separated and measured.
4. Other evaluation procedures estimate the protein and fiber content of the silage. Here the samples are shown on a fiber reflux condenser. Samples are boiled for an hour in detergent solutions and filtered to determine fiber.

Results of the four analyses are presented. They are:

1. **DMD=dry-matter digestibility.** This is a measure of energy available from the corn forage. The higher the DMD, the greater the energy content. It is determined by a laboratory method which incubates a sample of the corn forage with microbes from the rumen of a cow. Thirty hours is

used to represent the average retention time of feed in the rumen. Differences among hybrids in DMD are approximately equal to differences in total digestible nutrients of TDN. A high DMD is desirable.

2. **FD=fiber digestibility.** This is a measure of the degree of fermentation of fiber by ruminant animals. It is determined as the disappearance of neutral detergent fiber during an in-vitro rumen fermentation. High fiber digestibility has been found to increase intake of ruminants as it decreases the filling effect of the feed and provides energy to microbes in the rumen increasing microbial protein production. A high FD is desirable.

3. **NDF=neutral detergent fiber.** This is a measure of the fiber content of the corn forage. Fiber must be fermented by microbes in the gastrointestinal tract to be utilized by ruminants. It is less digestible than non-fiber constituents of the forage. Forages with high levels of NDF have lower energy. It is also a measure of the gut-filling properties of the forage and high NDF decreases forage intake. A low NDF content is desirable.

4. **CP=crude protein.** Forages are generally supplemented with high protein concentrates such as soybean meal to increase the protein content of ruminant diets. Corn hybrids with high protein require less supplementation and therefore lowered feed costs. A high protein content is desirable.

## SELECTION OF CORN HYBRIDS FOR SILAGE

### *A nutritionist's Perspective*

Hybrid selection is one of the most important management decisions influencing the economics of corn silage production. Hybrids should be selected from a group that is well adapted to the area in terms of maturity, disease and insect resistance and drought tolerance. Hybrids among this group will vary in grain yield, forage yield and quality. Grain yield has been the most widely used criterion for selection of silage hybrids. However, grain yield is not related to silage quality and is not highly related to forage yield, two important criteria for silage hybrids. Although there is a slight negative relationship between forage yield and quality, the relationship is not strong and there is variation in quality even among the highest yielding hybrids. This allows opportunity to select for high quality with little reduction in yield.

While excellent silage hybrids with high forage yield and high quality exist, dual purpose hybrids that are excellent for both silage and grain do not. This is because characteristics that make an excellent grain hybrid such as fast rate of kernel dry-down and hard kernel texture are undesirable for silage production since they reduce the digestibility of starch in the grain. Kernels in corn silage should have high moisture and be of soft kernel texture to increase starch digestion by the animal. Hard, dry kernels resist digestion and will reduce the energy content of the silage. Hybrids also vary in amount and

digestibility of fiber which can affect intake and production. Varying levels of crude protein can affect supplementation costs.

### *Specific Recommendations*

Any hybrid selected for silage should be among the top 50 percent in forage yield. The hybrid should have a slow to medium rate of kernel dry-down, so the kernel will not be too dry when the whole plant is dry enough to ensile. This is particularly important for upright silos that require drier silage to reduce seepage. The kernel should have soft texture so that it is easily fractured during chopping and chewing. Additional recommendations vary by animal type and level of performance. Hybrids with high digestibility due to highly digestible NDF should be selected for high producing dairy cattle in early lactation. Hybrids with low NDF and high crude protein should be selected for growing animals consuming high corn silage diets to increase dry matter intake and reduce protein supplementation costs. As research becomes available, hybrid selection indexes will be able to more accurately rank hybrids for different animal types.

*M.S. Allen, assistant professor  
Department of Animal Science  
Michigan State University*

**TABLE 5E (A). AVERAGE OF IONIA, INGHAM & HURON COUNTY SILAGE TRIALS - EARLY (103 Day and earlier)**

BRAND	HYBRID VARIETY	1999				2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% DM	Green WT/A	Dry WT/A	% STD	% DM	Green WT/A	Dry WT/A	% STD	% DM	Green WT/A	Dry WT/A	% STD
BALDRIDGE	BH-511	34.3	20.3	6.9	100	--	--	--	--	--	--	--	--
CALLAHAN	C7526S	35.2	22.8	* 8.0	99	31.9	22.9	7.3	99	--	--	--	--
DAIRYLAND	STEALTH-1203	42.1	18.4	7.7	100	38.3	18.4	7.0	100	37.4	19.0	7.0	98
DAIRYLAND	STEALTH-1297	39.3	18.6	7.4	99	36.6	18.9	6.9	99	35.5	19.8	7.0	97
DAIRYLAND	DST-10212	42.8	18.5	* 7.9	98	38.3	18.6	7.1	96	--	--	--	--
GARST	8707	42.0	18.6	7.7	100	37.4	19.3	7.1	99	--	--	--	--
GEERTSON	GS998	39.2	19.6	7.6	97	--	--	--	--	--	--	--	--
GOLDEN HARVEST	H-2398	40.1	18.0	7.2	97	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex787	42.6	17.0	7.2	100	--	--	--	--	--	--	--	--
HYTEST	HT4310	42.9	17.5	7.5	99	--	--	--	--	--	--	--	--
HYTEST	HT7415	41.5	17.9	7.5	100	--	--	--	--	--	--	--	--
LG SEEDS	LG2499	36.4	19.7	7.2	100	34.0	19.2	6.6	98	33.0	20.7	6.8	97
MYCOGEN	TMF100	39.5	21.4	**8.5	100	35.8	21.4	7.7	98	--	--	--	--
PIONEER	36G12	40.4	20.2	* 8.1	95	--	--	--	--	--	--	--	--
PIONEER	36H36	38.4	19.1	7.3	100	36.4	19.3	7.0	98	--	--	--	--
PIONEER	37R71	41.0	16.8	6.9	100	38.1	16.8	6.4	95	--	--	--	--
PIONEER	38P05	43.3	16.8	7.4	99	--	--	--	--	--	--	--	--
RENK	RK546	38.8	18.9	7.3	100	--	--	--	--	--	--	--	--
RENK	RK569	40.2	16.9	6.9	99	--	--	--	--	--	--	--	--
RENK	RK648	36.6	20.8	7.6	100	--	--	--	--	--	--	--	--
AVERAGE		39.8	18.9	7.5	99	36.3	19.4	7.0	98	35.3	19.8	6.9	97
HIGHEST		43.3	22.8	8.5	100	38.3	22.9	7.7	100	37.4	20.7	7.0	98
LOWEST		34.3	16.8	6.9	95	31.9	16.8	6.4	95	33.0	19.0	6.8	97
LSD .05%		3.0	1.6	0.7									
CV		4.5	5.2	5.6									

\*\*HIGHEST YIELDING HYBRID FOR DRY WEIGHT PER ACRE

\* DRY WEIGHT NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

**TABLE 5L (A). AVERAGE OF IONIA, INGHAM & HURON COUNTY SILAGE TRIALS - LATE (104 Day and later)**

BRAND	HYBRID VARIETY	1999				2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% DM	Green WT/A	Dry WT/A	% STD	% DM	Green WT/A	Dry WT/A	% STD	% DM	Green WT/A	Dry WT/A	% STD
BALDRIDGE	BH-611	35.7	19.9	7.0	100	--	--	--	--	--	--	--	--
BROWN	BR X6990ED	37.0	20.5	7.6	100	--	--	--	--	--	--	--	--
CORN BELT	C567	45.3	19.0	8.6	96	40.4	19.4	7.8	97	40.6	20.0	8.1	96
DAIRYLAND	STEALTH-1406	45.4	18.3	8.3	99	41.0	18.7	7.7	96	40.3	19.9	7.9	95
DAIRYLAND	STEALTH-1407	43.0	17.5	7.5	100	39.0	18.1	7.0	98	39.9	19.0	7.5	97
DAIRYLAND	STEALTH-1508	44.1	18.7	8.2	99	39.3	19.8	7.7	99	38.7	20.4	7.8	96
GARST	8541IT	43.3	18.9	8.1	100	--	--	--	--	--	--	--	--
GOLDEN HARVEST	H-8250	40.7	18.9	7.7	99	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex98590	43.6	18.7	8.2	90	--	--	--	--	--	--	--	--
GREAT LAKES	5456	40.9	18.7	7.6	100	38.6	19.4	7.5	97	--	--	--	--
GREAT LAKES	5816	40.1	21.2	8.5	100	36.8	21.3	7.8	96	36.5	22.1	8.0	94
GREAT LAKES	5831	37.6	22.5	8.4	100	--	--	--	--	--	--	--	--
HIGH CYCLE	HC6762nE	38.4	22.1	8.5	100	--	--	--	--	--	--	--	--
HYTEST	BH4602	46.0	19.1	8.8	100	--	--	--	--	--	--	--	--
LG SEEDS	LG2526SP	39.7	19.8	7.8	100	--	--	--	--	--	--	--	--
MYCOGEN	TMF114	39.0	25.0	* 9.7	100	34.7	24.6	8.6	97	--	--	--	--
MYCOGEN	TMF2720	41.5	20.9	8.6	100	--	--	--	--	--	--	--	--
NOSCO CLASSIC E	5111 Super Silo	39.7	22.2	8.8	100	--	--	--	--	--	--	--	--
NOVARTIS	MAX101	44.1	17.4	7.6	97	--	--	--	--	--	--	--	--
NOVARTIS	NX4687	43.0	22.7	**9.8	100	--	--	--	--	--	--	--	--
NOVARTIS	N58-D1	38.0	22.9	8.7	99	--	--	--	--	--	--	--	--
PIONEER	33J24	36.4	22.6	8.3	96	--	--	--	--	--	--	--	--
PIONEER	33T90	39.7	23.5	* 9.3	99	--	--	--	--	--	--	--	--
PIONEER	34G82	39.5	20.5	8.1	100	--	--	--	--	--	--	--	--
RENK	RK648Bt	40.6	18.9	7.5	100	--	--	--	--	--	--	--	--
RENK	RK775	45.7	18.2	8.3	100	41.8	19.0	7.9	96	41.0	19.8	8.0	94
TRELAY	7004	39.7	20.2	7.9	99	--	--	--	--	--	--	--	--
TRELAY	7005	43.4	19.1	8.2	100	--	--	--	--	--	--	--	--
TRELAY	9001	41.7	19.5	8.0	100	--	--	--	--	--	--	--	--
TRELAY	9700	37.5	24.7	9.2	100	34.6	23.8	8.2	99	--	--	--	--
AVERAGE		41.0	20.4	8.3	99	38.5	20.5	7.8	97	39.5	20.2	7.9	95
HIGHEST		46.0	25.0	9.8	100	41.8	24.3	8.6	99	41.0	22.1	8.1	97
LOWEST		35.7	17.4	7.0	96	34.6	18.1	7.0	96	36.5	19.0	7.5	94
LSD .05%		3.4	1.7	0.5									
CV		5.0	5.1	3.8									

\*\*HIGHEST YIELDING HYBRID FOR DRY WEIGHT PER ACRE

\* DRY WEIGHT NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

**TABLE 5E (B). AVERAGE OF IONIA, INGHAM & HURON COUNTY SILAGE TRIALS - EARLY (103 Day and earlier)  
IN-VITRO ANALYSES**

BRAND	HYBRID VARIETY	1999				2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP
BALDRIDGE	BH-511	77.0	51.9	47.7	8.0	--	--	--	--	--	--	--	--
CALLAHAN	C7526S	82.6	53.0	36.9	7.1	82.1	54.1	39.0	7.1	--	--	--	--
DAIRYLAND	STEALTH-1203	82.1	54.3	39.1	7.5	82.9	55.8	38.6	7.6	81.4	52.4	38.9	7.6
DAIRYLAND	STEALTH-1297	82.2	55.1	39.7	8.2	83.0	56.6	39.1	7.9	81.7	52.9	39.1	7.7
DAIRYLAND	DST-10212	82.8	55.7	38.9	7.3	83.4	58.4	39.9	7.9	--	--	--	--
GARST	8707	79.6	53.8	44.2	7.1	80.0	54.2	43.7	7.1	--	--	--	--
GEERTSON	GS998	85.1	58.3	35.9	7.6	--	--	--	--	--	--	--	--
GOLDEN HARVEST	H-2398	83.1	54.3	37.1	7.9	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex787	82.1	51.7	36.7	7.6	--	--	--	--	--	--	--	--
HYTEST	HT4310	83.1	53.7	36.4	7.6	--	--	--	--	--	--	--	--
HYTEST	HT7415	81.1	51.8	39.3	7.0	--	--	--	--	--	--	--	--
LG SEEDS	LG2499	81.0	53.1	40.6	7.7	82.1	55.9	39.8	7.8	80.5	52.2	40.2	7.7
MYCOGEN	TMF100	81.1	55.3	42.4	7.4	82.4	57.2	41.0	7.3	--	--	--	--
PIONEER	36G12	84.2	58.1	37.4	7.2	--	--	--	--	--	--	--	--
PIONEER	36H36	82.2	54.1	38.9	7.8	82.9	55.8	38.8	7.9	--	--	--	--
PIONEER	37R71	83.8	53.5	34.9	7.2	83.8	55.3	36.1	7.8	--	--	--	--
PIONEER	38P05	82.4	52.7	37.2	7.3	--	--	--	--	--	--	--	--
RENK	RK546	78.6	52.3	45.0	7.5	--	--	--	--	--	--	--	--
RENK	RK569	82.4	55.1	39.3	7.4	--	--	--	--	--	--	--	--
RENK	RK648	80.9	52.8	40.5	7.4	--	--	--	--	--	--	--	--
AVERAGE		81.9	54.0	39.4	7.5	82.5	55.9	39.6	7.6	81.2	52.5	39.4	7.7
HIGHEST		85.1	58.3	47.7	8.2	83.8	58.4	43.7	7.9	81.7	52.9	40.2	7.7
LOWEST		77.0	51.7	34.9	7.0	80.0	54.1	36.1	7.1	80.5	52.2	38.9	7.6
LSD .05%		2.3	3.0	4.5	0.7								
CV		1.7	3.3	6.9	5.4								

**TABLE 5L (B). AVERAGE OF IONIA, INGHAM & HURON COUNTY SILAGE TRIALS - LATE (104 Day and later)  
IN-VITRO ANALYSES**

BRAND	HYBRID VARIETY	1999				2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP
BALDRIDGE	BH-611	78.3	53.9	47.0	8.3	--	--	--	--	--	--	--	--
BROWN	BR X6990ED	80.1	51.8	41.3	7.4	--	--	--	--	--	--	--	--
CORN BELT	C567	82.1	51.4	36.8	7.7	84.0	56.3	36.6	7.4	81.4	52.0	38.4	7.3
DAIRYLAND	STEALTH-1406	79.9	50.4	40.5	7.2	82.2	54.9	39.3	7.2	80.2	51.7	40.7	7.2
DAIRYLAND	STEALTH-1407	80.5	52.0	40.5	7.2	82.5	55.5	38.9	6.9	81.0	52.1	39.2	7.1
DAIRYLAND	STEALTH-1508	82.0	55.2	39.9	7.4	83.3	57.6	39.6	7.0	81.1	53.9	40.8	7.3
GARST	8541IT	81.6	52.1	38.4	6.9	--	--	--	--	--	--	--	--
GOLDEN HARVEST	H-8250	82.4	53.7	38.0	7.0	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex98590	82.0	54.8	40.1	7.2	--	--	--	--	--	--	--	--
GREAT LAKES	5456	79.6	50.2	41.0	7.3	81.5	52.5	38.8	7.2	--	--	--	--
GREAT LAKES	5816	81.2	54.3	41.1	7.3	83.4	58.5	39.8	7.4	81.4	53.8	40.1	7.3
GREAT LAKES	5831	79.9	51.0	40.9	7.2	--	--	--	--	--	--	--	--
HIGH CYCLE	HC6762nE	78.4	51.2	44.2	7.2	--	--	--	--	--	--	--	--
HYTEST	BH4602	80.5	52.5	41.2	6.8	--	--	--	--	--	--	--	--
LG SEEDS	LG2526SP	79.8	52.9	42.6	6.6	--	--	--	--	--	--	--	--
MYCOGEN	TMF114	79.8	54.5	44.4	6.8	80.3	55.6	44.6	6.4	--	--	--	--
MYCOGEN	TMF2720	81.5	55.0	40.9	7.0	--	--	--	--	--	--	--	--
NOSCO CLASSIC E	5111 Super Silo	81.6	56.3	42.0	6.8	--	--	--	--	--	--	--	--
NOVARTIS	MAX101	81.6	56.2	42.2	7.0	--	--	--	--	--	--	--	--
NOVARTIS	NX4687	80.5	55.7	43.9	6.7	--	--	--	--	--	--	--	--
NOVARTIS	N58-D1	80.2	55.1	43.9	7.0	--	--	--	--	--	--	--	--
PIONEER	33J24	82.4	54.7	39.0	7.1	--	--	--	--	--	--	--	--
PIONEER	33T90	82.3	53.9	38.5	6.9	--	--	--	--	--	--	--	--
PIONEER	34G82	79.2	47.4	39.6	7.0	--	--	--	--	--	--	--	--
RENK	RK648Bt	79.6	48.7	40.0	7.2	--	--	--	--	--	--	--	--
RENK	RK775	81.7	52.9	38.9	7.2	81.6	54.5	40.7	6.9	80.1	51.1	40.7	7.2
TRELAY	7004	79.9	51.2	41.3	7.4	--	--	--	--	--	--	--	--
TRELAY	7005	80.5	53.7	42.1	7.6	--	--	--	--	--	--	--	--
TRELAY	9001	78.8	51.0	43.2	7.9	--	--	--	--	--	--	--	--
TRELAY	9700	80.1	53.8	43.1	6.9	81.7	56.8	42.3	6.7	--	--	--	--
AVERAGE		80.6	52.9	41.2	7.2	82.3	55.8	40.1	7.0	80.9	52.4	40.0	7.2
HIGHEST		82.4	56.3	47.0	8.3	84.0	58.5	44.6	7.4	81.4	53.9	40.8	7.3
LOWEST		78.3	47.4	36.8	6.6	80.3	52.5	36.6	6.4	80.1	51.1	38.4	7.1
LSD .05%		3.6	5.3	5.3	0.6								
CV		2.7	6.1	7.8	5.2								



TABLE 5E (B) cont.

## IN-VITRO ANALYSES

BRAND	HYBRID VARIETY	IONIA (Early)				INGHAM (Early)				HURON (Early)			
		% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP
BALDRIDGE	BH-511	76.3	51.4	48.7	8.5	77.7	52.6	47.0	7.9	77.1	51.7	47.4	7.6
CALLAHAN	C7526S	84.4	55.6	35.1	7.3	80.3	49.6	39.2	6.8	83.2	53.7	36.3	7.2
DAIRYLAND	STEALTH-1203	85.0	57.2	35.2	7.5	80.6	52.6	40.9	7.8	80.7	53.2	41.3	7.3
DAIRYLAND	STEALTH-1297	80.9	56.0	43.4	9.8	81.5	53.8	40.0	7.2	84.1	55.4	35.7	7.6
DAIRYLAND	DST-10212	84.7	58.4	36.8	7.3	81.9	52.1	37.7	7.6	81.7	56.7	42.2	6.9
GARST	8707	79.3	55.4	46.6	7.2	79.8	52.5	42.4	7.1	79.8	53.6	43.5	7.0
GEERTSON	GS998	85.7	59.2	35.1	7.7	85.2	56.2	34.3	7.7	84.5	59.4	38.2	7.4
GOLDEN HARVEST	H-2398	84.1	54.3	34.7	8.0	82.7	54.2	37.9	7.9	82.4	54.5	38.7	7.8
GOLDEN HARVEST	Ex787	83.9	53.3	34.4	7.9	81.5	50.5	36.8	7.9	81.0	51.3	39.0	6.9
HYTEST	HT4310	86.5	56.7	31.3	8.0	80.5	50.8	40.0	7.4	82.3	53.5	37.9	7.4
HYTEST	HT7415	83.8	57.5	38.1	7.3	79.1	47.2	39.9	6.9	80.4	50.7	39.8	6.9
LG SEEDS	LG2499	80.1	54.6	43.8	7.5	81.1	52.7	39.8	7.6	81.7	52.1	38.2	7.9
MYCOGEN	TMF100	82.0	54.9	40.0	7.7	80.2	55.0	44.0	7.1	81.0	55.9	43.1	7.3
PIONEER	36G12	86.6	60.7	34.0	7.6	84.1	58.1	38.0	7.1	82.0	55.5	40.3	7.0
PIONEER	36H36	82.8	55.3	38.4	8.3	82.8	53.5	37.1	7.5	80.9	53.5	41.2	7.7
PIONEER	37R71	83.9	55.7	36.3	7.1	84.2	53.9	34.2	7.1	83.2	51.0	34.3	7.5
PIONEER	38P05	83.9	57.9	38.2	7.5	80.6	50.1	38.8	7.4	82.7	50.2	34.6	7.0
RENK	RK546	77.5	55.4	50.4	8.6	78.2	50.4	44.0	6.8	80.2	51.1	40.5	7.1
RENK	RK569	84.4	58.9	38.0	7.6	80.9	52.3	40.0	7.1	81.8	54.2	39.9	7.5
RENK	RK648	81.6	52.6	38.8	7.8	80.4	51.0	40.0	7.3	80.7	54.7	42.7	7.2
AVERAGE		82.9	56.1	38.9	7.8	81.2	52.5	39.6	7.4	81.6	53.6	39.7	7.3
HIGHEST		86.6	60.7	50.4	9.8	85.2	58.1	47.0	7.9	84.5	59.4	47.4	7.9
LOWEST		76.3	51.4	31.3	7.1	77.7	47.2	34.2	6.8	77.1	50.2	34.3	6.9

TABLE 5L (B) cont.

## IN-VITRO ANALYSES

BRAND	HYBRID VARIETY	IONIA (Late)				INGHAM (Late)				HURON (Late)			
		% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP
BALDRIDGE	BH-611	75.6	49.3	48.2	9.2	80.0	57.1	46.6	7.2	79.3	55.2	46.2	8.4
BROWN	BR X6990ED	82.2	48.3	34.4	7.8	83.3	57.9	39.7	7.3	74.7	49.1	49.7	7.0
CORN BELT	C567	82.7	50.9	35.2	7.3	83.4	52.1	34.7	8.3	80.2	51.2	40.6	7.5
DAIRYLAND	STEALTH-1406	82.2	52.2	37.2	7.6	77.2	47.3	43.3	7.1	80.3	51.8	40.9	7.0
DAIRYLAND	STEALTH-1407	83.9	52.7	34.1	7.8	80.2	52.8	42.0	6.9	77.4	50.5	45.5	6.8
DAIRYLAND	STEALTH-1508	81.2	54.0	40.9	7.6	85.7	58.8	34.6	7.3	79.2	52.9	44.2	7.3
GARST	8541IT	82.9	52.6	36.1	7.1	79.9	50.0	40.2	7.0	82.1	53.7	38.8	6.7
GOLDEN HARVEST	H-8250	84.7	53.4	32.8	7.4	82.9	58.8	41.6	6.6	79.7	48.8	39.6	6.9
GOLDEN HARVEST	Ex98590	82.7	51.5	35.7	7.5	84.5	64.2	43.3	7.0	78.7	48.6	41.4	7.2
GREAT LAKES	5456	81.3	50.9	38.1	7.5	78.9	51.8	43.8	7.2	78.6	47.9	41.1	7.3
GREAT LAKES	5816	82.9	55.0	38.0	8.2	83.4	58.7	40.3	6.8	77.2	49.2	44.9	6.8
GREAT LAKES	5831	81.8	53.2	39.0	7.5	76.9	47.0	43.7	7.0	81.1	52.7	40.0	7.2
HIGH CYCLE	HC6762nE	79.1	50.5	42.1	7.0	81.0	52.2	39.7	7.7	75.1	50.9	50.7	7.0
HYTEST	BH4602	82.9	52.1	35.8	7.2	80.3	54.5	43.4	6.5	78.2	50.9	44.4	6.8
LG SEEDS	LG2526SP	80.4	48.8	38.3	7.3	84.1	59.7	39.3	6.6	74.9	50.1	50.3	6.0
MYCOGEN	TMF114	81.0	55.0	42.2	7.1	80.2	55.3	44.4	7.1	78.1	53.1	46.7	6.1
MYCOGEN	TMF2720	78.1	51.4	45.0	7.2	85.0	57.1	34.9	6.5	81.4	56.5	42.8	7.2
NOSCO CLASSIC E	5111 Super Silo	81.9	53.7	39.1	7.0	84.9	61.9	39.7	6.6	77.9	53.2	47.3	6.8
NOVARTIS	MAX101	81.1	51.6	39.1	7.6	83.6	63.8	45.4	6.5	80.2	53.1	42.1	7.0
NOVARTIS	NX4687	80.8	55.0	42.8	6.8	82.8	59.4	42.3	6.6	77.9	52.6	46.7	6.8
NOVARTIS	N58-D1	78.5	49.7	42.7	7.3	85.2	65.5	42.8	7.2	76.9	50.0	46.2	6.6
PIONEER	33J24	83.8	53.7	35.0	7.9	81.6	57.3	43.2	6.3	81.8	53.2	38.9	7.0
PIONEER	33T90	83.6	52.4	34.4	7.8	83.8	58.4	38.9	6.5	79.4	51.0	42.1	6.5
PIONEER	34G82	78.9	46.0	39.0	7.2	80.2	45.6	36.4	6.8	78.6	50.7	43.4	7.1
RENK	RK648Bt	81.7	46.1	34.0	7.5	79.7	53.3	43.5	7.2	77.5	46.8	42.4	7.0
RENK	RK775	81.8	49.1	35.7	7.8	84.0	59.0	38.9	7.2	79.2	50.5	42.1	6.7
TRELAY	7004	81.2	48.6	36.6	7.9	78.1	52.7	46.2	7.1	80.4	52.3	41.1	7.2
TRELAY	7005	82.0	51.9	37.5	7.8	83.6	58.8	39.7	7.2	75.8	50.5	49.0	7.7
TRELAY	9001	78.1	48.7	42.7	8.0	80.7	52.8	40.9	7.8	77.7	51.5	46.0	7.9
TRELAY	9700	80.7	52.9	41.1	7.4	81.4	56.4	42.6	7.3	78.2	52.1	45.5	6.1
AVERAGE		81.3	51.4	38.4	7.5	81.9	56.0	41.2	7.0	78.6	51.4	44.0	7.0
HIGHEST		84.7	55.0	48.2	9.2	85.7	65.5	46.6	8.3	82.1	56.5	50.7	8.4
LOWEST		75.6	46.0	32.8	7.0	76.9	45.6	34.6	6.3	74.7	46.8	38.8	6.0



TABLE 6A.

## AVERAGE OF ALPENA, MISSAUKEE &amp; DELTA COUNTY SILAGE TRIALS

BRAND	HYBRID VARIETY	1999				2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% DM	% Green WT/A	% Dry WT/A	% STD	% DM	% Green WT/A	% Dry WT/A	% STD	% DM	% Green WT/A	% Dry WT/A	% STD
CARGILL	1877	42.9	16.5	6.3	98	39.6	17.8	6.3 D	98	37.3	18.3	6.2 D	98
CARGILL	2411FQ	41.1	17.1	6.4	98	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1289	41.5	19.2	* 7.3	99	38.1	19.5	6.9 B	99	35.3	20.7	6.9 A	99
DAIRYLAND	STEALTH-1493	39.3	21.3	* 7.7	99	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1496	40.5	19.5	* 7.3	94	37.8	20.4	7.2 D	95	35.8	21.3	7.1 D	96
DAIRYLAND	STEALTH-1499	39.5	19.0	7.0	93	--	--	--	--	--	--	--	--
GEERTSON	GS998	36.9	20.1	6.8	95	34.2	20.9	6.7 B	97	--	--	--	--
GOLDEN HARVEST	H-6726	41.8	18.0	6.8	93	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex96608	38.8	19.1	6.9	88	--	--	--	--	--	--	--	--
LG SEEDS	LG2367	43.7	19.1	* 7.7	99	38.8	20.3	7.5 A	99	--	--	--	--
LG SEEDS	LG2411	39.6	19.9	* 7.3	98	--	--	--	--	--	--	--	--
MYCOGEN	TMF2202	39.2	20.0	7.1	100	37.1	20.0	7.0 B	100	--	--	--	--
PIONEER	37J99	41.9	20.3	**7.8	100	--	--	--	--	--	--	--	--
PIONEER	38P05	43.2	18.3	* 7.3	94	--	--	--	--	--	--	--	--
PIONEER	38D66	40.2	19.9	* 7.4	100	36.8	20.7	7.2 A	100	--	--	--	--
RENK	RK232	43.7	18.1	* 7.3	97	--	--	--	--	--	--	--	--
RENK	RK546	37.6	21.7	* 7.5	100	--	--	--	--	--	--	--	--
AVERAGE		40.7	19.2	7.2	97	37.5	19.9	7.0	98	36.1	20.1	6.7	98
HIGHEST		43.7	21.7	7.8	100	39.6	20.9	7.5	100	37.3	21.3	7.1	99
LOWEST		36.9	16.5	6.3	88	34.2	17.8	6.3	95	35.3	18.3	6.2	96
LSD .05%		3.1	1.7	0.6									
CV		4.6	5.2	4.8									

\*\*HIGHEST YIELDING HYBRID FOR DRY WEIGHT PER ACRE

\* DRY WEIGHT NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

A TWO &amp; THREE YEAR DATA FOR ALL TRAITS ARE CALCULATED USING DATA FROM ALL THREE LOCATIONS FOR 1998 &amp; 1997

B TWO YEAR DATA FOR ALL TRAITS ARE CALCULATED USING DATA FROM ONLY ALPENA &amp; MISSAUKEE COUNTIES FOR 1998

D TWO &amp; THREE YEAR DATA FOR ALL TRAITS ARE CALCULATED USING DATA FROM ONLY DELTA COUNTY FOR 1998 &amp; 1997

TABLE 6B.

AVERAGE OF ALPENA, MISSAUKEE & DELTA COUNTY SILAGE TRIALS  
IN-VITRO ANALYSES

BRAND	HYBRID VARIETY	1999				2 YEAR AVG (98 / 99)				3 YEAR AVG (97 - 99)			
		% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP
CARGILL	1877	81.1	53.4	40.3	8.4	81.2	53.2	40.1	8.4 D	80.7	52.1	40.3	8.4 D
CARGILL	2411FQ	82.0	55.9	40.6	7.8	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1289	80.8	54.7	42.2	8.4	81.5	56.8	42.8	8.2 B	79.7	53.4	43.5	8.4 A
DAIRYLAND	STEALTH-1493	79.7	52.6	42.8	7.9	--	--	--	--	--	--	--	--
DAIRYLAND	STEALTH-1496	81.2	56.9	43.6	8.2	81.0	56.3	43.4	8.4 D	79.7	54.4	44.4	8.4 D
DAIRYLAND	STEALTH-1499	82.3	57.9	42.0	8.0	--	--	--	--	--	--	--	--
GEERTSON	GS998	82.4	59.1	43.1	8.4	83.4	61.0	42.7	8.5 B	--	--	--	--
GOLDEN HARVEST	H-6726	81.0	56.0	43.2	8.5	--	--	--	--	--	--	--	--
GOLDEN HARVEST	Ex96608	81.8	59.2	45.1	8.4	--	--	--	--	--	--	--	--
LG SEEDS	LG2367	82.7	59.0	42.3	8.0	83.6	60.0	41.9	7.8 A	--	--	--	--
LG SEEDS	LG2411	81.0	56.1	43.4	8.0	--	--	--	--	--	--	--	--
MYCOGEN	TMF2202	82.6	58.0	41.6	8.9	82.6	59.0	42.6	8.7 B	--	--	--	--
PIONEER	37J99	81.8	55.0	40.5	8.0	--	--	--	--	--	--	--	--
PIONEER	38P05	81.9	53.4	38.8	7.9	--	--	--	--	--	--	--	--
PIONEER	38D66	83.1	57.6	39.8	7.8	83.4	57.6	39.3	7.7 A	--	--	--	--
RENK	RK232	80.4	53.1	41.7	8.3	--	--	--	--	--	--	--	--
RENK	RK546	79.8	52.9	42.9	8.1	--	--	--	--	--	--	--	--
AVERAGE		81.5	55.9	42.0	8.2	82.4	57.7	41.8	8.2	80.0	53.3	42.7	8.4
HIGHEST		83.1	59.2	45.1	8.9	83.6	61.0	43.4	8.7	80.7	54.4	44.4	8.4
LOWEST		79.7	52.6	38.8	7.8	81.0	53.2	39.3	7.7	79.7	52.1	40.3	8.4
LSD .05%		3.2	6.4	3.6	0.8								
CV		2.4	6.9	5.1	5.7								

A TWO &amp; THREE YEAR DATA FOR ALL TRAITS ARE CALCULATED USING DATA FROM ALL THREE LOCATIONS FOR 1998 &amp; 1997

B TWO YEAR DATA FOR ALL TRAITS ARE CALCULATED USING DATA FROM ONLY ALPENA &amp; MISSAUKEE COUNTIES FOR 1998

D TWO &amp; THREE YEAR DATA FOR ALL TRAITS ARE CALCULATED USING DATA FROM ONLY DELTA COUNTY FOR 1998 &amp; 1997

TABLE 6A (cont.)

BRAND	HYBRID VARIETY	ALPENA						MISSAUKEE						DELTA					
		% Green		Dry Weight / Acre			%	% Green		Dry Weight / Acre			%	% Green		Dry Weight / Acre			%
		DM	WT/A	1999	2yr	3yr	STD	DM	WT/A	1999	2yr	3yr	STD	DM	WT/A	1999	2yr	3yr	STD
CARGILL	1877	47.9	11.0	5.3	-	-	99	53.4	11.7	6.2	-	-	99	27.3	26.7	7.4	6.9	6.5	95
CARGILL	2411FQ	45.5	12.5	5.6	-	-	98	50.6	12.7	6.4	-	-	96	27.2	26.2	7.2	-	-	98
DAIRYLAND	STEALTH-1289	43.7	14.2	6.2	6.0	6.0	100	52.4	14.2	*7.4	7.2	7.5	98	28.4	29.3	*8.2	-	-	100
DAIRYLAND	STEALTH-1493	41.7	16.7	*7.0	-	-	98	48.3	14.6	*7.0	-	-	100	27.8	32.6	**9.0	-	-	98
DAIRYLAND	STEALTH-1496	42.5	15.4	*6.6	-	-	100	51.4	14.4	*7.3	-	-	98	27.6	28.6	7.9	7.4	7.2	84
DAIRYLAND	STEALTH-1499	41.8	15.2	6.4	-	-	96	48.3	14.1	6.8	-	-	91	28.4	27.7	7.9	-	-	93
GEERTSON	GS998	38.0	15.5	5.9	5.8	-	99	47.8	15.3	*7.3	7.4	-	96	24.9	29.5	7.3	-	-	90
GOLDEN HARVEST	H-6726	42.2	14.1	6.0	-	-	96	55.7	12.4	6.8	-	-	94	27.4	27.4	7.5	-	-	87
GOLDEN HARVEST	Ex96608	36.9	16.2	6.0	-	-	87	51.8	13.9	*7.1	-	-	90	27.6	27.3	7.6	-	-	88
LG SEEDS	LG2367	45.7	14.5	*6.6	6.3	-	99	54.3	14.4	**7.8	8.2	-	98	31.0	28.3	*8.8	8.0	-	100
LG SEEDS	LG2411	41.3	16.7	*6.9	-	-	100	50.2	14.3	*7.2	-	-	100	27.4	28.6	7.8	-	-	94
MYCOGEN	TMF2202	40.9	15.1	6.2	5.9	-	100	49.9	13.9	6.9	7.5	-	100	26.7	31.1	*8.3	-	-	99
PIONEER	37J99	45.9	15.7	**7.3	-	-	100	50.9	14.3	*7.3	-	-	100	29.0	31.0	*8.8	-	-	100
PIONEER	38P05	45.6	14.2	6.5	-	-	90	53.7	13.4	*7.1	-	-	94	30.3	27.2	*8.3	-	-	97
PIONEER	38D66	42.8	15.0	6.4	6.1	-	100	50.7	15.3	**7.8	7.8	-	100	27.2	29.3	*8.0	7.9	-	100
RENK	RK232	49.2	13.4	*6.6	-	-	100	51.8	13.3	6.8	-	-	92	30.0	27.7	*8.4	-	-	98
RENK	RK546	39.3	15.5	6.1	-	-	100	46.5	16.3	*7.5	-	-	99	27.1	33.4	**9.0	-	-	100
AVERAGE		43.0	14.8	6.3	6.0	6.0	98	51.0	14.0	7.1	7.6	7.5	97	28.0	28.9	8.1	7.6	6.9	95
HIGHEST		49.2	16.7	7.3	6.3	-	100	55.7	16.3	7.8	8.2	-	100	31.0	33.4	9.0	8.0	7.2	100
LOWEST		36.9	11.0	5.3	5.8	-	87	46.5	11.7	6.2	7.2	-	90	24.9	26.2	7.2	6.9	6.5	84
LSD .05%		2.8	1.4	0.7	-	-	-	3.6	1.5	0.8	-	-	-	1.9	3.4	1.0	-	-	-
CV		4.4	6.5	7.1	-	-	-	4.6	6.8	7.4	-	-	-	4.7	8.1	8.7	-	-	-

\*\*HIGHEST YIELDING HYBRID FOR DRY WEIGHT PER ACRE

\* DRY WEIGHT NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

TABLE 6B (cont.)

## IN-VITRO ANALYSES

BRAND	VARIETY	ALPENA				MISSAUKEE				DELTA			
		% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP
CARGILL	1877	83.1	56.8	39.0	7.7	82.5	54.7	38.7	8.8	77.8	48.6	43.1	8.7
CARGILL	2411FQ	86.0	60.4	35.4	7.5	78.1	54.0	47.7	7.9	81.9	53.2	38.7	8.0
DAIRYLAND	STEALTH-1289	81.0	55.6	42.7	7.7	82.9	59.0	41.6	8.9	78.6	49.6	42.4	8.5
DAIRYLAND	STEALTH-1493	80.9	54.7	42.2	8.1	81.5	57.2	43.3	7.7	76.8	45.8	42.9	7.8
DAIRYLAND	STEALTH-1496	79.9	53.1	43.0	8.4	84.1	64.2	44.3	8.6	79.7	53.3	43.5	7.5
DAIRYLAND	STEALTH-1499	80.5	54.3	42.8	8.0	87.3	69.8	42.0	8.2	79.2	49.7	41.3	7.8
GEERTSON	GS998	83.2	59.9	41.9	8.2	82.0	61.6	46.8	8.6	82.1	55.9	40.7	8.5
GOLDEN HARVEST	H-6726	82.2	60.7	45.2	8.2	80.4	54.7	43.2	8.4	80.5	52.5	41.2	9.0
GOLDEN HARVEST	Ex96608	81.0	58.6	45.9	8.3	85.4	68.7	46.8	8.1	78.9	50.2	42.5	8.9
LG SEEDS	LG2367	82.3	58.8	42.9	8.1	85.2	64.6	41.9	8.4	80.5	53.6	42.0	7.6
LG SEEDS	LG2411	80.5	54.7	43.1	7.3	81.9	58.5	43.6	7.9	80.5	55.2	43.6	8.7
MYCOGEN	TMF2202	83.6	61.9	43.2	9.1	84.7	63.4	41.8	9.6	79.6	48.7	39.7	8.0
PIONEER	37J99	84.0	61.4	41.4	7.7	81.0	53.0	40.5	8.3	80.4	50.6	39.6	7.9
PIONEER	38P05	80.6	51.6	40.0	8.6	84.1	57.5	37.4	7.3	80.9	51.1	39.0	7.8
PIONEER	38D66	83.0	58.2	40.6	8.0	85.3	62.7	39.3	7.8	81.0	51.9	39.5	7.5
RENK	RK232	82.2	58.5	42.8	8.5	82.2	55.6	40.2	8.1	76.8	45.1	42.2	8.2
RENK	RK546	80.3	55.9	44.7	8.0	81.8	56.0	41.4	8.4	77.3	46.8	42.6	7.9
AVERAGE		82.0	57.4	42.2	8.1	83.0	59.7	42.4	8.3	79.6	50.7	41.4	8.1
HIGHEST		86.0	61.9	45.9	9.1	87.3	69.8	47.7	9.6	82.1	55.9	43.6	9.0
LOWEST		79.9	51.6	35.4	7.3	78.1	53.0	37.4	7.3	76.8	45.1	38.7	7.5

TABLE 7A.

## AVERAGE OF ALGER and DELTA COUNTY EARLY SILAGE TRIAL

BRAND	HYBRID	VARIETY	1999				2YR AVERAGE (98 / 99)			
			% DM	Green WT/A	Dry WT/A	% STD	% DM	Green WT/A	Dry WT/A	% STD
CARGILL		XB227	25.0	25.5	6.4	98	25.7	22.3	5.7 A	98
CARGILL		1877	26.5	23.8	6.3	97	28.4	21.3	6.0 B	98
CARGILL		2411FQ	26.7	23.7	6.3	97	28.1	21.2	5.9 A	98
MYCOGEN		TMF2202	26.5	26.6	* 7.0	100	--	--	--	--
MYCOGEN		TMF2322	28.9	26.7	* 7.8	100	--	--	--	--
PIONEER		38W36	27.4	26.2	* 7.2	96	27.9	26.6	7.4 D	96
PIONEER		39K73	25.0	25.5	6.4	98	29.2	20.3	5.5 A	97
RENK		RK232	28.9	25.6	* 7.4	99	--	--	--	--
RENK		RK277	30.4	22.7	6.9	98	31.6	23.8	7.5 D	99
RENK		RK546	27.4	31.3	**8.6	99	--	--	--	--
AVERAGE			27.3	25.8	7.0	98	28.5	22.6	6.3	98
HIGHEST			30.4	31.3	8.6	100	31.6	26.6	7.5	99
LOWEST			25.0	22.7	6.3	96	25.7	20.3	5.5	96
LSD .05%			4.4	4.0	1.6					
CV			6.9	7.2	10.3					

\*\*HIGHEST YIELDING HYBRID FOR DRY WEIGHT PER ACRE

\* DRY WEIGHT NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

A - TWO YEAR AVERAGE FROM ALGER COUNTY

B - TWO YEAR AVERAGE FOR BOTH ALGER &amp; DELTA COUNTIES

D - TWO YEAR AVERAGE FROM DELTA COUNTY

TABLE 7B.

AVERAGE OF ALGER and DELTA COUNTY EARLY SILAGE TRIAL  
IN-VITRO ANALYSES

BRAND	HYBRID	VARIETY	1999				2YR AVERAGE (98 / 99)			
			% DMD	% FD	% NDF	% CP	% DMD	% FD	% NDF	% CP
CARGILL		XB227	86.7	68.0	41.9	8.3	87.5	70.2	42.4	8.0 A
CARGILL		1877	78.2	46.9	41.1	8.5	80.9	52.6	40.5	8.5 B
CARGILL		2411FQ	81.0	51.2	39.0	8.4	82.0	55.4	39.5	7.9 A
MYCOGEN		TMF2202	81.3	57.3	44.0	9.1	--	--	--	--
MYCOGEN		TMF2322	77.9	50.4	44.6	8.1	--	--	--	--
PIONEER		38W36	80.4	54.7	43.4	7.8	80.6	54.7	42.6	8.0 D
PIONEER		39K73	78.7	54.2	46.0	8.7	80.6	57.0	44.5	8.5 A
RENK		RK232	80.3	52.4	41.5	8.0	--	--	--	--
RENK		RK277	81.4	54.4	40.8	7.9	81.5	55.0	41.0	7.8 D
RENK		RK546	79.3	54.0	44.9	7.6	--	--	--	--
AVERAGE			80.5	54.4	42.7	8.2	82.2	57.5	41.8	8.1
HIGHEST			86.7	68.0	46.0	9.1	87.5	70.2	44.5	8.5
LOWEST			77.9	46.9	39.0	7.6	80.6	52.6	39.5	7.8
LSD .05%			5.6	7.4	8.3	0.9				
CV			3.1	6.1	8.6	4.6				

A - TWO YEAR AVERAGE FROM ALGER COUNTY

B - TWO YEAR AVERAGE FOR BOTH ALGER &amp; DELTA COUNTIES

D - TWO YEAR AVERAGE FROM DELTA COUNTY

**TABLE 7A (cont.)**

BRAND	VARIETY	ALGER								DELTA							
		% Dry Matter		Green Weight		Dry Weight		%	% Dry Matter		Green Weight		Dry Weight		%		
		1999	2yr	1999	2yr	1999	2yr	STD	1999	2yr	1999	2yr	1999	2yr	STD		
CARGILL	XB227	25.3	26.2	23.0	19.5	5.8	5.1	100	24.6	--	27.9	--	6.9	--	96		
CARGILL	1877	26.4	28.7	20.5	18.3	5.4	5.2	95	26.5	28.1	27.0	24.3	7.2	6.8	98		
CARGILL	2411FQ	27.6	29.3	21.2	18.8	5.8	5.4	99	25.8	--	26.1	--	6.8	--	96		
MYCOGEN	TMF2202	26.2	--	20.8	--	5.4	--	100	26.7	--	32.3	--	*8.6	--	100		
MYCOGEN	TMF2322	27.4	--	22.2	--	6.1	--	100	30.4	--	31.1	--	**9.5	--	99		
PIONEER	38W36	26.5	--	23.9	--	6.3	--	97	28.3	28.7	28.4	28.0	8.1	8.0	96		
PIONEER	39K73	25.3	31.5	23.0	16.6	5.8	4.8	100	24.6	--	27.9	--	6.9	--	96		
RENK	RK232	27.9	--	23.1	--	6.4	--	100	29.8	--	28.0	--	*8.3	--	99		
RENK	RK277	29.4	--	21.1	--	6.2	--	96	31.4	32.7	24.2	25.1	7.6	8.2	100		
RENK	RK546	27.6	--	29.1	--	**8.0	--	100	27.2	--	33.4	--	*9.1	--	98		
AVERAGE		26.4	28.9	22.1	18.3	5.8	5.1	99	27.5	29.8	28.6	25.8	7.9	7.7	98		
HIGHEST		29.4	31.5	29.1	19.5	8.0	5.4	100	31.4	32.7	33.4	28.0	9.5	8.2	100		
LOWEST		25.3	26.2	20.5	16.6	5.4	4.8	95	24.6	28.1	24.2	24.3	6.8	6.8	96		
LSD .05%		3.6		3.0		1.0			2.5		3.7		1.3				
CV		9.1		9.7		11.4			6.0		9.0		11.0				

\*\*HIGHEST YIELDING HYBRID FOR DRY WEIGHT PER ACRE  
 \* DRY WEIGHT NOT SIGNIFICANTLY DIFFERENT FROM TOP YIELDING HYBRID

**TABLE 7B (cont.)**

**IN-VITRO ANALYSES**

BRAND	VARIETY	ALGER								DELTA							
		% DMD		% FD		%NDF		% CP		%DMD		%FD		%NDF		% CP	
		1999	2yr	1999	2yr	1999	2yr	1999	2yr	1999	2yr	1999	2yr	1999	2yr	1999	2yr
CARGILL	XB227	87.0	88.0	70.8	72.7	44.4	44.0	8.9	8.2	86.4	--	65.2	--	39.3	--	7.7	--
CARGILL	1877	79.7	82.8	49.7	56.9	40.5	39.9	9.0	8.3	76.7	79.1	44.0	48.3	41.6	40.5	8.0	8.3
CARGILL	2411FQ	79.6	81.9	50.3	57.0	41.0	40.8	8.8	7.9	82.3	--	52.0	--	36.9	--	7.9	--
MYCOGEN	TMF2202	81.2	--	56.9	--	43.7	--	10.0	--	81.3	--	57.7	--	44.2	--	8.2	--
MYCOGEN	TMF2322	78.0	--	51.7	--	45.6	--	8.3	--	77.7	--	49.0	--	43.6	--	7.9	--
PIONEER	38W36	80.4	--	51.7	--	40.5	--	8.4	--	80.4	80.8	57.6	56.2	46.2	43.6	7.1	7.7
PIONEER	39K73	74.1	79.3	51.1	56.8	53.0	47.2	9.8	9.0	83.3	--	57.2	--	39.0	--	7.6	--
RENK	RK232	81.3	--	54.9	--	41.5	--	8.3	--	79.2	--	49.9	--	41.4	--	7.7	--
RENK	RK277	82.3	--	56.9	--	41.2	--	8.5	--	80.5	81.1	51.8	54.0	40.4	41.0	7.2	7.5
RENK	RK546	78.1	--	53.1	--	46.7	--	8.3	--	80.5	--	54.8	--	43.0	--	6.9	--
AVERAGE		80.2	83.0	54.7	60.9	43.8	43.0	8.8	8.4	80.8	80.3	53.9	52.8	41.6	41.7	7.6	7.8
HIGHEST		87.0	88.0	70.8	72.7	53.0	47.2	10.0	9.0	86.4	81.1	65.2	56.2	46.2	43.6	8.2	8.3
LOWEST		74.1	79.3	49.7	56.8	40.5	39.9	8.3	7.9	76.7	79.1	44.0	48.3	36.9	40.5	6.9	7.5

**TABLE C AGRONOMIC TABLE - SILAGE TRIALS**

COUNTY	PLANTING/ HARVEST DATES	SOIL TYPE	PREVIOUS CROP	PLANTING RATE/ AVG. STAND	FERTILIZER	SOIL TEST	FARM COOPERATOR	LOCATION
IONIA - Zone 2	May 1 Sept. 2, 10	Miami Clay Loam	Wheat	28,512 28,255	173 - 51 - 51	ph 7.2 P 127, K 263	Clarksville Hort. Res. Stn. Michigan State University	Clarksville
INGHAM	May 3 Sept. 1, 9	Capac Loam	Soybeans	28,512 28,326	173 - 51 - 51	ph 6.4 P 99, K 305	Crop & Soil Scs. Res. Fac. Michigan State University	East Lansing
HURON - Zone 3	April 30 Sept. 4, 13	Kilmanagh Loam	Soybeans	28,512 28,141	144 - 38 - 38	ph 6.8 P 89, K 316	Wil-Le Farms William, Ron & Ed McCrea	Bad Axe
ALPENA - Zone 4	May 19 Sept. 15	Selkirk Loam	Dry beans	28,512 27,856	121 - 60 - 60	ph 7.1 P 169, K 395	Allen Schiellard	Hubbard Lake
MISSAUKEE	May 13 Sept. 8	Graycalm Rubicon Sands	Corn	28,512 27,599	209 - 57 - 57	ph 6.6 P 390, K 438	Dave Tocoma	Falmouth
DELTA	May 12 Sept. 14	Onaway Fine Sandy Loam	Alfalfa	27,720 26,736	130 - 38 - 38	ph 7.1 P 107, K 415	Benny Herioux	Bark River
ALGER	May 12 Sept. 14	Chatham Stoney Loam	Oats/Barley	26,928 26,363	177 - 57 - 57 10 Ton Manure	ph 6.9 P 149, K 214	UP Experiment Station Michigan State University	Chatham

## SILAGE INDEX FOR 1999 CORN HYBRIDS COMPARED

There were 69 hybrids from 18 seed companies entered in 221 county tests in the 1999 Michigan Corn Performance Trials. Numbers within parentheses refer to the table in which the hybrid appears. The map shows the zones where the hybrids were entered. Early and late hybrids are designated by an E or L respectively. Company names used in association with hybrid numbers refer to the brand and the numbers are the variety (hybrid) designation. A and B designations refer to silage yield tables (A) and In-vitro Analysis tables (B).

### Table 5E / 5L (A & B)

Ionia Silage  
Ingham Silage  
Huron Silage  
Average

### Table 6A / 6B

Alpena Silage  
Missaukee Silage  
Delta Late Silage  
Average

### Table 7A / 7B

Alger Silage  
Delta Early Silage  
Average

### Baldrige Hybrids

BALDRIDGE BH-511 (5E)  
BALDRIDGE BH-611 (5L)

### Brown Seed Farms

BROWN BR X6990ED (5L)

### Callahan Seeds

CALLAHAN C7526S (5E)

### Cargill Hybrid Seeds

CARGILL XB227 (7)  
CARGILL 1877 (6,7)  
CARGILL 2411 FQ (6,7)

### Corn Belt Hybrids

CORN BELT C 567 (5L)

### Dairyland Seed Company, Inc.

DAIRYLAND STEALTH-1203 (5E)  
DAIRYLAND STEALTH-1289 (6)  
DAIRYLAND STEALTH-1297 (5E)  
DAIRYLAND STEALTH-1406 (5L)  
DAIRYLAND STEALTH-1407 (5L)  
DAIRYLAND STEALTH-1493 (6)  
DAIRYLAND STEALTH-1496 (6)  
DAIRYLAND STEALTH-1499 (6)  
DAIRYLAND STEALTH-1508 (5L)  
DAIRYLAND DST-10212 (5E)

### Garst Seed Co.

GARST 8541IT (5L)  
GARST 8707 (5E)

### Geertson Seed Farms

GEERTSON GS998 (5E,6)

### Golden Harvest/Sommer Bros. Seed Co.

GOLDEN HARVEST H-2398 (5E)  
GOLDEN HARVEST H-6726 (6)  
GOLDEN HARVEST H-8250 (5L)  
GOLDEN HARVEST Ex787 (5E)  
GOLDEN HARVEST EX96608 (6)  
GOLDEN HARVEST EX98590 (5L)

### Great Lakes Hybrids, Inc.

GREAT LAKES 5456 (5L)  
GREAT LAKES 5816 (5L)  
GREAT LAKES 5831 (5L)

### Trelay Seed Company

HIGH CYCLE HC6762nE (5L)

### AgriBiotech, Inc.

HYTEST HT4310 (5E)  
HYTEST BH4602 (5L)  
HYTEST HT7415 (5E)

### LG Seeds

LG SEEDS LG2367 (6)  
LG SEEDS LG2411 (6)  
LG SEEDS LG2499 (5E)  
LG SEEDS LG2526SP (5L)

### Mycogen Plant Sciences

MYCOGEN TMF100 (5E)  
MYCOGEN TMF114 (5L)  
MYCOGEN TMF2202 (6,7)  
MYCOGEN TMF2322 (7)  
MYCOGEN TMF2720 (5L)

### The Andersons, Inc.

NOSCO CLASSIC ELITE 5111 Super Silo (5L)

### Novartis Seeds, Inc.

NOVARTIS MAX101 (5L)  
NOVARTIS NX4687 (5L)  
NOVARTIS N58-D1 (5L)

### Pioneer Hi-Bred International, Inc.

PIONEER 33J24 (5L)  
PIONEER 33T90 (5L)  
PIONEER 34G82 (5L)  
PIONEER 36G12 (5E)  
PIONEER 36H36 (5E)  
PIONEER 37R71 (5E)  
PIONEER 37J99 (6)  
PIONEER 38P05 (5E,6)  
PIONEER 38W36 (7)  
PIONEER 38D66 (6)  
PIONEER 39K73 (7)

### Renk Seed Company, Inc.

RENK RK232 (6,7)  
RENK RK277 (7)  
RENK RK546 (5E,6,7)  
RENK RK569 (5E)  
RENK RK648 (5E)  
RENK RK648Bt (5L)  
RENK RK775 (5L)

### Trelay Seed Company, Inc.

TRELAY 7004 (5L)  
TRELAY 7005 (5L)  
TRELAY 9001 (5L)  
TRELAY 9700 (5L)

## ENTRANTS IN THE 1999 MICHIGAN CORN PERFORMANCE TRIALS

<u>BRAND</u>	<u>COMPANY NAME AND ADDRESS</u>	<u>BRAND</u>	<u>COMPANY NAME AND ADDRESS</u>
AGRIPRO	Agripro Seeds Inc. 4850 W. 350N. Danville, IN 46122	GREAT LAKES	Great Lakes Hybrids P.O. Box 637 Ovid, MI 48866
ASGROW	Asgrow Seed Company P.O. Box 7570 Des Moines, IA 50322-7570	GRIES	Gries Seed Farms, Inc. 2348 N. Fifth St. Fremont, OH 43420
BALDRIDGE	Baldrige Hybrids P.O. Box 99 Cherry Fork, OH 45618	GUTWEIN	Gutwein Seeds Rt. 1 Box 40 Francesville, IN 47946
BAYSIDE	Bayside Seeds 494 E. Munger Rd. Munger, MI 48747	HIGH CYCLE	Trelay Seeds 11623 Hwy 80 Livingston, WI 53554
BECK'S	Beck's Superior Hybrids 6767 E. 276 <sup>th</sup> St. Atlanta, IN 46031	HYTEST	AgriBiotech, Inc. 120 Corporate Park Dr. Henderson, NV 89014
BIO GENE	Bio Gene 5491 Tri County Hwy. Sardinia, OH 45171	JUNG	Jung Seed Genetics 341 South High St. Randolph, WI 53956
BROWN	Brown Seed Farms Box 186, 720 St. Croix St. Prescott, WI 54021	LG SEEDS	LG Seeds P.O. Box 457 Windfall, IN 47906
CALLAHAN	Callahan Seeds 1122 E. 169 <sup>th</sup> St. Westfield, IN 46074	MIDWEST	Midwest Seed Genetics 908 Clubview Blvd. N. Columbus, OH 43235-1219
CARGILL	Cargill Hybrid Seeds P.O. Box 5645 Minneapolis, MN 55440	MYCOGEN	Mycogen Seeds 1340 Corporate Center Curve Eagan, MN 55121-1233
CORN BELT	Corn Belt Hybrids P.O. Box 95 St. Marys, OH 45885	NOSCO CLASSIC	The Andersons 321 West Main Street Delta, OH 43515
CROW'S	Crow's Hybrid Corn Co. P.O. Box 306 Milford, IL 60953	NOVARTIS	Novartis Seeds, Inc. 12275 S. Sherman Lake Augusta, MI 49012
DAIRYLAND	Dairyland Seed Co., Inc. P.O. Box 958 West Bend, WI 53095-0958	PFISTER	Pfister Hybrid Corn Co. P.O. Box 187 El Paso, IL 61738
DEKALB	Monsanto 3100 Sycamore Rd. Dekalb, IL 60115	PIONEER	Pioneer Hi-Bred International, Inc. PO Box 756 Bryan, OH 43506
DYNA-GRO	UAP Great Lakes 221 W. Lake Lansing, Ste. 102 East Lansing, MI 48823	RENK	Renk Seed Co. R-2 6800 Wilburn Rd. Sun Prairie, WI 53590
GARST	Garst Seed Co. 9877 W. Britton Rd. Laingsburg, MI 48848	RUPP	Rupp Seeds, Inc. 17919 Co. Rd. B Wauseon, OH 43567
GEERTSON	Geertson Seed Farms 1665 Burroughs Rd Adrian, OR 97901	SUNSTAR	Sunstar Hybrids 14993 State Rd. 17 Culver, IN 46511-9642
GENESIS	Genesis Ag Ltd. P.O. Box 21085 Lansing, MI 48909	TRELAY	Trelay Seeds 315 Tartan Place Eau Claire, WI 54701
GOLDEN HARVEST	Golden Harvest Sommer Bros. Seed Co. P.O. Box 248 Pekin, IL 61554		

# Michigan Corn Performance in Narrow Rows 1997- 1999 Summary

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In 1997, an extensive corn research project was designed and implemented by Michigan State University utilizing narrow rows. Three-year averages over many locations indicate there is a potential for significant yield increases with narrow rows (15- or 22-inch) compared to 30-inch row corn. However, results are not always consistent. Changing row width effects many management practices: for example, hybrid selection, plant population, weed control, intercropping, and fertility management. This research project evaluates the affects of hybrid selection, row spacing, population, and planting date on narrow row corn production in Michigan. This report is a summary of data from 1997 to 1999 covering 15 trials with 240 plots per trial in Michigan.

## Materials and Methods

Field research was conducted in 1997, 1998, and 1999 throughout Michigan (Table 1). Trial locations were chosen that best represented the diverse soil types and cultural practices used in Michigan. The trials were separated into southern and central zones. Three locations were planted in each zone with only one location in the Southern Zone in 1997.

**Table 1: Test locations by year**

Location by County	1997	1998	1999	Zone
Ingham	*	*	*	Central
Saginaw	*	*	*	Central
Huron	*	*	*	Central
Monroe	*	*	*	Southern
Kalamazoo <sup>1</sup>			*	Southern
Calhoun <sup>1</sup>		*		Southern

<sup>1</sup> Locations had both irrigated and non-irrigated trials.

The experiment was designed as a randomized complete block with a split-split plot arrangement with four replications. The hybrid represented the whole plot (110 by 30 feet), row spacing represented the split-plot (110 by 10 feet), and population represented the split-split-plot (22 by 10 feet). This design was chosen so the interaction between hybrid, row spacing, and populations could be better observed.

To more efficiently plant these trials, a seven-row, 15-inch corn planter was built in 1997. This planter also facilitated the planting of 30- and 22-inch rows. To configure the planter for four 30-inch rows, units 2, 4, and 6 are locked-up with their seed drive turned off. The planter toolbar extends to accommodate planting of five 22-inch rows. Row units 1 and 7 are locked-up and turned off, so they will not interfere with adjacent plots. An Accu-plant™ programmable rate control processor was installed on the planter so quick population changes could be made. Two corn heads were also built to facilitate the harvesting of the 15- and 22-inch rows. One conventional three row, 30-inch corn head was fitted with five 15-inch row units using one gathering chain. The original row units were than mounted on a narrower frame and adjusted to 22 inches.

Four hybrids were selected and planted at three different row spacings of 30-, 22-, and 15-inch rows. Within each row spacing, hybrids were planted at five target populations of 26K, 30K, 34K, 38K, and 42K plants per acre. The middle rows of each plot were harvested for yield to allow one border row on each side of the plot. In the 30-inch rows only two rows were harvested, while in the 22- and 15-inch plots 3 and 5 rows were harvested, respectively.



To better match the hybrid to each location and zone, hybrids with different maturity dates and agronomic characteristics were chosen. The same hybrids were planted at all locations in 1997. In 1998 and 1999, six different hybrids were selected and matched to the maturity zones. Of these six hybrids, four were selected for each maturity zone. The two earliest hybrids were used in the Central Zone along with the two medium maturing hybrids. The same medium maturing hybrids were then used in the Southern Zone along with the two later maturing hybrids (Table 2).

Plant populations were determined at all locations after corn emergence. Plots were thinned by hand if populations exceeded population levels for the plot. Lodging observations were recorded prior to harvest. The percent of lodging is calculated based upon the total number of plants in the plot.

## Results and Discussion

Weather over the three years played an important part in the variability between trial locations. All plots were planted and harvested in a timely manner (Table 3). Growing conditions from year-to-year affected the plots greatly. Statistical evaluation determined that analysis could not be combined within years or over years for each location.

Yield advantages over the three years, 1997-1999, show significant yield increases in narrow rows as compared to 30-inch rows. Comparing yield by year reveals that there is significant variation in yield from year-to-year. This is due to environmental and other management practices. Even though there is variability between years, there is a strong correlation between the effects of row spacing on yield (Table 4). Regression analysis of yield across population and row

**Table 2: Hybrid maturity and agronomic characteristics.**

1997					
Company	Hybrid	Maturity	Ear Type	Height	Leaf type
Pioneer	PIO 3751	97	Flex	Med-tall	Wide
Great Lakes	GL 4929	99	Determinate	Short	Semi-upright
Garst	GRST 8735	102	Determinate	Med-short	Thin-upright
Garst	GRST 8640	104	Flex	Tall	Wide-upright
1998 - 1999					
Company	Hybrid	Maturity	Ear Type	Height	Leaf type
Novartis	Max 86	93 day	Determinate	Tall	Erect
Renk	RK 552	95 day	Indeterminate	Medium	Erect
Great Lakes	GL 4758	100 day	Flex	Med-tall	Semi-upright
Pioneer	PIO 3573	103 day	Flex	Med-short	Semi-upright
Great Lakes	GL 5715	105 day	Determinate	Medium	Wide
Renk	RK 775	108 day	Indeterminate	Medium	Semi-upright

**Table 3: Planting and harvesting dates.**

Location	Planting Date			Harvest Date		
	1997	1998	1999	1997	1998	1999
Ingham	May 20	April 30	May 6	Nov. 8	Oct. 3	Oct. 2
Saginaw	May 24	April 29	May 10	Nov. 11	Sept. 29	Oct. 5
Huron*	May 24	May 14	May 10	Nov. 11		Oct. 5
Monroe	May 25	May 13	May 5	Nov. 7	Oct. 13	Oct. 11
Calhoun		May 11			Oct. 26	
Kalamazoo			May 11			Oct. 12

\* Location not harvested in 1998 due to poor emergence

width resulted in  $R^2$  of 0.92 (see Table 5, page 41). At lower populations, the yield differences between row widths are not as large as they are at the highest populations.

**Table 4: 1997-99 Narrow row yield advantage over 30-inch rows.**

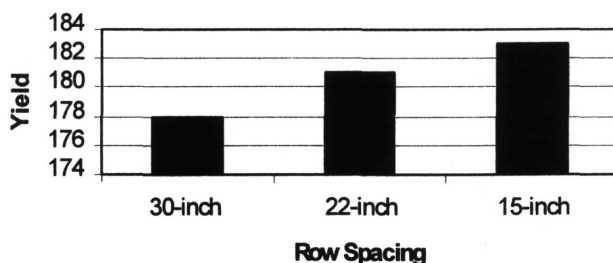
	1997	1998	1999	3 yr avg.
22 in. (bu/A)	2.25	4.7	2.6	3.2
15 in. (bu/A)	-0.05	6.9	6.8	4.5
22 in. (%)	1.30	2.7	1.4	1.8
15 in. (%)	-0.03	4.0	3.7	2.6

### Factors effecting Grain Yield

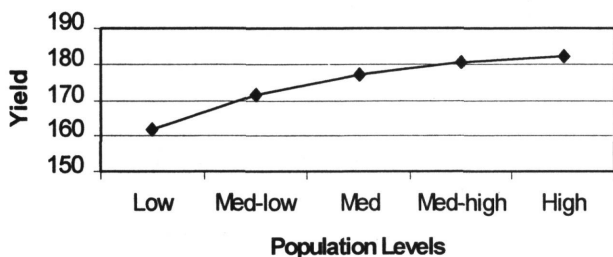
The factor with the most influence on yield was plant population. As populations increased, so did yield. However, yields were not always significantly different at the higher populations. In 1997, the yields between population levels up to three and four were significant. In 1998, yields were not significant at populations greater than level three. Of the 4 locations in 1999 that had a statistical difference, 2 of the locations had significant yield increases up to population level five, while the remaining 2 locations were significant to levels no higher than three and four. The following table shows that when averaged over all locations that had significance to population, the highest yields were at the higher population levels.

Row spacing is the next factor which has an effect on yield. Generally, as row-spacing narrows yield goes up. Eight locations show a statistically significant yield increase with decreased row width with 15-inch rows having the higher yield as shown in the table below.

**Effects of Row Spacing on Grain Yield**



**Effects of Populaton on Grain Yield**

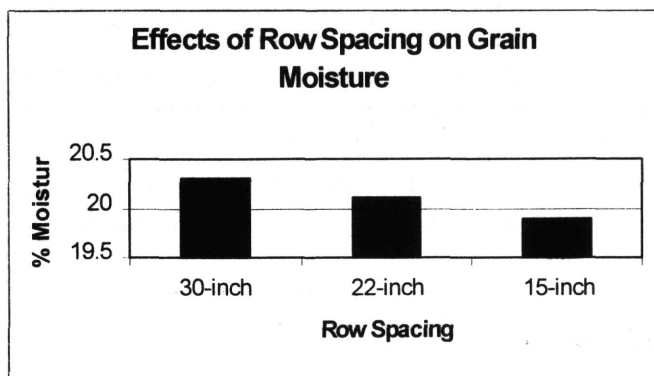


In 7 locations where yield was statistically different the later maturing hybrids had the advantage.

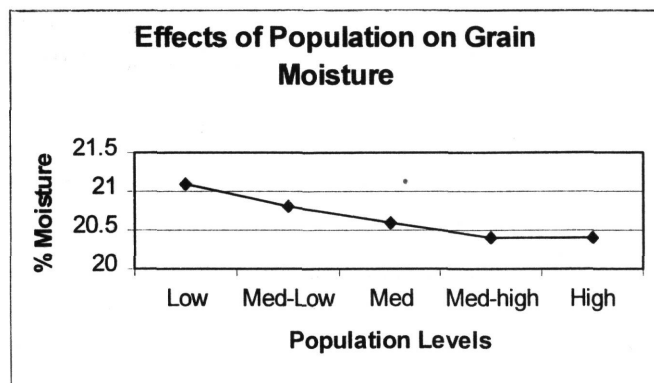
## Factors effecting grain moisture

As expected, hybrid maturity has the greatest effect on moisture. All locations were significant for moisture, with the later maturing hybrids having the higher moistures.

Row spacing had some effect on moisture. In 8 locations where moisture was significantly different, narrow rows had lower moisture content than did 30-inch rows as shown in the table below.



Population had the least effect on grain moisture. Only 5 of the 15 locations showed any significance between population. The table below shows that, where a significant



difference appeared, the higher populations had the lower moisture.

## Factors effecting test weight

Again, as expected, hybrid has the greatest effect on grain test weight. Fourteen of the 15 locations had a significant difference in test weight and were due to differences in hybrid.

Population did not have a major effect on test weight. Only six locations showed significant differences in test weight between populations. The higher population had the higher test weight.

Row spacing had the least effect on test weight. Of the four locations showing any significant difference in test weight by row spacing there was no advantage to one system over the other locations.

## Factors effecting lodging

Hybrid selection had an effect on lodging in 11 of the 15 locations.

Six locations that showed significant increases in lodging by population were at the higher population levels.

Narrow row spacing had statistically higher lodging at only 5 of the 15 locations.

## Summary

The bottom table shows the number of times a statistical difference existed among each trait at the 15 locations from 1997-1999.

Factor	Yield	Moist.	Test WT	Lodging
Hybrid (main plot)	7	15	14	11
Row Spacing (sub-plot)	8	8	4	5
Population (sub-sub-plot)	11	5	6	6

## Conclusions

- Three-year averages over multiple locations indicate there is a potential for significant yield increases with narrow row corn.
- Yield increases appear to be inconsistent and dependent on several management factors.
- Grain yield was found to be dependant on plant population, row spacing, and hybrid.
- Grain moisture was dependant on hybrid and row width and less dependant on population.
- Grain test weight was dependent on hybrid and less affected by population and row width.
- Stalk lodging was dependent on hybrid and less affected by population and row spacing.

Table 5.

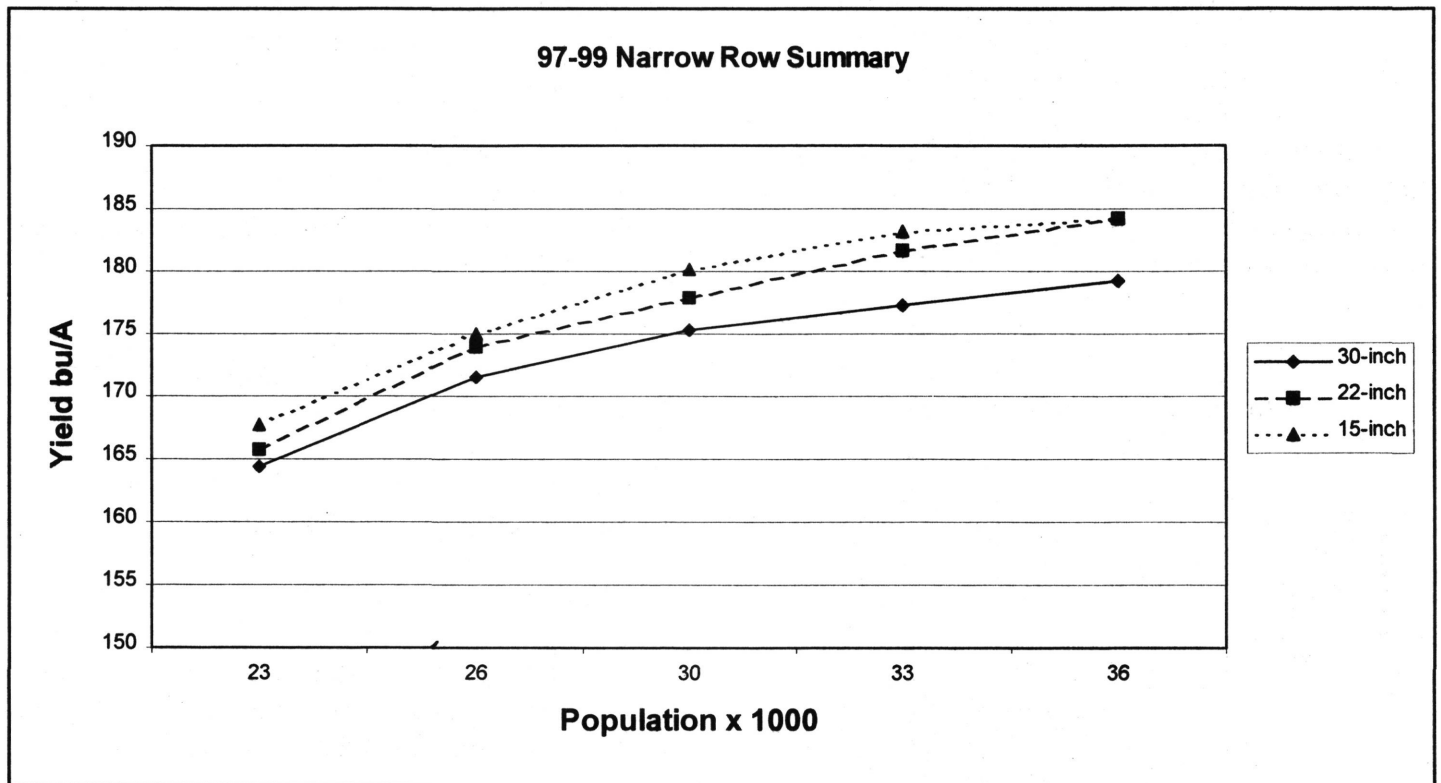


TABLE 1A.

DATA BY ROW WIDTH AND POPULATIONS FOR EACH HYBRID

Hybrid	Row Width	INGHAM NARROW ROW TRIAL					SAGINAW NARROW ROW TRIAL					HURON NARROW ROW TRIAL				
		Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL
Max 86	30	22473	17	170	61	1	24354	22	197	59	0	22770	20	179	58	2
		26433	17	176	61	0	27918	23	210	58	0	25740	20	178	58	2
		29403	17	182	61	2	31086	22	214	59	0	29304	19	169	58	2
		32967	17	184	61	1	34452	21	223	60	0	31383	19	183	58	2
		37026	16	180	61	1	37224	20	220	60	1	35145	18	169	58	4
	22	23310	17	166	60	3	24750	21	198	58	0	21510	20	168	58	4
		26010	17	185	60	0	26820	20	221	58	0	25290	20	178	59	6
		31050	17	195	61	0	30960	20	216	58	0	28980	19	186	59	2
		33210	16	191	61	0	34830	21	221	60	0	30600	19	180	59	5
		36450	16	200	61	0	37980	20	237	59	0	31860	19	182	59	4
	15	24171	17	197	60	0	24171	22	200	59	0	23220	20	179	58	3
		28451	16	192	61	0	27262	21	223	59	0	26866	20	188	59	2
		30987	16	205	61	1	30432	21	231	59	0	29798	19	191	59	3
		33523	16	210	61	0	33602	21	232	59	0	34078	18	180	58	3
		38436	15	210	61	1	38119	20	235	60	0	37406	19	193	58	3
RK 552	30	22473	17	167	57	6	23661	20	212	53	0	22572	18	163	53	10
		28116	16	202	58	1	26334	19	214	55	1	25641	17	170	53	15
		29304	15	190	57	1	30294	19	221	55	1	28314	17	167	53	9
		33462	15	196	57	0	32670	19	215	55	1	30987	17	166	53	15
		36729	15	208	56	0	37620	19	226	56	1	33660	17	172	54	14
	22	22590	17	184	58	1	22950	20	205	54	0	22230	18	160	55	9
		26550	16	202	57	2	26280	19	216	54	1	26550	17	163	55	11
		29070	16	196	57	3	29790	19	222	54	0	28980	17	170	55	13
		31320	15	202	57	0	32670	19	229	55	1	32850	17	167	54	16
		35910	16	208	57	2	34380	19	222	54	1	34740	17	177	55	13
	15	22983	16	170	56	4	23141	20	217	54	1	24409	18	165	54	17
		25598	15	194	57	2	27262	19	226	55	0	27817	17	169	53	9
		28292	15	194	58	0	29877	19	229	55	0	32017	17	174	53	12
		32096	16	200	57	2	32572	19	228	56	2	35821	17	166	52	15
		37565	15	215	57	1	35266	19	240	55	0	38436	16	162	53	10
GLH 4758	30	20988	17	163	58	1	25443	25	209	54	0	24255	19	169	54	9
		29304	15	188	59	1	27720	24	225	54	0	27621	19	174	53	12
		31086	16	183	59	0	30789	23	222	55	1	30195	19	170	53	14
		34254	15	189	59	1	35145	23	221	55	1	33957	18	169	53	11
		37917	15	197	59	1	37422	23	225	55	2	36531	19	178	53	19
	22	24570	17	180	56	1	23220	23	185	54	1	24930	18	175	56	9
		27450	17	185	58	0	28260	22	219	55	0	28440	19	181	57	11
		30420	17	183	57	1	31950	22	222	54	1	31680	19	180	56	11
		35370	16	190	57	1	37440	23	220	54	2	36090	18	177	57	13
		37530	17	197	57	1	39510	22	227	55	3	39060	18	182	57	10
	15	24726	17	180	58	1	25756	23	211	55	0	23220	19	171	53	8
		29402	16	192	60	1	28926	23	219	55	0	28847	19	174	53	13
		33840	16	208	59	1	31938	23	229	55	1	31700	19	189	53	9
		35821	16	200	59	1	37406	22	231	56	2	34632	18	185	53	9
		40735	16	212	59	1	40655	23	234	56	2	38040	19	187	53	15
PIO 3573	30	23166	18	169	55	3	23661	26	210	52	1	21879	21	166	53	7
		26631	18	184	56	1	25938	25	207	52	2	24849	21	167	53	10
		30294	17	202	57	3	28908	25	210	53	1	29601	19	157	53	10
		31680	17	191	56	3	32868	24	210	53	2	32076	18	155	51	11
		36432	17	190	56	2	34848	23	219	54	4	34056	19	151	52	20
	22	23670	18	190	56	1	23400	26	203	52	1	24300	20	164	53	8
		26550	18	192	57	1	27180	25	221	52	1	26190	20	159	53	8
		30240	17	192	57	3	29520	24	212	53	0	29970	19	156	53	11
		32940	17	196	57	3	32580	24	218	52	1	33300	19	160	52	9
		36630	16	195	57	4	36630	23	228	53	2	36810	19	164	53	13
	15	23379	18	191	55	1	23537	26	215	53	0	24092	21	168	52	7
		26628	18	214	56	3	26628	26	211	53	2	27579	20	166	52	11
		30432	18	212	56	2	29164	25	220	54	1	30194	20	172	52	10
		31938	17	220	57	2	32176	23	229	55	1	32730	18	160	51	13
		35504	16	228	57	2	35862	23	233	55	3	36138	18	162	51	10
C.V.		4	7	2	15	4	5	2	145	4	5	2	43			
*LSD.05		1	19	2	2	1	13	1	1	1	11	2	5			
**LSD.05		1	15	1	3	1	12	1	1	1	10	1	5			

\*LSD for comparing data of two different row spacings at the same population in a hybrid.

\*\*LSD for comparing data of two different populations at the same row spacing in a hybrid.

TABLE 1B.

## POPULATION COMPARISONS AVERAGED ACROSS ROW WIDTHS FOR EACH HYBRID

Hybrid	INGHAM NARROW ROW TRIAL						SAGINAW NARROW ROW TRIAL					HURON NARROW ROW TRIAL				
	Row Width	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL
Max 86		23318 e	17 a	178 b	60 a	1 a	24425 e	22 a	198 c	58 b	0 ab	22500 e	20 a	175 a	58 a	3 a
		26965 d	17 ab	185 ab	61 a	0 a	27333 d	21 ab	218 b	58 b	0 b	25965 d	20 a	181 a	58 a	3 a
		30480 c	17 ac	194 a	61 a	1 a	30826 c	21 ab	220 b	59 b	0 b	29361 c	19 b	182 a	59 a	2 a
		33233 b	16 cd	195 a	61 a	0 a	34295 b	21 b	225 ab	60 a	0 ab	32020 b	19 b	181 a	58 a	3 a
		37304 a	16 d	196 a	61 a	1 a	37774 a	20 c	230 a	60 a	0 a	34804 a	18 b	181 a	58 a	4 a
RK 552		22682 e	16 a	174 c	57 a	4 a	23251 e	20 a	211 c	54 b	0 a	23070 e	18 a	162 b	54 a	12 a
		26755 d	16 b	199 b	57 a	1 ab	26625 d	19 b	219 bc	55 ab	0 a	26669 d	17 b	167 ab	54 a	12 a
		28889 c	16 b	193 b	57 a	2 ab	29987 c	19 b	224 ab	55 ab	0 a	29770 c	17 b	170 a	54 a	12 a
		32293 b	15 b	200 b	57 a	1 b	32637 b	19 b	224 ab	55 a	1 a	33219 b	17 b	166 ab	53 a	15 a
		36735 a	15 b	210 a	57 a	1 b	35755 a	19 b	230 a	55 a	1 a	35612 a	17 b	171 a	54 a	12 a
GLH 4758		23428 e	17 a	174 c	58 b	1 a	25863 e	24 a	204 bc	54 b	0 b	24135 e	19 a	171 b	54 a	9 b
		28719 d	16 b	188 b	59 a	1 a	28302 d	23 ab	221 a	55 a	0 b	28303 d	19 a	177 ab	54 a	12 ab
		31782 c	16 b	192 b	58 ab	1 a	31559 c	23 b	225 a	55 ab	1 b	32169 c	19 ab	178 a	54 a	11 ab
		35148 b	16 b	193 ab	58 a	1 a	36664 b	23 b	224 a	55 a	1 ab	34893 b	18 b	177 ab	54 a	11 ab
		38727 a	16 b	202 a	58 a	1 a	39196 a	23 b	229 a	55 a	2 a	37877 a	19 ab	182 a	54 a	15 a
PIO 3573		23405 e	18 a	183 b	55 a	2 a	23533 e	26 a	209 c	52 b	1 b	23424 e	21 a	166 a	53 a	8 c
		26603 d	18 ab	196 a	56 a	2 a	26582 d	25 b	213 bc	53 b	1 b	26206 d	20 ab	164 a	52 ab	9 cb
		30322 c	17 bc	202 a	56 a	3 a	29197 c	24 c	214 bc	53 a	1 b	29922 c	20 b	162 a	52 ab	10 cb
		32186 b	17 c	203 a	57 a	3 a	32541 b	24 cd	219 ab	54 a	1 b	32702 b	19 c	159 a	52 b	11 b
		36189 a	16 c	205 a	57 a	3 a	35780 a	23 d	227 a	54 a	3 a	35668 a	19 c	159 a	52 ab	14 a

TABLE 1C.

## ROW WIDTH COMPARISONS AVERAGED ACROSS POPULATIONS FOR EACH HYBRID

Hybrid	Row Width	INGHAM NARROW ROW TRIAL				SAGINAW NARROW ROW TRIAL				HURON NARROW ROW TRIAL			
		% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL
Max 86	30	17 a	179 b	61 a	1 a	22 a	213 b	59 a	0 a	19 a	176 a	58 a	3 b
	22	17 a	188 ab	60 a	1 a	20 b	218 ab	58 a	0 a	19 a	179 a	59 a	4 a
	15	16 a	203 a	61 a	1 a	21 a	224 a	59 a	0 a	19 a	186 a	58 a	3 b
RK 552	30	16 a	193 a	57 a	2 a	19 b	218 b	55 a	1 a	17 a	167 a	53 a	13 a
	22	16 a	198 a	57 a	2 a	19 b	219 b	54 a	1 a	17 a	167 a	55 a	13 a
	15	15 a	195 a	57 a	2 a	20 a	228 a	55 a	1 a	17 a	167 a	53 a	13 a
GLH 4758	30	16 c	184 a	59 a	1 a	24 a	220 a	55 a	1 a	19 a	172 b	53 b	13 a
	22	17 a	187 a	57 a	1 a	23 a	215 a	55 a	1 a	18 a	179 a	56 a	11 a
	15	16 b	198 a	59 a	1 a	23 a	225 a	55 a	1 a	19 a	181 a	53 b	11 a
PIO 3573	30	17 a	187 a	56 a	2 a	25 a	211 a	53 a	2 a	20 a	159 a	52 a	12 a
	22	17 a	193 a	57 a	3 a	24 a	216 a	53 a	1 a	19 a	161 a	53 a	10 a
	15	17 a	213 a	56 a	2 a	25 a	222 a	54 a	1 a	20 a	166 a	51 a	10 a

TABLE 1D.

## AVERAGE OF ALL HYBRIDS BY POPULATION ACROSS ROW WIDTH

Hybrid	Row Width	INGHAM NARROW ROW TRIAL				SAGINAW NARROW ROW TRIAL				HURON NARROW ROW TRIAL						
		Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL
		23208 e	17 a	177 d	58 b	2 a	24268 e	23 a	206 d	55 c	0 c	23282 e	19 a	169 b	55 a	8 c
		27260 d	17 b	192 c	58 a	1 b	27211 d	22 b	218 c	55 b	0 c	26786 d	19 a	172 ab	55 a	9 bc
		30368 c	16 b	195 bc	58 a	2 ab	30392 c	22 c	221 bc	55 b	0 c	30305 c	19 b	173 a	55 ab	9 bc
		33215 b	16 c	198 b	58 a	1 ab	34034 b	22 c	223 b	56 a	1 b	33209 b	18 c	171 ab	54 b	10 ab
		37239 a	16 c	203 a	58 a	1 ab	37126 a	21 d	229 a	56 a	2 a	35990 a	18 c	173 a	54 ab	11 ab

TABLE 1E.

## AVERAGE OF ALL HYBRIDS BY ROW WIDTH ACROSS POPULATION

Hybrid	Row Width	INGHAM NARROW ROW TRIAL				SAGINAW NARROW ROW TRIAL				HURON NARROW ROW TRIAL			
		% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL
	30	16 b	186 b	58 a	1 a	22 a	215 b	56 ab	1 a	19 a	168 b	54 b	10 a
	22	17 a	192 b	58 a	1 a	22 b	217 b	55 b	1 a	19 a	171 ab	56 a	9 a
	15	16 b	202 a	58 a	1 a	22 ab	225 a	56 a	1 a	19 a	175 a	54 b	9 a

\* Average means within a column followed by the same letter are not significantly different at .05%.  
Duncans multiple range test was used to control type I comparisonwise error rate.

TABLE 2A.

## DATA BY ROW WIDTH AND POPULATIONS FOR EACH HYBRID

Hybrid	Row Width	MONROE NARROW ROW TRIAL					KALAMAZOO NARROW ROW TRIAL					KALAMAZOO-IRR NARROW ROW				
		Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL
GLH 4758	30	24057	19	152	61	2	25146	18	167	60	0	25047	19	169	61	0
		28314	19	163	61	2	29601	18	174	61	0	27720	18	172	61	1
		31086	19	162	61	0	32868	19	161	61	0	31086	18	190	62	0
		35145	19	162	61	0	36135	19	169	61	1	34254	18	187	62	2
		38709	18	166	61	0	40392	18	174	61	1	38808	18	211	62	1
	22	24300	19	159	61	1	23850	18	156	60	1	25380	18	167	59	2
		27360	18	160	62	1	29250	18	174	60	2	28710	18	183	60	1
		31680	19	162	62	1	33300	18	170	60	1	33390	18	190	60	3
		35550	18	172	62	0	35100	18	172	60	1	36360	18	189	61	1
		38430	19	171	62	1	40950	18	184	61	2	40140	18	207	60	1
	15	25439	18	155	62	1	25836	18	180	60	1	25677	18	177	62	1
		28609	19	175	61	0	29877	18	167	61	0	30036	17	190	61	1
		33127	18	168	62	0	33840	18	163	61	2	33523	18	185	62	0
		35742	18	170	62	1	38040	18	186	61	1	37089	18	188	62	1
		40655	18	172	62	0	41052	19	181	61	0	40259	18	191	62	1
PIO 3573	30	22374	19	152	59	2	24255	18	164	60	1	22968	19	173	58	0
		24156	18	152	60	2	27027	18	176	60	0	25839	19	173	58	0
		29106	18	154	60	1	29898	18	169	60	1	30294	18	156	58	2
		33165	18	175	60	4	32967	19	179	60	2	33363	18	168	59	0
		36927	18	164	60	2	37125	18	187	60	2	36531	18	177	59	1
	22	22140	18	160	60	3	23580	18	175	59	2	23400	19	174	58	1
		25020	19	160	60	4	26190	18	167	60	1	27000	18	157	59	1
		28980	18	161	60	3	29700	19	169	60	1	30420	19	180	59	0
		32220	18	161	60	1	32940	18	179	60	0	35010	18	176	58	2
		36540	18	158	60	5	36720	18	163	60	3	36810	18	183	59	1
	15	23775	18	165	60	2	24409	18	161	60	1	22349	18	160	59	0
		26073	18	161	60	2	27975	18	174	60	1	26073	19	167	58	1
		30036	17	161	60	2	30670	18	166	60	1	31145	18	168	60	1
		34157	17	170	60	2	34236	18	165	60	2	33444	18	175	59	1
		36851	17	166	60	4	37485	18	168	60	3	37327	18	174	59	1
GLH 5715	30	25443	20	151	60	0	26037	19	161	62	0	24750	18	165	62	0
		28710	20	155	59	1	29403	20	171	61	0	29403	19	168	62	1
		32472	20	162	60	0	33462	20	180	61	0	33165	20	183	62	1
		36432	20	156	60	1	35640	21	169	61	1	35838	19	181	61	1
		40194	20	163	61	2	38709	21	161	61	0	39303	19	173	62	1
	22	25110	20	150	61	1	25740	19	164	61	1	25200	19	182	62	0
		29430	20	154	61	2	29880	19	165	61	2	29250	19	174	62	1
		33660	19	151	61	2	33120	19	171	61	1	31590	19	176	62	2
		37980	20	153	61	3	37350	19	170	61	1	36360	19	190	62	2
		41310	20	156	61	1	41040	20	168	61	1	40500	19	180	62	2
	15	23934	20	165	60	0	24568	20	154	61	0	25043	18	161	62	0
		30115	20	150	60	1	28292	20	168	60	0	29798	19	180	62	1
		32889	20	158	60	1	31066	21	162	60	0	33285	19	176	62	0
		35821	21	158	60	1	33681	21	166	60	1	37168	19	192	62	1
		38436	21	152	60	4	39150	21	163	61	1	40021	19	191	62	2
RENK 775	30	23463	18	163	59	3	24552	20	186	60	2	23562	19	174	59	1
		25344	18	163	59	2	27225	20	186	60	0	26037	19	191	60	2
		28512	18	167	59	3	30987	19	190	60	1	29898	19	156	60	0
		31581	18	171	59	3	33759	19	183	60	1	33660	19	217	59	2
		36234	18	174	59	2	38016	20	190	60	1	35343	19	186	61	2
	22	22500	19	160	59	2	22680	18	184	60	2	22680	18	172	60	3
		26100	18	157	60	5	26100	18	179	60	3	25560	18	198	60	4
		27450	19	162	59	3	29430	19	176	60	2	29430	19	196	60	3
		32580	18	168	60	3	32490	19	192	60	1	33750	19	194	59	2
		36000	19	173	60	4	37440	18	184	61	3	36900	19	217	59	9
	15	22111	18	164	59	1	23379	19	177	60	3	23458	19	186	60	1
		25043	19	168	59	2	26787	19	198	59	2	26390	19	192	59	2
		29243	19	186	59	4	31859	19	189	60	2	30828	19	207	60	4
		33919	18	186	59	3	34553	19	179	60	2	33047	19	190	60	2
		36455	18	187	60	5	38638	19	184	60	3	37406	19	184	60	1
C.V.		4	6	1	92		3	8	1	151		3	7	1	121	
*LSD <sub>.05</sub>		1	13	1	2		2	18	1	3		1	15	1	2	
**LSD <sub>.05</sub>		1	12	1	2		1	18	1	2		1	15	1	2	

\*LSD for comparing data of two different row spacings at the same

\*\*LSD for comparing data of two different populations at the same row

TABLE 2B.

## POPULATION COMPARISONS AVERAGED ACROSS ROW WIDTHS FOR EACH HYBRID

Hybrid	MONROE NARROW ROW TRIAL						KALAMAZOO NARROW ROW TRIAL					KALAMAZOO-IR NARROW ROW TRIAL				
	Row Width	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL
GLH 4758		24599 e	19 a	155 b	61 b	1 a	24944 e	18 a	168 ab	60 b	1 a	25368 e	18 a	171 c	61 b	1 a
		28094 d	19 a	166 a	62 ab	1 a	29576 d	18 a	172 ab	61 a	1 a	28822 d	18 a	181 b	61 b	1 a
		31964 c	18 a	164 a	61 b	0 a	33336 c	18 a	164 b	61 a	1 a	32666 c	18 a	189 b	61 ab	1 a
		35479 b	19 a	168 a	62 ab	0 a	36425 b	19 a	176 ab	61 a	1 a	35901 b	18 a	188 b	62 a	1 a
	39265 a	18 a	170 a	62 a	1 a	40798 a	18 a	180 a	61 a	1 a	39736 a	18 a	203 a	61 a	1 a	
PIO 3573		22763 e	18 a	159 b	60 bc	2 b	24081 e	18 a	167 a	60 a	1 a	22906 e	19 a	169 ab	58 b	0 a
		25083 d	18 a	158 b	60 abc	3 ab	27064 d	18 a	172 a	60 a	1 a	26304 d	19 a	166 b	59 ab	1 a
		29374 c	18 b	159 b	60 ab	2 b	30089 c	18 ab	168 a	60 a	1 a	30620 c	18 ab	168 b	59 ab	1 a
		33181 b	18 b	169 a	60 a	2 ab	33381 b	18 ab	174 a	60 a	1 a	33939 b	18 bc	173 ab	59 a	1 a
	36773 a	18 b	163 b	60 c	4 a	37110 a	18 b	173 a	60 a	2 a	36889 a	18 c	178 a	59 a	1 a	
GLH 5715		24829 e	20 b	155 a	60 ab	0 a	25448 e	19 b	160 b	61 a	0 a	24998 e	18 c	170 c	62 a	0 b
		29418 d	20 ab	153 a	60 b	2 a	29192 d	20 a	168 ab	61 a	1 a	29484 d	19 b	174 bc	62 a	1 ab
		33007 c	20 ab	157 a	60 ab	1 a	32549 c	20 a	171 a	61 a	0 a	32680 c	19 a	178 abc	62 a	1 ab
		36744 b	20 ab	155 a	60 ab	1 a	35557 b	20 a	168 ab	61 a	1 a	36455 b	19 ab	187 a	62 a	1 ab
	39980 a	20 a	157 a	61 a	2 a	39633 a	20 a	164 ab	61 a	1 a	39941 a	19 a	181 ab	62 a	2 a	
RK 775		22691 e	18 a	163 b	59 b	2 a	23537 e	19 a	182 a	60 a	2 a	23233 e	19 b	177 a	60 a	2 a
		25496 d	18 a	163 b	59 ab	3 a	26704 d	19 a	188 a	60 a	2 a	25996 d	19 b	194 a	60 a	3 a
		28402 c	18 a	171 ab	59 b	3 a	30759 c	19 a	185 a	60 a	2 a	30052 c	19 ab	183 a	60 a	2 a
		32693 b	18 a	175 a	59 ab	3 a	33601 b	19 a	185 a	60 a	1 a	33486 b	19 a	200 a	59 a	2 a
	36230 a	18 a	178 a	60 a	4 a	38031 a	19 a	186 a	60 a	2 a	36550 a	19 ab	196 a	60 a	4 a	

TABLE 2C.

## ROW WIDTH COMPARISONS AVERAGED ACROSS POPULATIONS FOR EACH HYBRID

Hybrid	Row Width	MONROE NARROW ROW TRIAL				KALAMAZOO NARROW ROW TRIAL				KALAMAZOO-IR NARROW ROW TRIAL			
		% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL
GLH 4758	30	19 a	161 b	61 a	1 a	18 a	169 b	61 a	0 a	18 a	186 a	62 a	1 a
	22	19 a	165 ab	62 a	1 a	18 a	171 b	60 a	1 a	18 b	184 a	60 b	2 a
	15	18 a	168 a	62 a	0 a	18 a	175 a	61 a	1 a	18 b	186 a	62 a	1 a
PIO 3573	30	18 a	159 a	60 a	2 b	18 a	175 a	60 a	1 a	18 a	170 a	59 a	1 a
	22	18 a	160 a	60 a	3 a	18 a	171 a	60 a	1 a	18 a	174 a	59 a	1 a
	15	18 a	165 a	60 a	2 b	18 a	167 a	60 a	2 a	18 a	169 a	59 a	1 a
GLH 5715	30	20 a	157 a	60 a	1 a	20 a	168 a	61 a	0 c	19 a	174 a	62 a	1 b
	22	20 a	153 a	61 a	2 a	19 b	168 a	61 a	1 a	19 a	180 a	62 a	2 a
	15	20 a	156 a	60 a	1 a	21 a	162 a	60 a	1 b	19 a	180 a	62 a	1 b
RK 775	30	18 a	167 a	59 a	2 a	20 ab	187 a	60 a	1 a	19 a	185 a	60 a	1 a
	22	18 a	164 a	59 a	3 a	19 b	183 a	60 a	2 a	19 a	194 a	60 a	4 a
	15	18 a	178 a	59 a	3 a	19 ab	185 a	60 a	2 a	19 a	192 a	60 a	2 a

TABLE 2D.

## AVERAGE OF ALL HYBRIDS BY POPULATION ACROSS ROW WIDTH

Hybrid	Row Width	MONROE NARROW ROW TRIAL					KALAMAZOO NARROW ROW TRIAL					KALAMAZOO-IR NARROW ROW TRIAL				
		Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL	Pop Plants/A	% H2O	Bu/A	Test WT	% SL
		23720 e	19 a	158 c	60 c	1 b	24503 e	19 a	169 b	60 a	1 a	24126 e	18 a	172 c	60 b	1 a
		27023 d	19 a	160 bc	60 bc	2 ab	28134 d	19 a	175 a	60 ab	1 a	27651 d	18 a	179 bc	60 b	1 ab
		30687 c	19 a	163 ab	60 bc	2 b	31683 c	19 a	172 ab	60 ab	1 a	31505 c	19 a	180 b	61 ab	1 ab
		34524 b	19 a	167 a	60 ab	2 b	34741 b	19 a	176 a	60 ab	1 a	34945 b	19 a	187 a	60 ab	1 ab
		38062 a	19 a	167 a	60 a	3 a	38893 a	19 a	176 a	61 a	1 a	38279 a	18 a	190 a	61 a	2 a

TABLE 2E.

## AVERAGE OF ALL HYBRIDS BY ROW WIDTH ACROSS POPULATION

Hybrid	Row Width	MONROE NARROW ROW TRIAL				KALAMAZOO NARROW ROW TRIAL				KALAMAZOO-IR NARROW ROW TRIAL			
		% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL	% H2O	Bu/A	Test WT	% SL
	30	19 a	161 b	60 a	2 b	19 a	174 a	60 a	1 b	19 a	179 a	60 ab	1 b
	22	19 a	160 b	61 a	2 a	19 b	173 a	60 a	1 a	18 b	182 a	60 b	2 a
	15	19 a	167 a	60 a	2 ab	19 a	172 a	60 a	1 a	18 b	182 a	61 a	1 b

\* Average means within a column followed by the same letter are not significantly different at .05%.

Duncans multiple range test was used to control type I comparison-wise error rate.



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