

HIGH YIELD CORN RESEARCH

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1984 Corn Hybrid, Row Spacing, and Plant Density Study

The objective of this study was to evaluate four corn hybrids at 15 and 30 inch row spacing and at plant densities of 28,000 and 34,000 plants per acre. The irrigated study was conducted at East Lansing on a Metea loamy sand soil. The 15 inch row spacing was obtained by back-planting in between 30 inch rows. Other cultural and management inputs are described at the bottom of Table 1.

The first obviously noticeable difference in 1984 was the uneven stand in the 15 inch row spacing particularly for the two Dekalb hybrids. Harvest populations shown in Table 1 were on the average 4-5,000 plants per acre less than the seeding rates of 28,000 and 34,000 plants per acre. All hybrids were handled identically. A plateless John Deere planter was used for planting, thus seed drop should have been the same, however, no effort was made to determine the number of seeds planted. Germination of the Dekalb hybrids appeared to be significantly reduced. Conditions after planting were cold and wet and plants did not emerge until two weeks after planting.

Yields in Table 2 show that they are directly related to the plant population in Table 1. Pioneer 3707 which had the highest plant population also had the highest yield. Yields in 30 inch rows significantly out-yielded the 15 inch rows but the difference is probably due to lower plant density of the 15 inch row spacing particularly at the lower plant population level (25,838 vs. 27,750 for 15 and 30 inch row spacing, respectively). The planter was adjusted from a setting to obtain 28,000 or 34,000 to 14,000 or 17,000 seeds per acre, respectively, for the 15 inch row spacing and then back-planted between the 30 inch rows to obtain a seeding rate approximately equivalent to the 30 inch row spacing. The only way to obtain equal stands would have required hand thinning.

Excellent yields in excess of 200 bushels per acre were obtained for three of the four hybrids at the highest plant population in the 30 inch row spacing. These data indicate that under high fertility and good irrigation management, plant population and hybrid are very important to producing yields in excess of 200 bushels per acre.

1984 Irrigation Management Study with Corn

This study was conducted at East Lansing on the MSU Research Farm. The soil type is a Metea loamy sand. The objectives of this study were

(1) to evaluate the performance of three corn hybrids to varying levels of irrigation water, (2) determine water use efficiency, and (3) to improve our estimates of daily crop water use. A line source irrigation system was used to apply different rates of water in a single application. The irrigation system supplied a high rate of water to plots established closest to the line and decreasing amounts with distance from the line until no irrigation water was applied on the outside edges. Tensiometers were used near the irrigation line to determine when to irrigate. A computerized irrigation schedule was also used to compare the estimates of crop water use with measurements of soil water loss. Soil moisture was monitored by a neutron soil moisture probe.

Corn yields are shown in Table 3. Yields were nearly always highest with the highest rate of water, however, water use efficiency (bushels per inch of precipitation) was highest with only 2.2 inches of water. However, the most important question irrigators will ask, is what was the most economical rate of water to apply. Table 3 also shows the economic returns to irrigation. Using \$3.00 corn and \$5.00 per acre inch of water, we see that for all hybrids the highest yielding treatment also produced the most economical yield. In summary, the grower should not under-estimate the importance of obtaining high yields even if it means producing at a lower water use efficiency level.

1984 Irrigated Corn Tillage Study

The objectives of this study were (1) to compare no-tillage and conventional tillage methods of corn production on a fine textured soil and (2) to determine if there are any fertility interactions between the two tillage systems. The experiment was established in 1982 at the MSU Research Farm in a corn-soybean rotation on a Capac-Colwood loam soil. All treatments including the no-till and conventional areas have remained the same since establishment. The conventional treatment for the past two years has consisted of fall chisel and spring seed-bed preparation with a disk and field cultivator. The experiment is irrigated to obtain maximum yields. Other cultural and management practices are listed at the bottom of Table 4.

There were no significant difference in yields between the two tillage systems or method of phosphorus placement. Nitrogen rates and potassium rates were significantly different. A 4 bushel increase was observed from the additional 150 lb of N. Economically, the last 150 lb of N would not have been profitable at prices of \$3.00 per bushel of corn and 20¢ per lb of N. Likewise, the 5 bushel increase in yield from the additional 150 lb of K would not have been profitable. Yields, in general were not as high as expected. The no-till system continues to work well on this soil type. Significant amounts of residue have begun to build on the surface and soil tilth under the mulch was excellent this spring. There appears to be no serious disadvantages for growing corn with the no-till method on this well-tiled loam soil.

Table 1. Harvest population of four corn hybrids at two row spacings and two seeding rates.

Treatments		Final Plant Population				
Hybrids	Row Spacing - Seeding Rate	15" 28,000	15" 34,000	30" 28,000	30" 34,000	Mean ¹
-----plants per acre-----						
Pioneer 3707		26603	35833	29662	33500	31400 d
Pioneer 3572		24943	32411	25980	30492	28457 c
Dekalb 587		18824	24528	23906	29092	24088 ab
Dekalb T1100		21313	22247	23439	25929	23232 a
OVERALL MEANS						
Row Spacing	15 inches					25838 a
	30 inches					27750 b
Seeding Rate	28,000 seeds/A					24334 a
	34,000 seeds/A					29254 b

¹ Any two means followed by different letters are significantly different as measured by LSD Method (p = .01)

Planted: May 3, 1984	Herbicide: Atrazine 1/2 lb a.i.
Harvested: October 29, 1984	Bladex 1 lb a.i.
Harvest area: 210 sq. ft.	Lasso 2 lb a.i.
Soil type: Metea loamy sand	Insecticide: Counter @ 8 oz 15 g/1000
Rainfall: 14.0 inches	row-ft. + Furadan
Irrigation: 12.5 inches	granuals for corn borer
Fertilizer: preplant 184-0-120	Soil test: pH = 6.6
starter 19-77-77	Bray p1 = 189 lb/A
nitrogation 184-0-0	Exch K = 259 lb/A
manure 80-40-160	Exch Ca = 1219 lb/A
Total N-P ₂ O ₅ -K ₂ O	Exch Mg = 231 lb/A
467-117-357	CEC = 4.0 me/100 g

Table 2. Irrigated corn yield of four corn hybrids as affected by row spacing and seeding rate.

Treatments		Corn Yield ¹				
Hybrids	Row Spacing - Seeding Rate	15" 28,000	15" 34,000	30" 28,000	30" 34,000	Mean ²
	-----bu/A-----					
	Pioneer 3707	188	220	200	218	206 c
	Pioneer 3572	183	211	189	204	197 b
	Dekalb 587	142	160	175	201	170 a
	Dekalb T1100	158	175	174	185	173 a
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OVERALL MEANS						
Row Spacing	15 inches					180 a
	30 inches					193 b
Seeding Rate	28,000 seeds/A					176 a
	34,000 seeds/A					197 b

¹Yields are adjusted to 15.5% moisture.

²Any two means followed by different letters are significantly different as measured by LSD Method (p = .01).

Table 3. Yield of three corn hybrids as affected by irrigation level.

Hybrids	Treatments		Corn Yield ¹				
	Irrigation - %	Irrigation-inches	0%	25%	58%	81%	100%
			0.0	2.2	5.1	7.1	8.8
			-----bu/A-----				
Pioneer 3707			102	141	168	179	191
Pioneer 3572			126	167	185	191	184
Dekalb 587			116	148	165	178	167
OVERALL MEAN			115	152	173	183	181
			Water Use Efficiency ²				
			-----bu/inch-----				
Pioneer 3707			9.9	11.3	11.0	10.3	10.0
Pioneer 3572			12.2	13.4	12.1	11.0	9.6
Dekalb 587			11.3	11.9	10.7	10.3	8.8
OVERALL MEAN			11.1	12.2	11.3	10.5	9.5
			Net Return to Irrigation ³				
			-----\$/A-----				
Pioneer 3707			-	\$107	\$177	\$197	\$224
Pioneer 3572			-	\$112	\$156	\$160	\$131
Dekalb 587			-	\$86	\$125	\$153	\$111
OVERALL MEAN				\$102	\$153	\$170	\$155

¹Yields are adjusted to 15.5% moisture.

²Bushels per acre divided by inches of rainfall plus irrigation.

³Calculations are based on \$3.00 per bushel of corn and \$5.00 per acre inch of water.

Planted: May 3, 1984
 Harvested: October 18, 1984
 Harvest area: 250 sq. ft.
 Soil type: Metea loamy sand
 Rainfall: 10.3 inches
 Fertilizer: preplant 276-0-120
 starter 19-77-77

Herbicide: Atrazine 1/2 lb a.i.
 Bladex 1 lb a.i.
 Lasso 2 lb a.i.
 Insecticide: Counter @ 8 oz 15 g/
 1000 row-ft. +
 Furadan granuals for
 corn borer

Soil test: pH = 6.8
 Bray pl = 200 lb/A
 Exch K = 183 lb/A
 Exch Ca = 1143 lb/A
 Exch Mg = 203 lb/A
 CEC = 3.0 me/100 g

Table 4. Irrigated corn yield as affected by tillage method, nitrogen and potassium rate, and phosphorus placement.

Treatments ¹			Tillage Method		
N Rate	P Placement	K ₂ O Rate	Conventional	No-Till	Treatment Mean
-1b/A-		-1b/A-	-----bu/A-----		
150	Broadcast	50	170	164	167
150	Broadcast	150	173	170	171
300	Broadcast	50	173	168	170
300	Broadcast	150	179	175	177
150	Banded	50	170	165	167
150	Banded	150	172	171	172
300	Banded	50	170	170	170
300	Banded	150	176	175	175
OVERALL MEANS					
Tillage			173	169	
Nitrogen Rate			150 lb/A		169 a ²
			300 lb/A		173 b
Phosphorus Placement			Broadcast		172
			Banded		171
Potassium Rate			50 lb/A		169 a
			150 lb/A		174 b

¹150 N = 100 preplant + 50 at planting, 300 N = 100 preplant + 50 at planting + 150 sidedress, P rate = 50 lb P₂O₅, 50 K₂O = 50 at planting, 150 K₂O = 50 at planting + 150 preplant.

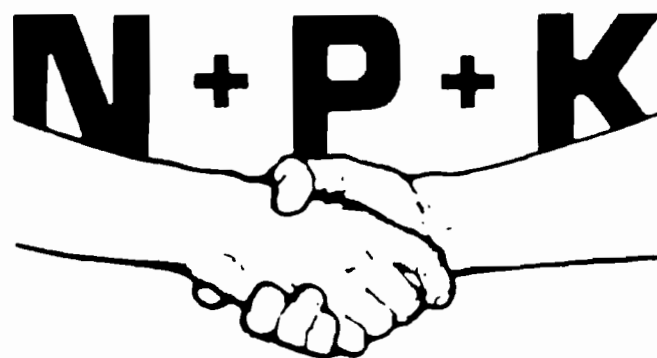
²Any two means followed by different letters are significantly different as measured by LSD Method (p = .01).

Planted: May 2, 1984
 Harvested: October 11, 1984
 Harvest area: 250 sq. ft.
 Soil type: Capac-Colwood
 Rainfall: 14.0 inches
 Irrigation: 9.25 inches
 N source: Ammonium Nitrate
 Hybrid: Pioneer 3747
 Row spacing: 30 inches
 Seeding rate: 34,000

Herbicide: Atrazine 3/4 lb a.i.
 Bladex 1 1/2 lb a.i.
 Lasso 2 1/2 lb a.i.
 Roundup 1 lb a.i.
 (no-till only)

Soil test: pH = 6.5
 Bray p1 = 112
 Exch K = 236
 Exch Ca = 4835
 Exch Mg = 699
 CEC = 15.3 me/100 g

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