

Performance of Corn Hybrids for Silage in the West Cross Timbers

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Summary

Dry matter yields of 20 corn hybrids ranged from 4.9 to 6.9 tons/A under irrigation and from 1.3 to 2.0 tons/A dryland with no statistically significant differences among hybrids. Hybrids grown dryland were harvested at early tasseling due to drought. Crude protein content of irrigated hybrids cut at soft dough ranged from 6.5 to 7.5 percent, ear weight percent ranged from 23.2 to 40.2,

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and ear height ranged from 27 to 45 inches. The soft dough stage of maturity was a relatively good index of dry matter percentage for most hybrids. Failure to show statistical differences in yield and ears per hundred plants was partially due to differences in plant population.

Introduction

The value of corn silage for lactating dairy animals is well known. Renewed interest in the use of corn silage by dairymen of the West Cross Timbers has resulted from the recognition of this fact and the availability of equipment for handling silage from harvest to feeding. Since corn has not been grown in the area for many years, silage production is dependent upon knowledge of corn hybrid performance under limited irrigation as well as dryland conditions. Hybrid differences in dry matter production, crude protein content, plant maturity, and ear weight are of interest to the potential grower who must profitably produce corn silage. Potential growers in the area include producers of irrigated peanuts whose acreage has been steadily reduced by government controls. Corn might also be grown for silage under dryland conditions by seeding about the time of final frost to take advantage of the rainfall pattern for the area. The objectives of this test were to determine differences in yield, crude protein content, maturity, ear weight, and ear percentage of selected corn hybrids.

Procedure

An irrigated test and a dryland test were located on a Windthorst fine sandy loam soil and separated by a

buffer area of corn 70-feet long and the width of each test. Fertilizer was broadcast and incorporated with a tandem disk 2 weeks prior to seeding. Urea, ammonium nitrate, and 18-46-0 were applied separately to provide a total of 173 and 60 lb nitrogen and phosphorus (P₂O₅), respectively. Seeding rate was adjusted according to percentage seed germination and an estimated 10 percent death loss to provide 20,000 and 24,000 plants/A, respectively, for the dryland and irrigated tests. The tests were seeded on March 20 by hand metering preweighed seed packets into a funnel placed into the seed spout of a John Deere Flexi-Planter with double-disk openers. Dual 8E herbicide was sprayed broadcast at the rate of 2 pt/A within 1 day after seeding.

Twenty corn hybrids in each test were arranged in a randomized complete block design with four replications. Plots were 9 feet (three rows) wide and 20 feet long.

The irrigated test received 12 acre-inches of irrigation and 6.1 inches of rainfall between planting and harvest. Water was applied once at the rate of 3.0 acre-inches and five times at the rate of 1.8 acre-inches by releasing water from gated pipe into furrows using gravity flow down a 0-1 percent slope.

The dryland test received only 4.95 inches of rainfall from March 20 to June 20; therefore, the test was harvested on June 20 when most hybrids were in the early tasseling stage. Plants were cut 3 inches above ground level from the middle 15 feet of the center row of each plot.

Plants in the irrigated test were cut as kernels of each hybrid reached the soft dough (dent) stage of maturity. Plants were cut 3 inches above ground level from the middle 10 feet of the center row of each plot. Ears were removed with the shuck attached; stalks (with leaves) and ears counted and weighed. Stalks and ears were randomly selected as subsamples for dry matter determinations and crude protein analysis. Ears and stalks were recombined for the subsamples in the same proportion as existed for the harvested row. Plants and ears were cut into 8-inch pieces to facilitate drying, which initially was in outdoor bins made of quarter-inch hail screen. Final drying was accomplished in a forced-draft oven at 70°C. Crude protein was determined by the macro-Kjeldahl method using samples ground to pass a 1 mm screen.

Results and Discussion

Although yields of irrigated corn ranged from 4.9 to 6.9 tons dry matter/A (Table 1), differences were not statistically significant due to high variation (coefficient of variation = 26.7 percent). Sources of variation may be in application of irrigation water and in differences in plant population. Regardless of variation most hybrids produced between 5.1 and 5.9 tons dry matter/A, which, adjusted to 35 percent dry matter, is equivalent to 14.6 and 16.9 tons of forage at the proper water content for quality silage.

Crude protein content ranged from 6.5 to 7.5 percent (Table 1). Protein content of 'WAC 918' and 'TX-34' was

significantly greater than that of 'II-890', 'PX-83', 'G4673-A' and 'SX-2434'.

Fresh weight of ears in the shuck as a percentage of the total weight ranged from 23.2 to 40.2 (Table 2). Percentage ear weight of WAC 918, '7251', and 'Pio.3165' was significantly greater than 'RA-1502', 'RX-962W', and 'Pio.3192'.

Height of ear from ground level to the base of the ear shank ranged from 26.5 to 45 inches (Table 2). Ear height of TX-34, 'GSC-2355', and '8990' was significantly greater than RA-1502, SX-2434, WAC-918 and Pio.3192.

Number of ears per hundred plants ranged from 71 to 123, but differences were not statistically significant (Table 3). Forty-one percent of the variation was due to plant population.

The grain of all hybrids reached soft dough between 111 and 118 days after planting (Table 3). The soft dough stage was used as an index to 35 percent dry matter content, but actual percentages ranged from 27.4 to 38.8 (Table 1). Therefore, days to harvest may vary slightly from those found in this study. The five hybrids having more than 35 percent dry matter had a statistically greater percentage dry matter than those eight hybrids with less than 31 percent. The standard deviation for dry matter content was 2.7 percent, while mean of all

TABLE 1. DRY MATTER YIELD, PERCENTAGE, AND CRUDE PROTEIN CONTENT OF IRRIGATED CORN HYBRIDS GROWN FOR SILAGE

Hybrid	Company	Dry Matter ¹		Crude Protein ¹
		Tons/A	Percent	Percent
H-890	Horizon	6.9 a	38.8 a	6.5 b
Pio. 3165	Pioneer	6.3 a	34.6 abcde	6.7 ab
Pio. 3192	Pioneer	5.9 a	30.5 efgh	7.2 ab
RA-1505	Ring			
	Around	5.9 a	32.1 cdefg	6.7 ab
G4673-A	Funk	5.9 a	31.1 defgh	6.5 b
G4507-A	Funk	5.8 a	31.3 defgh	7.2 ab
GSC-2355	Gro Agri	5.7 a	29.9 fgh	6.9 ab
XL-72 aa	DeKalb-Pfizer	5.7 a	34.1 bcdef	7.2 ab
RA-1604	Ring			
	Around	5.6 a	35.0 abcde	7.1 ab
8990	Paymaster	5.5 a	29.8 fgh	6.8 ab
NS-212	Gro Agri	5.4 a	37.9 ab	7.1 ab
RX-962-W	Asgrow	5.4 a	35.8 abc	7.4 ab
XL-73	DeKalb-Pfizer	5.4 a	30.6 efgh	7.0 ab
TE-6996	Taylor-Evans	5.3 a	33.4 cdef	7.1 ab
RA-1502	Ring			
	Around	5.3 a	29.7 fgh	6.7 ab
PX-83	Northrup			
	King	5.3 a	27.4 h	6.5 b
7251	Paymaster	5.2 a	36.2 abc	6.8 ab
TX-34	TAES			
	(Harper)	5.2 a	35.5 abcd	7.5 a
WAC-918	SeedTec	5.1 a	30.4 efgh	7.5 a
SX-2434	Browning	4.9 a	28.5 gh	6.5 b

¹Values within the same column followed by the same letter are not statistically different at the 0.05 probability level, Duncan's Multiple Range Test.

TABLE 2. EAR WEIGHT AND EAR HEIGHT OF IRRIGATED CORN HYBRIDS

Hybrid	Ear Weight ¹	Ear Height ²
	(percent)	(inches)
H-890	35 abc	36 abc ³
Pio. 3165	39 ab	33 abcde
Pio. 3192	23 d	27 f
RA-1505	38 abc	36 ab
G4673-A	36 abc	32 cde
G4507-A	37 abc	34 abcde
GSC-2355	31 abcd	37 a
XL-72 aa	33 abc	34 abcde
RA-1604	35 abc	34 abcde
8990	30 bcd	36 ab
NS-212	34 abc	33 abcde
RX-962-W	29 bcd	35 abc
XL-73	32 abcd	32 bcde
TE-6996	38 abc	34 abcde
RA-1502	29 cd	31 de
PX-83	30 abcd	34 abcd
7251	39 ab	33 bcde
Tx 34	38 abc	45 a
WAC-918	40 a	27 f
SX-2434	35 abc	30 ef

¹Mean weight per acre of fresh cut ears (in shuck) divided by the mean total fresh weight per acre times 100.

²Measured from ground level to base of ear shank.

³Values within a column followed by the same letter are not statistically different at the 0.05 probability level, Duncan's Multiple Range Test.

TABLE 3. PLANT POPULATION, EAR COUNT, AND DAYS TO SOFT DOUGH OF IRRIGATED CORN HYBRIDS

Hybrid	Plant	Ear Count (per 100 plants)	Days to ² Soft Dough
	Population ¹ (1,000's/A)		
Pio. 3192	29.0 a	88 a	111
8990	28.3 ab	78 a	113
Px-83	27.6 ab	84 a	113
SX-2434	27.2 ab	84 a	114
RA-1502	26.9 ab	76 a	114
G4507-A	26.5 ab	90 a	114
G4673-A	26.1 ab	87 a	115
XL-72 aa	25.8 ab	85 a	115
Pio. 3165	25.4 ab	95 a	118
WAC-918	25.4 ab	93 a	113
GSC-2355	25.0 ab	94 a	114
H-890	25.0 ab	92 a	118
TE-6996	24.7 ab	95 a	115
Rx-962-W	24.0 ab	71 a	118
XL-73	24.0 ab	86 a	113
RA-1604	24.0 ab	93 a	115
RA-1505	23.6 ab	97 a	115
NS-212	22.9 abc	83 a	118
7251	21.8 bc	87 a	118
Tx 34	17.1 c	123 a	118

¹Values followed by the same letter are not statistically different at the 0.05 probability level, Duncan's Multiple Range Test.

²Number of days from planting to soft dough of kernels.

hybrids was 32.6 percent. Since ears were checked daily to determine when soft dough was reached, this variation may be near the minimum.

Dryland yields ranged from 1.3 to 2.0 tons dry matter/A (Table 4). No statistical differences were

TABLE 4. DRY MATTER YIELDS OF CORN HYBRIDS GROWN DRYLAND¹

Hybrid	Dry Matter ² (tons/A)
GSC-2355	2.0 a
G4507 A	2.0 a
RA-1604	2.0 a
8990	2.0 a
TE-6996	2.0 a
NS-212	1.9 a
G-4673 A	1.8 a
Rx-962-W	1.7 a
RA-1502	1.7 a
Tx-34	1.7 a
Pio. 3192	1.7 a
XL-73	1.7 a
XL-72 aa	1.6 a
PX-83	1.6 a
WAC-918	1.6 a
H-890	1.5 a
SX-2434	1.5 a
Pio. 3165	1.4 a
RA-1505	1.3 a
7251	1.3 a

¹Test was harvested prematurely at approximately tassel stage due to drought.

²Values followed by the same letter are not statistically different at the 0.05 probability level, Duncan's Multiple Range Test.

found among hybrids. The test average was 4.1 tons per acre less than that for the irrigated test, which indicates the value of supplemental irrigation for corn in this area. Rainfall for the dryland test was approximately 11 inches below the 45-year average for the period.

Plant population in the irrigated test ranged from 17,100 to 29,000 plants/A despite attempts to assure a population of 24,000 plants/A for all hybrids (Table 1). The linear regression of plant population on dry matter yield per acre resulted in the equation: tons dry matter = $18.1 - 0.49 \times$ plant population per acre in thousands. The coefficient of determination (r^2) was 0.83 indicating that 83 percent of the variation in dry matter yield was due to differences in plant population. Therefore, plant population may be more important than the hybrid when yield is the criterion for selection.