

Kansas Agricultural Experiment Station Research Reports

Volume 0

Issue 1 *Cattleman's Day* (1993-2014)

Article 706

1993

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Recommended Citation

Sonon, R.N.; Dalke, B.S.; Holthaus, D.L.; Bonilla, D.R.; Pfaff, L.; Boyer, John E.; Brent, B.E.; Bolsen, K.K.; and Young, Matthew A. (1993) "Evaluation of 24 corn hybrids for silage agronomic performance under both irrigated and dryland conditions," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 1. <https://doi.org/10.4148/2378-5977.2109>

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Evaluation of 24 corn hybrids for silage agronomic performance under both irrigated and dryland conditions

Abstract

In 1992, 24 corn hybrids were grown under both irrigated and dryland conditions and were harvested at 90% of the kernel milk line. Growing condition and hybrid significantly affected plant height and the number of days to the tasseling and silking stages. Most dryland hybrids had higher dry matter (DM) contents than irrigated hybrids, but all 24 hybrids had higher grain yields under irrigation. Growing condition and hybrid also significantly affected whole-plant DM and stover yields and percentages of cob and stover. The grain portion made the greatest contribution to the higher whole-plant silage yields for the irrigated hybrids compared to their dryland counterparts.

Keywords

Cattlemen's Day, 1993; Kansas Agricultural Experiment Station contribution; no. 93-318-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 678; Beef; Corn; Hybrid; Silage; Yield

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EVALUATION OF 24 CORN HYBRIDS FOR SILAGE AGRONOMIC PERFORMANCE UNDER BOTH IRRIGATED AND DRYLAND CONDITIONS¹

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Summary

In 1992, 24 corn hybrids were grown under both irrigated and dryland conditions and were harvested at 90% of the kernel milk line. Growing condition and hybrid significantly affected plant height and the number of days to the tasseling and silking stages. Most dryland hybrids had higher dry matter (DM) contents than irrigated hybrids, but all 24 hybrids had higher grain yields under irrigation. Growing condition and hybrid also significantly affected whole-plant DM and stover yields and percentages of cob and stover. The grain portion made the greatest contribution to the higher whole-plant silage yields for the irrigated hybrids compared to their dryland counterparts.

(Key Words: Corn, Hybrid, Silage, Yield.)

Introduction

Typically, corn hybrids grown for silage have been selected for their high grain yield potential and not necessarily for silage traits. However, in three previous KAES Reports of Progress (592, 623, and 651; pages 110, 62, and 110, respectively), we have shown that growing season (year), growing condition (irrigated vs. dryland), hybrid, and stage of maturity at harvest all affect whole-plant silage and grain yields and whole-plant DM contents. Therefore, our objective was to continue

measuring the agronomic traits important to silage production, using 24 corn hybrids grown under both irrigation and dryland in 1992.

Experimental Procedures

Twenty-four, high grain-yielding, corn hybrids, representing a range of season lengths and genetic diversity, were grown under both irrigated and dryland conditions in 1992 near the Kansas State University campus. The experiment was a split-plot design, with growing condition as the main plot and each hybrid assigned to subplots that were replicated three times. The hybrids were planted on May 18, in plots 33 ft long that contained six, 30-in. rows. Anhydrous ammonia (100 lb/acre) was applied preplant, Furadan 15G insecticide was applied in the furrows at planting, and Ramrod-atrazine (2 lb/acre) was applied as the preemergence herbicide 1 day after planting. Two weeks after seedling emergence, irrigated plots were thinned to about 26,000 and dryland plots, to about 17,000 plants per acre. All hybrids were harvested just before the black layer stage of maturity (approximately 90% milk line of kernel development). Agronomic data included days to tassel and silk, plant height, whole-plant DM percent and yield, and grain and stover yields. Shortly prior to harvest, each plot was trimmed to remove border effects. Whole-plant DM yield was deter-

¹Partial financial assistance was provided by Cargill Hybrid Seeds, Minneapolis, MN; ICI Seeds, West Des Moines, IA; and Pioneer Hi-Bred International, Inc., North American Seed Division, Johnston, IA.

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mined from two inside rows, and grain and stover yields and plant part proportions were obtained from the other two inside rows.

Results and Discussion

Agronomic performance of the 24 corn hybrids is shown in Table 1. There were significant interactions between growing condition and hybrid for whole-plant DM content, grain yield, and percent grain. Growing condition and hybrid both significantly influenced the number of days to reach the tassel and silk stages (data not shown), and the average interval between these stages was 4 days for each growing condition. The irrigated hybrids averaged 5 inches taller than dryland hybrids.

Whole-plant DM content ranged from 30.0 to 42.1% (avg, 35.4%) for the irrigated and 34.1 to 44.8% (avg, 39.9%) for the dryland hybrids. All but two of the 24 hybrids (Pioneer 3417 and ICI 8513) had a lower DM content under irrigation than dryland. All hybrids grown under irrigation had higher grain yields than their dryland

counterparts (avg. 209.5 vs. 166.3 bu/acre). However, because the magnitude of the increase in grain yield from irrigation was not the same across all hybrids, significant interaction occurred between growing condition and hybrid. Five of the top six grain-producing hybrids under irrigation were from Pioneer (3245, 3377, 3379, 3394, and 3417), and three of those were also in the top six grain-producing hybrids under dryland (3245, 3377, and 3417).

Growing condition significantly affected whole-plant DM and stover yields. All 24 hybrids had higher whole-plant DM yields under irrigation than dryland (avg. 10.0 vs. 8.4 tons/acre). Twenty hybrids had their highest stover yield under irrigation.

The increase in whole-plant yields from irrigation was due largely to an increase in the grain portion. These results are consistent with previous studies and confirm the important contribution of grain yield to whole-plant silage yields.

Table 1. Effects of Hybrid and Growing Condition on Plant Height; Whole-plant Dry Matter Content; Whole-plant DM, Stover, and Grain Yields; and Plant Part Proportions of the 24 Corn Hybrids

| Hybrid | Irrigated | | | | | | | | Dryland | | | | | | | | |
|----------------|----------------------|---------------------------|------------------------------|-------------------------|-----------------------------------|------------------------|-------------|------------|----------------------|---------------------------|------------------------------|-------------------------|-----------------------------------|------------------------|-------------|------------|--|
| | Plant height, inches | DM yield | | | Grain yield, bu/acre ¹ | Plant part proportions | | | Plant height, inches | DM yield | | | Grain yield, bu/acre ¹ | Plant part proportions | | | |
| | | Whole-plant DM content, % | Whole-plant yield, tons/acre | Stover yield, tons/acre | | grain | stover | cob | | Whole-plant DM content, % | Whole-plant yield, tons/acre | Stover yield, tons/acre | | grain | stover | cob | |
| <u>Cargill</u> | | | | | | | | | <u>DeKalb</u> | | | | | | | | |
| | | | | | % of the whole-plant DM | | | | | | | % of the whole-plant DM | | | | | |
| 6227 | 93 | 37.9 | 9.0 | 3.4 | 213.5 | 56.6 | 37.2 | 6.2 | 91 | 40.4 | 8.1 | 3.5 | 168.5 | 50.1 | 43.7 | 6.2 | |
| 7697 | 109 | 35.0 | 9.8 | 3.9 | 215.2 | 53.4 | 38.9 | 7.7 | 101 | 38.5 | 8.7 | 4.1 | 164.1 | 45.2 | 47.6 | 7.3 | |
| 7877 | 109 | 33.3 | 10.1 | 4.4 | 214.5 | 50.9 | 43.4 | 5.7 | 103 | 42.6 | 8.6 | 4.1 | 165.9 | 46.3 | 47.6 | 6.2 | |
| 7997 | 101 | 39.0 | 10.4 | 5.0 | 202.3 | 46.4 | 47.6 | 6.0 | 103 | 44.8 | 7.7 | 3.1 | 169.4 | 53.3 | 39.4 | 7.3 | |
| 8427 | 97 | 35.9 | 10.5 | 4.9 | 200.6 | 45.7 | 46.9 | 7.4 | 91 | 36.0 | 8.9 | 4.6 | 152.6 | 41.2 | 51.4 | 7.4 | |
| 9027 | 113 | 35.2 | 10.3 | 5.4 | 179.9 | 41.7 | 52.5 | 5.8 | 112 | 41.2 | 9.0 | 4.7 | 158.2 | 42.1 | 52.3 | 5.7 | |
| 636 | 98 | 31.9 | 9.6 | 4.6 | 186.3 | 46.4 | 47.4 | 6.2 | 97 | 42.0 | 8.5 | 4.0 | 165.7 | 46.7 | 46.8 | 6.4 | |
| 646 | 102 | 35.3 | 9.8 | 4.5 | 192.6 | 47.4 | 46.2 | 6.4 | 101 | 40.6 | 8.2 | 3.4 | 178.2 | 51.8 | 41.2 | 7.0 | |
| 656 | 99 | 36.1 | 10.4 | 4.9 | 204.8 | 47.1 | 46.9 | 6.0 | 97 | 36.4 | 8.5 | 4.2 | 157.8 | 44.6 | 49.1 | 6.3 | |
| 671 | 108 | 38.2 | 10.4 | 4.4 | 217.9 | 50.4 | 42.3 | 7.4 | 94 | 44.7 | 7.9 | 3.3 | 169.6 | 51.9 | 40.9 | 7.2 | |
| 711 | 107 | 34.8 | 9.6 | 3.8 | 214.4 | 53.4 | 39.2 | 7.3 | 101 | 40.7 | 8.4 | 4.0 | 160.0 | 46.0 | 46.6 | 7.4 | |
| 715 | 105 | 37.0 | 10.2 | 4.2 | 217.2 | 51.1 | 41.5 | 7.4 | 98 | 42.5 | 8.2 | 3.6 | 164.2 | 47.9 | 44.1 | 8.0 | |
| <u>Pioneer</u> | | | | | | | | | <u>ICI</u> | | | | | | | | |
| 3245 | 103 | 36.0 | 10.3 | 3.9 | 240.3 | 56.0 | 37.6 | 6.4 | 95 | 44.8 | 7.9 | 3.1 | 176.8 | 53.5 | 38.8 | 7.7 | |
| 3377 | 108 | 37.7 | 10.5 | 4.4 | 221.3 | 51.0 | 41.5 | 7.5 | 100 | 39.3 | 8.9 | 3.8 | 182.4 | 49.1 | 42.9 | 8.0 | |
| 3379 | 104 | 34.9 | 10.0 | 4.1 | 219.1 | 52.6 | 40.8 | 6.6 | 98 | 36.9 | 9.0 | 4.2 | 172.3 | 45.9 | 46.9 | 7.2 | |
| 3389 | 106 | 30.0 | 9.2 | 4.3 | 173.8 | 45.5 | 47.3 | 7.2 | 101 | 34.1 | 7.9 | 3.7 | 151.1 | 45.9 | 46.2 | 7.9 | |
| 3394 | 101 | 33.2 | 9.9 | 3.5 | 237.0 | 57.4 | 35.0 | 7.7 | 99 | 36.4 | 7.7 | 3.0 | 170.4 | 53.5 | 37.9 | 8.6 | |
| 3417 | 95 | 42.1 | 10.2 | 3.9 | 230.8 | 54.3 | 38.1 | 7.6 | 87 | 40.7 | 8.1 | 3.3 | 172.7 | 51.3 | 40.6 | 8.1 | |
| 8260 | 103 | 35.2 | 9.7 | 3.8 | 217.2 | 53.4 | 39.3 | 7.4 | 96 | 43.5 | 7.7 | 3.3 | 159.2 | 49.6 | 42.2 | 8.2 | |
| 8272 | 96 | 33.3 | 9.8 | 4.5 | 197.5 | 48.2 | 46.0 | 5.7 | 90 | 40.9 | 8.6 | 4.3 | 159.3 | 44.5 | 49.7 | 5.7 | |
| 8310 | 97 | 34.3 | 10.5 | 5.0 | 202.0 | 46.1 | 47.4 | 6.4 | 95 | 40.0 | 8.6 | 4.1 | 164.2 | 45.5 | 47.8 | 6.7 | |
| 8315 | 110 | 33.1 | 10.2 | 4.7 | 205.3 | 48.1 | 45.9 | 6.0 | 107 | 38.4 | 9.1 | 4.7 | 160.4 | 42.1 | 51.9 | 6.0 | |
| 8326 | 103 | 35.0 | 10.3 | 4.7 | 206.5 | 48.0 | 45.2 | 6.8 | 100 | 35.6 | 8.4 | 3.5 | 173.9 | 49.7 | 42.0 | 8.2 | |
| 8513 | 98 | 36.3 | 10.2 | 4.4 | 218.1 | 51.1 | 43.1 | 5.8 | 94 | 35.3 | 8.7 | 4.0 | 174.3 | 47.9 | 45.7 | 6.4 | |
| Mean | 103 | 35.4 | 10.0 | 4.2 | 209.5 | 50.1 | 43.2 | 6.7 | 98 | 39.9 | 8.4 | 3.7 | 166.3 | 47.7 | 45.1 | 7.1 | |

¹Adjusted to 14.5% moisture.