THE UNIVERSITY OF ARIZONA
Cooperative Extension

az1840 August 2020

Research Report
Corn Hybrid Evaluation at Maricopa, 2019

Michael J. Ottman and Pedro Andrade-Sanchez

Summary

Corn hybrids for silage were evaluated in small plots at the University of Maricopa Agricultural Center. The maturity range of the hybrids was approximately 115-120 days. The trial was irrigated up on March 7, 2019 and harvested on July 15, 2019. Various measurements were taken during the season including plant height, solar radiation interception, silking and tasseling dates, and initial and final stand. Differences in yield and other parameters were detected among hybrids, but differences in forage quality parameters were not statistically significant.

Introduction

Corn for silage is an important crop in Arizona due to the needs of the dairy industry for high quality feed. The University of Arizona has tested corn hybrids in the past, but there is no formalized program at this time for doing so. This trial was initiated at the request of the dairy industry and may be conducted annually depending on demand for this information and available funding.

Procedure

Corn hybrids were evaluated at Maricopa Agricultural Center in Field 2, Border 66. The seed was planted with a cone planter in plots 25 ft long in 4 rows spaced 30 inches apart. The seeds were spaced 6 inches apart for a seeding rate of 34,848 seeds/acre. The experimental design was a randomized complete block with 4 replications and 18 corn hybrids. Growing conditions are listed in Table 1.

The following data was collected: interception of photosynthetically active radiation, PAR (2 times), plant height (4 times), silking and tasseling dates, initial and final stand, forage yield adjusted to 72% moisture, forage moisture, and forage quality measured by NIRS (by Chandler Analytical Labs, Chandler, AZ). Interception of PAR was determined by measuring PAR at the ground level with a sunfleck ceptometer and expressed as a percentage of the incoming PAR. As a side note, PAR and plant height were measured to ground truth NDVI and 3D laser measurements taken with tractor-mounted sensors. Plant height was measured as the height of the plant with leaves in their natural position. Silking and tasseling dates were defined when 50% of the plants in the plots had silks or tassels emerged. Initial and final stand were counted as stalks in the middle two harvest rows. None of the hybrids tillered. Forage yields were determined from the middle two rows of the four row plots using a two row chopper where the forage was shot into a weigh wagon with load cells to determine weight. A sample from the chopper chute was taken for moisture content and forage quality analysis. Forage quality was determined from two replications.

Discussion

Yield and plant characteristics of the varieties are presented in Tables 2 and 3 and quality is presented in Table 4. Abbreviations used for the quality parameters in Table 4 is presented in Table 5.

The trial was managed as close as possible to commercial conditions. Due to cold weather at emergence time, there were some plots with poor stand establishment. If the initial stand was less than 24,000 plants per acre for the center two harvest rows, the plot was discarded from yield analysis. Three out of the 72 plots were discarded.

The sample for moisture and quality determination were captured from the chute of the chopper. An effort was made to obtain a representative sample by collecting forage three times per plot, but these samples may not have been entirely representative due to sorting of the forage based on weight as it emerges from the chute. It may have been better to sample whole plants.

The moisture content to calculate yield for each plot was based on the average for each hybrid for all four reps, which was more representative than individual plot measurements due to variation in samples obtained from the chute of the chopper.

We harvested past the date for optimum silage making. The moisture content at harvest averaged 57%, about 8 percentage points lower than optimum for silage making and perhaps 4-5 days late. However, we were not making silage and the hybrids could still be compared based on dry matter content.

Forage quality analysis was from only two reps due to cost of the analysis, which might explain why no statistically significant differences were found in any forage quality parameter since the power of the statistical analysis was low due to only two reps.

Several locations and years are needed to accurately assess corn hybrid performance. The results of this trial are most useful when combined with data from previous years. Nevertheless, the results show that there were some differences in the performance of corn hybrids in this particular trial.

Acknowledgments

The technical assistance of Said Attalah and John Heun is greatly appreciated.

Table 1. Cultural practices for a corn hybrid evaluation trial at the University of Arizona Maricopa Agricultural Center in 2019.

Cultural practice	Information
Previous crop	Fallow
Soil texture	Sandy loam
Preplant soil test values	NO3-N= 7.9 ppm NH4-N= 4.3 ppm PO4-P= 2 ppm
Germination irrigation date	3/7/19
Irrigation dates and amounts	Date Inches 3/07 3.57 3/15 2.34 3/21 2.23 4/01 3.12 4/12 3.13 4/26 3.98 5/03 2.60 5/10 3.25 5/17 2.99 5/24 2.13 5/31 2.56 6/04 4.39 6/07 2.19 6/12 1.83 6/17 1.46 6/21 1.99 6/26 4.27 7/02 1.99 7/05 1.83 TOTAL 51.85
Seasonal rainfall	0.64 inches
Nitrogen application dates	3/5: 50 lbs N/A as 16-20-0 4/12: 50 lbs N/A as 46-0-0 4/26: 50 lbs N/A as 46-0-0 5/10: 50 lbs N/A as 46-0-0 5/24: 50 lbs N/A as 46-0-0 TOTAL = 250 lbs N/A
Phosphorus application date and amount	3/5: 63 lbs P_2O_5/A as 0-45-0
Pesticides	4/8: Coragen insecticide at 20 fl oz/A
Harvest date	7/15/19

Table 2. Forage yield (at 72% moisture), forage moisture, stand, silk, and tassel dates for a corn hybrid evaluation trial at the University of Arizona Maricopa Agricultural Center in 2019.

Breeder	Hybrid	Forage yield	Moisture	Initial stand	Final stand	Silk	Tassel
		T/A	%	plants/A	plants/A	date	date
Axis	66N51	29.1	57.9	33,396	30,976	5/30	5/31
Axis	68A30	30.5	60.5	27,007	28,072	5/31	5/30
Axis	68K80	33.6	58.5	31,847	30,782	5/31	5/31
DeKalb	DKC66-29RIB	35.6	51.6	31,654	30,298	5/30	5/30
DeKalb	DKC67-44RIB	31.6	56.2	35,526	35,816	5/31	5/30
DeKalb	DKC69-16RIB	30.4	60.1	35,526	33,396	6/01	6/01
DeKalb	DKC70-64RIB	34.3	61.4	34,170	33,590	6/02	6/03
Integra	6709 VT3P	31.9	61.7	33,396	32,138	5/31	5/31
Integra	9678 VT2P	36.0	54.8	33,977	32,622	5/29	5/30
LG Seeds	ES 7531GT	32.7	44.8	32,428	32,525	5/30	5/30
LG Seeds	ES 7698-3110	32.0	58.5	34,597	33,969	6/01	6/02
LG Seeds	LG 5701VT2PRO	36.8	50.5	34,923	33,621	5/30	5/30
LG Seeds	LG 5717VT2PRO	32.2	58.2	36,010	33,783	6/01	5/31
LG Seeds	LG 67C01VT2PRO	27.4	66.1	34,407	33,105	5/31	5/31
Bud Wylie	14R34	27.8	57.5	31,363	30,202	5/31	5/30
Bud Wylie	15R48	32.2	54.0	32,084	31,298	6/02	6/01
Bud Wylie	15H58	28.0	63.0	35,113	35,260	6/04	6/04
Bud Wylie	15R47	30.5	57.8	33,202	32,718	6/05	6/04
Avg		31.8	57.4	33,368	32,454	5/31	5/31
LSD (5%)		1.2	3.0	1,112	1,247	0.98	0.74

Table 3. Photosynthetically active radiation (PAR) intercepted and plant height at various dates for a corn hybrid evaluation trial at the University of Arizona Maricopa Agricultural Center in 2019.

		PAR intercepted		Plant height			
Breeder	Hybrid	5/23	5/30	4/24	5/08	5/23	5/30
		----- % -----		---------- inches ----------			
Axis	66N51	78.9	75.1	18.1	28.2	71.1	84.7
Axis	68A30	70.2	69.2	17.5	31.5	75.9	92.6
Axis	68K80	77.2	79.8	17.1	29.9	70.5	90.4
DeKalb	DKC66-29RIB	77.8	74.9	19.6	29.1	75.0	89.9
DeKalb	DKC67-44RIB	70.1	75.4	16.3	31.3	72.8	92.1
DeKalb	DKC69-16RIB	78.0	74.9	16.5	30.3	72.0	85.9
DeKalb	DKC70-64RIB	85.3	87.4	18.1	31.9	76.9	94.5
Integra	6709 VT3P	81.1	80.9	16.9	28.0	77.6	84.3
Integra	9678 VT2P	79.0	73.6	18.3	30.5	73.3	91.4
LG Seeds	ES 7531GT	72.3	67.2	17.8	29.7	74.6	87.2
LG Seeds	ES 7698-3110	72.2	74.9	15.3	28.8	71.7	87.9
LG Seeds	LG 5701VT2PRO	77.5	74.4	17.0	33.4	62.5	84.8
LG Seeds	LG 5717VT2PRO	80.3	75.7	16.0	31.9	74.2	91.8
LG Seeds	LG 67C01VT2PRO	76.1	77.8	16.8	33.0	78.8	95.4
Bud Wylie	14R34	79.4	76.4	17.2	29.5	67.7	85.8
Bud Wylie	15R48	69.3	76.0	17.6	32.3	71.0	83.5
Bud Wylie	15H58	77.3	81.4	15.6	23.6	67.0	83.3
Bud Wylie	15R47	70.7	73.1	15.1	32.5	66.4	82.1
Avg		76.3	76.0	17.1	30.3	72.2	88.2
LSD (5%)		3.9	3.5	NS	NS	2.9	3.9

Table 4. Forage quality for a corn hybrid evaluation trial at the University of Arizona Maricopa Agricultural Center in 2019. No statistical difference were found among hybrids for any quality parameter. See Table 5 for quality parameter abbreviations.

Crop	Entry	DM	Moist	Ash	NDF	ADF	CP	RFV	TDN	RFQ	NEL	Fat
		%	%	%	%	%	%					%
Axis	66N51	93.2	6.83	6.29	41.0	24.7	7.52	159	63.8	153	0.655	2.70
Axis	68A30	93.5	6.55	4.76	40.2	22.4	7.71	169	65.5	163	0.675	2.73
Axis	68K80	93.5	6.46	5.86	44.1	25.5	7.99	146	63.2	141	0.650	2.56
DeKalb	DKC66-29RIB	93.6	6.44	6.07	38.1	23.1	8.08	174	65.0	167	0.670	2.84
DeKalb	DKC67-44RIB	93.2	6.81	6.60	43.3	26.7	7.39	151	62.3	145	0.635	2.56
DeKalb	DKC69-16RIB	93.6	6.44	6.74	43.5	26.1	8.17	152	62.8	146	0.645	2.77
DeKalb	DKC70-64RIB	93.9	6.15	5.57	41.4	24.7	7.64	156	63.8	150	0.655	2.54
Integra	6709 VT3P	93.7	6.32	5.78	45.3	26.6	7.77	140	62.4	135	0.640	2.62
Integra	9678 VT2P	93.3	6.73	4.62	35.6	19.8	8.02	192	67.5	186	0.700	3.01
LG Seeds	ES 7531GT	93.4	6.59	4.67	35.8	19.9	8.00	191	67.4	184	0.695	2.79
LG Seeds	ES 7698-3110	93.3	6.67	5.71	39.9	22.9	8.17	166	65.2	160	0.670	2.68
LG Seeds	LG 5701VT2PRO	93.2	6.83	4.66	35.9	20.9	7.52	189	66.7	183	0.685	2.81
LG Seeds	LG 5717VT2PRO	93.1	6.93	5.43	40.5	23.6	7.62	172	64.7	165	0.665	2.86
LG Seeds	LG 67C01VT2PRO	94.0	5.97	6.15	45.4	27.3	7.37	144	61.9	138	0.630	2.34
Bud Wylie	14R34	93.9	6.14	5.74	41.7	24.3	8.08	158	64.1	152	0.660	2.55
Bud Wylie	15R48	93.5	6.55	4.55	36.3	19.3	8.57	191	67.9	184	0.700	2.91
Bud Wylie	15H58	93.5	6.51	6.31	44.0	25.9	8.08	145	62.9	140	0.640	2.46
Bud Wylie	15R47	93.6	6.42	5.84	43.1	24.5	7.90	154	64.0	148	0.660	2.42
Avg		93.5	6.52	5.63	40.9	23.8	7.86	164	64.5	157	0.663	2.67

Table 4 (con'd). Forage quality for a corn hybrid evaluation trial at the University of Arizona Maricopa Agricultural Center in 2019. No statistical difference were found among hybrids for any quality parameter. See Table 5 for quality parameter abbreviations.

Crop	Entry	Ca	K	Mg	S	K	Na	Cl	Fe	Mn	Cu	Zn
		%	%	%	%	%	%	%	ppm	ppm	ppm	ppm
Axis	66N51	0.320	0.115	0.160	0.100	1.02	0.015	0.90	491	77.4	4.81	28.9
Axis	68A30	0.335	0.075	0.185	0.085	0.91	0.025	0.93	148	67.3	3.45	26.1
Axis	68K80	0.330	0.105	0.180	0.095	1.14	0.020	0.99	319	72.9	4.54	27.9
DeKalb	DKC66-29RIB	0.290	0.105	0.165	0.090	1.03	0.015	0.95	325	69.1	3.95	29.8
DeKalb	DKC67-44RIB	0.365	0.110	0.175	0.110	1.10	0.020	0.91	536	85.0	5.58	30.2
DeKalb	DKC69-16RIB	0.330	0.125	0.170	0.110	1.18	0.020	1.03	465	73.2	5.24	30.1
DeKalb	DKC70-64RIB	0.370	0.085	0.190	0.085	0.94	0.025	0.98	275	78.3	4.77	27.7
Integra	6709 VT3P	0.305	0.105	0.185	0.095	1.07	0.020	0.82	292	67.8	4.57	29.9
Integra	9678 VT2P	0.320	0.080	0.165	0.085	0.84	0.020	1.05	177	71.7	3.53	26.3
LG Seeds	ES 7531GT	0.260	0.095	0.160	0.070	0.91	0.020	0.97	114	57.2	2.21	28.8
LG Seeds	ES 7698-3110	0.325	0.110	0.190	0.095	1.11	0.020	1.03	263	67.9	3.61	29.9
LG Seeds	LG 5701VT2PRO	0.310	0.090	0.155	0.080	0.86	0.020	0.95	187	69.5	3.18	28.5
LG Seeds	LG 5717VT2PRO	0.275	0.100	0.160	0.085	1.01	0.015	0.91	235	66.8	3.28	31.1
LG Seeds	LG 67C01VT2PRO	0.365	0.085	0.195	0.090	1.04	0.025	0.93	363	75.4	4.85	28.2
Bud Wylie	14R34	0.265	0.120	0.170	0.080	1.12	0.015	1.02	190	64.0	2.77	32.2
Bud Wylie	15R48	0.265	0.105	0.170	0.075	1.05	0.020	1.03	35	61.7	1.88	28.4
Bud Wylie	15H58	0.390	0.110	0.210	0.110	1.16	0.020	1.06	380	76.6	5.12	28.4
Bud Wylie	15R47	0.285	0.105	0.155	0.090	1.06	0.015	0.90	310	77.2	4.07	27.2
Avg		0.317	0.101	0.174	0.091	1.03	0.019	0.96	284	71.1	3.97	28.9

Table 4 (con'd). Forage quality for a corn hybrid evaluation trial at the University of Arizona Maricopa Agricultural Center in 2019. No statistical difference were found among hybrids for any quality parameter. See Table 5 for quality parameter abbreviations.

Crop	Entry	SP	ADF-CP	NDF-CP	UIP	Lignin	Starch	NFC	Carbo	Sugar
		%	%	%	%	%	%	%	%	%
Axis	66N51	30.4	0.555	1.70	32.2	4.13	35.2	36.1	-0.035	1.29
Axis	68A30	34.0	0.550	1.64	31.9	3.46	33.1	33.9	0.835	1.56
Axis	68K80	32.1	0.575	1.74	32.5	4.13	30.1	36.7	0.335	1.63
DeKalb	DKC66-29RIB	31.0	0.550	1.68	30.9	4.59	34.4	35.5	0.270	1.41
DeKalb	DKC67-44RIB	32.5	0.600	1.66	32.1	4.22	32.8	35.8	0.000	1.45
DeKalb	DKC69-16RIB	31.8	0.660	1.76	32.8	4.56	31.5	33.2	0.425	1.49
DeKalb	DKC70-64RIB	32.3	0.560	1.62	31.0	4.34	29.3	37.1	0.610	1.54
Integra	6709 VT3P	34.3	0.570	1.71	32.5	4.45	29.5	33.1	0.280	1.63
Integra	9678 VT2P	29.0	0.535	1.62	31.3	3.54	36.9	35.2	0.890	1.42
LG Seeds	ES 7531GT	28.9	0.540	1.54	31.4	4.04	37.6	34.5	0.810	1.58
LG Seeds	ES 7698-3110	33.2	0.540	1.64	31.8	4.02	32.8	34.4	0.730	1.69
LG Seeds	LG 5701VT2PRO	28.9	0.570	1.65	31.5	3.21	38.9	37.5	0.590	1.19
LG Seeds	LG 5717VT2PRO	32.3	0.565	1.67	31.8	3.87	35.0	34.5	0.505	1.62
LG Seeds	LG 67C01VT2PRO	37.5	0.605	1.71	31.3	4.49	27.2	35.7	0.185	1.72
Bud Wylie	14R34	29.6	0.555	1.55	31.1	4.47	32.6	33.2	-0.195	1.47
Bud Wylie	15R48	30.0	0.535	1.53	30.1	3.38	37.4	37.0	0.515	1.46
Bud Wylie	15H58	34.4	0.550	1.70	32.0	4.47	28.2	33.4	0.870	1.71
Bud Wylie	15R47	32.3	0.525	1.55	30.9	3.96	31.7	31.8	0.175	1.49
Avg		31.9	0.563	1.65	31.6	4.07	33.0	34.9	0.433	1.52

Table 4 (con'd). Forage quality for a corn hybrid evaluation trial at the University of Arizona Maricopa Agricultural Center in 2019. No statistical difference were found among hybrids for any quality parameter. See Table 5 for quality parameter abbreviations.

Crop	Entry	IVTD-MD24	IVTD-MD30	IVTD-MD48	NDF-D24	NDF-D30	NDF-D48	Lys	Met	AA	LA
		%	%	%	%	%	%	%	%	%	%
Axis	66N51	68.2	72.4	77.8	39.1	50.6	59.2	0.195	0.115	0.455	0.550
Axis	68A30	68.0	72.2	77.7	39.5	51.0	59.5	0.210	0.125	0.335	0.820
Axis	68K80	67.3	71.6	77.1	41.2	52.7	61.2	0.200	0.115	0.400	0.915
DeKalb	DKC66-29RIB	68.3	72.6	78.0	40.4	51.9	60.4	0.200	0.120	0.220	0.560
DeKalb	DKC67-44RIB	66.7	71.0	76.5	37.7	49.2	57.7	0.200	0.120	0.345	0.480
DeKalb	DKC69-16RIB	66.4	70.7	76.4	39.3	50.7	59.2	0.200	0.115	0.295	0.360
DeKalb	DKC70-64RIB	67.9	72.1	77.2	40.7	52.2	60.8	0.205	0.120	0.095	0.825
Integra	6709 VT3P	67.3	71.6	77.0	40.3	51.8	60.3	0.195	0.115	0.390	0.825
Integra	9678 VT2P	68.9	73.1	78.7	39.0	50.5	59.1	0.210	0.125	0.200	0.635
LG Seeds	ES 7531GT	68.0	72.2	78.0	38.4	49.9	58.4	0.210	0.120	0.485	0.955
LG Seeds	ES 7698-3110	67.2	71.5	76.9	38.5	50.0	58.5	0.205	0.120	0.600	0.920
LG Seeds	LG 5701VT2PRO	68.5	72.7	78.3	37.9	49.3	57.8	0.205	0.125	0.255	0.690
LG Seeds	LG 5717VT2PRO	68.3	72.5	78.2	39.8	51.3	59.8	0.205	0.120	0.500	0.655
LG Seeds	LG 67C01VT2PRO	66.1	70.4	75.6	39.4	50.9	59.5	0.190	0.115	0.515	1.055
Bud Wylie	14R34	66.7	70.9	76.3	38.3	49.8	58.3	0.205	0.120	0.295	0.810
Bud Wylie	15R48	68.7	73.0	78.6	38.1	49.6	58.1	0.210	0.130	0.280	1.035
Bud Wylie	15H58	66.4	70.6	76.2	39.4	50.9	59.4	0.200	0.120	0.820	0.950
Bud Wylie	15R47	67.0	71.2	76.5	40.1	51.6	60.3	0.200	0.120	0.300	1.110
Avg		67.6	71.8	77.3	39.3	50.8	59.3	0.203	0.120	0.377	0.786

Table 5. Abbreviations used for forage quality parameters.

Abbreviation	Parameter	Abbreviation	Parameter
DM	DM	SP	Soluble Protein
Moist	Moisture	ADF-CP	ADF CP
Ash	Ash	NDF-CP	NDF CP
NDF	NDF	UIP	UIP
ADF	ADF	Lignin	Lignin
CP	Crude Protein	Starch	Starch
RFV	RFV	NFC	NFC
TDN	TDN	Carbo	Soluble Carbohydrate
RFQ	RFQ	Sugar	Simple Sugar
NEL	NEL	IVTDMD24	IVTDMD24
Fat	Fat	IVTDMD30	IVTDMD30
Ca	Calcium	IVTDMD48	IVTDMD48
K	Phosphorus	NDFD24	NDFD 24
Mg	Magnesium	NDFD30	NDFD 30
S	Sulfur	NDFD48	NDFD 48
K	Potassium	Lys	Lysine
Na	Sodium	Met	Methionine
Cl	Chloride	AA	Acetic Acid
Fe	Iron (ppm)	LA	Lactic Acid
Mn	Manganese (ppm)		
Cu	Copper (ppm)		
Zn	Zinc (ppm)		

THE UNIVERSITY OF ARIZONA
Cooperative Extension

The University of Arizona
College of Agriculture and Life Sciences
Tucson, Arizona 85721

AUTHORS

Michael J. Ottman
Agronomy Specialist

Pedro Andrade-Sanchez
Associate Specialist & Professor

CONTACT

Michael J. Ottman
mottman@arizona.edu

This information has been reviewed by University faculty.
extension.arizona.edu/pubs/az1840-2020.pdf

Other titles from Arizona Cooperative Extension can be found at:
extension.arizona.edu/pubs