

Wenwei Xu<sup>1\*</sup>, Thomas Marek<sup>2</sup>, Jourdan M. Bell<sup>3</sup>, and Dennis Pietsch<sup>4</sup>

<sup>1</sup>Professor and Corn Breeder, Texas A&M AgriLife Research, Lubbock;

<sup>2</sup>Irrigation Engineer, Texas A&M AgriLife Research, Amarillo;

<sup>3</sup>Agronomist, Texas A&M AgriLife Research & Extension, Amarillo;

<sup>4</sup>Director of Crop Testing Program, Texas A&M AgriLife Research, College Station.

\*Corresponding author: Wenwei Xu, Tel. 806-723-8436, E-mail: [we-xu@tamu.edu](mailto:we-xu@tamu.edu).

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### **Introduction**

Silage corn is a significant crop on the Texas High Plains as it supplies the vast and dominant dairy and beef industries in this region. Hybrid selection is an important decision for silage corn producers. A good silage hybrid should have a strong adaptation to local environment, appropriate maturity, high tonnage and digestibility, and stable production performance across varying environments. This combination of qualities make the complex and challenging task of maximizing feedstuff potential for cattle more efficient and leads to higher producing cattle operations in the Texas High Plains. All silage corn in this region is produced with irrigation water derived from the Ogallala Aquifer. More tonnage per acre and better forage quality is a good indicator of genetic improvement of crop water use efficiency and better genetics adapted to this environment.

We have been conducting the annual state silage corn performance test at Etter and Halfway since 2007, but the Etter location has now been relocated to Bushland due to the loss of leased land. The interest among producers and the seed industry regarding this program's data remains strong. Almost all seed companies that offer corn hybrids in this region have participated in the tests. For a fee, commercial seed companies have an opportunity to enter hybrids at either one or both test sites. To our knowledge, this is the only public comparative field testing program available in the Texas High Plains. This test provides producers with timely and unbiased performance information regarding yield, quality, and agronomic traits. In 2015, we conducted the state silage performance tests in Halfway and Bushland. Both locations used the similar design. The Bushland test was planted on nearby rented land on May 4. This test was abandoned because of the poor stand due to uneven manure application and the subsequent damages from a strong hail/wind storm occurring on June 14. Thus the 2015 report only shows the results from the Halfway location.

### **Materials and Methods**

The 40 tested hybrids represented 35 hybrids from seven seed companies and five Texas A&M AgriLife Research hybrids - one experimental and four fills (Table 1). Nine of the 35

commercial entries were not entered by the respective seed companies for evaluation at Halfway but they were included in this location because of available space. Mycogen F2F817 was the only brown midrib (BMR) hybrid in the trial. Eight entries (three Blue River hybrids, four fills, and AgriLife B5C2NC) were conventional and all other had transgenic trait(s).

The test was conducted under a center pivot irrigated field at the Texas A&M AgriLife Research station at Halfway. The test used a randomized complete block design with three replications. Each plot consisted of four rows, 18 feet long with 2-foot alleys. Row-spacing was 40-inches. The two center rows of each plot were harvested for yield.

The test was planted on April 25 and harvested on August 27, 2015. The previous crop was cotton. Pre-plant liquid fertilizers were applied on March 18 at a rate of 90 lbs. N/a and on March 23 at a rate of 80 lbs. P/a. Fertilizers were incorporated into the soil after P application by using an offset disc. An additional 180 lbs. of N/a was applied by side dressing on June 11. Pre-emergent herbicides were Atrazine 4L at 1 qt/a on March 26 followed by a tank mix of Banvel at 1 pt/a and Roundup at 1 qt/a on April 10, and one more tank mix of Atrazine 4L at 1 pt/a, Warrant at 3 pt/a, and Roundup at 32 oz/a on May 1 (just before the plants emerged). Post-emergent herbicide tank mix of Atrazine 4L at 1 pt/a and Warrant at 3 pt/a was applied on June 11. Lorsban 15G was applied at 6.5 lbs/a through the planter units to control corn rootworm. At three-leaf stage, seedlings were hand-thinned to achieve a uniform target population of 30,618 plants/a. On June 11, the insecticide Prevathon was applied with an airplane at the rate of 20 oz/a to control fall armyworm and corn borers. A total of 3.25 inches of water was applied between April 6 and April 17, prior to planting. In-season irrigation totaled 7.0 inches of water that was applied at regular intervals (0 from April 25 to May 31, 0.50 on June 27, 3.5 from July 1 to 31, and 3.0 on August 1 to 21). Rainfall from planting to harvesting totaled 22.38 inches (April 1.40 inches, May 10.44 inches, June 4.11 inches, July 4.97 inches, August 1.46 inches).

Data was recorded for stand, pollen shedding dates, plant and ear height, and root and stalk lodging. Plant stand is reported as a percentage of the target plant population. There were few plants with root or stalk lodging in the field at harvest. The two-center rows of each plot were harvested with a John Deere 5200 small-plot silage chopper equipped with a Hagie silage plot weighing system. Plants were cut 5 inches above the ground. Approximately 2 lbs of a chopped sub-sample were collected from each plot, weighed for the fresh weight, dried at 50°C, weighed for dry weight, and then analyzed for silage quality using a near infrared reflectance (NIR) method by the Dairy One Forage Lab (Ithaca, NY). Moisture content was calculated by using fresh and dry weight of the sub-samples. Yields were measured on a plot basis, converted to short tons per acre, and adjusted to a 65% moisture level.

## **Results**

This test was designed to focus on the hybrids with a relative maturity of 112-117 days. There was a significant difference in days from planting to pollen shedding, ranging from 73 days (Armor 1621) to 80 days (Mycogen T14749) with an average of 76 days (which was July 11). The average yield of all 40 hybrids was 28.4 tons per acre (Table 1), ranging from 24.6

tons/a to 32.6 tons/a. Only one hybrid, B5C2NC (32.6 tons/a), yielded significantly higher than the test means (28.4 tons/a). B5C2NC is an experimental hybrid developed by the Texas A&M AgriLife Corn Breeding Program in Lubbock. Any company interested in licensing this single cross hybrid can contact Dr. Wenwei Xu. The top 10 yielding hybrids were B5C2NC, G7663, G7601, D59HR50, T14749, MCT6733, TMF2H747, X14020RR, and MCEXP600M X.

This was a uniform test as evidenced by the relatively low CV values for agronomic traits and yield (Table 1). In general, many of the tested hybrids appeared to be very similar in morphology, maturity and yield. The early flowering hybrids tended to have lower ear placement ( $r^2 = 0.37$ ), but the correlations between days to flowering with plant height ( $r^2 = 0.23$ ) and with silage yield ( $r^2 = 0.19$ ) were not significant. The early flowering plants hybrids had much drier plants as indicated by the significant correlation between moisture and DTP ( $r^2 = 0.43$ ), the highest correlation among the traits measured in this study.

Silage quality was analyzed with NIR. There was a significant difference among hybrids in crude protein, water soluble starch, and percentage of NDF that is digestible by in vitro incubation for 24 hours, lysine, and methionine. However, the other forage quality characters such as ADF, NDF, lignin, and TDN did not show significant variation among hybrids (Table 2). Users should consider different quality traits, but TDN and IVTN24 are commonly used to represent forage digestibility. The average for TDN and IVTN24 was 76.3% and 80.1%, respectively. A high value of TDN and IVTD24 indicates a higher digestibility. Digestibility of corn silage is also highly correlated to the amount of grain produced and also the chemical composition of the stalk.

These results are available at the Texas AgriLife Variety Testing web page (<http://varietytesting.tamu.edu>) and the Texas A&M AgriLife Research Lubbock Center websites (<http://lubbock.tamu.edu>). These results will help producers, Extension specialists and consultants in their selection of commercial hybrids best suited for the Texas High Plains.

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### References

Wenwei Xu, Bruce Spinhirne, Thomas Marek, Brent Bean, and Dennis Pietsch. 2007. Silage corn hybrids for the Texas High Plains. TAES-Lubbock Center Technical Publication No.07-2. pp.2.

Table 1. Means of stand, days to pollen shed (DTP), plant height (PHT), ear height (EHT), stalk lodging (STL), root lodging (RTL), moisture at harvest, and forage yield adjusted to 65% moisture of the State Silage Corn Performance Test at Halfway, Texas in 2015.

ENO	Hybrids	Company	RM	BMR	Trait	Stand %	DTP days	PHT cm	EHT cm	STL %	RTL %	Moisture %	Yield tons/a	% of Test mean	Yield rank
1	Armor 1414	Armor Seed	114	No	PRO2DG	101.1	77.0	281.0	116.0	0.0	0.0	57.6	28.6	100.9	22
2	Armor 1621	Armor Seed	116	No	PRO2	100.4	73.0	243.0	103.0	0.0	0.0	57.9	25.8	91.0	36
3	Armor 1880	Armor Seed	118	No	PRO2	98.8	77.0	269.0	95.0	0.0	0.0	60.1	27.3	96.1	30
4	73L90	Blue River	116	No	None	106.2	77.0	253.0	97.0	0.0	0.0	60.9	29.3	103.3	12
5	70A47	Blue River	113	No	None	99.2	75.0	275.0	114.0	0.0	0.0	59.0	26.5	93.2	33
6	68N15	Blue River	113	No	None	102.8	74.0	298.0	111.0	0.0	0.0	62.4	25.0	88.2	38
7	D55QC73	CPS Dyna-Gro Seed	115	No	VIP 3110	101.2	76.0	293.0	113.0	0.0	0.0	60.9	27.5	96.9	28
8	D55VP77	CPS Dyna-Gro Seed	115	No	VT3Pro	98.8	75.0	262.0	100.0	0.0	0.0	59.2	27.7	97.5	26
9	D53VC47	CPS Dyna-Gro Seed	113	No	VT2Pro	94.7	75.0	264.0	101.0	0.0	0.0	57.3	26.8	94.4	32
10	D58QC72	CPS Dyna-Gro Seed	118	No	VIP 3110	97.2	75.0	276.0	104.0	0.0	0.0	61.6	28.9	101.7	14
11	D59HR50	CPS Dyna-Gro Seed	119	No	RR2HX	105.1	76.0	298.0	117.0	0.0	0.0	61.3	31.0	109.1	4
12	CX15116	CPS Dyna-Gro Seed	116	No	VT2Pro	99.2	74.0	263.0	89.0	0.0	0.0	58.2	28.3	99.5	25
13	G7601	Golden Acres	117	No	VT3P	104.5	74.0	268.0	119.0	0.0	0.0	59.7	31.2	109.8	3
14	G7663	Golden Acres	117	No	VT3P	108.7	75.0	290.0	112.0	0.0	0.0	60.8	31.6	111.2	2
15	28V81	Golden Acres	118	No	VTP3	105.7	74.0	283.0	117.0	0.0	0.0	60.5	28.4	99.8	24
16	X6525	Golden Acres	118	No	VIP3110	99.6	75.0	270.0	93.0	0.0	0.0	61.2	28.9	101.6	17
17	TMF2L825	Mycogen	117	No	SSX	102.0	78.0	294.0	129.0	0.0	16.0	60.9	26.1	92.1	34
18	T14785	Mycogen	117	No	PowerCore	104.1	79.0	282.0	116.0	0.0	0.0	59.0	30.2	106.2	8
19	T14749	Mycogen	114	No	SSX	102.4	80.0	281.0	119.0	0.0	0.0	62.1	30.7	108.1	5
20	TMF2H747	Mycogen	113	No	SSX	100.0	77.0	276.0	121.0	0.0	0.0	63.2	30.5	107.2	7
21	F2F817	Mycogen	116	Yes	SSX	102.4	79.0	272.0	117.0	0.0	0.0	66.0	25.0	88.1	39
22	MCT 6363	MasterChoice	113	NO	GT,CB,LL,RW	100.4	75.0	266.0	104.0	0.0	0.0	60.4	24.6	86.5	40
23	MCT 6733	MasterChoice	117	NO	GT,CB,LL,RW	102.8	76.0	279.0	103.0	0.0	0.0	58.7	30.5	107.4	6
24	MC EXP600M X	MasterChoice	115	NO	GT,CB,LL,RW	101.2	75.0	293.0	115.0	0.0	0.0	60.0	28.7	101.2	21
25	MC EXP633E X	MasterChoice	115	NO	GT	102.0	76.0	298.0	122.0	0.0	0.0	60.7	29.6	104.1	10

Table 1. Means of stand, days to pollen shed (DTP), plant height (PHT), ear height (EHT), stalk lodging (STL), root lodging (RTL), moisture at harvest, and forage yield adjusted to 65% moisture of the State Silage Corn Performance Test at Halfway, Texas in 2015 (continued).

ENO	Hybrids	Company	RM	BMR	Trait	Stand %	DTP days	PHT cm	EHT cm	STL %	RTL %	Moisture %	Yield tons/a	% of Test mean	Yield rank
26	BH 8900VIP3111	BH Genetics	117	NO	Agrisure Viptera 3111	98.4	76.0	296.0	111.0	0.0	0.0	64.3	25.5	89.9	37
27	BH 8830VTTP	BH Genetics	116	NO	Genuity VT3P	102.8	78.0	250.0	91.0	0.0	0.0	59.5	26.1	91.9	35
28	BH 8735VTTP	BH Genetics	117	NO	Genuity VT3P	105.3	77.0	278.0	117.0	0.0	0.0	60.9	27.1	95.3	31
29	BH 8732VTTP	BH Genetics	118	NO	Genuity VT3P	106.1	74.0	284.0	117.0	0.0	0.0	59.5	28.8	101.5	19
30	BH 8688DG2P	BH Genetics	114	NO	Genuity DroughtGuard VT2P	102.8	74.0	251.0	107.0	0.0	0.0	58.4	28.7	101.2	20
31	BH 7810VT2P	BH Genetics	108	NO	Genuity VT2P	101.2	74.0	246.0	90.0	0.0	0.0	56.2	28.9	101.7	15
32	XP7646VT2PRIB	BH Genetics	107	NO	Genuity VT2P	98.0	73.0	258.0	112.0	0.0	0.0	58.6	27.4	96.6	29
33	X14020RR	BH Genetics	118	NO	RR2	103.3	74.0	275.0	108.0	0.0	0.0	58.0	30.1	106.1	9
34	X13007VIP3110	BH Genetics	118	NO	Agrisure Viptera 3110	102.4	76.0	272.0	100.0	0.0	0.0	60.3	28.8	101.6	18
35	X14028GT3	BH Genetics	117	NO	Agrisure GT3000	97.6	76.0	283.0	113.0	0.0	0.0	62.4	27.5	96.9	27
36	Fill 1	Fill 1				95.1	76.0	281.0	114.0	0.0	0.0	62.8	28.4	99.9	23
37	Fill 2	Fill 2				96.3	78.0	269.0	119.0	0.0	0.0	60.3	29.5	103.8	11
38	Fill 3	Fill 3				102.8	80.0	267.0	118.0	0.0	0.8	63.6	29.1	102.5	13
39	Fill 4	Fill 4				98.6	77.0	291.0	105.0	0.0	0.0	61.3	28.9	101.7	16
40	B5C2NC	Texas A&M AgriLife	117	No	None	93.2	78.0	295.0	149.0	0.0	0.0	56.8	32.6	114.7	1
	Test mean					101.1	76.0	275.6	110.5	0.0	0.4	60.3	28.4	100.0	
	CV%					4.7	2.4	7.5	9.2	0.0	264.2	3.8	7.3		
	LSD 0.05					7.8	3.0	33.7	16.6	0.0	1.8	3.7	3.4		

Table 2. Forage quality of the State Silage Corn Performance Test at Halfway, Texas in 2015.

ENO	Hybrids	CP	ADF	NDF	Lignin	NFC	Starch	WSC	TDN	IVTD24	NDFD24	MILK1	MILK2	Lys	Meth
1	Armor 1414	8.3	20.1	35.5	3.1	49.8	42.5	4.7	77.0	80.3	45.7	3158.0	3501.7	0.21	0.13
2	Armor 1621	8.4	18.7	33.2	3.0	51.8	45.0	4.8	79.0	82.0	46.0	3237.0	3602.0	0.21	0.13
3	Armor 1880	8.3	23.4	41.1	3.0	44.0	36.2	4.5	75.0	78.0	47.0	3137.0	3430.3	0.21	0.13
4	73L90	8.4	23.4	40.0	3.5	44.4	35.8	6.2	76.0	79.7	48.7	3236.0	3526.7	0.21	0.13
5	70A47	8.4	24.1	41.4	3.6	43.2	35.7	5.5	74.0	79.3	49.7	3156.0	3446.3	0.21	0.13
6	68N15	8.2	22.0	38.4	3.5	46.4	39.3	5.8	77.0	80.0	48.0	3218.0	3536.3	0.21	0.13
7	D55QC73	8.3	22.7	38.9	3.5	46.1	38.3	5.1	76.0	79.3	47.3	3190.0	3499.7	0.21	0.13
8	D55VP77	8.7	21.8	38.3	3.2	46.4	40.0	4.5	77.0	80.0	48.3	3187.0	3511.3	0.22	0.13
9	D53VC47	7.9	21.1	37.5	2.9	48.0	40.8	5.4	78.0	81.0	50.0	3227.0	3557.7	0.20	0.12
10	D58QC72	8.5	23.2	39.7	3.4	44.9	35.9	6.1	76.0	79.3	47.7	3209.0	3500.3	0.21	0.13
11	D59HR50	8.4	21.3	37.2	3.5	47.8	40.0	5.5	77.0	81.0	48.0	3204.0	3529.0	0.21	0.13
12	CX15116	8.8	21.9	37.9	3.5	46.7	39.4	4.7	76.0	80.0	48.0	3190.0	3509.0	0.22	0.14
13	G7601	8.3	20.1	35.7	3.4	49.4	42.3	4.7	77.0	81.0	45.7	3205.0	3548.7	0.21	0.13
14	G7663	8.3	24.5	41.7	3.6	43.6	34.8	6.3	74.0	79.3	51.0	3152.0	3434.3	0.21	0.13
15	28V81	8.1	22.4	39.0	3.2	46.4	39.8	4.9	76.0	79.7	47.3	3129.0	3452.0	0.20	0.12
16	X6525	8.3	25.1	43.7	3.5	41.8	34.0	4.7	74.0	77.3	48.3	3103.0	3379.0	0.21	0.13
17	TMF2L825	8.3	23.5	40.8	3.4	43.6	36.2	5.4	75.0	78.3	46.7	3130.0	3423.3	0.21	0.13
18	T14785	8.1	22.9	39.4	3.5	45.5	38.4	5.6	76.0	80.3	49.3	3166.0	3477.0	0.20	0.12
19	T14749	8.4	23.1	39.6	3.6	44.9	37.3	6.2	75.0	80.7	51.0	3150.0	3452.7	0.21	0.13
20	TMF2H747	8.2	21.7	37.3	3.4	47.9	40.3	4.9	77.0	80.3	47.3	3186.0	3513.3	0.21	0.13
21	F2F817	9.4	22.7	39.7	3.2	44.1	36.5	6.0	76.0	82.0	54.7	3173.0	3468.3	0.24	0.15
22	MCT 6363	8.2	21.2	36.7	3.2	48.6	40.3	6.4	78.0	81.7	50.3	3254.0	3580.3	0.20	0.12
23	MCT 6733	8.6	19.3	33.9	3.1	51.0	42.6	5.8	78.0	83.0	49.7	3267.0	3612.0	0.22	0.13
24	MC EXP600M X	8.6	20.0	35.1	3.2	49.8	42.1	5.5	78.0	82.3	49.7	3237.0	3578.0	0.22	0.13
25	MC EXP633E X	8.0	23.0	40.1	3.3	45.1	38.8	4.5	76.0	79.7	49.3	3138.0	3452.7	0.20	0.12

Table 2. Forage quality of the State Silage Corn Performance Test at Halfway, Texas in 2015 (continued).

ENO	Hybrids	CP	ADF	NDF	Lignin	NFC	Starch	WSC	TDN	IVTD24	NDFD24	MILK1	MILK2	Lys	Meth
26	BH 8900VIP3111	8.7	21.8	37.8	3.2	47.0	38.2	6.8	77.0	81.7	51.7	3222.0	3531.3	0.22	0.13
27	BH 8830VTTP	8.8	22.5	39.8	3.3	44.6	36.9	5.0	76.0	79.7	49.3	3215.0	3513.7	0.22	0.13
28	BH 8735VTTP	8.7	22.2	39.6	3.1	44.8	37.1	4.9	75.0	79.7	48.0	3166.0	3466.0	0.22	0.13
29	BH 8732VTTP	8.1	22.5	39.8	3.3	45.6	38.3	4.8	76.0	79.7	48.3	3189.0	3499.3	0.20	0.12
30	BH 8688DG2P	8.5	23.3	40.4	3.4	44.5	36.8	4.5	76.0	79.0	47.3	3172.0	3470.7	0.21	0.13
31	BH 7810VT2P	7.9	20.2	35.6	2.9	49.4	42.2	4.5	79.0	81.7	48.3	3272.0	3614.0	0.20	0.12
32	XP7646VT2PRIB	8.4	20.7	36.1	3.4	48.6	41.8	4.9	77.0	81.3	48.0	3213.0	3552.0	0.21	0.13
33	X14020RR	8.3	21.8	37.7	3.2	47.6	40.2	4.3	76.0	78.7	43.7	3113.0	3439.0	0.21	0.13
34	X13007VIP3110	8.9	17.5	31.5	2.9	52.9	45.9	4.9	79.0	83.0	46.3	3233.0	3604.7	0.22	0.14
35	X14028GT3	8.6	22.6	39.3	3.4	45.4	38.0	5.2	76.0	79.7	49.3	3161.0	3469.3	0.21	0.13
36	Fill 1	9.0	23.0	39.4	3.5	44.9	36.3	5.6	76.0	79.7	47.7	3187.0	3481.7	0.22	0.14
37	Fill 2	9.0	20.7	36.3	3.4	47.7	41.1	4.9	77.0	81.7	49.3	3232.0	3566.0	0.22	0.14
38	Fill 3	8.9	24.5	42.9	3.5	40.8	33.3	4.9	75.0	79.0	51.0	3178.0	3447.3	0.22	0.13
39	Fill 4	8.5	23.3	40.1	3.3	44.2	35.8	5.9	76.0	79.0	47.3	3162.0	3452.7	0.21	0.13
40	B5C2NC	8.4	26.3	45.7	3.7	39.4	31.3	4.9	73.0	76.3	48.7	3088.0	3341.7	0.21	0.13
	Test mean	8.5	22.2	38.6	3.3	46.2	38.6	5.2	76.3	80.1	48.5	3186.1	3499.3	0.21	0.13
	CV%	3.3	13.4	12.0	9.3	10.4	13.3	10.3	3.0	2.8	3.6	2.4	3.2	3.40	3.96
	LSD 0.05	0.5	NS	NS	NS	NS	NS	0.9	NS	NS	2.8	NS	NS	0.01	0.01

<sup>§</sup>: Forage nutritional values based on NIR analysis. CP = Crude protein, the total protein in the sample including true protein and non-protein nitrogen. ADF = Acid detergent fiber, a measure of cellulose and lignin. ADF is negatively correlated with overall digestibility. NDF = Neutral detergent fiber, a measure of hemicellulose, cellulose and lignin representing the fibrous bulk of the forage. NDF is negatively correlated with intake. Lignin = undigestible plant component and has a negative impact on cellulose digestibility. NFC = Percentage of non-fibrous carbohydrates; estimates the amount of rapidly digestible carbohydrates in a forage. Starch is primarily in the grain and later maturing hybrids have lower starch since all hybrids were harvested at the same time. IVTD24 = *In vitro* true digestibility (IVTD) after 24 hours of incubation in rumen fluid. It measures digestibility and can be used to estimate energy. A higher value of IVTD 24 hr. presents a better forage quality. NDFD24 = Percentage of NDF that is digestible by *in vitro* incubation. TDN = Total digestible nutrients. It represents the sum of the digestible protein, digestible nitrogen-free extract, digestible crude fiber and 2.25x the digestible fat. MILK 1 = Estimated lbs. of milk produced per ton of dry matter. MILK 2 = Estimated lbs. of milk produced per ton of processed dry matter. Lys = lysine. Meth = methionine.