UtahStateUniversity COOPERATIVE EXTENSION

July 2007 **AG/Crop Trials/2007-01**

Corn Silage Performance, 2006; Cache County, Utah

T.C. Griggs[1] and ***C.E. Israelsen***[2]
[1]Dept. of Plants, Soils, & Climate and [2]USU Extension

This report summarizes on-farm performance of irrigated silage corn hybrids at Benson (Cache County) in 2006. The site is at 4439 ft elevation and has a long-term average of 2800 corn growing degree days (50/86° F) per year. Hybrids were seeded with a six-row planter on May 10 at approximately 35,000 seeds/ac into Kidman fine sandy loam. Plots were six rows wide at 30-in row spacing by 1070 ft long in three randomized complete blocks. Nutrient and pesticide applications are indicated in Table 1. The previous crop was one year of silage corn. Soil test levels (0-12 in) at planting were pH 7.5, 1.9% organic matter, 39 ppm P, 235 ppm K, 37 ppm NO_3-N, and 2 ppm SO_4-S. Levels of Cu, Fe, Mn, and Zn were 1, 9, 8, and 3 ppm, respectively. All nutrient levels were within recommended ranges with the exception of low S. Plots were furrow-irrigated on June 17, July 8 and 25, and August 10. Climatic conditions were conducive to silage corn production.

Hybrids spanned relative maturity (RM) ratings of 88-114 days. All hybrids were Roundup Ready® (tolerant to glyphosate herbicide), and approximately half possessed Bt traits for resistance to corn borer and/or rootworm (Table 1). Plots were harvested with a silage chopper without a kernel processor on September 12 to target whole-plant moisture concentrations of 65-70%. Weights were obtained with trucks and calibrated axle scales. Samples were dried at 55º C (131º F) for forage quality analyses and 105º C (221º F) for dry matter (DM) determination. Plot weights were expressed as tons/ac of DM and 70% moisture silage. Forage crude protein (CP), neutral detergent fiber (NDF), in vitro true DM digestibility (IVTDMD), neutral detergent fiber digestibility (NDFD), and starch levels were determined via near-infrared reflectance spectroscopy. Energy and potential milk production

levels were calculated from forage quality constituents with the University of Wisconsin MILK2006 spreadsheet (www.wisc.edu/dysci/uwex/nutritn/nutritn.htm).

Hybrids ranked in decreasing order of forage production and quality (Tables 1-2) may be compared in terms of the least significant difference (LSD). This is the minimum difference required between hybrids in a column for detection of true variety effects at a given level of probability. Values of LSD are shown for 5 and 30% probabilities that observed differences are merely due to chance, rather than to hybrid effects. For example, in Table 1, DM yields of the top six hybrids are not different at the 5% probability level, because they vary by less than the LSD of 0.72 ton/ac. Yields of the first- and seventh-ranked hybrids differ at the 5% level because they vary by at least the LSD. At 30% probability that yield variations are due to chance, smaller differences become significant. The coefficient of variation (CV) describes variation among replications of the same hybrid; values below 10% suggest good precision for detecting differences among hybrids.

Forage production was as high as has been recorded in USU Extension trials in Cache Valley since 2001 and differed by 6.6 tons/ac (at 70% moisture) among hybrids (Table 1). Differences were not strongly associated with varying population densities and RM ratings. The lowest harvest moisture concentrations were associated with shorter RM ratings and a few hybrids were at 70% moisture concentration, which can lead to energy loss via seepage of soluble DM and impaired silage fermentation. Excessive moisture at harvest can be avoided by selecting hybrids that perform well at shorter RM ratings and permit adequate grain filling and field drying prior to harvest.

Concentrations of forage quality constituents (Table 2) differed significantly among hybrids, except for fiber digestibility (NDFD). As has been observed regularly in these trials, hybrid rankings were dramatically different for energy value (TDN, NEL, and milk/ton) than for forage production. Hybrids that were highest-ranked for TDN had some combination of high starch and low NDF. These characteristics, in conjunction with high fiber digestibility, contribute to silage energy density. Hybrid rankings for potential milk production/ac were largely independent from those for quality or forage production, reflecting the interactions among these factors that determine energy/ac. Differences in rankings for forage production and nutritional value underscore the need to clearly define nutritional requirements that hybrids should fulfill for different classes of livestock.

We would like to acknowledge the generous contributions of our cooperating grower, John Allen, who provided land and services for this project.

Other Utah State University Extension crop performance trial results are available at http://extension.usu.edu/htm/publications (Agriculture - Crop Performance Trials).

Table 1. 2006 silage corn production at Benson, UT (John Allen, cooperator).

Planted May 10, harvested Sept. 12. Elevation 4439 ft, 2800 corn GDD[a], Kidman fine sandy loam.
Applications: winter manure, pre-plant urea at 200 lb N/ac; Roundup® herbicide (once), no insecticides.
Previous crop: silage corn, 1 year. Furrow-irrigated.

Brand	Hybrid	Specialty traits[b]	Relative maturity	Population density	Harvest moisture	Silage yield[c]	
						DM (105° C)	70% moist.
			days	plants/ac	% fresh wt.	ton/ac	
PGS Hybrids	K8112LFRR	RR	112	31341	69.0	10.21	34.04
PGS Hybrids	K8099LFRR	RR	99	32674	58.8	9.97	33.24
PGS Hybrids	K8105LFRR	RR	105	30896	69.7	9.79	32.62
DEKALB	DKC61-68	RR2/YGRW	111	32008	67.7	9.78	32.60
Grand Valley	23R50	RR	110	28673	70.2	9.73	32.42
Grand Valley	22B90	RR/YGCB	106	28896	67.8	9.62	32.07
DEKALB	DKC63-39	RR2/YGPL	113	29896	70.0	9.08	30.26
Grand Valley	22B40	RR/YGCB	103	30785	65.4	8.95	29.82
DEKALB	DKC64-23	RR2/YGRW	114	33452	70.4	8.94	29.81
PGS Hybrids	S 3687 RR	RR	88	30340	64.5	8.23	27.45
Mean			**106**	**30896**	**67.4**	**9.43**	**31.43**
Significance of F test (P)				0.07	<0.01	<0.01	<0.01
LSD (0.05)				3038	2.8	0.72	2.38
LSD (0.30)				1543	1.4	0.36	1.21
CV (%)				5.7	2.4	4.4	4.4

[a]Corn Growing Degree Days (base 50°/max. 86° F) per year.
[b]Roundup Ready® hybrids tolerate glyphosate herbicide; YieldGard® Corn Borer (YGCB), Rootworm (YGRW), and Plus (YGPL) hybrids contain an insecticidal protein from the bacterium *Bacillus thuringiensis* (Bt) for protection against corn borer, corn rootworm, or both, respectively.
[c]Dry matter or corrected to standard moisture.

Table 2. 2006 silage corn forage quality at Benson, UT, ranked by TDN. No kernel processor on chopper.

Brand	Hybrid	CP[a]	NDF[b]	NDFD[c] 48 hr	Starch	MILK2006 outputs[d] TDN, 1x mtnce.	NEL, 3x mtnce.	Milk per Ton DM	Milk per ac
		% DM		% NDF	% DM		Mcal/lb	lb	
DEKALB	DKC61-68	8.5	40.6	61.4	29.5	71.2	0.70	3291	32204
Grand Valley	22B40	8.2	39.9	62.7	29.6	70.9	0.69	3252	29093
Grand Valley	22B90	8.4	40.2	61.1	28.9	70.8	0.69	3256	31328
DEKALB	DKC64-23	9.0	40.2	61.0	27.3	70.6	0.69	3245	29010
Grand Valley	23R50	8.0	44.1	61.9	27.3	70.2	0.69	3206	31223
DEKALB	DKC63-39	9.1	41.2	61.4	26.0	69.8	0.68	3175	28848
PGS Hybrids	K8105LFRR	8.1	45.3	60.8	23.7	68.9	0.67	3105	30405
PGS Hybrids	S 3687 RR	8.4	45.3	62.1	22.4	67.1	0.64	2945	24230
PGS Hybrids	K8112LFRR	7.5	51.2	60.9	19.4	66.3	0.64	2896	29544
PGS Hybrids	K8099LFRR	8.0	43.6	60.3	29.3	65.2	0.62	2809	28003
Mean		**8.3**	**43.2**	**61.4**	**26.3**	**69.1**	**0.67**	**3118**	**29389**
Significance of F test (P)		<0.01	<0.01	0.68	<0.01	<0.01	<0.01	<0.01	<0.01
LSD (0.05)		0.6	3.8	NS[e]	4.4	2.4	0.03	191	2892
LSD (0.30)		0.3	1.9	NS	2.2	1.2	0.02	97	1469
CV (%)		4.1	5.1	2.3	9.7	2.0	2.7	3.6	5.7

[a, b]Crude protein and neutral detergent fiber.
[c]Neutral detergent fiber digestibility in rumen fluid, expressed as % of fiber.
[d]Total digestible nutrients at 1x maintenance level of intake and net energy for lactation at 3x maintenance intake (DM basis). Both are calculated from summation of digestibilities of individual constituents.
[e]No significant differences among hybrids.