2013 Tulare County Silage Corn Variety Trial Results

The 2013 silage corn variety trial was planted to moisture on beds on June 20, in a field with fine sandy loam soil. The previous crop was winter forage. Plots were 8 rows wide for the length of the field, a bit short of a ¼ mile. Each variety was replicated three times.

To estimate plant population, seedlings were counted for an 8.7 ft section in each row at three locations through the field for a total of 24 different counts for each plot. Although plant populations ranged from 31,764 to 33,222 plants per acre, there were no statistical differences among the varieties (Table 1).

Table 1. Plant population, plant height and ear height, and lodging ratings, 2013 silage corn trial, Tulare County, CA.

Brand	Plant Population per Acre	Ear Height (ft)		Plant height (ft)		Lodging Rating Sept 23 1=none; 10= complete		Lodging Rating Oct 10 1= none; 10=complete	
Integra 9682 VT3P	31,930	5.7	bc	12.0	bc	1.0	a	1.4	a
DK 6469 VT3P	32,555	4.8	e	9.5	f	1.1	a	1.0	a
NuTech 5H-122	32,945	5.6	bcd	12.0	b	2.1	ab	2.5	ab
DnyeGro 57VP75	33,139	6.2	a	12.6	a	4.5	c	5.0	c
Baglietto 5517 RR	32,250	4.7	e	11.6	cd	1.2	a	1.0	a
Eureka 7649 VT2P	32,055	5.4	cd	11.4	d	1.5	ab	1.6	ab
Croplan 7927 VT3P	32,750	6.1	a	12.4	ab	2.4	b	3.1	b
Mycogen TMF 2L825	33,222	5.3	d	11.9	bcd	1.5	ab	1.3	a
B-H 8830 VTTP	32,514	4.7	e	10.7	e	1.1	a	1.0	a
Syngenta NK 82V3111	31,764	5.8	b	12.7	a	5.8	d	7.5	d
Grand Mean	32,627	5.35		11.7		2.23		2.6	
Probability	0.35	0.00		0.00		0.000		0.000	
LSD .05	NS	0.28		0.45		1.00		1.53	
Coefficient of Variation %	2.83	3.14		2.24		26.33		34.72	

Means are the averages of 3 replications. Values within a column followed by a common letter do not differ at the 5% level of probability using Duncan's Multiple Range Test.

Lodging ratings: 1 = no lodging; 10 = 100% lodged

Spider mites were controlled by a ground application of Onager at 1 pt/A. Glyphosate plus a 2 oz/A rate of Status, applied by ground, controlled weeds. Eighty pounds of nitrogen (N) were side dressed before lay-by and manure water was used in some irrigations.

Tasseling occurred mid-August. Daytime temperatures during pollination were in the mid-90's with an occasional spike to 100^{o}F but night time temperatures were mild. Irrigations were timely and there was little to no stress on plants during pollination.

In mid-September **plant height and ear height** to the base of the primary ear were taken. Results are presented in Table 1. At the time, ears were large and heavy. A few days later, on September 21, a very strong windstorm blew through the area, causing **lodging** in several plots. Another windy event occurred in early October but very little additional lodging occurred. Comparing height and lodging data (Table 1), it is obvious that the tallest varieties had the biggest problem with falling down. It is not uncommon to have a squall or thunderstorm in September/October and the possibility of a windy weather occurrence in these months should be considered when choosing a variety for a later planting date.

On October 11, 2013, the field was harvested by custom choppers. With 3 choppers and trucks of different sizes, some plot yields were calculated based on the harvest weight of 4 rows and yields from other plots were calculated based on 8 rows. With 3 choppers it was also a bit hectic and yield data from 3 plots were lost. Analysis of yield data utilized missing plot calculations.

Samples for moisture and quality were collected from each plot at the silage pile by taking several small handfuls from different areas of the just-dumped pile of chopped corn. Moisture samples were put in zip lock bags. These samples were weighed and put into a drying oven the same day. Samples for quality were vacuum sealed at the silage pile and sent to Cumberland Valley Lab for quality analysis. Always keep in mind when evaluating both yield and quality results that the amount of chopped corn that can be handled in a drying oven and lab is relatively small compared to the total biomass harvested in each plot. Having three replications to average for a final value of moisture and quality gives more confidence in the final estimate given in the tables but it is still based on a relatively small sample.

Table 2. Yield summary, 2013 silage corn trial, Tulare County, CA.

Brand	Tons/Acre as Harvested		Moisture Percent at Harvest		Tons Per Acre Dry Matter	Tons per Acre Adjusted to 70% Moisture
Integra 9682 VT3P	30.2	abc	63.0	def	11.2	37.2
DK 6469 VT3P	27.0	de	59.0	g	11.1	37.0
NuTech 5H-122	31.4	ab	65.7	b	10.8	36.0
DnyeGro 57VP75	30.7	ab	64.6	bcd	10.8	35.9
Baglietto 5517 RR	28.8	bcd	63.1	def	10.5	35.2
Eureka 7649 VT2P	30.5	ab	65.3	bc	10.5	35.1
Croplan 7927 VT3P	32.0	a	67.7	a	10.4	34.6
Mycogen TMF 2L825	30.9	ab	66.3	ab	10.4	34.5
B-H 8830 VTTP	28.0	cd	63.7	cde	10.2	34.1
Syngenta NK 82V3111	25.1	e	61.7	f	9.6	32.0
Grand Mean	29.27		63.9		10.52	35.07
Probability	0.00		0.00		0.067	0.067
LSD .05	2.290		2.30		NS	NS
Coefficient of Variation %	4.54		2.05		4.77	4.76

Means are the averages of 3 replications. Values within a column followed by a common letter do not differ at the 5% level of probability using Duncan's Multiple Range Test.
Moisture samples were collected at the silage pile, sealed, and put in the dryer on the same day.

Yield results are shown in Table 2. Statistics are run on data to give us an idea of how sure we are if varieties are truly different from each other or if the differences could be due to chance. "Chance" might include some varieties in a part of the field with a sand streak, an irrigation set that was delayed, or just the inherent variability in a field. In Table 2, if the yield from a variety is followed by the same letter as another variety, it means that those varieties are the same and the difference in their yield is more likely due to chance than one variety being "better" than the other. But if the varieties do not have the same letters then we are 95% confident that there was a real difference between the varieties. Looking at Table 2, we are 95% confident that there were differences in the "as harvested" yield among the varieties. For example, Eureka 7649 produced 30.5 tons per acre as measured at the silage pile and its weight is followed by "ab." DK 6469's "as harvested" yield at the field was 27.02 followed by "de," so there are no letters in common between these 2 varieties. From this we can say we are 95% confident that the yield, as measured at the field, was significantly higher for the Eureka variety than for the DK variety. (The footnote below Table 2 states that the probability used in the statistics was 5%, meaning we would accept a 5% risk that we are wrong or, in other words, a 95% confidence level that the difference is real).

But to evaluate silage trials, one has to remember that moisture content greatly influences weight and a few days difference in maturity at harvest can make a big difference in yield as measured at the silage pile. Looking at the next column in Table 2, "Moisture Percent at Harvest," it is obvious that the varieties differed significantly in their moisture content when the harvest occurred. We know this in part because the range of moisture goes from a low of 59% to a high of almost 68%. In addition, we know the differences are (statistically) significant because there are letters after the moisture values and they are not the same for each of the varieties. We try to test varieties of the same maturity but they are never all the same on the harvest date. It is unfair and unwise to decide what variety to plant looking just at the field weight without taking into account the moisture, an indication of maturity.

So how do we make a fair comparison? We can calculate the dry matter (which is everything that isn't water such as sugars, starch, fiber, protein, etc.) by taking the percent moisture at harvest and subtracting it from 100% to get the percent of dry weight. Multiplying the yield at harvest by the percent dry weight and dividing by 100, we get the Tons/Acre of Dry Matter.

For example, Integra 9682 had 63% moisture at harvest. 100% – 63% moisture leaves the dry matter at 37%.

(37/100) x 30.2 = 11.2 Tons/A of Dry Matter.

However, yields are often discussed based on a standardized basis of 70% moisture. Once we have the dry matter we can calculate what the weight would be at 70% moisture. The equation for that step is to take the dry matter and divide it by 0.30.

Tons/Acre Dry Matter/0.30 = Tons/Acre at 70% Moisture

(11.2 T/A Dry Matter)/0.30 = 37.3 Tons/Acre adjusted to 70% Moisture
(This value differs just a tad from the table because numbers have been rounded off in the table).

Unfortunately, simply adjusting all the yields to 70% moisture by an equation does not solve the problem of comparing varieties because it favors varieties that are drier on the harvest date. This is because a drier variety has all of the advantage of having developed more starch in the kernels due to its advanced maturity when harvested and then, with the adjustment calculation, moisture weight is added to get to 70% moisture. Wetter, less mature corn is at a disadvantage because it did not have enough time to fill the kernel, as compared to the more mature corn, by the time of harvest and less moisture weight is added to get to 70%. (If a variety has more than 70% moisture at harvest, weight is actually subtracted to give a 70% standard value). In this year's trial, all the varieties were less than 70% moisture at harvest but the adjustment calculation still favors drier varieties over less dry varieties.

Table 3. Protein and fiber analysis, 2013 silage corn trial, Tulare County, CA

	Fiber % DM				Carbohydrates	Proteins % DM	
Brand	ADF	NDF	Lignin	NDF Digestibility (30 hr) % NDF	Starch % DM	Crude Protein	Rumen Degr. Protein
Integra 9682 VT3P	25.9 b	39.4 abc	3.2 bc	54.8 a	32.6 cde	7.6 de	5.3 cd
DK 6469 VT3P	23.6 a	37.5 ab	3.0 ab	53.8 ab	37.4 a	7.5 e	5.2 cd
NuTech 5H 122	24.9 ab	37.6 ab	3.1 b	50.6 c	34.6 abc	7.7 cde	5.5 bc
DyneGro 57VP75	25.6 b	40.2 bcd	3.5 c	51.3 bc	31.2 de	8.2 abc	5.9 ab
Baglietto 5517 RR	25.5 b	38.9 abc	3.1 ab	55.1 a	32.2 cde	8.1 abcd	5.8 ab
Eureka 7649 VT2P	25.5 b	39.4 abc	3.2 b	54.4 a	30.5 e	8.2 ab	5.9 a
Croplan 7927 VT3P	25.5 b	38.9 abc	3.2 bc	50.6 c	32.7 cde	7.5 e	5.3 cd
Mycogen TMF 2L825	28.2 c	42.3 d	3.4 c	50.8 c	29.8 e	7.0 f	5.0 d
BH 8830 VT2P	25.6 b	40.5 cd	3.2 bc	53.9 ab	33.8 bcd	7.5 e	5.3 cd
Syngenta NK 82V3111	23.5 a	37.1 a	2.8 a	55.8 a	36.0 ab	8.3 a	5.7 ab
P-Value (0.05)	0.001	0.023	0.010	0.000	0.002	0.000	0.001
LSD	1.63	2.63	0.25	2.13	2.97	0.43	0.34
Grand Mean	25.4	39.3	3.2	53.2	33.0	7.7	5.5
CV %	3.8	3.9	4.6	2.3	5.2	3.3	3.6

Means are the averages of 3 replications. Values within a column followed by a common letter do not differ at the 5% level of probability using Duncan's Multiple Range Test.
Samples for quality analysis were collected at the silage pile, vacuum sealed and mailed to Cumberland Valley Lab in Maryland.

Looking at dry matter values and tonnage adjusted to 70% moisture, there were no differences among any of the varieties. When evaluating corn trial results, one has to rely on his or her experience and consider the maturity (moisture) at harvest and how maturity influences the results. Other characteristics such as plant and ear height, lodging, and quality should also be considered.

Quality is an increasingly important factor when selecting a variety. High quality going into the silage pile does not guarantee it will be high quality after ensilage but, if it is not high quality going in, it definitely will not be high quality coming out. Keep in mind that differences in maturity at harvest are also important when looking at quality data. More mature corn of the same variety will have more lignin, fiber and starch than when that same variety is less mature. Digestibility of fiber will decline as the plant becomes older. Quality data for this trial are summarized in Tables 3 and 4. Statistical analysis was not run on the mineral values or pH contents as these values were very similar. Each nutritionist seems to have his or her own system for determining what makes the best feed so you may want to share these results and confer with your nutrition consultant when selecting varieties to plant.

Table 4. Energy calculations and mineral analyses, 2013 silage corn trial, Tulare County, CA

	Energy and Index Calculations		Minerals % DM					
Brand	TDN (% DM)	Milk per Ton[1] (lbs/Ton)	Ash	Ca	P	Mg	K	pH
Integra 9682 VT3P	71.0 bcde	3185 ab	4.7	0.2	0.2	0.1	1.3	3.9
DK 6469 VT3P	72.5 a	3019 b	4.7	0.2	0.2	0.2	1.2	3.9
NuTech 5H 122	72.0 abc	3192 ab	4.8	0.2	0.2	0.1	1.3	3.8
DyneGro 57VP75	70.8 cde	3183 ab	4.8	0.2	0.2	0.2	1.4	3.9
Baglietto 5517 RR	71.2 abcde	3223 a	5.1	0.2	0.2	0.2	1.4	3.9
Eureka 7649 VT2P	70.8 cde	3215 a	5.2	0.2	0.2	0.2	1.4	3.8
Croplan 7927 VT3P	71.4 abcd	3225 a	4.8	0.2	0.2	0.1	1.3	3.8
Mycogen TMF 2L825	69.8 e	3100 ab	5.0	0.2	0.2	0.2	1.2	3.8
BH 8830 VT2P	70.8 cde	3056 ab	4.9	0.2	0.2	0.2	1.3	3.8
Syngenta NK 82V3111	72.4 ab	3170 ab	4.6	0.2	0.2	0.1	1.3	3.9
P-Value (0.05)	0.029	0.045						
LSD	1.46	177.6						
Grand Mean	71.2	3140.5						
CV %	1.7	0.4						

Means are the averages of 3 replications. Values within a column followed by a common letter do not differ at the 5% level of probability using Duncan's Multiple Range Test.

Samples for quality were collected at the silage pile, vacuum sealed and mailed to Cumberland Valley Lab in Maryland.

[1] Milk per Ton calculated by Cumberland Lab from the University of Wisconisn Milk 2006 for Corn Silage program.

Ca- Calcium, P- Phosphorus, Mg- Magnesium, K- Potassium