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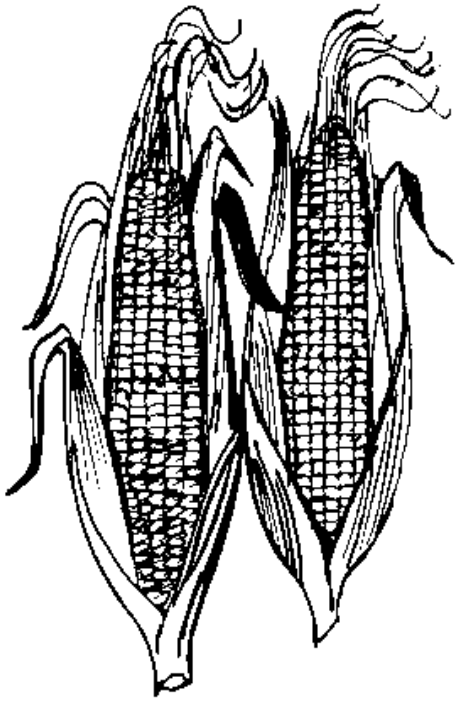
2012 Short Season Corn Silage Variety Trial



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The UNIVERSITY of VERMONT EXTENSION

2012 SHORT SEASON CORN SILAGE VARIETY TRIAL

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In 2012, the University of Vermont Extension Crops and Soils Team evaluated yield and quality of short season corn silage varieties at Borderview Research Farm in Alburgh, VT. While short season corn is an obvious choice in areas that accumulate fewer Growing Degree Days (GDDs), it also has a place in longer season areas. Past UVM Extension variety trials have shown that many shorter season corn varieties can have comparable yield and quality to longer season corn. Growing a shorter season variety can also provide other benefits such as an earlier harvest allowing for more time in the fall for planting of cover crops and manure applications. It is important to remember that the data presented in this report is from a single year. Hybrid-performance data from additional tests over several years should be compared before making varietal selections.

MATERIALS AND METHODS

Several seed companies submitted varieties for evaluation. Companies and contact names are listed in Table 1. Twenty-eight corn varieties were evaluated, ranging in relative maturity (RM) from 79 – 95 days. Specific varieties, their traits, and RM are listed in Table 2.

Table 1. Participating companies and local contact information.

Dekalb/Monsanto	Mycogen	Pioneer	Seedway
Klaus Busch Territory Sales Manager Knox, NY 518-320-2462	Claude Fortin District Sales Manager Highgate, VT 802-363-2803	Jacob Bourdeau Bourdeau Bros. Sheldon, VT 802-933-2277	Ed Schillawski 3442 Rt. 22A Shoreham, VT 802-897-2281

Table 2. Short season silage corn varieties evaluated in Alburgh, VT.

Company	Variety	RM (Days)	Traits
Dekalb	DKC39-07	89	GENVT2PRIB
Dekalb	DKC38-03	88	GENVT2PRIB
Dekalb	DKC37-38	87	GENVT2PRIB
Dekalb	DKC33-7	83	GENSS
Dekalb	DKC33-53	83	GENSSRIB
Dekalb	DKC30-20	80	VT3
Mycogen	2H079	79	HXT/LL/RR2
Mycogen	2R081	80	RR2
Mycogen	2T108	82	SSX/LL/RR2
Mycogen	2R157	83	SSX/LL/RR2
Mycogen	2G192	83	GT/YGCB/LL
Mycogen	TMF2Q298	88	HXT/LL/RR2

Mycogen	TMF2L418	89-92	HXT/LL/RR2
Mycogen	F2F298	90	HXI/LL/RR2
Mycogen	X12301S3	91	Experimental sp.
Mycogen	F2F343	92	RR2
Mycogen	TMF94	94	Leafy
Mycogen	F2F387	95	HXT/LL/RR2
Seedway	1994RR	80	RR2
Seedway	SW2750	86	RR2
Seedway	SW2934GT	88	GT
Seedway	SW3301L	90	Leafy
Seedway	SW3254RR	90	RR2
Seedway	SW3008RRYGCRW	90	GENVT3P-VT3
Pioneer	38N94AM-R	92	AM/RR2
Pioneer	P8906HR	89	HX1/LL/RR2
Pioneer	P9519HR	95	HX1/LL/RR2
Pioneer	P8581R	85	RR2

AM- AcreMax™.
GenVT2PRIB - Genuity® VT Triple PRO™ RIB complete (Refuge In a Bag).
GENVT3- Genuity® VT Triple PRO™.
GenSS – Genuity® SmartStax™ provides protection against corn earworm, fall armyworm, Northern corn rootworm, Western bean cutworm, European corn borer, and black cutworm, as well as glyphosate herbicide (Roundup®, Touchdown®) and glufosinate-ammonium herbicide (LibertyLink®) tolerant.
GenSSRIB - Genuity® SmartStax RIB complete (Refuge In a Bag).
GT – Glyphosate herbicide (Roundup®, Touchdown®) tolerant.
HXI – Herculex I® provides protection against above-ground pests such as European corn borer, Western bean cutworm and black cutworm.
HXT – Herculex Xtra® provides season-long control of a variety of pests, including European corn borer, Western bean cutworm, corn rootworm, and black cutworm.
LL – Glufosinate-ammonium herbicide (LibertyLink®) tolerant.
RR2 – Roundup Ready corn is glyphosate herbicide (Roundup®, Touchdown®) tolerant.
SSX – SmartStax corn provides a broad spectrum of insect control, using multiple modes of action, as well as glyphosate herbicide (Roundup Ready®, Touchdown®) and glufosinate-ammonium (LibertyLink®) tolerance.
VT3 – YieldGard VT Triple™ uses VecTran™ technology which stacks insect- and weed-control traits in one variety. Provides glyphosate herbicide (Roundup®, Touchdown®) tolerance, as well as protection against Western corn rootworms, Northern corn rootworms, European corn borers, black cutworms, stalk borers, wireworms, white grubs, seed corn maggots, early flea beetles, and corn earworms.

The soil type at the Alburgh location was a Benson rocky silt loam (Table 3). The seedbed was spring disked followed by spike tooth harrow. The previous crop was sunflower. Starter fertilizer (10-20-20) was applied at a rate of 200 lbs per acre. Plots were 25' long and consisted of two 30-inch rows. They were planted with a John Deere 1750 planter on 21-May. The seeding rate was 34,000 seeds per acre. The plot design was a randomized complete block with two replications. Treatments were twenty-eight varieties. Lumax (S-metolachlor, atrazine, and mesotrione) was sprayed at 3 pints per acre post emergence for weed control. Urea was side-dressed at a rate of 200 lbs per acre on 23-Jun, when the corn was at the V6 growth stage. On 7-Sep and 11-Sep, depending on RM the corn was harvested with a John Deere 2-row chopper, and the forage wagon was weighed on a platform scale. A subsample of the harvested material was collected, dried, ground, and then sent to Cumberland Valley Analytical Services in Hagerstown, MD for quality analysis. Dry matter yields were calculated and then adjusted to 35% dry matter.

Table 2. 2012 short season corn trial specifics for Alburgh, VT.

	Borderview Farm Alburgh, VT
Soil type	Rocky silt loam
Previous crop	Sunflower
Row width (in.)	30
Planting date	21-May
Harvest date	7-Sep & 11-Sep
Tillage operations	Spring disk, spike tooth harrow
Starter fertilizer	200 lbs ac^{-1} 10-20-20
Sidedress	200 lbs ac^{-1} Urea

Silage quality was analyzed using wet chemistry at Cumberland Valley Analytical Services in Hagerstown, MD. Plot samples were sent to the lab where they were analyzed for crude protein (CP), starch, acid detergent fiber (ADF), neutral detergent fiber (NDF), and 30-hour digestible NDF (dNDF). Mixtures of true proteins, composed of amino acids, and nonprotein nitrogen make up the CP content of forages. The CP content of forages is determined by measuring the amount of nitrogen and multiplying by 6.25. The bulky characteristics of forage come from fiber. Forage feeding values are negatively associated with fiber since the less digestible portions of plants are contained in the fiber fraction. The detergent fiber analysis system separates forages into two parts: cell contents, which include sugars, starches, proteins, nonprotein nitrogen, fats and other highly digestible compounds; and the less digestible components found in the fiber fraction. The total fiber content of forage is contained in the neutral detergent fiber (NDF). Chemically, this fraction includes cellulose, hemicellulose, and lignin. Because of these chemical components and their association with the bulkiness of feeds, NDF is closely related to feed intake and rumen fill in cows. Recently, forage testing laboratories have begun to evaluate forages for NDF digestibility (dNDF). Evaluation of forages and other feedstuffs for dNDF is being conducted to aid prediction of feed energy content and animal performance. Research has demonstrated that lactating dairy cows will eat more dry matter and produce more milk when fed forages with optimum dNDF. Forages with increased dNDF will result in higher energy values and, perhaps more importantly, increased forage intakes. Forage dNDF can range from 20 – 80% NDF.

Net energy of lactation (NEL) is calculated based on concentrations of NDF and ADF. NEL can be used as a tool to determine the quality of a ration, but should not be considered the sole indicator of the quality of a feed, as NEL is affected by the quantity of a cow's dry matter intake, the speed at which her ration is consumed, the contents of the ration, feeding practices, the level of her production, and many other factors. Most labs calculate NEL at an intake of three times maintenance. Starch can also have an effect on NEL, where the greater the starch content, the higher the NEL (measured in Mcal per pound of silage), up to a certain point. High grain corn silage can have average starch values exceeding 40%, although levels greater than 30% are not considered to affect energy content, and might in fact have a negative impact on digestion. Starch levels vary from field to field, depending on growing conditions and variety.

The silage performance indices of milk per acre and milk per ton were calculated using a model derived from the spreadsheet entitled "MILK2000", developed by researchers at the University of Wisconsin.

Milk per ton measures the pounds of milk that could be produced from a ton of silage. This value is generated by approximating a balanced ration meeting animal energy, protein, and fiber needs based on silage quality. The value is based on a standard cow weight and level of milk production. Milk per acre is calculated by multiplying the milk per ton value by silage dry matter yield. Therefore, milk per ton is an overall indicator of forage quality and milk per acre an indicator of forage yield and quality. Milk per ton and milk per acre calculations provide relative rankings of forage samples, but should not be considered as predictive of actual milk responses in specific situations for the following reasons:

1) Equations and calculations are simplified to reduce inputs for ease of use,
2) Farm to farm differences exist,
3) Genetic, dietary, and environmental differences affecting feed utilization are not considered.

Yield data and stand characteristics were analyzed using mixed model analysis using the mixed procedure of SAS (SAS Institute, 1999). Replications within trials were treated as random effects, and hybrids were treated as fixed. Hybrid mean comparisons were made using the Least Significant Difference (LSD) procedure when the F-test was considered significant ($p<0.10$).

Variations in yield and quality can occur because of variations in genetics, soil, weather, and other growing conditions. Statistical analysis makes it possible to determine whether a difference among hybrids is real or whether it might have occurred due to other variations in the field. At the bottom of each table a LSD value is presented for each variable (i.e. yield). Least Significant Differences (LSDs) at the 0.10 level of significance are shown. Where the difference between two hybrids within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure that for 9 out of 10 times, there is a real difference between the two hybrids. Hybrids that were not significantly lower in performance than the highest hybrid in a particular column are indicated with an asterisk. In the example below, hybrid C is significantly different from hybrid A but not from hybrid B. The difference between C and B is equal to 1.5, which is less than the LSD value of 2.0. This means that these hybrids did not differ in yield. The difference between C and A is equal to 3.0, which is greater than the LSD value of 2.0. This means that the yields of these hybrids were significantly different from one another.

Hybrid	**Yield**
A	6.0
B	7.5*
C	**9.0***
LSD	2.0

RESULTS

Weather data is recorded with a Davis Instrument Vantage PRO2 weather station, equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh, VT. Though May was warmer and wetter than normal (based on 1981-2010 data), June, July, and September all had less precipitation than normal (Table 4). There were an accumulated 2,545 Growing Degree Days (GDDs) at a base temperature of 50 degrees Fahrenheit. This was 264 more GDDs than the historical 30-year average for May-September.

Table 4. 2012 weather data for Alburgh, VT.

Alburgh, VT	May	June	July	August	September
Average temperature (°F)	60.5	67.0	71.4	71.1	60.8
Departure from normal	4.10	1.20	0.80	2.30	0.20
Precipitation (inches)*	3.9	3.2	3.8	2.9	5.4
Departure from normal	0.5	-0.5	-0.4	-1.0	1.7
Growing Degree Days (base 50°F)	370	504	657	650	364
Departure from normal	102	30	17	69	46

Based on weather data from our onsite Davis Instruments Vantage PRO2 weather station with a WeatherLink data logger. Historical averages are for 30 years of NOAA data from Burlington, VT (1981-2010).
*Precipitation data from June- September is based on Northeast Regional Climate Center data from an observation station in Burlington, VT.

The average yield for the short season corn trial was 21.6 tons per acre. The Dekalb variety 'DKC39-07' yielded the highest, but was not statistically significant from all other varieties evaluated, (Table 5 and Figure 1). The average moisture content for the trial was 58.5% (or 41.5% dry matter).

Table 5. Harvest characteristics of 28 short season corn silage varieties – Alburgh, VT, 2012.

Hybrid	**RM**	**Harvest moisture** %	**Yield 35% DM** tons ac^{-1}
DKC39-07	89	57.3	**27.4**
X12301S3	91	56.6	27.1
DKC30-20	80	56.0	25.3
FP8906HR	89	59.6	25.2
F2F298	90	58.7	24.7
F2F387	95	62.8*	24.2
SW2934GT	88	58.6	24.1
SW3301L	90	61.4*	23.9
SW3254RR	90	61.7*	23.7
TMF2L418	89-92	61.4*	23.3
SW3008RRYGCRW	90	61.6*	22.7
2H079	79	58.7	22.6
DKC38-03	88	58.8	22.5
SW2750	86	57.2	22.5
2T108	82	53.7	21.9
38N94AM-R	92	60.6*	21.6
F2F343	92	51.5	21.1
TMF2Q298	88	59.5	20.4
TMF94	94	**64.4***	20.0

2R157	83	56.5	19.3
2G192	83	55.1	18.6
P9519HR	95	54.6	18.6
P8581R	85	59.8	18.3
DKC37-38	87	61.7*	18.0
1994RR	80	53.5	17.3
2R081	80	56.8	17.3
DKC33-7	83	57.8	16.8
DKC33-53	83	63.5*	16.3
	LSD (0.10)	4.5	NS
	Trial Mean	58.5	21.6

Treatments indicated in bold had the top observed performance.
NS – No statistical significance was determined between varieties.
* Varieties that did not perform significantly lower than the top performing variety in a particular column are indicated with an asterisk.

With the exception of crude protein (CP) there were no significant differences in forage quality among the 28 varieties evaluated. Short season corn variety '2H079' (Mycogen) produced the highest CP (9.6%), although this was not statistically different from '2R081' (Mycogen), 'SW3001L' (Seedway), or 'SW2354RR' (Seedway). No significant difference was determined between short season corn silage hybrids in Alburgh, VT for milk per ton or milk per acre (Table 6).

Table 6. Forage quality of 28 short season corn silage varieties - Alburgh, VT, 2012.

Variety	RM	Forage quality characteristics						Milk	
		CP	ADF	NDF	dNDF	Starch	NEL	ton^{-1}	acre^{-1}
		% of DM	% of DM	% of DM	% of NDF	%	Mcal lb^{-1}	lbs	lbs
DKC39-07	89	7.0	27.4	46.1	54.4	28.8	0.74	2830	**27300**
X12301S3	91	7.9	26.3	44.9	54.0	32.0	0.75	2850	27100
DKC30-20	80	8.0	24.8	42.6	53.9	35.1	0.75	2760	24400
FP8906HR	89	7.5	26.4	44.8	55.2	31.5	0.75	2840	25100
F2F298	90	7.5	24.4	42.4	58.6	35.7	0.76	2860	25000
F2F387	95	7.4	26.9	46.0	63.3	29.4	0.75	3080	25800
SW2934GT	88	7.5	26.8	45.7	56.8	31.8	0.74	2790	23500
SW3301L	90	8.9*	25.8	44.9	57.0	30.1	0.75	2780	24900
SW3254RR	90	8.7*	25.0	43.0	57.4	31.7	0.75	3020	25000
TMF2L418	89-92	7.6	27.7	46.2	53.6	27.7	0.74	2830	23000
SW3008RRYGCRW	90	7.9	26.8	45.0	52.1	30.0	0.74	2810	22300
2H079	79	**9.6***	25.7	45.2	54.9	30.9	0.73	2650	21000
DKC38-03	88	7.1	27.6	46.2	51.9	33.4	0.74	2630	20800
SW2750	86	8.2	27.3	46.7	52.1	31.5	0.73	2620	20700
2T108	82	7.4	25.8	44.8	53.3	34.8	0.75	2650	20200
38N94AM-R	92	7.5	24.2	41.1	57.9	36.6	**0.77**	2970	22400
F2F343	92	7.2	24.6	41.6	59.4	35.4	**0.77**	3050	22500
TMF2Q298	88	7.8	24.4	42.6	60.9	34.8	0.76	2920	20600

TMF94	94	7.9	26.7	46.0	63.3	29.7	0.75	3080	21300
2R157	83	7.8	29.3	50.0	51.6	28.0	0.71	2510	17000
P9519HR	95	7.4	24.3	40.8	54.1	36.4	0.76	2890	18900
2G192	83	8.1	**22.7**	**39.2**	55.0	**39.5**	**0.77**	2850	18600
P8581R	85	8.0	25.3	44.4	**68.0**	29.5	0.76	**3270**	21000
DKC37-38	87	8.0	26.0	44.3	54.2	34.1	0.74	2700	17100
2R081	80	8.8*	25.9	45.1	53.2	31.6	0.73	2650	16200
1994RR	80	8.2	24.0	41.7	54.7	36.4	0.75	2760	16700
DKC33-7	83	7.8	25.0	43.4	53.1	35.5	0.75	2700	15900
DKC33-53	83	7.9	29.8	50.4	50.5	26.9	0.71	2480	14000
	LSD (0.10)	1.1	NS	NS	NS	NS	NS	NS	NS
	Trial mean	7.9	25.9	44.4	55.8	32.4	0.74	2822	21400

Treatments indicated in bold had the top observed performance.
NS – no statistical significance was determined between varieties.

* Varieties that did not perform significantly lower than the top performing variety in a particular column are indicated with an asterisk.

Figure 1 displays the relationship between milk per ton and milk per acre for varieties trialed in Alburgh, VT. The dotted lines dividing the figure into four quadrants represent the mean milk per ton and acre for the location. Hybrids that fall above or to the right of the lines performed better than the average, and hybrids below or to the left of the lines performed below average. There were many varieties at the Alburgh location that ranked above average in yield and quality. Varietal selection should be based on the goals of the farm as well as data compared from multiple sites and years.

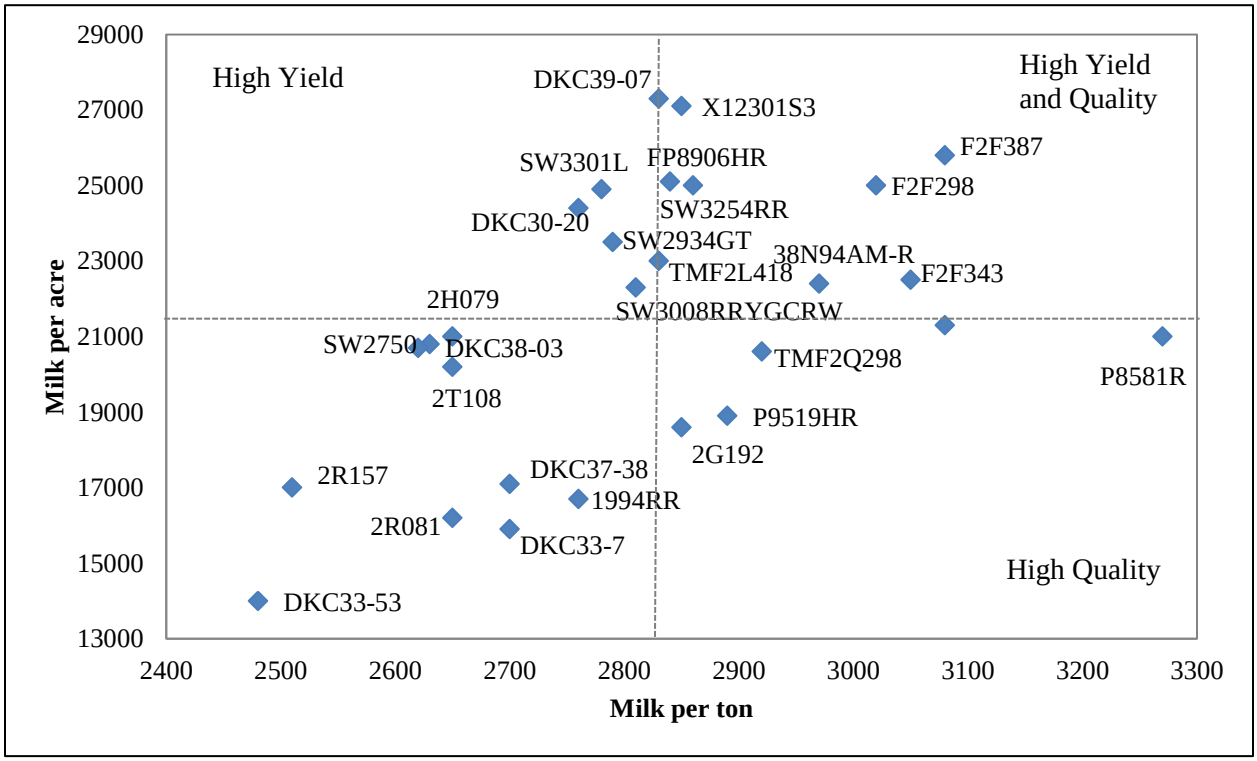

Figure 1. Relationship between milk per ton and milk per ac^{-1} for short season corn silage varieties grown in Alburgh, VT. *Dotted lines represent the mean milk per ton and milk per ac^{-1}.*

DISCUSSION

All varieties reached proper maturity for harvest at Borderview Research Farm in Alburgh, VT. There was no severe lodging of corn stalks like there had been in previous years. Overall, the short season corn yielded an average of 21.6 tons per acre. The range of yields was between 16.3 and 27.4 tons per acre, showing the importance of proper varietal selection to maximize short season corn yields.

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