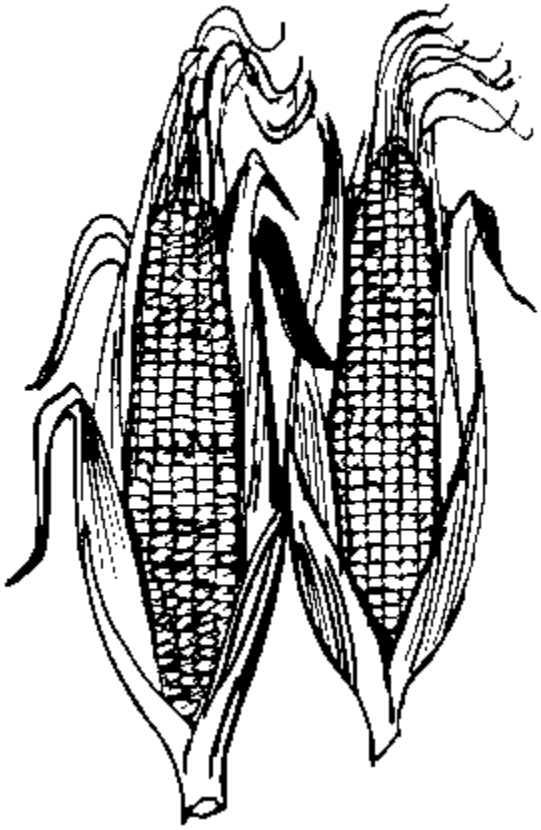
UNIVERSITY OF VERMONT EXTENSION

CULTIVATING HEALTHY COMMUNITIES

2009
Vermont Corn Silage Maturity Trial



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2009 Vermont Relative Maturity Corn Silage Trials

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In 2009, the University of Vermont Extension conducted an experiment to evaluate yield and quality of corn hybrids with a range of relative maturities. The goal is to document the best range of corn silage maturities to grow in this area to maximize corn yield and quality. It is important to remember that the data presented are from a single test at only one location. Hybrid-performance data from additional tests in different locations and often over several years should be compared before you make conclusions.

TESTING PROCEDURE

In 2009, the University of Vermont Extension conducted a variety trial to evaluate yield & quality performance of a range of corn maturities at Border View Research Farm in Alburgh, VT. Several seed companies submitted varieties for evaluation. Companies and contact names are listed in Table 1. Twelve corn varieties ranging in maturities from 90-110 days were grown at this site. The Relative Maturities (RM) is provided by the companies.

Table 1. Participating Companies and Local Contact Information

Mycogen	Dekalb/Monsanto	Pioneer
Claude Fortin District Sales Manager Highgate, VT 802-363-2803	Scott Walker District Sales Manager Schenectady, NY 315-528-0580	Jacob Bourdeau Bourdeau Bros. Sheldon, VT 802-933-2277

Table 2. Varieties and Descriptions

Company	Variety	RM	Description & Traits
Dekalb	DKC45-79	95	VT3
Mycogen	F2F297	90	BMR
Mycogen	TMF2N422	94	RR
Mycogen	TMF94	97	
Mycogen	F2F489	98	BMR
Mycogen	TMF2T497	100	
Mycogen	TMF2W583	105	
Mycogen	F2F635	110	BMR, HX1, RR
Pioneer	38H08	92	HX1,LL,RR2
Pioneer	38A57	97	HX1,LL,RR2
Pioneer	36Y26	101	HX1,LL,RR2
Pioneer	35F37	105	RR2

BMR – Brown Mid-Rib Corn is of higher digestibility because it contains less lignin than other non BMR corn hybrids. BMR corn is not considered a GMO.
HX1- trait provide protection against European corn borer, black cutworm, fall armyworm, western bean cutworm, lesser corn stalk borer, and suppresses corn earworm.
LL – LIBERTY LINK CORN® is tolerant to broadcast applications of Liberty herbicide, glufosinate ammonium.
RR – ROUND-UP READY CORN® is resistant to the herbicide glyphosate, a post-emergent, foliar applied, non-selective herbicide.
YGVT3 – YieldGard VT Triple® insect protection trait controls 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

WEATHER DATA

Seasonal precipitation and temperature recorded at weather stations in close proximity to the trial site is shown in Table 3. This season brought cooler than normal temperatures and higher than normal rainfall patterns across the region. In general corn silage yields were average to below average for most farms including our trial locations. Below average Growing Degree Days (GDD) resulted in corn maturing at a slower rate and hence a later than normal harvest date. The total accumulated GDD for corn growth was 1846 which was about 300 GDD less than normal for this area.

Table 3. Temperature, precipitation, and growing degree days summary – Alburgh, VT

	April	May	June	July	August	September	October
Average Temperature	44.9	53.9	62.8	65.9	67.7	57.7	44.1
Departure from Normal	+1.4	-2.7	-3.0	-5.2	-1.3	-2.7	-4.7
Precipitation	2.89	6.32	5.19	8.07	3.59	4.01	5.18
Departure from Normal	+0.38	+3.39	+1.98	+4.66	-0.26	+0.55	+0.79
Growing Degree Days (50˚)	111.5	209.0	398.0	494.5	557	286	40.5
Departure from Normal	+71.0	-51.4	-76.0	-158.1	-32.0	-26.0	-61.8

*Based on National Weather Service data from cooperative observer stations in South Hero. Historical averages are for 30 years of data (1971-2000).

CULTURAL PRACTICES

The seedbed was prepared with conventional tillage methods. The previous crop was corn. Fertilizer starter was applied at planting at a rate of 200 lbs 10-20-20 to the acre. Plots were planted with a John Deere 4-row corn planter on May 13, 2009 at 32,000 seeds to the acre. The soil type was Benson rocky silt loam over shaly limestone. The plot design was a randomized complete block with two replications and the plot size measured 10'x75'. The plots were harvested on September 24, 2009 with a John Deere 2 row chopper, and the forage wagon was weighed on a platform scale. A subsample was collected for moisture determination and quality analysis. Pertinent trial information is summarized in Table 4.

Table 4. Maturity corn variety trial information - 2009

Trial Information	Alburgh, VT
Soil type	Rocky silt loam over shaly limestone
Previous Crop	Corn
Row Width (in.)	30
Planting date	13-May
Harvest date	24-Sept & 2-Oct
Harvest population (plants/acre)	32,000
Tillage operations	Spring Plow & Disk
Manure (gal/acre)	Spring & Fall applied - 7500 gal/acre
Starter fertilizer	150 lbs/acre 10-20-20
Other fertilizer	130 lbs/acre 46-0-0

SILAGE QUALITY

Silage quality was analyzed using wet chemistry techniques at Cumberland Valley Analytical Services in Hagerstown, Maryland. Plot samples were dried, ground and analyzed for crude protein (CP), neutral detergent fiber (NDF), and 30h 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 N 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, non-protein 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. Evaluation of forages and other feedstuffs for NDF digestibility 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 NDF digestibility. Forages with increased NDF digestibility will result in higher energy values, and perhaps more importantly, increased forage intakes. Forage NDF digestibility can range from 20 – 80%.

The silage performance indices of milk per acre and milk per ton were calculated using a model 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.

PRESENTATION OF DATA

Results for the maturity variety trial are listed in Table 5. Dry matter yields were calculated and then adjusted to 35% dry matter for the report. Varieties are ranked by dry matter at harvest in table 5. The numbers presented in the tables are of two replications. There is a figure displaying the relationship between milk per ton and milk per acre. The dotted lines dividing the figure into four quadrants represent the mean milk per ton and acre for the location. Therefore hybrids that fall above the lines performed better than the average and hybrids below the lines performed below average.

LEAST SIGNIFICANT DIFFERENCE (LSD)

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 (LSD's) at the 10% level of probability 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 in 9 out of 10 chances that 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 A is significantly different from hybrid C but not from hybrid B. The difference between A 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 A and C 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. The asterisk indicates that hybrid B was not significantly lower than the top yielding hybrid.

Hybrid	Yield
A	6.0
B	7.5*
C	9.0
LSD	2.0

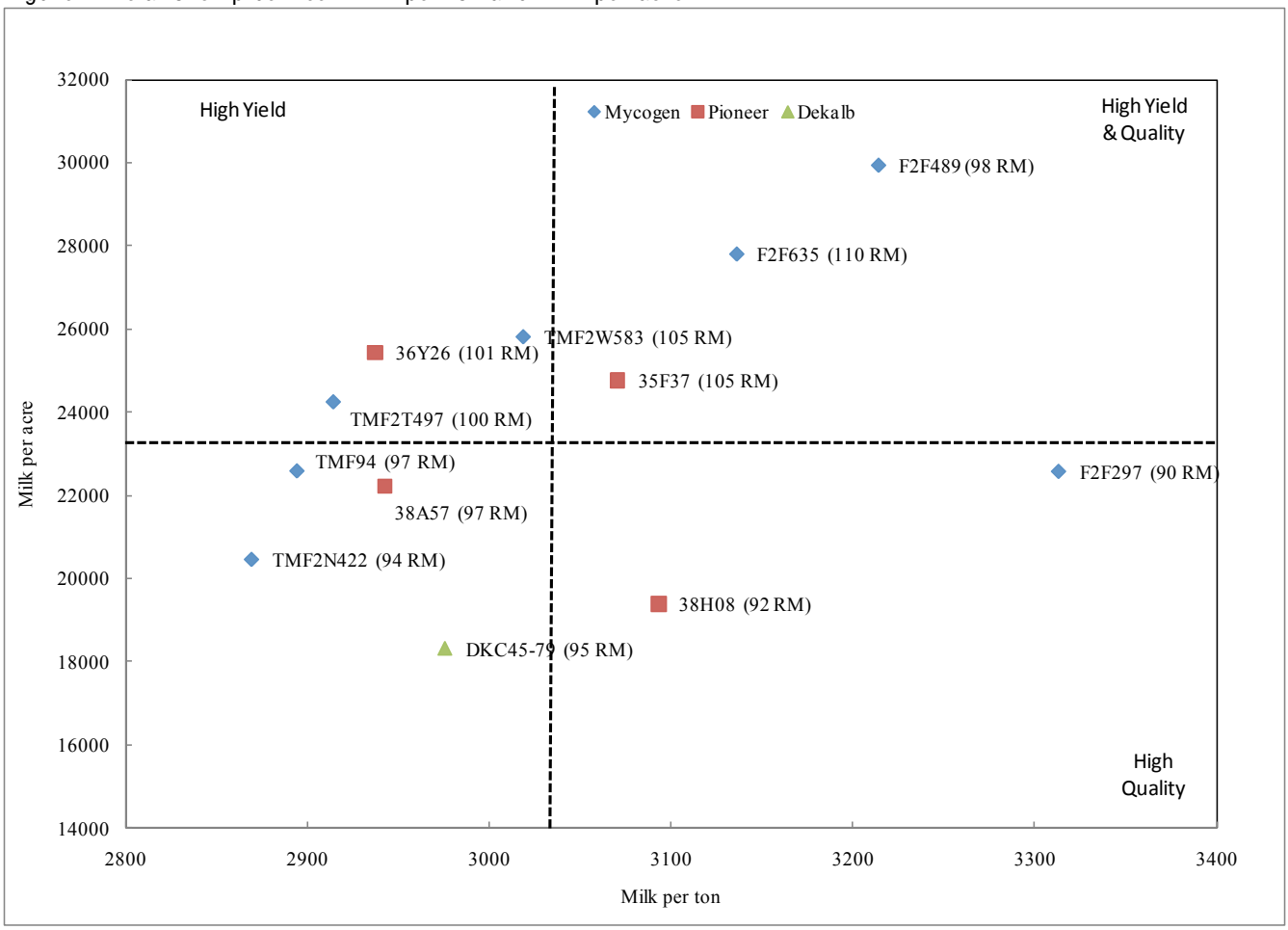
RESULTS

Table 5. Yield and quality comparisons of corn with different relative maturities – Alburgh.

Company	Hybrid	Relative maturity	DM at harvest	Yield 35 % DM	Forage Quality Characteristics					Milk per	
					CP	ADF	NDF	dNDF	Nel	ton	acre
			%	T/A	%	%	%	%	%		
Mycogen	F2F635	110	30.5	25.3*	6.77	24.2*	39.0*	60.8	0.77	3136	27806*
Pioneer	38H08	92	32.5	18.4	7.40	26.0	43.9	60.7	0.75	3093	19393
Mycogen	F2F297	90	32.5	19.5	7.93	24.5*	41.7	72.6*	0.77	3313*	22581
Mycogen	TMF2T497	100	33.5	22.6	7.40	25.0*	40.7*	57.1	0.76	2914	24253
Mycogen	F2F489	98	34.0	26.6*	7.69	24.1*	38.8	69.8	0.77	3214	29940*
Pioneer	36Y26	101	35.0	24.7*	7.42	27.1	43.4	54.8	0.74	2937	25446*
Dekalb	DKC45-79	95	35.0	18.6	7.00	24.3*	39.7*	58.4	0.76	2976	18316
Pioneer	38A57	97	35.5	21.6	6.64	27.0	43.9	59.1	0.74	2942	22230
Pioneer	35F37	105	37.0	23.0*	7.31	23.1*	37.4*	58.4	0.78	3071	24763
Mycogen	TMF2N422	94	37.5	20.4	7.26	25.9	42.0	57.3	0.74	2869	20464
Mycogen	TMF94	97	37.5	22.3	7.22	25.0*	40.8	54.8	0.75	2894	22593
Mycogen	TMF2W583	105	39.5	23.9*	7.11	23.0*	37.3*	56.8	0.77	3019	25817*
Trial mean			35.0	22.3	7.26	24.9	40.7	60.1	0.76	3031	23634
LSD (0.10)**			NS	3.8	NS	2.2	3.4	1.9	NS	93	5064

* Corn that did not perform significantly lower than the top performing hybrid in a particular column is indicated with an asterisk.
** See text for further explanation.
NS - None of the varieties were significantly different from one another.

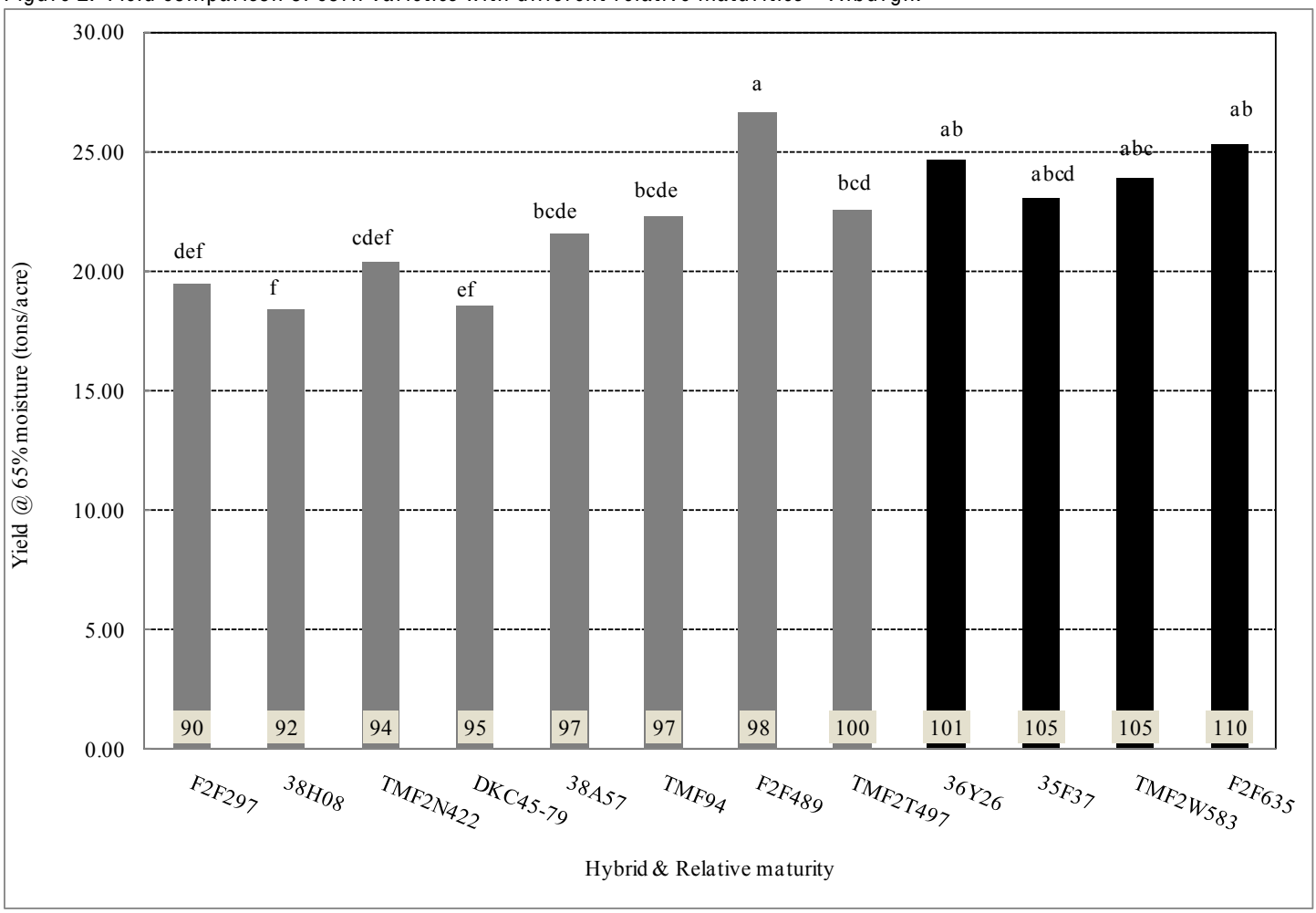
Figure 1. Relationship between milk per ton and milk per acre



Dotted lines represent the mean milk per ton and milk per acre.

RESULTS

Figure 2. Yield comparison of corn varieties with different relative maturities – Alburgh.



Hybrids with the same letter did not differ statistically in yield.
Gray bars represent hybrids harvested on September 21st and black bars represent hybrids harvested on October 2nd, 2009.

DISCUSSION

As seen in previous years there was no relationship between corn silage yield and corn silage relative maturity. This year a 98 RM BMR hybrid was superior in both yield and quality. All hybrids reached dry matters that were optimal for silage storage. Given the cool season, it was a surprise that the longer season hybrids were able to reach the proper dry matter for harvest. Overall the shorter season hybrids reached appropriate harvest dry matters up to two weeks earlier than some of the late season hybrids. An earlier harvest without yield and quality compromise would result in an opportunity for earlier manure application, cover cropping, and fall tillage.

UVM Extension would like to thank Roger Rainville and staff at Borderview Farm for their help implementing the trial. We would also like to thank Scott Walker of Seedway, Claude Fortin of Mycogen, and Dave Kostyo of Pioneer for the hybrid seed donation.