2012 Maine Corn Hybrid Performance Trial

Funding provided by local seed companies, the University of Maine Cooperative Extension, and Northeast SARE (Project LNE09-287).

Special thanks to John Stoughton and the farm crew at Misty Meadows Farm for hosting the trial and helping with planting and harvesting.

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NORTHEAST SARE Sustainable Agriculture Research & Education

In 2012, the University of Maine Cooperative Extension conducted a hybrid silage corn evaluation program in cooperation with local seed dealers, Maine Farm Days and Misty Meadows Farm who hosted the trial in Clinton, Maine.

The purpose of the program is to provide unbiased performance comparisons of hybrid corn available in the central Maine area. It is important to remember that the data presented are from a single test at one location. Hybrid performance data from additional tests in different locations, and often over several years, should be compared before you make conclusions.

Contacts for hybrid seed sources for 2012

American Organics
- Paris Farmers Union   Milt Sinclair   (207) 743-1291   miltwspfu@hotmail.com

Blue River
- Lauchlin Titus   (207) 314-2655   LTitus1@myfairpoint.net
- Newman Gamage   (207) 622-5009 (H)   (207) 446-5620 (M)

Blue Seal
- Michelle Bennett   (207) 754-0764   michele.bennett@kngfeed.com

Croplan
- Northeast Ag Sales*

Dairyland
- Dairyland Seed Co.   James Stone   800-236-0163   (262) 685-8859   jstone@dairyland.com
- Paris Farmers Union   Milt Sinclair   (207) 743-1291   miltwspfu@hotmail.com

DeKalb
- Northeast Ag Sales*
- Klaus Busch   (518) 320-246   klaus.j.busch@monsanto.com
- Crop Production Services**

Dyna-gro
- Crop Production Services**

Garst
- Lauchlin Titus   (207) 314-2655   LTitus1@myfairpoint.net
- Feed Commodities International   Ellis Additon   (207) 487-5589   eadditon@feedcommodities.com
- MPG   Tim Donovan   (207) 877-5923   tdonovan@mpgco-op.com
- Richard Belanger   (207) 576-5845   veggiefarmerinmaine@roadrunner.com
- Northeast Ag Sales*

Masters Choice
- Newman Gamage   (207) 622-5009 (H)   (207) 446-5620 (M)
- Paris Farmers Union   Milt Sinclair   (207) 743-1291   miltwspfu@hotmail.com

Mycogen
- Crop Production Services**
- Paris Farmers Union   Milt Sinclair   (207) 743-1291   miltwspfu@hotmail.com

NK Syngenta
- Crop Production Services**
- Northeast Ag Sales*

Nutridense
- Crop Production Services**
- Northeast Ag Sales*

Pioneer
- Derek Hines   (207) 717-0550   abhines@msn.com

Seedway

Lauchlin Titus	(207) 314-2655		LTitus1@myfairpoint.net
Feed Commodities International	Ellis Additon	(207) 487-5589	eadditon@feedcommodities.com
MPG	Tim Donovan	(207) 877-5923	tdonovan@mpgco-op.com
Richard Belanger	(207) 576-5845		veggiefarmerinmaine@roadrunner.com
Paris Farmers Union	Milt Sinclair	(207) 743-1291	miltwspfu@hotmail.com

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Brian McCleary	(207) 740-1911	brian.mccleary@cpsagu.com
Randy Drown	(207) 650-0310	randy.drown@cpsagu.com

***Northeast Ag Sales**

Rebecca Bubier	888-296-4818	(207) 441-6250 (M)	rebeccaneag@gmail.com
Justin Choiniere	800-462-7672	(802) 535-9938 (M)	Justin@neag.net
Spencer Greatorex	800-462-7672	(207) 341-1375 (M)	svg1@adelphia.net
Steve Goodwin	888-296-4818	(207) 242-2339 (M)	goodberry@roadrunner.com

TESTING PROCEDURE

The experiment was planted at the Misty Meadows Farm in Clinton on May 21, 2012, using a six-row corn planter. The predominant soil type was Woodbridge fine sandy loam. Prior to planting, liquid cow manure was applied at the rate of 6,000 gallons per acre and included "More that Manure"(http://morethanmanure.com/) . Lumax (3 quarts/acre) and atrazine (1 pound/acre) pre-emergent herbicides were applied at early post-emergence. Starter fertilizer BLACK LABEL ZN (www.uap.ca) 6-20-0 0.77% ZN was applied at 2.5 gallons per acre at planting. Liquid nitrogen was sidedressed at the rate of 50 pounds of nitrogen per acre.

Three replications of 43 hybrids were planted in a randomized block design. Plots were 75 feet long and 6 rows (30 feet) wide. The hybrids used were nominated and donated by seed companies. Hybrids had relative maturity days ranging from 80 to 113 (Tables 2 and 3). We targeted a planting density of 32,000 plants/acre.

Growing degree days were calculated using the Adapt N model. Total growing degree days (86/50) were 2160 for 2012, the second-highest since 2007 (Table 1). The experiment was harvested on September 27, 2012. At this time, silage harvest was underway on commercial farms. Some locations had received a frost, although the project site had not.

Table 1. Growing degree days, Maine corn silage variety trial, 2007-2012.

Year	Location	Growing degree days (86/50)
2012	Clinton	2160
2011	Clinton	2287
2010	Leeds	2120
2009	Leeds	1908
2008	Clinton	1840
2007	Clinton	2086

At press time, rainfall for 2012 at the National Weather Service's Winthrop, Maine, location was not available for June, July, August, or September. In May, 6.41 inches of rain were recorded.

The plots were harvested using a six-row corn chopper. Corn from each plot was loaded into a mixer wagon with scales. Grab samples from one replicate of each treatment were frozen and sent to the Dairy One Laboratory in New York for immediate analysis for moisture and quality.

Analysis of variance was conducted to identify differences between hybrid silage yield (corrected to 30% dry matter) and expected milk yield (milk per ton of dry matter multiplied by dry matter). Linear regression analysis was conducted to see the effect of relative maturity on silage yield, expected milk yield, % dry matter, and all quality parameters.

RESULTS

Table 2 summarizes yield and select quality results.

Yield

Yields are corrected to a standard 30% dry matter. All yield observations for the variety American Organics 82DP were identified as outliers by quartile analysis. This variety was excluded from all statistical analyses.

There were significant differences in yield (corrected to 30% dry matter) among the hybrids tested ($p < 0.0001$). Figures 1, 2, and 3 show these yield results, with hybrids presented in order of relative maturity. Across all hybrids there was an average corrected yield of 22.2 tons per acre. Hybrids with similar superscripts are not statistically different (Tukey's HSD). There was a significant ($p=0.0013$), but very weak, linear correlation between relative maturity and yield (30% dry matter) ($r^2 = 0.082$) (Figure 4).

Data from BMR (Brown Mid-Rib) varieties are displayed in Table 2. BMR varieties need to be evaluated for their higher digestibility and enhanced animal intake and performance if rations are balanced correctly. When comparing these varieties, producers should make sure they look at NDF digestibility (NDFD, % of NDF). Producers should segregate BMR varieties at harvest to utilize this feed with cows for specific rations, including pre-fresh, fresh and high producing groups.

Table 2. Varieties, yield, and select quality results, non-BMR varieties, 2012.

Hybrid	Maturity	Yield, corrected to 30% DM, tons/acre	Calculated milk yield, lbs/acre*	% Dry matter	% Crude protein	%NDF	%NFC	NEL, Mcal/lb	IVTD 30hr., % of DM**	NDFD, % of NDF
NK N19G 3111	85	21.1	21254	29.1	7.9	38	45.7	0.74	80	48
NK N29T 3111	92	25.0	23927	32.2	7.6	34.5	49.4	0.72	78	36
NK N36A 3000GT	96	19.5	20345	28.1	8.1	39.2	44.2	0.76	82	54
Garst 89A33	85	21.0	19537	34.7	7.6	39.7	44.2	0.7	78	45
Garst 89T43 3111	92	22.9	22823	30.6	8	35.8	47.7	0.74	80	44
Garst 87U28 3111	101	24.7	23377	28.9	7.7	37.3	46.5	0.7	77	39
Blue River 26A17	88	19.4	20784	31.1	7.9	39.6	44	0.77	83	58
Blue River 29B17	89	18.5	17341	31	7.6	39.2	44.6	0.69	77	40
Blue River 34C17	94	23.7	21607	35.6	7.3	35.5	48.7	0.7	78	39
Pioneer P9690HR	95	25.1	24683	33.8	7	39.3	45.1	0.72	80	49
Pioneer P0210HR	107	25.5	24198	27.8	8.2	40.2	43.1	0.7	77	43
Dynagro 51V57	85	22.5	19829	35.3	7.7	40.5	43.3	0.67	76	41
Dynagro D32VP29	92	19.9	21094	30.9	7.8	37.7	46.1	0.77	83	55
Dynagro D39QN29	99	25.6	27807	30.3	8.3	34.7	48.5	0.79	84	54
American Organics 82DP	82	13.4	13421	33.6	8.2	39.9	43.4	0.73	81	52
American Organics vp2P78	85	18.9	19387	29.6	7.8	39.5	44.2	0.75	81	52
American Organics vp3P26	88	19.5	19174	31.3	8.2	39.3	44	0.72	79	47
Blue Seal 861 L GT	86	21.6	20317	30.5	9.7	43.2	39.2	0.7	77	46
Blue Seal 901GT	90	23.0	23645	34.7	8.2	32.7	50.6	0.76	84	50
Blue Seal 942LGT	94	22.1	22287	26.8	7.7	40.1	43.7	0.74	80	51
Masters Choice MC4050	90	21.7	22130	29.9	7.8	36.4	47.3	0.75	81	47
Masters Choice MC4280	92	23.0	22925	31.1	7.9	40.4	43.2	0.73	80	49
Masters Choice MC4560	95	21.0	21600	30.9	8	32	51.5	0.76	82	42
Seedway SW 1994 RR	80	22.2	21878	33.8	8	38.6	44.9	0.73	80	49
Seedway SW 2184 RR	83	19.6	19981	32.9	8.4	37.2	45.8	0.75	81	50

Seedway SW 3688 RRYGCRW	93	21.2	20866	30.8	8.6	34.8	48.1	0.73	79	40
DeKalb DKC37-38	87	24.3	24150	34.9	8.4	32.1	51	0.75	82	45
DeKalb DKC39-07	89	22.8	20537	33.9	7.7	34.7	49.1	0.7	77	33
DeKalb DKC45-51	95	22.4	21827	29.5	7.3	40	44.2	0.71	78	46
Dairyland Stealth 9789 VT3	87	22.8	23585	32.1	7.9	36.6	46.9	0.76	82	50
Dairyland HiDF 3290-9 3000GT	90	21.9	23061	31.7	7.5	36.9	47.1	0.77	83	53
Dairyland HiDF 3702-9 3000GT	102	24.6	24989	28.5	7.7	37.2	46.5	0.75	81	48
Croplan 2520 VT3	85	24.6	27375	32.9	8.5	36.4	46.6	0.8	88	66
Croplan 3080 VT3	90	24.4	25675	31.4	7.8	35.3	48.5	0.77	83	50
Croplan 4819 AS 3000	105	23.0	23734	33.1	7.9	33.1	50.5	0.76	82	47
Nutridense XB12092	92	23.2	25044	30.1	7	37.7	46.8	0.78	84	57
Nutridense XB12093	93	22.9	23852	30.6	8	40.5	43	0.75	82	55
Nutridense XB12094	94	24.4	24027	30.8	7.7	40	43.8	0.72	79	47

*Expected milk yield = Milk lbs/ton multiplied by dry matter. Milk lbs/ton is a projection of potential milk yield per ton of forage dry matter, based on forage digestibility and energy content.

**IVTD 30 hr, % of DM = in vitro true digestibility samples incubated in rumen fluid for 30 hours.

Table 3. Varieties, yield, and select quality results, BMR varieties, 2012.

Hybrid	Maturity	Yield, corrected to 30% DM, tons/acre	Calculated milk yield, lbs/acre*	% Dry matter	% Crude protein	%NDF	%NFC	NEL, Mcal/lb	IVTD 30hr., % of DM**	NDFD, % of NDF
Pioneer P1376XR BMR	113	22.9	25425	22.9	8	40.7	42.8	0.78	86	65
Mycogen F2F343 BMR	92	16.8	18004	28.7	8.3	40.2	43.1	0.77	83	59
Mycogen F2F387 BMR	95	18.8	19983	26.1	8	43.8	39.8	0.76	83	61
Mycogen F2F488 BMR	99	22.4	23606	28.5	7.7	36.9	46.9	0.77	83	53

*Expected milk yield = Milk lbs/ton multiplied by dry matter. Milk lbs/ton is a projection of potential milk yield per ton of forage dry matter, based on forage digestibility and energy content.

**IVTD 30 hr, % of DM = in vitro true digestibility samples incubated in rumen fluid for 30 hours.

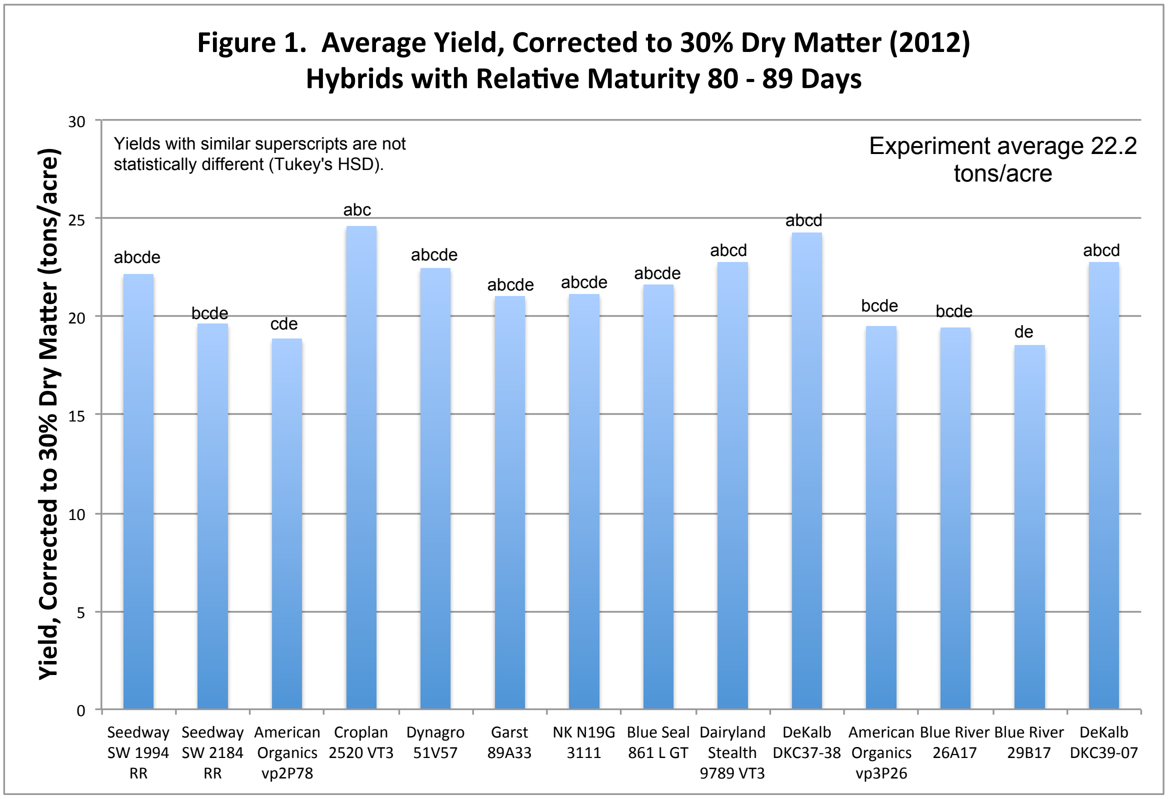
Figure 1. Average Yield, Corrected to 30% Dry Matter (2012)
Hybrids with Relative Maturity 80 - 89 Days
Yield, Corrected to 30% Dry Matter (tons/acre)
Yields with similar superscripts are not statistically different (Tukey's HSD).
Experiment average 22.2 tons/acre
abcde
bcde
cde
abc
abcde
abcde
abcde
abcde
abcd
abcd
bcde
bcde
de
abcd
Seedway SW 1994 RR
Seedway SW 2184 RR
American Organics vp2P78
Croplan 2520 VT3
Dynagro 51V57
Garst 89A33
NK N19G 3111
Blue Seal 861 L GT
Dairyland Stealth 9789 VT3
DeKalb DKC37-38
American Organics vp3P26
Blue River 26A17
Blue River 29B17
DeKalb DKC39-07

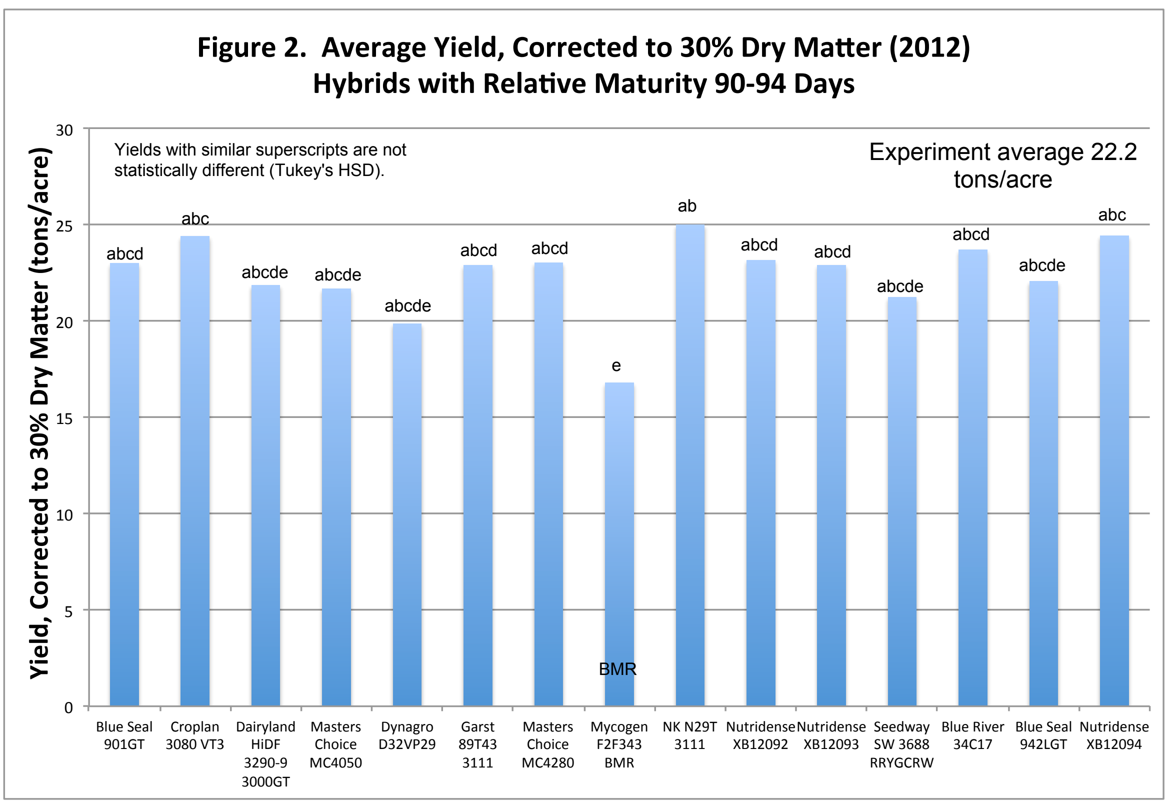
Figure 2. Average Yield, Corrected to 30% Dry Matter (2012)
Hybrids with Relative Maturity 90-94 Days
Yield, Corrected to 30% Dry Matter (tons/acre)
Yields with similar superscripts are not statistically different (Tukey's HSD).
Experiment average 22.2 tons/acre
abcd
abc
abcde
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abcde
abcd
abcd
e
ab
abcd
abcd
abcde
abcd
abcde
abc
BMR
Blue Seal 901GT
Croplan 3080 VT3
Dairyland HiDF 3290-9 3000GT
Masters Choice MC4050
Dynagro D32VP29
Garst 89T43 3111
Masters Choice MC4280
Mycogen F2F343 BMR
NK N29T 3111
Nutridense XB12092
Nutridense XB12093
Seedway SW 3688 RRYGCRW
Blue River 34C17
Blue Seal 942LGT
Nutridense XB12094

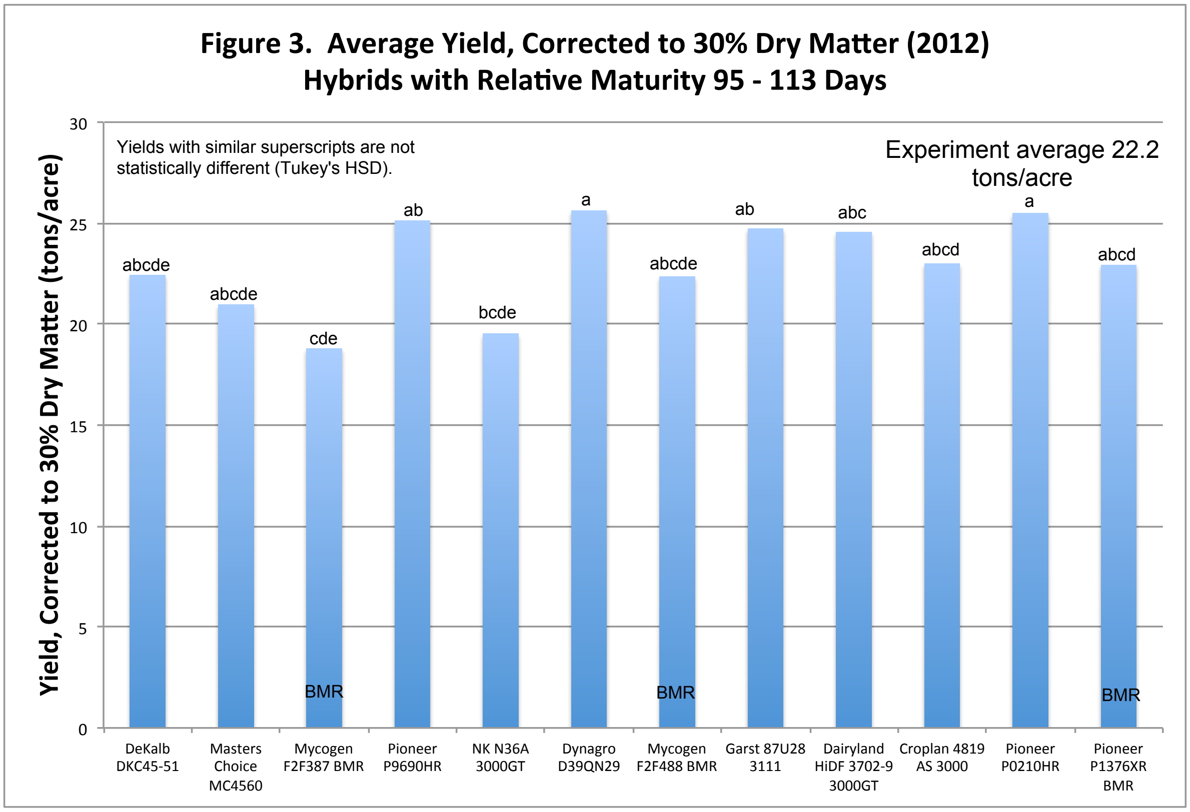
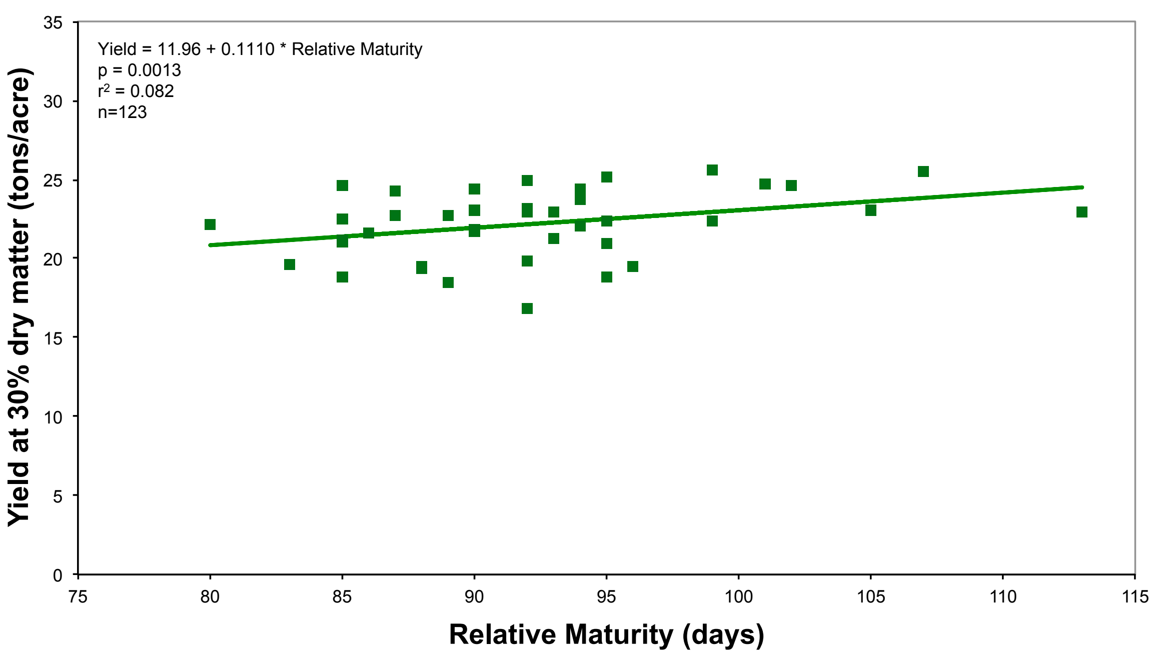


Figure 4. Effect of Relative Maturity on Corn Silage Yield (corrected to 30% DM) (2012)



Expected Milk Yield

Forage digestibility and energy content were used to project potential milk yield (milk lbs/ton of dry matter). Expected milk yield per acre was calculated by multiplying the potential milk per ton of dry matter by the tons of dry matter per acre. This serves as another measure of productivity of each hybrid. All expected milk yield observations for the variety American Organics 82DP were identified as outliers by quartile analysis. This variety was excluded from all statistical analyses.

There were significant differences in expected milk yield among the hybrids tested ($p < 0.0001$). Figures 5, 6, and 7 show these results. The hybrids are presented in order of relative maturity. Across all hybrids there was an expected milk yield of 22,382 pounds per acre. Hybrids with similar superscripts are not statistically different (Tukey's HSD). There was a significant ($p<0.0001$) linear correlation between relative maturity and expected milk yield ($r^2 = 0.126$) (Figure 8).

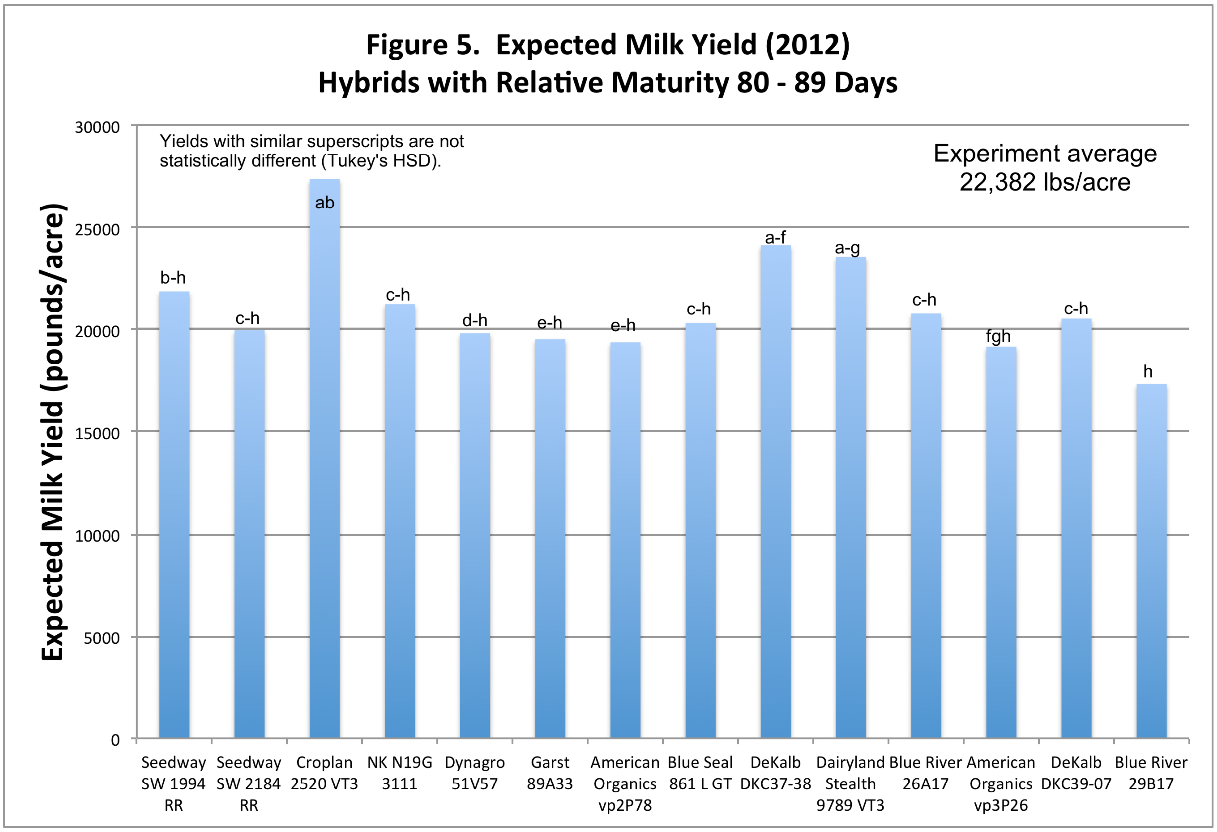


Figure 5. Expected Milk Yield (2012)
Hybrids with Relative Maturity 80 - 89 Days
Expected Milk Yield (pounds/acre)
30000
25000
20000
15000
10000
5000
0
Yields with similar superscripts are not statistically different (Tukey's HSD).
Experiment average 22,382 lbs/acre
b-h
c-h
ab
c-h
d-h
e-h
e-h
c-h
a-f
a-g
c-h
fgh
c-h
h
Seedway SW 1994 RR
Seedway SW 2184 RR
Croplan 2520 VT3
NK N19G 3111
Dynagro 51V57
Garst 89A33
American Organics vp2P78
Blue Seal 861 L GT
DeKalb DKC37-38
Dairyland Stealth 9789 VT3
Blue River 26A17
American Organics vp3P26
DeKalb DKC39-07
Blue River 29B17

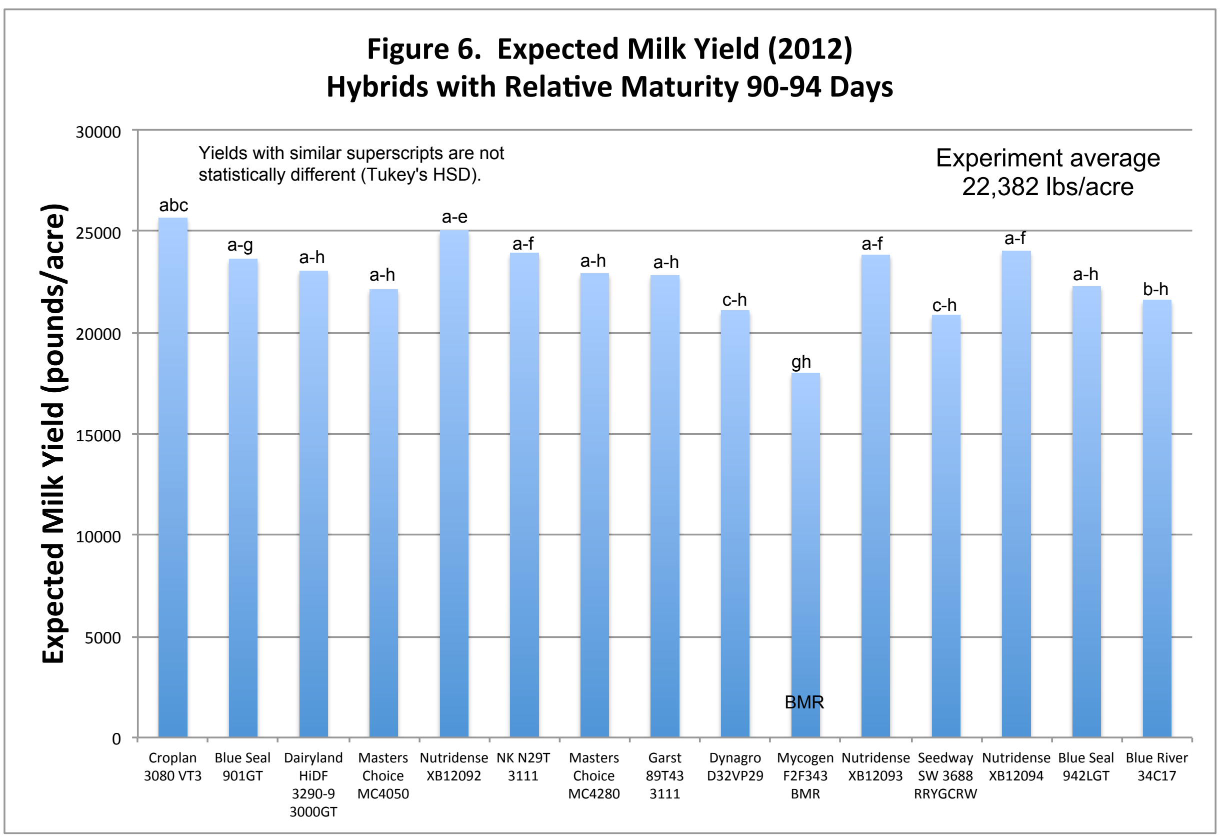


Figure 6. Expected Milk Yield (2012)
Hybrids with Relative Maturity 90-94 Days
Expected Milk Yield (pounds/acre)
30000
25000
20000
15000
10000
5000
0
Yields with similar superscripts are not statistically different (Tukey's HSD).
Experiment average 22,382 lbs/acre
abc
a-g
a-h
a-h
a-e
a-f
a-h
a-h
c-h
gh
a-f
c-h
a-f
a-h
b-h
BMR
Croplan 3080 VT3
Blue Seal 901GT
Dairyland HiDF 3290-9 3000GT
Masters Choice MC4050
Nutridense XB12092
NK N29T 3111
Masters Choice MC4280
Garst 89T43 3111
Dynagro D32VP29
Mycogen F2F343 BMR
Nutridense XB12093
Seedway SW 3688 RRYGCRW
Nutridense XB12094
Blue Seal 942LGT
Blue River 34C17

Figure 7. Expected Milk Yield (2012)
Hybrids with Relative Maturity 95 - 113 Days

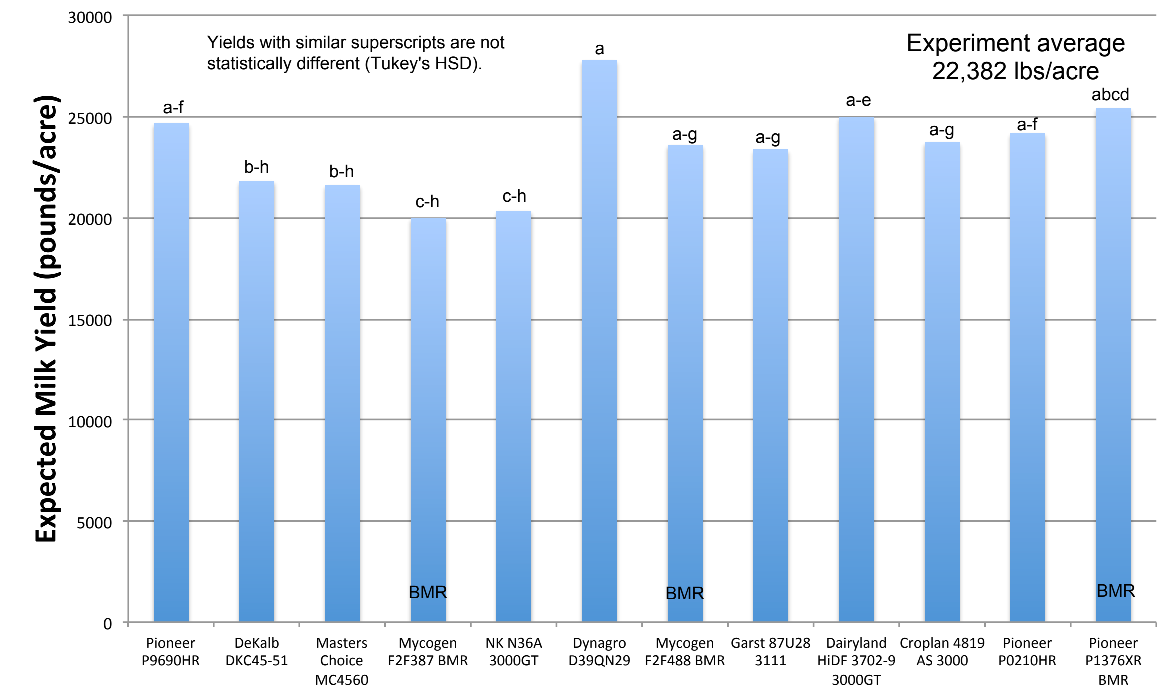
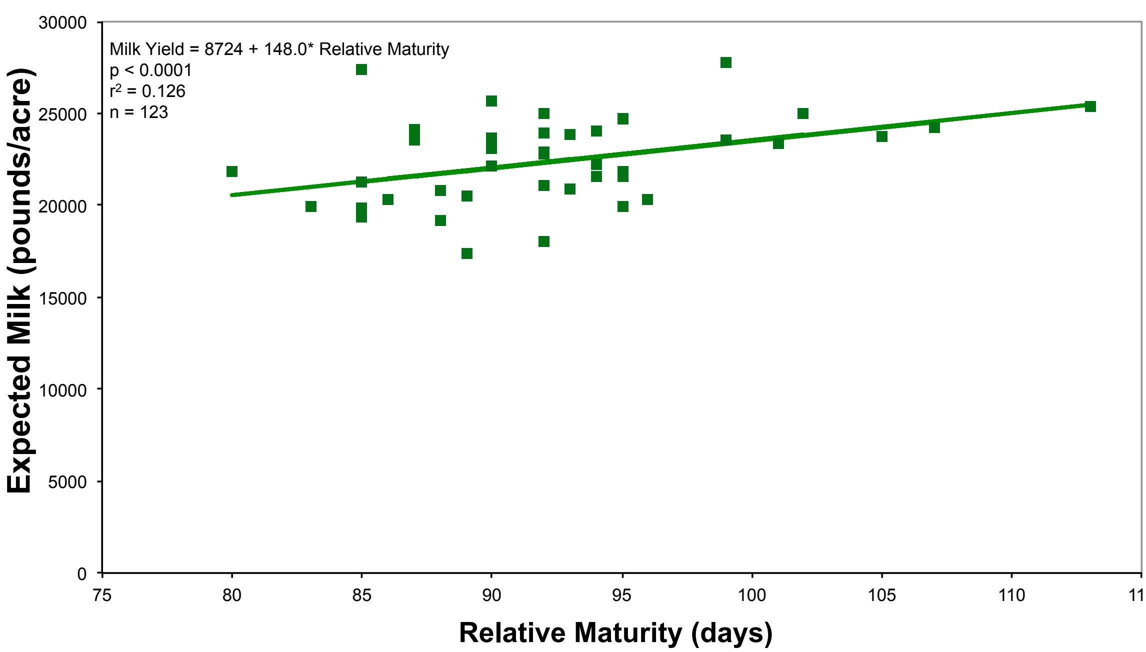


Figure 8. Effect of Relative Maturity on Expected Milk Yield Per Acre (2012)

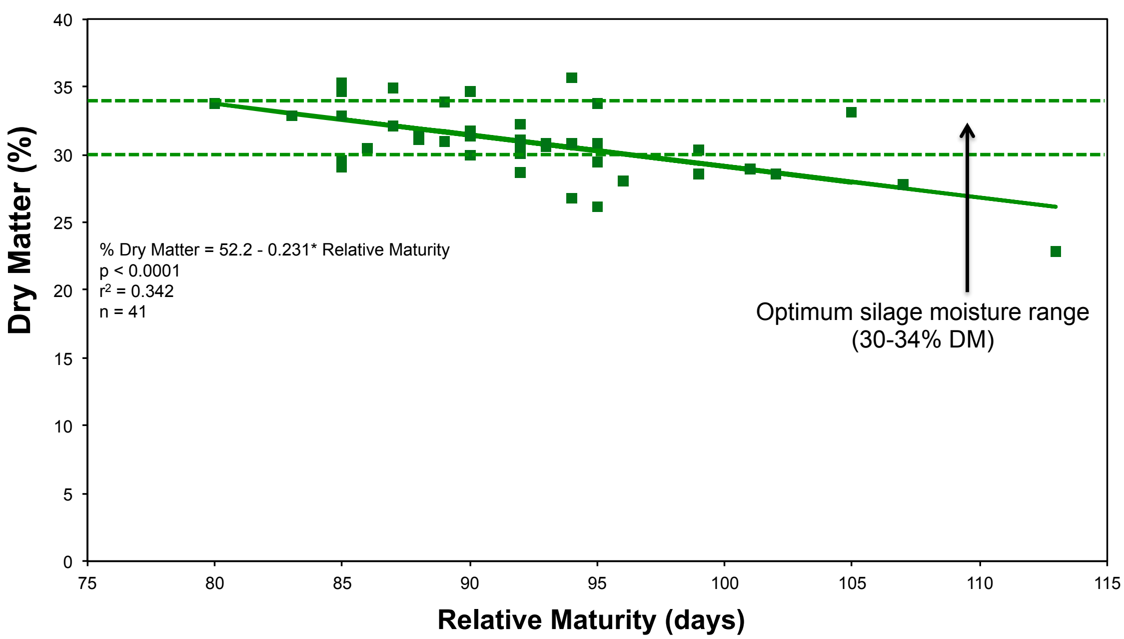


Quality

Dry matter decreased as relative maturity increased, as shown in Figure 9. There was a significant linear effect, and this relationship explained a moderate amount of variability in the data ($r^2 = 0.342$). In 2012, early-maturing varieties tended to be at optimum or higher dry matter; later-maturing varieties tended to be below optimum dry matter; mid-maturing varieties tended to be at or below optimum dry matter.

There were no significant linear relationships between relative maturity and any quality parameters, including net energy of lactation, digestibility (IVTD 30 hr (as % of dry matter) and NDFD (as % of NDF)), or % crude protein.

Figure 9. Effect of Relative Maturity on Dry Matter (2012)



CONCLUSION

2012 was an interesting year for silage corn production in Maine. While early May provided some decent planting conditions, late May and early June were extremely wet. Our plots were planted before the heavy rains and cool weather, but emergence was slow and early growth was delayed. The total growing degree days recorded was 2160--another year with a high total. Plots never displayed any drought stress, despite extended periods between rain storms. Corn harvest was conducted before any frost occurred, and many of the varieties reached the optimum harvest moisture of between 30% and 34% dry matter. Growers who did not capture the May planting window experienced substantial yield losses due to delayed planting in mid- to late June or even later.

In 2012, there were both differences among hybrids and a significant (but very weak) linear effect of relative maturity on yield corrected to 30% dry matter, with higher yield with later-maturing hybrids. This linear correlation indicated a 1.1 ton/acre increase in yield (30% dry matter) for every additional 10 days of maturity. Results of this linear regression analysis from all years of the trial are shown in Table 4. Although these relationships are weak (low r^2), they are consistent. Note that in 2009 there was no significant linear correlation between relative maturity and yield.

Table 4. Increase in yield (30% dry matter) and expected milk yield for each 10 days increase in relative maturity as estimated by linear regression (2007 – 2012).

	Tons/acre yield (30% DM) increase per 10 days maturity	**Pounds/acre milk yield increase per 10 days maturity**
2007	1.1	.
2008	0.97	.
2009	No relationship	91
2010	1.9	2890
2011	2.0	3280
2012	1.1	1480

In 2012, there were significant differences in expected milk per acre yield among hybrids. The linear relationship between expected milk yield per acre and relative maturity was significant, with longer-maturity hybrids having greater yield. This linear correlation indicated 1480 pounds/acre increase in expected milk yield for every additional 10 days of maturity. Expected milk yield has been calculated since 2009, and a significant linear relationship has been found in each year. The estimated increase in milk yield is shown in Table 4.

Although the shorter season hybrids appear to be slightly less productive in a single growing season, they offer options for improved cover crop establishment and the potential for double cropping. This can significantly improve the total yield of digestible nutrients per acre. Producers must also evaluate risk associated with choosing longer season hybrids for higher yield. While we did see a yield response to increased relative maturity, that response was greatest in the best growing years, and it was not present under poor growing conditions. By choosing short-season or mid-season varieties, producers help to guarantee a level of maturity and dry matter that produces quality corn silage that ferments well in the silo. They become less vulnerable to late wet harvest years. This also opens the door for improved nutrient and soil management options such as cover cropping.

Most early- and mid-maturing hybrids showed optimum or close to optimum dry matter content at harvest time. However, a number of later-maturing hybrids (later than 94 days relative maturity), had lower than recommended dry matter content at harvest. In all six years of the trials there has been a significant linear relationship between relative maturity and dry matter, with later-maturing hybrids being significantly wetter at harvest. In 2010 and 2011, hybrids with shorter maturities showed higher dry matter content than recommended, indicating that they could have been harvested earlier. Dry matter in 2012 was close to recommended levels, except for the later-maturing varieties.

As in previous years, in 2012 there were no other notable significant effects of relative maturity on quality parameters.

ACKNOWLEDGEMENTS

We would like to thank John Stoughton and the farm crew at Misty Meadows Farm for their help with planting, crop management, and harvest. Thanks are also extended to the seed dealers who helped with seed donation, planting, and harvesting and to staff and students who helped in the field and in the office.