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Corn Silage Hybrid Selection Considerations: Relative Maturity and Traits

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There is often discussion about the advantages of longer season corn hybrids and "pushing the envelope" for your growing region in an attempt to maximize yield. For silage growers the pros and cons of this are much more nuanced than they may be for grain.

Yield

Yield is a good example of the need to recognize influence of long term trends and seasonal variability. Bill Cox, Professor Emeritus Cornell University, reported that when averaging hybrid performance data over several growing seasons, yield is increased by 0.5 tons/acre (35% DM) for each 5 day increase in relative maturity (RM)[1]. On the surface this would support the idea of pushing day length when selecting hybrids. However, year to year and location to location variability has a very strong influence here. Planting date, weather conditions at pollination and the ability of the crop to reach maturity before a frost all play a significant role here. In any given growing season and at any given location it is quite common to see shorter season hybrids (both individual hybrids and relative maturity ranges) outperform longer season hybrids.

In the tables below we see some data from trials performed between 2005 and 2009 and then we see the last two years of data from the current NY & VT Corn Silage Hybrid Evaluation Program[2]. In both cases you can quickly see shorter season RM groups (and even shorter season locations) out yielding longer season material. There can certainly be

Avearge Corn Silage Yields by Maturity Group
NYS Corn Silage Hybrid Trials, Cornell

Site Location	Year	2005	2006	2007	2008	2009
	Relative Maturity	Average Corn Silage Yield Yield (35 % DM)				
	days	tons/acre				
Madrid, NY	74 - 85	26.6	28.2	27.4	-	-
	80 - 89*	**29.8**	**31.1**	**28.0**	**25.0**	**22.5**
	90 - 95	29.3	29.8	27.5	26.0	24.2
	96 - 100	**30.7**	**29.9**	**28.5**	**26.4**	**24.4**
Chazy, NY *2008 = Sackets Harbor, NY Site	74 - 85	23.1	20.5	23.1	-	-
	80 - 89*	**24.3**	**22.3**	**25.2**	**24.9**	**19.3**
	90 - 95	24.2	22.2	24.1	26.1	19.8
	96 - 100	**24.2**	**23.1**	**24.4**	**27.2**	**20.3**
Aurora, NY	94 - 100	20.9	27.3	22.6	29.0	24.7
	101 - 105	**20.6**	**28.0**	**22.7**	**30.5**	**25.8**
	106 - 110	22.3	28.9	22.5	31.5	26.3
	111 - 115	**23.2**	**28.5**	**23.6**	**31.1**	**28.7**
Groveland Station, NY	94 - 100	24.7	27.8	26.6	24.8	27.1
	101 - 105	**24.6**	**28.1**	**27.1**	**26.3**	**28.3**
	106 - 110	22.9	28.6	28.5	27.1	29.4
	111 - 115	**23.5**	**30.6**	**28.0**	**27.0**	**29.3**

* This was an 86-90 day relative maturitry range in 2005,2006 & 2007

Location	2017			2018		
	Relative Maturity Days	Average Yield, tons/acre	Dry Matter %	Relative Maturity Days	Average Yield, tons/acre	Dry Matter %
Albion, NY	85-91	24.4	31.4	86-92	19.0	37.1
	92-96	25.9	30.3	93-95	19.6	35.0
Willsboro, NY	85-91	18.8	31.8	86-92	18.5	35.5
	92-96	20.3	30.8	93-95	18.4	34.5
Alburgh, VT	85-91	27.5	32.3	86-92	18.8	33.9
	92-96	27.5	31.4	93-95	17.8	32.7
Aurora, NY	94-100	26.3	33.1	96-102	21.3	39.9
	101-105	26.1	31.8	103-110	22.0	36.6
	106-110	25.5	30.1			
Madrid, NY	94-100	31.7	37.5	96-102	28.2	33.9
	101-105	31.7	35.1	103-110	28.7	32.0
	106-110	32.6	31.8			
Alburgh, VT	94-100	28.4	33.3	96-102	23.1	35.6
	101-105	27.6	33.2	103-110	23.5	34.1
	106-110	28.4	31			

large hybrid to hybrid differences within these groups but that is the point, the internal variability in any given year can be more important than the longer term trends. It is also important to recognize the statistical significance of these differences. In the 2018 trials the least significant difference (LSD, smallest difference that indicates two hybrids were significantly different from each other) ranged from 1.6 tons/acre to one location where there was no significant differences between any hybrids (variability was so great that no numerical differences was statistically significant).

A long standing recommendation is to plant 50-60% of acres to the relative maturity range best suited for your area and split the balance of acres between hybrids that are slightly shorter and longer season. What constitutes the relative maturity range best suited for your area may change over time and be influenced by other management considerations such as the desire to cover crop or double crop.

Forage Quality

Now let's thinks about the impacts of harvesting in the mud, harvesting frosted corn and trying to store wet or immature silage on forage quality. Using the 0.5 tons/acre increase in yield for each 5 days increase in RM, 0.5 tons/acre represents approximately 2.8% of an 18 ton/acre (35% DM) corn silage yield.

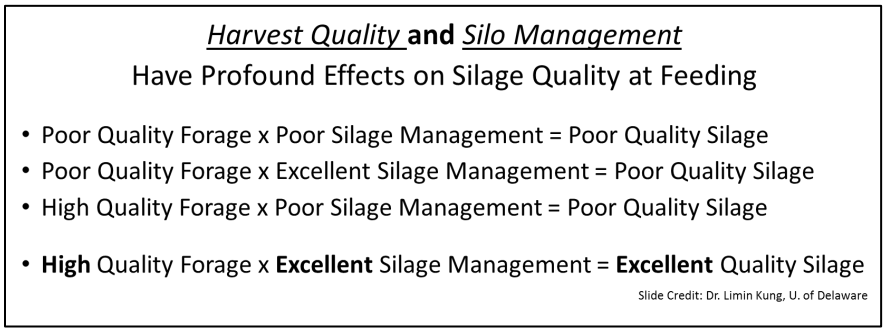
Mud – On average raising the cutting height by six inches cost you 1 ton/acre (35% DM) or 5.5% of 18 tons/acre[3]. This may be a strategic management decision to improve forage quality in years of exceptional yield; however, being forced to leave extra stalk in the field due to challenging harvest conditions can quickly negate any potential gains in yield from that longer season hybrid. There are also feed hygiene issues related to harvesting in these conditions.

Wet Silage – Wet silage is not high quality forage and can significantly challenge silage management. Fermentation and storage losses have received more attention in recent years; however, they are still a largely hidden cost. Normal (proper) fermentation can reduce dry matter tons by 8 to 10%. Additional dry matter losses resulting from less than ideal fermentation and challenging storage conditions can quickly eclipse the potential 2.8% gain from a longer season hybrid.

These examples are simply negating the actual tonnage that could be realized from this potential yield increase say nothing about the impact of lower quality forage on animal performance and total feed cost.

Frost – It is hard to quantify the impact of frost on actual yield but it can have a significant impact on starch levels, dry matter at harvest and fermentation.

Proper silo management (high density, excluding oxygen, inoculants) is very important; however, as these equations for *Quality Feed* show, none of them are remedies for low quality forage.



Hybrid Genetics & Pest Protection

A few misconceptions are often repeated regarding conventional and shorter season hybrids falling behind longer season hybrids in genetic improvement, disease tolerance, etc. The genetic lines used to develop new hybrids do carry certain strengths and weaknesses. With conventional breeding techniques there are some cases where a negative characteristic being carried along with a desired characteristic is unavoidable. BMR corn is a prime example, while BMR has a number of merits, it is recognized to have some deficiencies in stress and disease tolerance. A consideration that is understood and can be managed if the benefits of the crop fits your overall management goals.

Understanding these strengths and weaknesses is key to deciding if they can be managed on your farm and if they are worth managing in a tradeoff with the desired characteristics; however, any given strength or weakness is not more common in corn hybrids based on their relative maturity or status as a conventional or genetically engineered hybrid.

All else being equal, modern conventional hybrids have the same genetic potential as their genetically engineered (GE or GMO) counterparts. What GE traits (herbicide tolerance, insect resistance, drought tolerance) have offered us is a way to help *close the gap between the yield potential of a hybrid and the actual yields achieved*[4]. In other words, GE traits can help a plant overcome stressors that may otherwise prevent it from achieving its genetic potential and are of use ***when*** those stressors are expected to be present in the field.

To date, disease tolerance in corn hybrids is achieved through screening and natural breeding techniques. Disease tolerance can vary greatly by hybrid, and the specific disease, based on the genetic lineage of the hybrid. Corn breeders devote a great deal of time to screening for disease tolerance and most seed companies have rating systems for the most common diseases. If certain diseases are very prevalent in your area, understanding these ratings becomes even more important in the decision process.

Considerations for Silage Hybrid Selection

- Relative Maturity Matches Growing Season
- Forage quality characteristics that complement feeding goals and other feeds available Pest protection package to match
  - crop rotation, and
  - prevalence of specific pest (weeds, insects, diseases) in region

For the reasons outlined above, in some cases a hybrid may come to market with a weakness in one area but its strengths were determined to be valuable enough to justify its continued development. This is true of hybrids across the range of relative maturities and trait packages available and is why it is important to spend time understanding the potential strengths and weaknesses of any given hybrid you are considering for your farm as it relates to the unique needs of your operation.

References

[1]How Does Hybrid Relative Maturity Affect Corn Silage Yields and Moisture Levels in Central/ Western New York? Bill Cox, Phil Atkins, Cornell University. What's Cropping Up? Vol. 18 No. 5 https://scs.cals.cornell.edu/sites/scs.cals.cornell.edu/files/shared/documents/wcu/WCU18-5.pdf

[2]NY & VT Corn Silage Hybrid Evaluation Program https://scs.cals.cornell.edu/extension-outreach/field-crop-production/variety-trials/#corn-silage

[3]Considerations in Managing Cutting Height of Corn Silage, Penn State University https://extension.psu.edu/considerations-in-managing-cutting-height-of-corn-silage

[4](NASEM) National Academies of Sciences, Engineering, and Medicine. 2016. Genetically Engineered Crops: Experiences and Prospects. Washington, DC: The National Academies Press. https://doi.org/10.17226/23395