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Corn Silage Yield and Quality Changes Over Time

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Wisconsin dairy farmers produce more corn (*Zea mays* L.) silage than any other state in the U.S. A University of Wisconsin corn silage research consortium evaluated corn hybrids and found that the range for NDF and digestibility among commercial hybrids is narrow, but more importantly, yield and quality differences among corn hybrids were repeatable (Coors, 1996). In 1995, an extension program was begun to evaluate commercial corn hybrids for silage yield and quality traits. Desirable corn hybrids should have traits that include high dry matter yield, high energy content (high digestibility), high intake potential (low fiber), optimum dry matter content at harvest for acceptable fermentation and storage, and high protein content (Carter et al., 1991). Predicting animal performance and relating it to corn silage quality improvements whether from breeding or management is complex. Differences in fiber and digestibility translate into differences in animal performance (Bal et al., 2000).

Our objective was to describe corn silage yield and quality changes over time of representative cultivars used by farmers in the northern Corn Belt. Data from the last 15 years of the UW Corn Silage Evaluation program were used to represent the most recent era.

In the study by Lauer et al. (2001) a total of 36 cultivars were used: six open-pollinated cultivars used prior to 1930, 24 cultivars representing four 15-yr eras between 1931 and 1989, and six modern cultivars. Cultivars were divided into early- and late-maturity trials and grown at Arlington, Fond du Lac, Marshfield during 1997 and 1998.

In the UW silage evaluation program, corn hybrids are evaluated in a randomized complete block with three replications at 2 to 3 locations in a production zone. Whole-plant plots are harvested using

a one-row chopper (New Holland 707) and weighed using a custom electronic system. Plot weight and moisture content are measured, and yield is adjusted to dry matter.

Corn silage yield

Since the development of hybrid corn in 1930, corn grain and silage yields have steadily increased. Since 1996, corn grain yield has increased at the rate of 1.9 bu/A yr in Wisconsin (Figure 1). Corn silage yield has increased at the rate of 0.21 T/A yr.

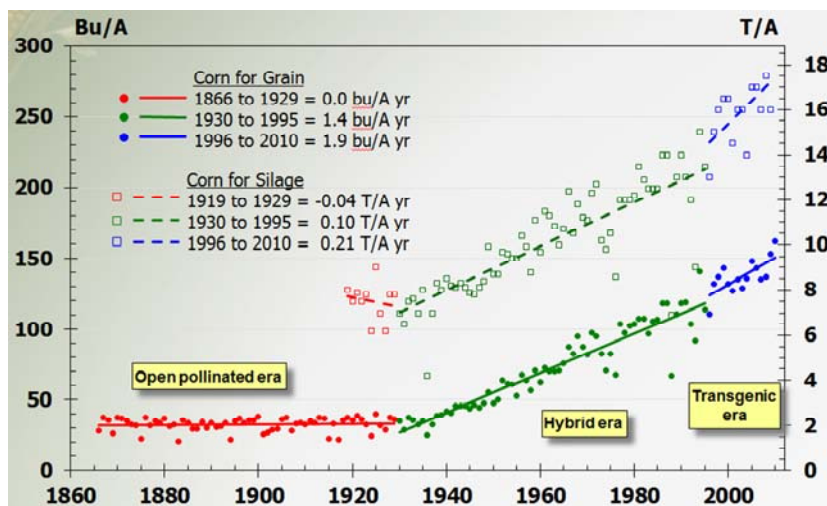


Figure 1. Corn grain and silage yield in Wisconsin since 1866, Source: USDA-NASS.

What is an average corn silage hybrid in Wisconsin?

Table 1 describes an average hybrid in Wisconsin. One GxE equals the 3 rep average of a hybrid grown at a location. Overall, an average corn silage hybrid yields 8 T DM/A, and has 47% NDF, 58% NDFD and 30% starch content. Normal hybrids (those without transgenic traits) are similar to the average hybrid and to hybrids with transgenic traits. Brown midrib hybrids yield 1.6 T DM/A lower than an average hybrid due to lower grain yield (i.e. starch content), but have higher NDFD resulting in greater than average forage quality

as measured by Milk per Ton. Leafy hybrids tend to have lower starch content than an average hybrid.

Table 1. Yield quality of corn silage hybrids in Wisconsin. Averages are derived from the UW Corn Silage Evaluation program (N= 266 trials and 21,420 GxEs).

Trait(s)	GxE	Forage yield		NDF	NDFD	Starch	Milk2006	
		N	T DM/A				%	%
Normal	3398	7.8	47	59	30	3100	25000	
Bmr	126	6.4	48	67	26	3300	21000	
Leafy	240	8.1	48	59	27	3100	25000	
CB	736	8.1	46	59	31	3100	26000	
RR	339	7.8	47	58	30	3100	24000	
CB,LL	331	8.2	47	59	30	3100	26000	
CB,RR	395	8.0	46	59	32	3100	25000	
CB,RW,RR	891	7.9	46	58	32	3100	25000	
LSD(0.05)		0.6	2	1	4	100	2000	
Average	7403	8.0	47	58	30	3100	25000	

Corn silage yield and quality changes over time

Whole plant yield has increased 0.76 T DM/A year while stover yield has increased 0.25 T DM/A year (Figure 2). Corn silage yield measured in the UW silage Trial program over the last 15 years is on the trendline compared to the previous eras.

Whole-plant NDF decreased at 1.3% per era, but over the previous 15 years NDF has increased slightly. Whole-plant *in vitro* digestibility has increased 0.83% per era and data from the previous 15 years indicates that digestibility continues to increase at the same rate.

There is no relationship for whole-plant NDFD and era of release and the trend continues although there has been an increase likely due to the inclusion of bmr

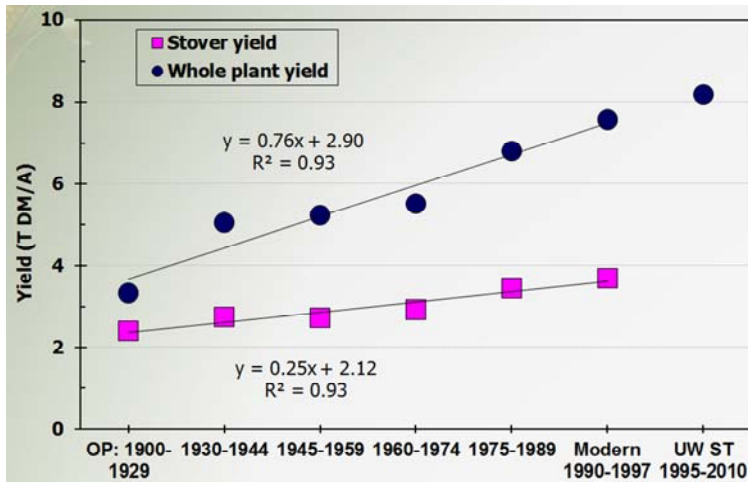


Figure 2. The relationship between era of release and whole-plant yield.

hybrids in the UW Silage Trial program. Starch content has increased 2.18% per era and the trend is continuing.

Milk yield as measured by Milk2006 has increased 2770 lb milk/A per era while Forage quality has increased 83.9 lb milk/T per era. These trends are continuing.

References

Bal, M.A., R.D. Shaver, H. Al-Jobeile, J.G. Coors, and J.G. Lauer. 2000. Corn Silage Hybrid Effects on Intake, Digestion, and Milk Production by Dairy Cows. *J Dairy Sci* 83:2849-2858.

Carter, P.R., J.G. Coors, D.J. Undersander, K.A. Albrecht, and R.D. Shaver. 1991. Corn hybrids for silage: an update. In Wilkinson D. (ed.) Proc. of 46th Annual Corn & Sorghum Research Conference, Chicago, IL. 11-12 Dec. 1991, American Seed Trade Association, Washington D.C.:141-164.

Coors, J.G. 1996. Findings of the Wisconsin corn silage consortium. Pages 20–28 in Proc. Cornell Nutr. Conf. Feed Manuf., Syracuse, NY. Cornell Univ., Ithaca, NY.

Lauer, J.G., J.G. Coors, and P.F. Flannery. 2001. Forage yield and quality of corn cultivars developed in different eras. *Crop Sci.* 41:1449-1455.

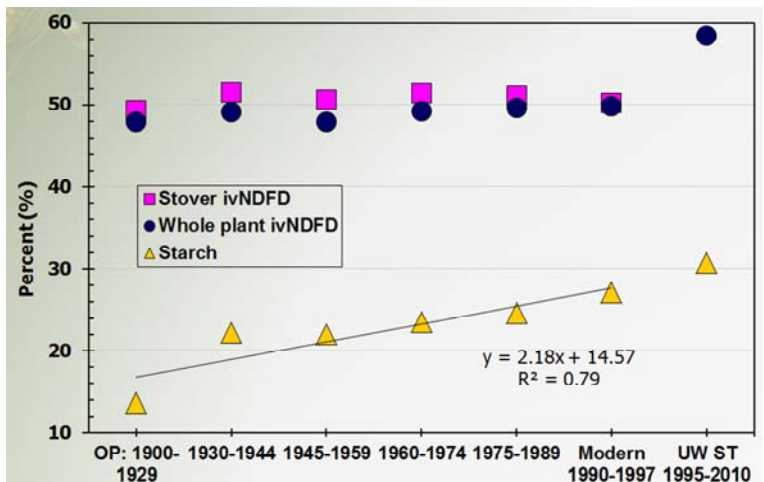


Figure 3. The relationship between era of release and ivNDFD and starch content.