Update of Seed Corn Hybrids for Producing Highly Digestible Corn Silage

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Can you believe corn silage harvest season is fast approaching? Where has the summer gone? As you are getting your equipment (e.g., trucks, chopper, bunker, silo) ready for the upcoming harvest and organizing what fields should be harvested first or last, you probably haven't given much thought to the question of *'what will the quality of corn silage be this season'?*

Actually, the quality of corn silage you harvest this season was partially determined by a buying decision that you probably made in November or December of 2013. That decision was the type of corn hybrid that you purchased for planting this spring. Soon you'll know the answer to the question - *did I choose the right corn silage hybrid for my cattle?* This will be determined after the completion of the fall 2014 corn silage harvest and when the sample results are back from the lab.

During my professional career as a Dairy Cattle Nutritionist, I have had great interest in the production of highly digestible forages. The basis for a high conversion of feed into milk or meat is the use of highly digestible forages. This ensures the lowest feed cost to produce milk/meat on a cost per cow per day, income over feed cost, or cost to produce a cwt of milk/meat.

In the spring of 2013, we embarked on a research project to evaluate seed corn hybrids for yield of corn silage and forage digestibility that would be a specific benefit to livestock producers. This was a plot-type experiment conducted at the Volga, SD, Agricultural Research Station. The seed corn hybrids were planted in 3 replications of 45 different hybrids. Corn plants were harvested by hand cutting in the fall, chopped, and ensiled in 5 gallon plastic buckets. Buckets were stored for 90 days or more to ensure the ensiling process was complete. Buckets were weighed, opened, and samples submitted to a commercial laboratory for measurements of nutrient composition and digestibility of dry matter (DM) and neutral detergent fiber (NDF). This project was expanded later in the fall to include measurements of grain yield along with starch hardness and digestibility. In addition, corn stalks were weighed, chopped, and submitted for nutrient analyses and digestibilities to evaluate corn hybrids following grain harvest as a source of nutrients for beef cattle grazing corn stover. This project has grown in size and scope with a lot of data to summarize which will be of value to several different livestock producer groups.

Table 1 contains a preliminary summary of information on the nutrient composition and DM digestibility and fiber of these 45 hybrids harvested for corn silage. All seed corn hybrids used in this plot experiment are considered grain hybrids. This year (2014), we have expanded the project to include the evaluation of seed corn hybrids that are specific for corn silage production.

Seed corn hybrid had a considerable effect on DM concentration of the silage due to the differences in maturity, but harvesting was completed within 3 days without regard for DM content. One of the challenges that will be addressed this year will be to harvest corn silage at the appropriate DM content of 35%. This will require us to spread the harvest window over several days to match maturity while monitoring DM content as the corn plant begins to dry down.

Table 1. Nutrient composition and nutrient digestibility of 45 corn hybrids grown for silage at Volga, SD, in 2013.

Nutrient[1]	Minimum	Maximum	Average
Dry Matter, %	27.5	57.7	39.1
Crude Protein, %	6.29	11.42	7.92
NDF, %	31.2	60.5	40.6
Hemicellulose, %	11.7	24.0	16.8
ADF, %	17.7	36.5	23.9
Cellulose, %	16.0	32.1	21.5
Lignin, %	1.6	4.4	2.4
Starch, %	15.6	43.3	33.1
DMD, %	56.6	77.6	69.8
NDFD, % of NDF	34.7	53.0	44.4
DNDF, %	11.8	24.1	18.0
Lactic acid, %	0.2	6.11	3.2
Acetic acid, %	0.0	2.1	0.8

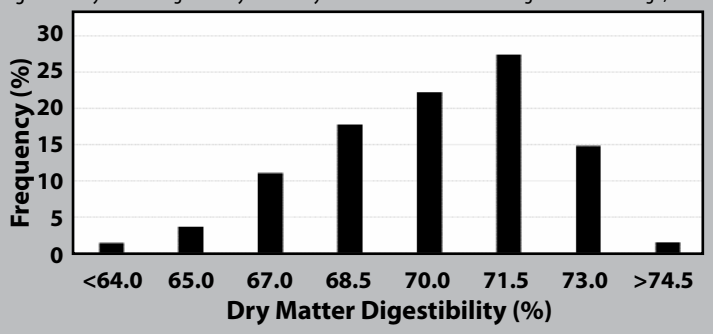
[1]*All values are based on 100% dry matter, unless indicated otherwise.*

Certain corn hybrids are known to produce corn silage with higher protein content than other seed corn hybrids. While corn silage is expected to be more of an energy and forage source compared to a protein source, the higher protein content will reduce the need for supplemental soybean meal to meet the animal's protein requirements. Soybean meal has been rather expensive over the past year (i.e., $500/ton).

The range in the various fiber fractions (NDF, ADF, Hemicellulose, Cellulose, and Lignin) are quite considerable across this data set. Certain seed corn hybrids are known to produce corn plants with greater standability for harvesting later in the season, however, that could increase fiber content and reduce digestibility. Again, keep in mind that these are grain hybrids and fiber concentrations would be expected to be higher than silage specific seed corn hybrids.

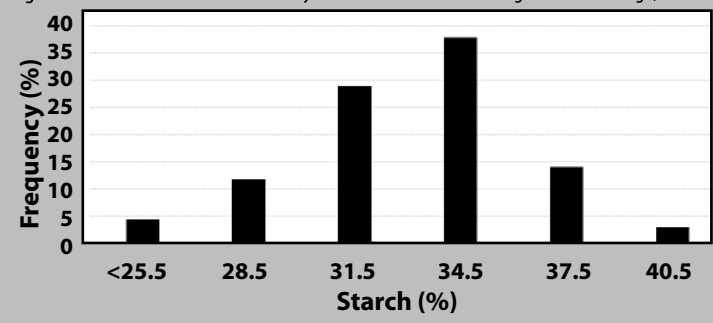
One of the more important characteristics of corn silage that has been receiving considerable attention in recent years is the digestibility of dry matter (DMD) and NDF digestibility (NDFD as a % of NDF). The reason is that it takes 0.5 lb of DMD to make 1 lb of milk, thus, the higher the DMD of corn silage, the more milk potential that corn silage has. While Table 1 lists the range in DMD, Figure 1 highlights the frequency distribution of DMD. Figure 1 indicates that DMD is skewed to the lower side of the graph, but it is possible to find those seed corn hybrids that are more digestible with high grain yields.

Figure 1. Dry matter digestibility of corn hybrids harvested for corn silage in 2013 at Volga, SD.



One of the other factors that can be correlated with DMD is the starch content of the corn silage. Table 1 gives the ranges in starch concentration. The average is 33.1%, which is very similar to other data published to date. However, Figure 2 presents the frequency distribution of starch concentrations in these corn silage samples and demonstrates that high starch contents are possible. High starch concentrations in corn silage, while being a great energy supply to meet the animal's energy requirements, would be a benefit to livestock producers in those years when corn prices are very high (i.e., $7/bushel).

Figure 2. Starch concentration of corn hybrids harvested for corn silage in 2013 at Volga, SD.



One of the issues in meeting the energy requirements for high milk production with high feed efficiency reducing the cost to produce milk or meat is digestible fiber. The point is that we can only feed so much corn and fat to an animal before it becomes a health issue. Thus, the last meaningful approach to increase energy intake by livestock is through the concept of digestible fiber. Table 1 lists the ranges and averages for digestible fiber through the common measurement of NDFD, which is based on the digestible NDF per unit of NDF. However, I like to express digestible fiber as DNDF, which is the amount of digestible NDF per unit of DM. This makes comparisons much easier, since the differences in NDF content are accounted for in conjunction with NDF digestibility. Figure 3 presents the frequency distribution of NDFD (common measurement) within these corn hybrids, however, Figure 4 gives the amount of DNDF per unit of DM. If digestible fiber is an extremely critical source of energy for livestock, this data demonstrates the considerable variation among seed corn hybrids. Therefore, selecting those seed corn hybrids that are higher in digestible fiber will result in meeting the animal's energy requirements without excessive use of corn grain. This will reduce the cost to produce milk or meat.

Figure 3. NDF digestibility of corn hybrids harvested for corn silage in 2013 at Volga, SD.

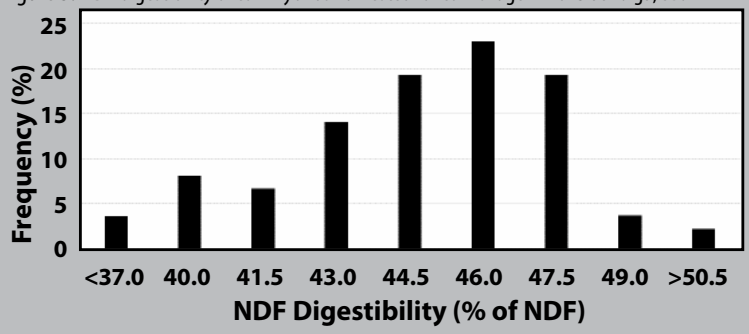
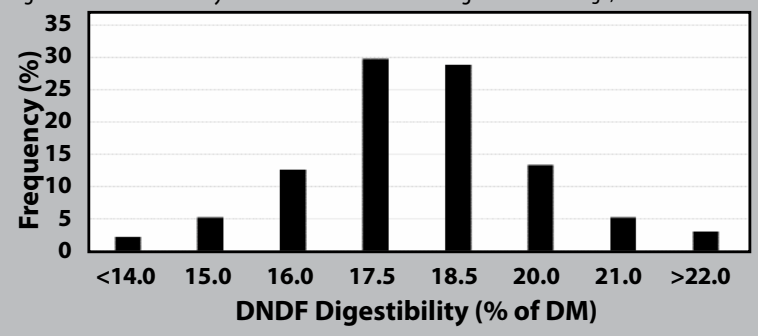


Figure 4. DNDF of corn hybrids harvested for corn silage in 2013 at Volga, SD.



We have much work to complete in order to fully summarize this data and provide recommendations to livestock producers. However, as you approach corn silage harvest season, be thinking about maintaining the quality and digestibility of the corn silage you harvest and be prepared to evaluate seed corn hybrids later this winter to improve the nutrient supply to your livestock in the 2015 harvest season. The decisions you make later this winter will have consequences for your livestock next year.