

# Improving Forage Quality: Dreams vs. Reality

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Estimates of the percentage of corn harvested for silage in the U.S. range from 7 to 10%, depending on the year and who's doing the estimating. A small portion of this acreage was planted for grain but harvested for silage because of low corn prices, too much rain, not enough rain, bugs, weeds, or disease. Therefore, the true market for seed corn for silage is 7% of total seed corn sales or perhaps a bit less. Seed companies are taking several approaches to selling corn hybrids for silage use. The one chosen by most seed companies is to develop and market dual-purpose hybrids, doing a thorough job of evaluating these hybrids for silage including yield and digestibility. A second approach is to "price the difference," selling silage-only hybrids at a premium price that supposedly reflects their nutritional advantage. Both BMR hybrids sold by Mycogen Seeds and some of the silage-only hybrids sold by Syngenta Seeds are examples of this. A third approach is to sell silage-only hybrids at normal prices, represented by the leafy hybrids sold by a number of seed companies. At least one other large seed company is currently developing corn hybrids that will be intended primarily for silage but could also be harvested for grain. And for good reason: for many farmers, "silage only" is the kiss of death for a corn hybrid. Even though the farmer hasn't harvested an acre of corn for grain in the past twenty years, he insists on planting hybrids that give him this option.

With the emphasis on corn for grain, it's no surprise that progress in improving silage quality has been tied almost entirely to increases in grain yield. While whole plant digestibility has generally been increasing for the past 100 years, until recently

this was accomplished by hanging a bigger, better ear from each plant. Stover digestibility hadn't increased much at all, and in fact the trend from the 1960s until the early 1990s was slightly down. However, recent plant breeding efforts to improve stover digestibility are paying dividends, and this gives dairy farmers interested in superior corn silage quality some options they didn't have a decade ago.

## **Dream: One Silo, One Hybrid, Uniform Silage Quality**

Sounds good, doesn't it? Plant enough of a single corn hybrid to fill the entire silo, reducing the need for ration adjustments. This is easy to do with silage bags, which depending on diameter usually hold between 150 and 300 tons. It often takes no more than 10 or 15 acres to fill a silo bag, and I'd certainly try to do it with one hybrid. But filling a 2000-ton bunker silo with one hybrid in an attempt to wind up with uniform quality? Unless the farmer has 100-acre fields, think again. Even if he does, the several soil types often found in a single field as well as within-field variations in topography and soil fertility will probably result in differences in silage quality. This isn't merely one agronomist's opinion: Penn State's Greg Roth has had experience with a farmer who had a neighbor custom grow a large acreage of a single corn hybrid in an effort to achieve uniform silage quality, only to discover that there was still a lot of variability. Also, if planting takes several weeks instead of several days from start to finish, planting a single hybrid may well result in unacceptable differences in harvest maturity.



Farmers shouldn't put all their eggs in one basket by relying on a single hybrid for most or all their silage. Most of today's corn hybrids have excellent defenses against diseases and some of the other things Mother Nature throws at them. However, sometimes strange and unpleasant things can happen to a particular hybrid, such as ear drop, tip breakage, unusual susceptibility to drought, cold, wind, a foliar disease, etc. Better to have an extremely unpleasant experience with some of the corn crop than with all of it.

So, how many hybrids for silage should a farmer plant? This depends on several factors, including the farmer's relationship with his seed dealers (more on this in a bit). With less than 100 acres for silage, 2 hybrids at least, and 3 or 4 isn't too many. Even with several hundred acres of corn for silage, it's just not necessary to plant more than 5 or 6 hybrids unless the farmer needs special traits such as Roundup Ready, Bt, etc.

One of the main reasons some farmers plant so many hybrids is a reluctance to say no to the farmer-dealers who stop by to sell corn every year. Also, limiting the number of hybrids usually means limiting the number of seed companies, possibly having a devastating effect on the farmer's collection of seed company jackets and caps. This would be a more understandable problem if the farmer didn't already have enough jackets and caps to last several lifetimes. (If in doubt on this, ask the farmer's wife.)

A note on bargain-priced seed corn: There's enough difference in digestibility and therefore in milk production potential between good and not-so-good corn hybrids that *farmers simply can't afford anything less than the hybrids that produce the best combination of yield and quality*—regardless of seed price. Even free seed can be expensive: In one hybrid trial there was a difference of \$275 per unit of seed corn in milk production potential (using the University of Wisconsin's "Milk 2000" spreadsheet) between hybrids ranking "average" and "high" in NDF digestibility.

The remainder of this paper will provide a "Who's who," or rather "What's what," in corn hybrids for silage.

### **Leafy Hybrids**

Leafy corn hybrids are usually sold as silage-only, although a few are sold as dual-purpose hybrids (can be harvested either for grain or silage). Leafy hybrids have a gene that produces more leaves above the ear than do non-leafy hybrids, sometimes twice as many. It's questionable, however, whether these additional leaves increase yield or silage quality. Leaves have lower feed value than grain in corn silage, so sacrificing grain yield for leafiness just doesn't make sense. And since leaves only represent about 10% of corn plant dry matter, increasing leafiness by 20% only amounts to a 2% yield increase. Some leafy hybrids have very low ear-to-stover ratios, and unless stover digestibility is very high they should be avoided.

Leafy hybrids represent a substantial portion of the silage corn business and dominate the "silage-only" hybrid sector. Seed price and silage yields are comparable to dual-purpose hybrids. Some leafy hybrids combine good yield and above-average fiber digestibility, while others look better than they really are. Leafy hybrids have great eye appeal though, and all those leaves above the ear can even be noticed from the pickup truck seat, always a plus for the farmer headed to the coffee shop to trade lies with his neighbors. Seed price of "leafies" is similar to non-leafy hybrids, adding to their popularity.

### **Brown Midrib Hybrids**

Brown midrib (BMR) hybrids are silage-only hybrids currently sold only by Mycogen Seeds, though at least two other seed companies are including BMR in their early-stage breeding programs. The midrib on the leaf of a BMR plant has a reddish-brown color, thus the name. A naturally occurring genetic mutation results in incomplete lignin formation, usually resulting in increased dry matter intake and higher milk production. BMR hybrids are almost the complete opposite of leafy



hybrids: They don't look at all attractive in the field, silage yield is typically 10 to 20% less than non-BMR hybrids of comparable maturity, and the seed costs about twice as much as most other corn hybrids.

BMR hybrids are in some ways similar to the corn our grandfathers grew. Plant breeders have been improving corn hybrids for well over 50 years, focusing on both offense (yield) and defense (standability, tolerance to drought, insects and diseases). Even though the BMR gene was discovered more than 80 years ago, because of terrible field performance BMR hybrids attracted little interest from seed companies until the 1990s. Therefore, improvement has been limited not only by the base genetics inherent to the BMR trait, but simply by the amount of time plant breeders have spent on improving them. Drought and disease resistance are poor when compared to today's top hybrids, but not when compared to many of the corn hybrids of the 1960s. This would suggest that with continued improvements, the future of BMR hybrids may be much brighter than the past. In 2007 we'll see both the Bt gene for corn borer resistance and the Roundup Ready gene in some BMR hybrids.

While BMR corn silage almost always results in higher milk production, it's less profitable (or perhaps not profitable at all) if fed to the entire herd. Transition cows and cows in peak production benefit most from BMR corn silage. An additional factor to consider: The combination of lower yield and higher dry matter intake unite to require about 25% more acres where BMR corn is grown, potentially having an impact on nutrient management programs. Partly offsetting this is the possibility of increasing the forage-to-grain ratio when feeding BMR corn, thus reducing the amount of purchased grain coming onto the farm.

### **Chop Height**

Chopping corn at a higher than normal height (12 to 18" vs. what's considered the normal 6 to 8") is most attractive when yields are high, since during

these years silo capacity is at a premium and there's often a poor local market for both corn silage and grain. If you have a big yield, chances are your neighbors also do. Two advantages of chop height decisions are that there's no additional equipment cost and the practice can be successful with most hybrid types. A reasonable approach is to adjust chop height upwards to squeeze a bumper corn crop into the available silage storage. The main effects of chopping higher than normal are lower yield and higher net energy. Differences in NDF and whole plant digestibility, while often statistically significant in research trials, aren't as great as many farmers, dairy nutritionists (and even some agronomists) have expected.

Cornell University research concluded that because of high fiber digestibility from top to bottom, BMR hybrids (and probably other high stover digestibility hybrids as well) shouldn't be harvested at more than a normal chop height. Nor should corn grown under drought stress be high chopped unless there's a serious concern for high stalk nitrate levels, since forage quality of droughty corn is usually pretty good. Of course this recommendation is an easy sell to farmers since in a drought year they want to harvest every ton possible. Immature corn shouldn't be chopped higher than normal, both because stover quality is high on a dry matter basis, and because high chopping corn with immature grain has less positive effect on net energy levels.

Recent trends are for higher corn silage chop heights, and not always because of forage quality concerns. Custom harvest operators have an aversion to putting a large rock (or even a small one) through their forage harvesters, and therefore—especially with wide chopper heads on fields where the farmer has been less than meticulous about stone picking—chop closer to 10" than 6". It's not just custom operators: When asked about what influences their chop height decisions, some farmers reply: "Just a bit higher than the largest remaining stone in the field."

