



Preserving Quality Silage at the Bunker

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Corn silage is a high value commodity and is becoming increasingly important in livestock and dairy diets. Over time, growers have made impressive progress in producing remarkable yields in the field along with increasing efficiency. Industry estimates, however, suggest that 20 percent of the corn silage ensiled each year is lost because of careless management at the bunker or silage piles. In times of high feed costs, every effort must be made to maintain quality and prevent feed losses. The purpose of this fact sheet is to suggest specific improvements to the process of preserving ensiled feedstuffs.

Maximize Silage Density

Filling silage bunkers rapidly limits air exposure to the silage, so quick filling must be a top priority. Oxygen is entrapped within the fresh forage delivered to the silage structure. This oxygen maintains the respiration of plants and microorganisms, causing heating and loss of nutrients. Adequate and immediate packing will remove that oxygen quickly and enhance the ensiling process. Today, most growers or silage contractors have the ability to chop corn or haylage at a faster rate than it can be properly packed, and slowing the delivery rate is not a realistic option. As such, adequate packing at the bunker to achieve the minimum recommended density can be a challenge. Feed quality is reduced significantly in loosely packed bunkers because of increased dry matter and nutrient losses from aerobic decay (Table 1).

Proper packing will impact silage quality and silage value quite significantly. Densely packed silage will have less dry matter loss and higher feed quality than loosely packed silage. Experience suggests that a density goal of 16 pounds dry matter per cubic foot of corn silage is reasonable in bunkers and on silage piles.

Table 1. Dry matter loss as influenced by silage density

Density (lbsDM/ft ³)		DM loss at 80 days
10		20.2
14		16.8
16		15.1
18		13.4
22		10.0

Adapted from the text: Bunker Silo Management: Four Important Practices by Keith K. Bolsen.

One commonly used guideline to maximize silage density is the minimum need of 800 pounds of packing weight per ton of silage delivered per hour (Table 2). Packing density can be improved if workers limit push-up layers to 6 to 12 inches and have plenty of tractor power. Most farmers need more than one packing tractor to keep up with the chopper. Managers must plan ahead to ensure adequate drivers and tractors to meet silage density goals. The heavier the packing tractors, the better will be the density of the corn silage. Tractor weight can be increased by adding weight to the front of the tractor or to the 3-point hitch on the back. Filling the tires with fluid is also helpful. Dual wheels can provide additional tractor weight and stability. Experts suggest keeping packing time in the range of 1 to 3 minutes per ton of fresh forage. Extra time spent packing the surface will improve the density of the critical top level by assuring sufficient wheel contact over the entire surface. Equipment manufacturers are now selling high impact silage packers that hook to the three point hitch of the packing tractors. These single use implements appear to

Table 2. Packing power needed at bunker		
Tons forage delivered / hour	Pounds Packing Tractor(s) Needed	Minutes Packing Time Needed / Hour
40	32000	40-120
60	48000	60-180
80	64000	80-240
100	80000	100-300
125	100000	125-375
150	120000	150-450
200	160000	200-600

be quite helpful in improving silage density. Buyers may also consider filling two bunkers simultaneously so the packing tractors can keep up. Additional packing tractors are needed to keep both bunkers properly packed, but it gives more time to actually press the forage.

Lower densities are consistently measured along bunker walls or on the outside edges of silage piles. Paying extra attention to packing along the bunker walls with narrow tires on a heavy tractor could be a way to reduce feed losses. Only an experienced operator should be trusted along a wall with large equipment. Safety must always be the first priority.



Corn silage is a high value commodity.

Silage Inoculants

While there is some debate in regard to whether or not someone should use a silage inoculant for corn silage, it ultimately comes down to why you are using it and what the perceived benefits are. In some ways it may seem

like it is in the same category as buying insurance. When you need it – you need it. In this case, because you only put up silage once a year, you don’t have the benefit of being able to go back and fix the problem. So what things should you consider?

Most silage inoculants are composed of single or combinations of bacterial species. Many have been developed to either (a) aid in dropping the pH rapidly as the silage is being stored; and/or (b) maintaining silage quality after it has completed the initial ensiling process. There is some overlap between these two processes and it is not always a guarantee that you will succeed in meeting these goals – even with an inoculant. For example, *Lactobacillus plantarum* and *Enterococcus faecium* are examples of bacteria usually added to rapidly drop the pH, while *Lactobacillus buchneri* is an example of a bacteria added to maintain “stability” after the pH has been lowered and to protect against mold growth. There is probably some overlap in the abilities of bacterial species to accomplish these goals and new and improved versions of these bacteria are being developed all the time. So the first objective is to determine if you need an inoculant and which one works best for the situations you see on your dairy or at your feedlot.

The second objective revolves around the issue of whether or not a particular product actually works. There are many products on the market, many being added all the time, and all make impressive claims. Growers should ask for research results, preferably published in peer-reviewed publications, which back up the claims that are made. Farmer testimonials should always be considered suspect. Companies may not have many of these documents, but they should have something that isn’t totally “in house.”

Research suggests that the use of inoculants will probably result in improved dry matter digestibility and improved animal performance, but like all things, users must determine if it is cost effective. In view of current feed costs, perhaps the question should be whether or not users can afford to not use an inoculant.

Cover and Seal Silage Bunkers or Piles

After filling the bunker, silage must be covered as soon as possible with plastic to prevent oxygen exposure to the forage mass. Minimizing oxygen exposure to corn silage stored in bunkers is key to maintaining feed quality. Silos not properly sealed immediately after harvest will have significant losses of feed quality. The average losses of dry matter vary depending on moisture and feeding rates, but it is not uncommon to show an average dry matter loss of 30 percent from the top 3 feet of the bunker.¹

Professionals recommend the use of 4-6 mm white or black/white plastic, overlapped by 4 to 6 feet, and secured with uniform weights such as 15 to 20 used tires per 100 square feet. Two layers are even better than a single layer. Protecting chopped corn from exposure to oxygen, sunlight, rain and snow is always cost effective. Research shows an estimated return of \$8 for every \$1 invested in covering silos.² An added advantage of preventing spoiled feed is the fact that nobody has to risk their safety by climbing to the top of silage piles to pitch off spoiled feed. Many progressive growers are successfully using an oxygen barrier film plus a 4 to 6 mm plastic to cover their silage. Research at a U. S. Dairy Forage Research Center in Madison, WI, reported that the use of oxygen-barrier films to cover stored silage can improve dry matter recovery at the top and near bunker walls by as much as 15 percentage units.³ Many areas have professional crews that specialize in covering and uncovering bunker silos in a timely manner.

Reducing Losses During Feedout

Corn silage needs at least 45 to 60 days to become uniformly preserved and for the kernels to reabsorb moisture and soften, making them easier to digest. Feeding unfermented or partially fermented silage will not provide the full economic or production benefits possible from properly fermented corn silage.

At feedout, the ensiled forage face is exposed to oxygen, which supports troublesome yeast growth. Silage pH increases, allowing previously inhibited fungi and bacteria to grow, further reducing silage quality. Successful feeders will be careful to minimize the time between removal of the silage from the structure and feeding it to animals. Silage should be removed from the whole silage face at an average minimum rate of 6 inches per day, depending on the season of the year. Feedout rate is a function of the number of animals being fed, the amount of silage fed in the diet, and the silo design. Thus, silo design and size should be matched with the feeding rate in order to minimize silage losses during feedout.⁴

Silage defacers, or feedout rakes help reduce exposed surface areas and limit silage exposure to sunlight and oxygen. These single purpose machines also help maintain a smooth, straight face on silage bunkers or piles. Front end loaders should never be used to break into a silage pile. Not only does this break open the pile, exposing forage to oxygen, but it is also dangerous for the operator who may become buried under an avalanche of feed.

Summary

Growers go to a lot of effort to produce large quantities of quality forage in the field. However, it makes no sense to then lose tonnage of that valuable feed during the storage and feeding phase. Research shows that this is a weak link in the entire process. Special care taken at the silage bunkers or piles will always ensure an improved bottom line for those who buy and feed ensiled forage. Success during harvest and feedout requires attention to a multitude of details and is essential to success and net profits.

References Cited

¹ Holthaus, D.L., M.A. Young, B.E. Brent, L. Pfaff, and K.K. Bolsen. 1995a. Losses from top spoilage in horizontal silos. *Kansas Agric. Exp. Sta. Rpt. Of Prog.* 727:59

² Bolsen, K.K. 2004 Unpublished field data trial comparing standard plastic and oxygen barrier film on bunker silos of corn silage and high moisture corn. Kansas State University, Manhattan, KS.

³ <http://hayandforage.com/silage/0923-oxygen-stopping-silagecovering-system>

⁴ Bolton, K., and B.J. Holmes. 2004. Management of bunker silos and silage piles. <http://www.uwex.edu/ces/crops/uwforage/mgmt-bunkers-piles-bjh2.pdf>

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