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FORAGE SOLUTIONS

Preparing for Corn Silage Harvest

By: Jon Pretz, Ph.D., Dairy Nutritionist, Hubbard Feeds

As corn silage growers near their anticipated harvest date, it's important to walk fields to determine how the crop is progressing. Ultimately, harvest timing can be critical in achieving high-quality corn silage that delivers optimal performance for livestock. Putting together a plan with your employees, nutritionist and harvest crew will ensure that everyone is on the same page when chopping begins. Controlling the variables highlighted in the following checklist can lead to a successful harvest.

1. **Optimal dry matter:** Be ready to chop when your corn silage has reached the optimal level of dry matter to ensure proper silage fermentation and compaction. For bunkers, piles and bags, the target is 34 to 37 percent dry matter. If plants are still healthy, they will maintain fiber digestibility and have enough moisture for adequate packing and fermentation. If plants are unhealthy, drying may occur much more quickly compared to healthy plants. Once the plant is at 30 percent dry matter, the average percentage of dry down per day is typically between 0.5 and 1 percent.

2. **Maturity vs. starch level:** In healthy plants, optimal corn silage harvest takes place at 37 percent dry matter and ¾ milk line, to capture the highest percentage of starch in the plant while maintaining fiber digestibility. If plant health is less than desirable, consider chopping at ½ milk line to preserve quality. Once the plant reaches 30 percent dry matter, starch can increase by as much as one percentage point per day. Be aware of plant dry matter and maturity as starch levels increase. If you delay harvest to achieve higher starch levels in your corn silage, you must increasingly process corn kernels to avoid the passage of harder starch particles. Corn silage harvested at dry matters greater than 38 percent can be detrimental due to decreases in fiber digestibility, poorer packing and fermentation, harder kernels to get processed, and potential intake complications for the cows at feed out.

3. **Kernel processing:** Proper kernel processing is crucial, especially with hybrids that have hard or dense starch forms. All kernels should be damaged, with kernels broken into four pieces or finer. Throughout harvest, subsamples should be collected to composite and submit to a forage lab for kernel processing score (KPS) analysis. The lab will then analyze the sample to identify the percentage of starch within the sample that passes through a 4.75-mm screen. Ideally, results should show more than 70 percent of starch particles being adequately processed to maximize energy efficiency and minimize fecal starch losses. Kernel size can also be evaluated in the field by one of the methods described below:

    - Take a 32-ounce cup of corn silage before ensiling, spread it out, and check the processing of corn kernels. If two or more half or whole kernels are found, adjustments to chopper rollers should be made.
    - Take two or three handfuls of corn silage, place in a five-gallon bucket of water, skim off the floating corn plant material, pour off the water, and evaluate the corn particles left in the bottom of the pan.

4. **Theoretical length of chop and roller opening:** Two different equipment changes can be made: TLC (theoretical length of chop) from ½ to ¾ inch and roller opening from 1 to 3 mm (the tighter the better). Most discussion centers on TLC, but both adjustments should be considered when getting an "optimal" corn silage particle size and a well-processed kernel. The following guidelines can be used and refined using a Penn State Particle Separator.

Corn silage dry matter, %	TLC, inches	Roller opening, mm
<34%	¾	1 to 2
34 to 37%	¾	1
>37%	½	1

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5. **Inoculant or preservative:** Inoculants and preservatives kick-start the fermentation process, allowing for a faster reduction in pH, reduced nutrient breakdown, and an increase in dry matter recovery. Always add a research-based silage inoculant or preservative. Published research has shown a three percent increase in dry matter recovery and a two percent increase in energy content as the fermentation is optimized. The benefit-to-cost ratio is typically three to one in nutrient recovery.
6. **Packing density:** Target corn silage density to exceed 15 pounds of dry matter per cubic foot in storage. This can be a challenge for bags and drier corn silage. Packing guidelines are below:
    - Tractor weight in pounds / 800 pounds = tons per hour that can be packed correctly
    - Example: 30,000-pound tractor / 800 pounds = 37.5 tons of corn silage per hour with this tractor
7. **Cover bunkers/piles:** Cover bunkers and piles with a layer of oxygen-barrier film followed by a 6-mil plastic sheet that is tightly sealed along the sides by piling sand or limestone along the edges. Tire sidewalls should be positioned across the top of the entire pile, and touching, to keep oxygen from entering beneath the plastic.
8. **Evaluate silage fermentation:** Check the fermentation profile of your corn silage to determine if the silage has an optimal fermentation pattern. Table 1 lists the desired silage pH, levels of organic acids (lactic, acetic, butyric and propionic acids), ammonia nitrogen (more important with haylage) and ethanol (not desired). Using an inoculant will enhance your fermentation profile along with optimal packing and filling rates.

    Table 1. Recommended fermentation profile for ensiled corn silage

Measurement	Corn silage target levels
Dry matter (%)	34 to 37
pH	3.8 to 4.2
Lactic acid (%)	5.0 to 10.0
Acetic acid (%)	1.0 to 3.0
Propionic acid (%)	<0.1
Butyric acid (%)	<0.1
Ethanol (% DM)	<3.0
Ammonia (% CP)	<8.0
Lactic:acetic ratio	>3.0
Lactic (% total)	>70

9. **Calculate needed inventory:** Calculate the amount of corn silage you will need for the upcoming feeding year. Be sure to have enough of this year's corn silage to allow for a three- to four-month carryover for next year, while also accounting for potential shrink. Research has shown that corn silage increases in feed value (more energy per pound of dry matter) if it has been allowed to ferment for three to five months after ensiling, primarily due to increases in starch digestion rate.
10. **Calculate corn silage value:** Calculate the value of your corn silage at harvest time to use in your farm budgeting program. One guideline is to charge the current price of a bushel of corn grain times 10. A more precise option is to evaluate the crop depending on the relationship of a bushel of corn per acre compared to tons of wet corn per acre.
    - **Example:** 20 tons of corn silage containing 140 bushels of corn results in a factor of 7 (140 bushels / 20 tons of wet corn silage). Add the cost to harvest, transport and store silage ($6 to $9 per ton), cost of silage inoculant ($0.40 to $1.00 per ton) and shrink loss (5 percent for bags and upright silos; 10 to 15 percent for piles and bunkers depending on packing and covering).
    - **Example:** Corn silage could be priced at $5.50 per bushel x 7 = $38.50 per wet ton + $7.50 harvest costs + $0.40 inoculant = $46.40 per ton + 10 percent shrink loss ($46.40 x 10 percent = $4.64), leading to the final value of $51.04 per wet ton.
11. **Review your previous year's corn silage harvest:** Conduct a check on Item 2 (dry matter levels last year), Item 3 (processing) and Item 8. Did your previous year's corn silage ferment properly? If your answers are optimal, strive to make exceptional silage again this year. If you have questions or need additional information, contact your local Hubbard representative.

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