dairy guidelines

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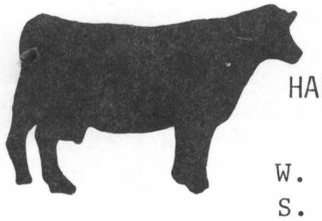

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HARVESTING AND STORING OF LEGUME AND GRASS FORAGES

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Legumes (alfalfa and red clover) and grasses (orchardgrass and fescue) can be harvested and stored at various dry matter (DM) contents. The resulting forages are referred to as wilted haycrop silage (haylage) or hay.

Table 1 presents comparative DM contents and losses for each type of harvesting method. Wilted silage usually contains 35-60% DM compared to 80-90% DM for hay. Storing forage as wilted silage results in a loss of approximately 15% DM with 4-5% being field losses and 7-10% storage losses. Expected DM loss with hay would be about 25% with the majority being field losses (15-20%).

Consumption of forage would be expected to vary depending on method of harvest. If animals are allowed to consume all the forage they desire, they would be expected to consume 70% as much wilted silage DM and 79% as much hay DM as when offered fresh cut forage (100%). Therefore, palatability appears to be reduced when forages are stored as haycrop silage or hay.

Table 1. Method of harvest as it affects dry matter losses and consumption.

	Fresh Forage	Wilted Silage	Hay
DM (%)	20-30	35-60	80-90
Total DM loss (%)[a]	-	15	25
Field loss (%)	-	4-5	15-20
Storage loss (%)	-	7-10	2-6
DM intake (% of fresh forage consumption)[b]	100	70	79

[a]Michigan State Univ. Agric. Econ. Report 947 (1964).
[b]Demarquilly, C. and R. Jarrige, Proc. XI Inter. Grasslands Congress (1970).

Wilted Haycrop Silage or Haylage (35-60% DM)

Wilted haycrop silage or haylage is defined as forage that is wilted before chopping and ensiling. The degree of wilting is critical because heating is more likely to occur in dryer material. During ensiling an anaerobic atmosphere

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(oxygen-free) must be created in the silo by proper packing or by using an oxygen limiting structure. As DM increases, water decreases and the chance of trapping air increases. This means the more water present the easier it will be to establish an oxygen-free environment in the silo. However, silage containing less than 30-35% DM should be avoided, if possible, due to the possibility of an undesirable fermentation which can result in reduced intakes and foul odors. Also, seepage is a problem in upright silos due to the large amount of water present. If forage must be ensiled with less than 30% DM a dry material such as chopped hay or corn and cob meal can be added (up to 400 lbs/ton) to increase DM content and thus improve quality.

Wilted silage has certain advantages over hay. Total nutrient loss during harvesting and storage is less for wilted silage than hay. Also, time in the field after cutting is reduced relative to hay and consequently there is less chance of rain damage. Wilted silage can be handled mechanically with a minimum amount of manual labor input, and will fit easily into a complete ration system.

Heating and Propionic Acid Addition

When wilted silage is ensiled too dry excessive heating occurs. As a result, certain proteins are bound within the plant cell and become unavailable (undigested) when fed to the animal. When feeding wilted silage, keep in mind the possibility that some of the protein may not be available, especially if the forage is dark brown or black. A measure of heat-damage can be obtained by measuring the nitrogen (protein) in the acid detergent fiber fraction of the forage (termed acid detergent insoluble nitrogen). This gives an estimation of bound protein and available protein can then be calculated by subtracting bound from total protein and this used to balance a ration. The forage testing lab at Virginia Tech does not offer this analysis, but certain commercial labs do.

Heating is most likely to occur in silages stored at greater than 55% DM. The dryer the forage, the greater the danger of excessive heating, regardless of type of silo. Propionic acid added at the blower during ensiling may reduce some of the heating. The upper third of the silo is the only part that needs to be treated since this area is the most prone to heating (Warning: Propionic acid is corrosive and will cause severe burns. Wear goggles and rubber gloves. Wash skin immediately upon contact. Rinse all equipment thoroughly after use).

Type of Structure

The type of structure used to store wilted silage need not be a critical problem if proper management techniques are utilized. Work at Wisconsin demonstrated a 7% DM loss during storage of alfalfa haylage in oxygen limiting silos compared to a 9% loss in concrete stave silos. Studies in Minnesota and Michigan show that about a third of the haylage samples obtained from farms in the states were heat damaged regardless of silo type. Therefore silo type does not appear to be as critical as management.

Bunker silos can be used to store wilted silage, but due to the larger surface area, heating is more of a problem. Adequate packing, usually with heavy machinery, is needed to exclude as much oxygen as possible. Also the silo must be covered to prevent excessive top spoilage. It is advisable to fill bunkers with wetter silage (30-40% DM).

Guidelines for Making Good Wilted Silage

- Buy a moisture tester because optimum DM is critical for proper silage making. Electronic testers are not accurate enough for forages, therefore testers using heat (Koster or Dexter) are more appropriate. These testers require 20-30 minutes for drying before a reading of values can be made.

- Harvest at proper stage of maturity (early bloom for legumes and early heading or boot for grasses).

- Make sure silo is as airtight as possible by sealing cracks in doors and walls.

- Stagger cutting of the crop so that forage cut last will not be too dry when ensiled.

- Start ensiling when DM is 35-40% and stop at 55-60% (50% DM or below is best). If too dry, consider making hay.

- Shear bar - knife clearance should be adjusted for 1/4 inch (theoretical cut = 1/4 to 3/8 inch).

- Fill silo rapidly and continuously, if possible, to exclude excess air.

- Pack tightly and distribute silage evenly in the silo.

- Put wetter material on top, if possible.

- If upper portion of silo is dry (greater than 55% DM) add a 1:1 (propionic acid - water mix) solution at 40 lbs per ton of wet silage at the blower to the upper third of the silo. (Warning: Propionic acid is corrosive and will cause severe burns. Wear goggles and rubber gloves. Wash skin immediately upon contact. Rinse all equipment thoroughly after use).

- Cover with plastic after filling and weight down after proper packing.

Hay (80-90% DM)

Hay has long been the choice method of harvesting legume and grass forages. Since most of the moisture is removed, not as much total weight is handled and a stable product is the result. Hay can be stored for relatively long periods with little change as long as it is dry (85-90% DM).

Hay cannot be incorporated into a complete ration unless chopped. As a result, more manual labor is usually required when hay is fed compared to haylage.

Moisture Level and Baling

The major loss during harvesting of hay is a result of leaf shatter. Baling hay too dry (88-90% DM) is the cause. Since legume leaves contain the majority of the nitrogen, this can cause a drastic reduction in the amount of harvested protein. To help reduce losses, rake before forage reaches 65% DM and bale between 80-86% DM.

Hay that is baled too wet (less than 78% DM) is prone to heating and molding. As a result, palatability and nutritive value are reduced. There are some products (preservatives) on the market for wet hay, but to date have not been shown to be effective. Most of these preservatives contain organic acids that might be effective if proper distribution throughout the bale were possible, but this appears to be a problem with treatment of hay. The best bet is to artificially dry hay that is baled too wet.

For economic reasons, large bale packages have become more common in recent years. These large bales can be handled mechanically and labor is reduced. In these large bales stems and leaves are rolled tightly, and as a result a greater amount of moisture is needed than in regular bales to prevent leaf shatter. Because of this extra moisture, round bales are more prone to molding and heating during storage. Also large bales are frequently stored outside allowing weathering to reduce the nutritive value of the exposed surfaces. Large bales should be stored on tires or gravel when stored outside to allow proper drainage and reduce the amount of spoilage under the bale.

Guidelines for Making Good Hay

- Buy a moisture tester in order to prevent baling too wet or dry (see guidelines for wilted silage).

- Harvest at proper stage of maturity.

- Rake hay before it reaches 65% DM.

- Bale between 80-86% DM for regular bales and 78-83% for large bales (Remember legume hay is fragile and leaves can be lost during harvesting if baled too dry).

- If rain threatens, chop and ensile or bale wet and artificially dry.

- If possible, store bales under cover regardless of type because moisture causes spoilage. If large bales are to be stored outside, cover with plastic and place on tires or gravel to allow drainage.