Grass Silage

Storage of grass as silage is the best method in the Northeast to maximize forage quality, and also allows for maximum mechanization, and is convenient for total mixed rations. Silage has become the primary storage option for grass forage for dairy cattle, due to advances in harvesting technology, silo types, plastic covers, and mechanization for feeding.

Grass Forage Issues

The goal of ensiling is to retain as much quality and dry matter as possible, using a controlled fermentation process to rapidly achieve anaerobic conditions and maintain them. Grass must be harvested at optimum quality as the first step to high quality silage. The primary forage factors affecting fermentation are moisture content, water soluble carbohydrate (WSC) content, and buffering capacity. Buffering capacity is directly related to how much sugar it takes to lower silage pH.

High rates of N fertilization of grasses tend to reduce WSC and increase buffering capacity. Species and cultivars of grass differ in WSC content, ryegrasses tend to be high and orchardgrass relatively low in WSC. Grass typically has a low buffering capacity and an adequate supply of sugars, the farmer must manage for the correct moisture content.

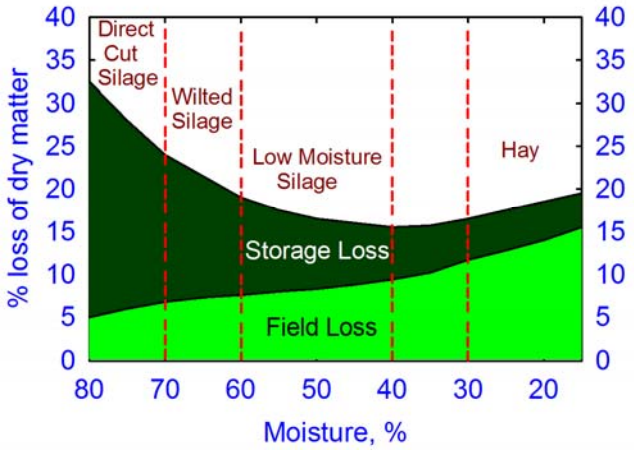

Figure 1. Estimated field vs. storage losses for different storage systems.

Grass Fermentation

Plant respiration continues after forage is ensiled and should be minimized. Rapid silo filling, correct chopping size, good compaction, and tight sealing will limit plant respiration losses by minimizing the oxygen available to the forage. Once the oxygen is gone, anaerobic fermentation using available sugars lowers silage pH to create stable silage. Grass resists compression more than other forages during silo packing.

Bunker Silos

Bunker silos are also known as trench silos or horizontal silos. They work best where 400 tons or more of silage will be stored. They typically consist of a paved area surrounded on three sides by near-vertical retaining walls, usually 8 to 10 feet high. Walls must slope outward about 10 degrees to maximize forage compaction. Bunker silos are less expensive to build than tower silos, but may have more feedout losses and more feedout labor.

Forage is dumped in the containment area and mechanically packed with a tractor or other large vehicle. Relatively thin layers of forage added sequentially and packed using vehicles with sufficient wheel load will result in high density storage. When filled, the open surface must be covered with plastic to limit oxygen access, plastic is typically held in place by used tires, side-walls and sand bags. The vertical feed-out surface must be carefully managed to minimize spoilage. Effluent control is essential and is more difficult than in a tower silo.

Upright Silos

Interest in tower silos declined markedly over the past few decades. Large scale operators prefer bunker silos, while smaller scale operators often prefer silage bags or tubes. Tower silos are relatively permanent, difficult to move, and less flexible in storage capacity. They can be cast or stave silos, typically top unloading, or they may be oxygen-limiting silos, typically bottom unloading. Good

fermentation can be achieved; negative issues are safety concerns entering the silo, effluent catchment, and corrosion.

Tube Silos

Silage tubes work well for short-term storage of chopped grass forage. Grass is cut and wilted to 50 to 60% moisture and then chopped and packed into bags of various diameters and lengths (Fig. 2). Bags will store over winter even with a few small holes, but warm weather losses can be large.

Figure 2. Silage bagger for tubes.

Bale Silage (Baleage)

Baling grass for silage is becoming increasingly popular. Grass forage is wilted to between 40 and 60% moisture, baled, then placed in a plastic bag, tube, or wrapped in stretch plastic. It is best to feed out bale silage within a few months, as the sealed plastic may puncture.

Advantages: Reduced aerobic losses. Reduced effluent. Fits better with grazing systems. Greater flexibility in harvest date. Transportable and marketable. Reduced capital investment. Better suited to smaller farms.

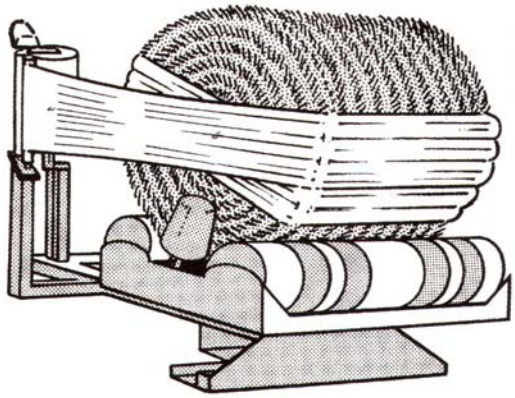

Figure 3. Bale silage wrapper (Trioplast AB, Smalandsstenar, Sweden).

Disadvantages: Plastic film is prone to damage, allowing oxygen in. Risk of toxic molds is higher than conventional silage. High labor at feedout, not well suited to large operations. More wasteage due to long chop-length. High variable costs. Excessive use of polyethylene.

Summary

High quality grass silage can be made without additives, but can be more challenging than making legume silage. Silage is more likely to result in higher forage quality than relying on good hay-making weather. All storage options will work if management is system specific.

Additional Resources

- 2011 Cornell Guide for Integrated Field Crops Management. Electronically accessible at: http://ipmguidelines.org/Fieldcrops/.
- Cherney, J.H. and D.J.R. Cherney. 2003. Chapt. 4. Assessing Silage Quality. pp. 141-198. *In* (D.R. Buxton, et al., ed.) Silage Science and Technology. ASA Monograph Series No. 42, ASA, CSSA, SSSA, Madison.
- Hall, M.W., J.H. Cherney and C.A. Rotz. 2007. Chapter 8. Saving Forage as Hay or Silage. Pages 121-134. In (E. Rayburn, ed.) Forage Utilization for Pasture-Based Livestock Production. NRAES-173. Natural Resource, Agriculture, and Engineering Service. Ithaca, NY.
- O'Kiely, P. and R.E. Muck. 1998. Grass silage. pp. 223-251. *In* (J.H. Cherney and D.J.R. Cherney, ed.) Grass for Dairy Cattle. CABI Publishing, New York, NY.

Disclaimer

For more information

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Grass Management Manual
http://forages.org

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