GUEST COLUMN

Baleage & Organic Acid Application

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Once again, 2017 was a challenging year to bale dry hay. When field-dried hay reached ideal baling moisture, rain fell, damaging the crop. With weather event frustrations, farmers are seeking ways to take control of crop inputs. Many are choosing to make baled silage or baleage for their own forages. Farmers who initially chose to make baleage to manage weather are now finding they get more milk per acre due to less dry matter (DM) loss.

What is baleage?

Baleage is a method of preserving grasses or legumes by first wilting the crop, allowing it to dry to 40-60% moisture (40-60% DM). Once dried to the correct moisture, it is made into round bales or large square bales and wrapped with multiple layers of plastic. Once wrapped, it is allowed to ferment like silage before feeding. Anaerobic bacteria consume some of the sugars in the forage and convert them to lactic acid. Lactic acid helps prevent growth of detrimental microorganisms such as molds, wild yeasts, and other spoilage organisms.

Not every operation can make baleage work. For many, the volume of hay produced does not pay for the additional equipment cost. At a minimum, four pieces of additional equipment are required to successfully implement a baleage program:

- **Baler** equipped to handle high moisture forage.
- **Tractor** with enough horsepower to carry bales safely.
- **Bale spear** to move bales to the wrapper.
- **Wrapper** with plenty of plastic to adequately cover bales.

Most round balers today are robust enough to bale high moisture bales. However, some companies sell belt and roller scrapers to prevent build-up of wet material. These balers also have heavy duty bearings to help handle increased weight of moisture bales. Wrappers are the biggest expense, ranging $8,000 to $30,000 or more, and come with a wide variety of accessories to relieve labor and reduce the need for other equipment. Many farmers choose to work with custom operators who specialize in wrapping bales.

Table 1. Effect of forage management system on conserved forage production and quality[3].

Item	Dry Hay	Baleage	SEM[a]	P-value
Number of cuttings	3	5		
Number of bales	259	479		
Total harvest, lbs wet	219,123	709,131		
Total harvest, lbs DM	202,743	312,728		
Mean bale:				
Wet weight, lbs	847	1,470	47.2	<0.001
DM, %	92.5	46.8	2.84	<0.001
Crude protein, %	10.1	12.9	0.51	<0.001
TDN, %	53.8	57.1	0.43	<0.001
DM, lbs	783	645[b]	20.1	<0.001
Crude protein, lbs	78.6	82.0	3.31	0.31
TDN, lbs	418.4	369.2	12.50	0.003

[a]SEM = Standard error of mean, n=24.
[b]Means with different superscripts differ, P<0.05.

Table 2. Mold population of hay baled at 20-25% moisture with and without wrapping and the application of an organic acid blend.

Wrapping	Preservative	Mold Counts (cfu/g)	Mold Species*
No	No	6,671,139A	Aspergillus
No	Yes	2,510,152A	Aspergillus Alternaria
Yes	No	1,992B	Fusarium Mucor
Yes	Yes	1,358B	Aspergillus Scopulariopsis

*Only major mold species reported. Different letters in the mold count column represent significantly different values.

What are the benefits of baleage?

Baleage often helps farmers save a crop when weather and humidity do not allow full dry-down to <15% moisture. Another benefit is DM retention. Less handling and shorter drying times reduce leaf shatter. Forage baled at 12-14% moisture has DM loss of 30-35%[1]. By mowing, conditioning, and baling at 40% moisture, losses are reduced to 15-20%[2].

Along with less DM loss, farmers who use baleage systems can harvest more nutrients per acre. Hersom found round bale silage made from Bermudagrass resulted in two more cuttings, nearly 55 tons more DM, and forage that was greater in crude protein and energy[3] (Table 1).

Do blended organic acids help with baleage quality?

Another management tool to help preserve the quality of baleage is the application of organic acids. In 2009, the Midwest Forage Association (MFA) funded Martinson and Sheaffer to evaluate organic acid blend applications to high moisture wrapped grass hay bales[4]. The hay was destined for horse feed, so they specifically focused on mold control for wrapped bales and for bales treated with the organic acid blend.

The researchers reported wrapped hay maintained forage quality and reduced mold counts at a higher moisture (20-25% and 30-35% moisture). Treating bales with the organic acid blend at 10 lbs/ton did not statistically reduce mold counts (Table 2). However, there was a trend towards lower mold counts in treated bales. They speculated the application rate of the organic acid blend should be increased in order to achieve desired results[4].

Conclusions

Farmers continue to seek new ways to reduce weather risk associated with harvesting high quality forages. Baleage is one technology to provide more harvest flexibility and help retain more nutrients per acre of crop. Thanks to MFA funding, we now know more about treating grass hay with blended organic acids. As farmers continue to refine the ways they make baleage, additional research will provide more information MFA members can use. Research using blended organic acids and alfalfa hay or small grain silage will aid farmers in making informed decisions when making baleage.

1. Pitt, R.E. 1990. Silage and hay preservation [NRAES-5]. Ithaca, NY: Northeast Regional Agricultural Engineering Service.
2. Mayer, Ralph. 1999. Baleage: A method of increasing usable forage value per acre. AgDM newsletter article, August 1999. https://www.extension.iastate.edu/AGDM/articles/mayer/MayAug99.htm. Accessed October 20, 2017.
3. Hersom, M, et al. Utilization of Round Bale Silage as a Compliment to Hay Production. 2007 University of Florida Beef Report. http://animal.ifas.ufl.edu/beef_extension/reports/2007/docs/hersom_bale_silage.pdf. Accessed October 25, 2017.
4. Martinson, K & Sheaffer, C. 2009. The effect of harvest moisture, bale wrapping, and the application of an organic acid blend on forage quality and temperature in grass hay. Final Report to Midwest Forage Association.