

KEYS TO SUCCESS WITH ALFALFA BALAGE

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Baled silage (or Balage) has many advantages over conventional hay production. Losses during the curing, baling, storage, and feeding phases are each dramatically lower when the forage is conserved as Balage rather than hay. Of course, this comes at an expense. The cost of the wrapper (generally \$14,000 – 21,000), plastic wrap (usually \$4-6 per ton of DM), and added labor can make this system quite costly. Furthermore, there is an environmental cost for disposal of the plastic. However, Balage enables the alfalfa producer to quickly harvest a crop with more independence from unfavorable weather and to create a more palatable product.

This paper builds from Dr. Gary Bates' (Univ. of Tennessee) presentation from last year's KY Alfalfa Conference entitled "Is There a Benefit to Alfalfa Balage?" (see pgs. 27-28 of <http://www.uky.edu/Ag/Forage/28th%20Kyalfproc%20with%20cover%20plus.pdf>, the proceedings of the 28th KY Alfalfa Conference here:). In that article, he presented several details on how Balage can be used to conserve higher quality alfalfa. When a producer begins to work with Balage, there can be a steep learning curve. In this paper, 10 practical tips are presented that can help the Balage producer to ensure success.



1) CUT DOWN NO MORE THAN YOU CAN HANDLE.

One of the most common mistakes that producers make when starting to make Balage is they will lay down too much forage and not have enough time or labor to bale, transport, and wrap the bales quickly enough. For example, a producer may be used to handling 30 acres of hay at one time. However, because Balage bales must be wrapped within 12 hrs of baling, the producer will find that the amount of forage that has been cut is not the bottleneck... the bottleneck is the wrapping operation.

To ensure that no more forage is cut down than can be handled, know how fast the bales can be wrapped. Each bale wrapper will have a different wrapping rate, so it is important to read the manufacturer's specifications. Some bale wrappers can wrap as fast as the machine can be loaded (80-100 bales per hr), while many others will take much more time. Furthermore, just because the manufacturer says it will wrap at a certain rate does not mean that it will work that fast in practice. It is likely, especially if

one is just getting started in Balage, that the wrapping rate will effectively be only 1/2 - 2/3 of that which is specified in the manual. With experience, the rate at which one can wrap bales will increase.

 **2) CHOOSE THE RIGHT BALE WRAPPER**

Since the bale wrapper serves as the primary bottleneck in processing Balage bales, the selection of the right bale wrapper for a given operation is critical. In addition to the cost of the wrapper, consider the bale wrapping rate of the equipment, the amount of labor required/available, and the size of bales that the equipment will accommodate.

Bale wrappers can generally be classified into three basic categories (Figure 1 and Table 1). Table 1 provides generalizations about each of these three basic categories with respect to wrapping rate, labor requirement, and bale capacity.



Figure 1. Examples of three basic categories of Balage wrappers: (L to R) individual bale wrapper on a 3-pt. hitch platform, individual bale wrapper on a trailer platform, and an in-line bale wrapper.

Table 1. Generalizations about different styles of bale wrapping equipment.

Wrapper Style	Bale Wrapping Rate (bales/hr)	Labor Requirement	Typical Max. Bale Size Capacity	Cost
Individual Bale Wrapper				
3-pt. Hitch Platform	20 - 30	Medium (One person wraps, one person unloads wagon)	4' wide x 5' tall	\$3 - 14,000
Trailer Platform	20 - 40	Medium – High (One person wraps, one person unloads wagon and, on some models, loads wrapper)	4' wide x 5' tall	\$5 - 18,000
In-line Bale Wrapper*	60 - 100	Low – Very Low (One person wraps and unloads wagon)	Up to 5' wide x 6' tall	\$13 - 24,000

* In-line wrappers also usually use 30-50% less plastic than individual bale wrappers.

3) EXPLORE YOUR OPTIONS

Many producers find themselves in a financial quandary: they can not necessarily justify the ownership of a bale wrapper for the size of their operation, but really would benefit from the advantages that Balage offers. In this situation, the producer should consider options other than “Own for Own Use.” At least two other options are available to most producers: i) to own the equipment and use it for both their own use and to perform custom work with it on the side or ii) to hire in or rent the wrapper.

Certainly, this key to success is closely related to key #2, especially if one is considering hiring out themselves and/or their equipment. If custom work is expected, determine the amount of travel that will be done and the volume of bales that will be wrapped at each location. If it is expected that there will be many small jobs, then an individual bale wrapper is probably best. However, if there will be relatively few jobs but each involving many bales, then an in-line wrapper will likely be better.

4) BALE AT THE RIGHT RANGE OF MOISTURE

The ideal moisture range for alfalfa or other forage that is to be made into Balage is 50 – 65% moisture. If the moisture drops below 50% moisture, the fermentation process will be hampered or may not occur at all. This leads to silage that may heat or become otherwise unstable. Poor fermentation also can lead to unsatisfactory levels of mold growth or smells. Attempts to add moisture by wetting down the bales in some way will not successfully raise moisture on the interior of the bale and will result in more surface mold.

On the other end of the spectrum, the forage can spoil or even rot when moisture levels exceed 65-70% moisture. Excessive moisture results in greater bale deformation (“squatty” bales) and may even cause the forage to seep effluent. In addition to these problems, excessive moisture increases the risk of listeriosis or botulism.

It is common for too much forage to be cut (see key #1) for the conditions, and the forage may get too dry before it can be baled and wrapped. There are a couple strategies that can help buffer against losing moisture too quickly, even if an appropriate amount of forage is cut. First, when conditions are such that the wilting will occur fairly rapidly, it is generally a good practice to cut the forage on one afternoon and bale and wrap on the next day. This will use the slower drying rate during the night time to help ensure that the forage doesn’t dry too quickly and maintain a more uniform moisture in the crop. If a mower-conditioner is available that allows for the forage to be windrowed, some (or in many cases, all) of the crop may need to be windrowed so that the forage will dry more slowly. In the spring/fall or when drying will not occur as quickly, it may be best to allow the forage to wilt for a full day (or possibly longer). In this situation, it is best to leave a full swath rather than windrowing the forage.

5) MAKE GOOD BALES

Another key to making good Balage is to pay close attention to the baling operation and the bales that are being produced. First, ensure that the size of the bales is appropriate for the size of the equipment used to transport and wrap the bales. Balage bales will be roughly twice as heavy as a hay bale of the equivalent size. Most producers find that a 4' x 5' bale is the most efficient size for their equipment, as these generally will be around 1100-1400 lbs. Tightly made (dense) bales ferment better, so it may be helpful to adjust the hydraulic pressure on variable-chambered (belt-type) balers so that a dense bale can be made. If an in-line bale wrapper is being used, it is also critical to ensure that the edges of the bales are packed well so that the bales will be uniform and have square edges where they abut to one another.

One final note on baling procedure is on the binder that is used. Plastic twine is the best and most economical choice. Normal sisal twine contains chemical residues from the manufacturing process that can cause a breakdown in the UV-inhibitor of the plastic wrap. Consequently, large splits can form in the plastic wrap over time and result in spoilage. Plastic net-wrap can be used as a binder, as well. Though the net-wrap helps prevent bale deformation, it is more expensive and can make the binder material and plastic wrap more difficult to remove during the feed-out phase.

6) CHOOSE AN APPROPRIATE SITE FOR WRAPPING

Another key consideration is in the selection of an appropriate site for storage. It is best to wrap the bales where they will be stored, even if the bales are individually wrapped. Excessive handling of the bales after wrapping can compromise the integrity of the plastic wrap and introduce oxygen to the forage. It is also critical for the bales to be wrapped within 12 hrs of being baled. This prevents excessive heating and aerobic deterioration of the material.

When choosing a site, the proximity to the field and to the site where the forage will be fed are equally important to consider. It is best to place the bales on a solid sod or along a firm roadbed so that adverse conditions during feed-out will cause minimal damage or soil disturbance. Bales should also be placed in an area so as to protect them from punctures. Avoid areas with stubs, exposed roots, or rocks. Groundhogs, birds, and other vermin will sometimes damage bales. By storing Balage in an open area and at least 10 ft from a fence-line, field borders, or other areas of shelter for wildlife, the bales will be less prone to damage from these pests.

7) APPLY ENOUGH PLASTIC BUT NO MORE

It is important to ensure that enough plastic is placed around the bales to exclude oxygen and allow for fermentation. However, too much plastic will drastically increase

the cost of producing baled silage. For in-line bale wrappers, a minimum of 6 – 8 layers of plastic needs to be applied with at least 10 – 12 layers at the joints where two bales abut one another. For individual bales, at least 4 layers of plastic (2 layers made on the first pass, and 2 additional layers on a second pass) are necessary. If the bales are expected to be stored for a long period of time (> 8 months), then 20% or more plastic should be applied.

The failure to apply enough plastic can cause unstable silage and reduce animal acceptance of the forage. Balage that has been properly formed can be very palatable and can, in fact, be more acceptable to the animals than alfalfa hay of similar quality (Figure 2).

Ensure that the plastic is being pre-stretched according to the manufacturer's instructions (usually 55% stretch) and that it is being applied with the tacky side toward the bale. The stretching and wrap's adhesive ensure a sufficient seal.

8) FEED IT IN AN APPROPRIATE WAY

It is a pretty safe assumption that alfalfa Balage will be relatively high in quality. (Of course, just how “high in quality” must be determined by a forage test.) Thus, it is important to ensure that this quality of forage is being put to its best use. High quality demands by stocker calves, replacement heifers, dairy cattle, and other high performance animals make these animal classes a good fit for alfalfa Balage. Balage can be used in TMRs, and some bale grinders can process these bales. However, it may be necessary to split or slice the bales if the bales are very dense and/or are oversized for the grinding facility. Of course, whole bales can be fed ad libitum like a hay bale. It is advisable, however, to use a hay ring or cone feeder to lessen feeding losses.

9) FEED THE BALES WITHIN 9 MONTHS

Over time, the plastic becomes more permeable to oxygen (allows more air into the bale) and the ensiled material will begin to deteriorate. Eventually, the forage begins to spoil and rot. In addition to this danger, these older bales deform and become very difficult (and unpleasant) to handle. Thus, it is important for Balage bales to be produced and consumed within the same season. As a general rule of thumb, the bales should be fed within 9 months of being wrapped.



Figure 2. Animal acceptance of baleage prepared with varying levels of plastic coverage relative hay of comparable quality.

10) HAVE A PLAN FOR HANDLING THE PLASTIC

Though this final note doesn't sound like it would need to be factored in, it is still an important "key to success." This note addresses a serious, but often overlooked disadvantage of Balage, which is the volume of waste plastic that can be produced. Many folks become disgusted with Balage because they have to deal with all the waste plastic it produces. Therefore, it is recommended that a producer devise a routine for collecting and disposing of this plastic. Compressing the material in an unused tobacco baler, barrel, or other such container will be helpful in reducing the bulk of the plastic. Since this waste plastic cannot be recycled (it is too dirty), it must be dumped in a landfill. Burning the plastic is not safe, may have adverse effects on the environment, and leaves a residue that is difficult to clean up. Thus, burning is not recommended.

ADDITIONAL RESOURCES

Several additional articles are available for those who may be interested in learning more about Balage. Two UK Extension articles that are most helpful include: "AGR-173: Baling Forage Crops for Silage" and "Baled Silage: Frequently Asked Questions." Both of these articles, along with many other informative articles can be found on the UK Forage Website (<http://www.uky.edu/Ag/Forage/>).