

# Is There a Benefit to Alfalfa Balage?

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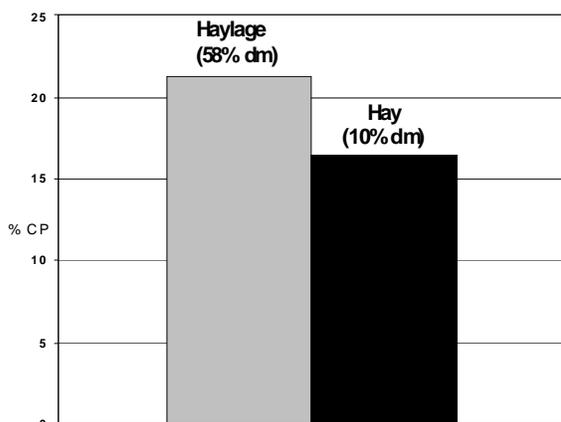
Making hay in the mid-South has always been a difficult process. High humidity and rainfall often make drying a long, tedious, if not impossible proposition. Over the last few years there has been an increased interest in making round bale silage, or balage, from forage crops. Fermenting alfalfa for storage has several advantages and disadvantages over regular haymaking systems.

## Understanding the Fermentation Process

During fermentation, bacteria use carbohydrates found in the plant, and produce lactic acid. This lactic acid causes the pH to drop, eventually to a level at which microbial activity stops and the crop can be safely stored for an extended period of time. The process of fermentation is an anaerobic process, meaning that the bacteria function in an environment that does not contain oxygen. For the first few days after the alfalfa is baled, there is oxygen present. Fermentation will not adequately begin until that oxygen is depleted, creating the anaerobic condition. The initial oxygen is used by other species of microbes, as well as plant cell respiration.

The amount of lactic acid needed to drop the pH will be directly proportional to the amount of moisture in the crop. Higher moisture contents will need more lactic acid to drop the pH to a stable level. Most forage crops will require wilting to drop the moisture content before they can be baled and wrapped. Generally only 1-2 days is required to drop the moisture content to an acceptable level for balage, compared to 3-5 days for dropping the moisture content to an acceptable level for hay production.

**Figure 1. Crude protein level of alfalfa as either hay or balage.** (Han and Collins. 2004. Crop Science. 44:914.)



## Is Balage Higher in Nutritive Quality?

Most producer's experience is that balage is higher quality than hay. This has been shown in various research projects as well (Figure 1). It is important to realize that making balage does not improve the quality of the forage. The higher nutrient content of balage is the result of less exposure of the forage to the

environment, and less degradation or loss of the nutrients that were contained in the alfalfa when it was first cut.

Immediately after alfalfa is cut, there is a slow (or sometimes rapid) loss in protein and energy in the crop. There are several factors that cause this loss in nutrients. First, and most dramatic, is rainfall. Rain on a crop during the drying process is disastrous for the nutrient content. With balage, it takes fewer days to achieve to the desired moisture content, so there is less chance of getting the crop wet from rain. A second factor in nutrient loss is in damage to leaves and leaf loss. Since the crop is raked and baled at a higher moisture content, there is less leaf loss.

### **Key Points For Successful Balage Production**

*Cut alfalfa at the proper maturity.* The forage quality of the alfalfa balage can be no better than it is when it is first cut. Everything that is done to it from that point will only cause leaf loss and a decrease in forage quality. It is important to not delay harvest, but cut at the right maturity to get a high quality crop. The decrease in drying time for balage should make it easier to cut in a timely manner.

*Wilt to approximately 50 percent moisture.* Research and experience have shown that there is a wide range of moisture content that can produce good fermentation with balage. Research conducted by Hancock and Collins made acceptable alfalfa balage from 37 to 61 percent moisture. The best recommendation is to aim for wilting alfalfa to approximately 50 percent moisture. The early bales will be higher in moisture and the last bales will be lower, but a wide range (40-60%) in moisture will still produce acceptable fermentation and a stable balage product.

*Wrap the bales as soon as possible after baling.* The alfalfa bales need to be wrapped as soon as possible after baling to reduce the heating that will occur and speed up the beginning of the fermentation process. It is best to begin wrapping within a few hours of baling.

*Keep bales air-tight.* The bacteria that convert carbohydrates in the plant to lactic acid only live in oxygen-free environments. It is important to wrap the bales as soon as possible after baling, then periodically inspect the wrap for punctures or holes. If any are found, cover them with some type of thick tape. Holes in the plastic will allow oxygen back into the wrap, and spoilage will occur in the area around the hole.

*Use at least 4 layers of plastic.* As has been stated several times, it is important to keep the alfalfa in an oxygen-free environment. In the past, a silo was used to keep out oxygen. In the case of balage, the plastic wrap replaces the silo. If only two layers of plastic are used, there may not be as good of fermentation. Research in Kentucky has shown that four layers are adequate to produce good quality balage.