

Comparison of Preservatives of Alfalfa Hay

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INTRODUCTION

At times, rainy weather conditions do not permit adequate curing; spoilage, caused by heating and molds, results in poor quality hay of decreased nutritive value. Many farmers also face yield and monetary loss from high winds disrupting windrows during the summer monsoons.

A relatively new approach to hay harvesting involves adding small amounts of various preservatives, particularly organic acids, at the time of baling. These preservatives, which inhibit mold activity, prevent nutrient loss. Therefore, the use of organic acids as preservatives might permit baling at higher moisture levels than normally recommended. This, in turn, would allow farmers a baling management choice when impending storms are a threat.

Other preservatives (such as urea, ammonia and bacterial cultures) have been proposed, but insufficient data are available to evaluate their effectiveness. Therefore, more research in this area is needed.

The objectives of this study were to determine:

1. The effect of adding different preservatives to high moisture alfalfa hay on heating, molding and retention of nutrients in the hay.
2. The effect of each preservative on the acceptability of the alfalfa hay to lactating cows.

RESULTS AND DISCUSSION

Different preservatives (Propionic acid, 1%; Urea, 2% and 4%; Lactobacillus culture, 10 g/ton; and Pro-serve, 45g/ton) were added to mid-bloom alfalfa hay baled at average moisture contents of 24, 26, 25, 29, and 29, respectively, and compared with untreated wet and dry hays at 31 and 11% moisture, respectively.

Mean bale temperatures at one week post-harvest were highest for wet control hay (41.2 C), which also had considerable visible mold. The lowest temperature was recorded for the dry control (31.4 C), which had no mold.

Temperatures for the five wet treated hays (propionic, low urea, high urea, Lactobacillus culture, and Pro-serve) were: 33.3, 36.7, 36.7, 36.3, and 38.6 C. Propionic acid and high urea successfully eliminated visible mold but small amounts of mold were observed for hays treated with low urea and the Lactobacillus culture. Pro-serve had a higher temperature and more mold than other treated hays.

Chemical analysis of hay sampled at different times after harvest showed a small increase in crude protein percent, probably due to the loss of fermentable carbohydrates. After 35 days of storage for all treated hays, there was an increase in ash, acid detergent insoluble nitrogen, acid detergent fiber, and lignin, but not as much as in the wet control.

Probably these increases in ash, fiber, and lignin were due to a percentage replacement and not to a true increase in these components. Also, the results of this study showed that acid-detergent insoluble nitrogen (ADIN) was directly correlated to the degree of heating in alfalfa hay. Pro-serve and wet control hays were the only treatments that were significantly higher ($P < 0.05$) in ADIN than the dry control.

In an experiment designed to determine whether the preservatives affected hay acceptability, 21 mid- and late-lactating Holstein cows were assigned to 7 groups in randomized block design. The alfalfa hay

was fed ad libitum as the only forage. Also, a concentrate mixture was fed at 1 kg per 3.5 kg milk. No significant differences in ration DM intakes or milk yields were noted between hays.

For hay treated with 2% urea, the chemical analysis showed that 70% of the added urea was converted to ammonia within 35 days of the treatment and only 19% urea was left by the time of feeding (120 days after baling). In the case of the hay treated with 4% urea, only 24% of that added urea was converted to ammonia 35 days after baling. By the time of feeding, 42% of the added urea was still in the hay and about 58% of the added N had been converted as NH_3 .

In general, the results obtained from IVDM digestibility trial determined on samples collected by the time of feeding (4 months after baling) showed that the wet control was significantly lower ($P < 0.05$) than all the treatments, except Pro-serve at 48 hours of incubation. Also, data indicated that NDF digestibility 4 months after baling was significantly different ($P < 0.05$) for propionic acid and urea treated hay than the two controls.

Based on feeding chemical composition and digestibility data reported from this trial, it can be concluded that propionic acid was the most effective additive used in preserving high moisture hay, followed by 24% urea and the Lactobacillus culture.