

Effect of Harvest Moisture, Bale Wrapping & Organic Acid on Forage Quality & Mold in Grass Hay

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Moisture level at time of baling is a significant factor leading to hay heating and fire. The relationship between forage moisture and the resulting bale temperature has been studied in small and large square bale dairy quality hay, but not in horse quality grass hay. Most guidelines currently used in the equine community are extracted from dairy related research results. However, horses are highly sensitive to mold. Guidelines for hay moisture at time of baling established for cattle may be too high for mold-sensitive horses. Ingesting moldy hay can result in both short-term and long-term respiratory problems in horses, specifically heaves and colic. Moldy hay also can cause human respiratory distress in addition to labor and financial burdens related to replacing and disposing of the moldy hay.

Previous research suggests that large hay packages need to be dried to <17% moisture if intended for use as quality horse hay. In Sweden, researchers have investigated plastic wrapping round bales at ~35% moisture. Wrapping bales at this moisture level results in minimal fermentation and has been shown to be safe for horse feed. Even though bale wrapping is an accepted means of forage processing for cattle, it has not been accepted or researched extensively in the horse community in the United States. Bale wrapping may be a strategy to provide high quality horse hay.

While many horse owners select hay based on different characteristics (color, smell, type of hay, or hay mix), one characteristic remains the same - it must be dust and mold free. While the window for baling premium, rain-free hay is narrow, mostly due to environmental challenges, the use of preservatives during the baling process has been shown to effectively preserve high moisture, aerobically stored hay. Preservatives at rates of 1-2% are used to prevent mold formation and the most common hay preservative is an organic acid preparation containing buffered propionic acid. In a free-choice palatability trial, horses preferred alfalfa that was not treated with a preservative over alfalfa that had been treated with a mixture of acetic and propionic acid. However, another study found that yearlings receiving hay treated with preservative consumed and gained as much over a one-month feeding period as yearlings consuming untreated hay. Clinical measures of well-being such as serum enzyme levels were not affected by consumption of preservative-treated hay, indicating the hay had no negative effects on the horses.

The objectives of this research were to:

1. Determine relationship between moisture at time of baling on hay, forage quality, and mold formation in large round baled grass hay.
2. Determine effect of wrapping and hay preservatives on forage quality of large round hay baled at different moisture ranges.

MATERIALS & METHODS

Thirty-six 4' x 5' round bales (~1,000 lb) were baled and net wrapped at three moisture ranges: <15, 20-25, and 30-35% (wet basis). Moisture at baling was estimated with a moisture probe. Each treatment was replicated four times in a randomized complete block design. First cutting, flowering grass (primarily orchardgrass) hay was baled in 2009. After baling, each bale was cored (0.8" diameter x 20" long), and samples were analyzed for a basic equine forage nutrient composition and fiber by a commercial lab. A commercially available organic acid blend hay preservative (Fresh CUT® Plus brand Kemin Industries) was applied to the 20-25 and 30-35% moisture bales during baling at 10 lbs/ton (1.0%). Bales at each moisture range were wrapped six times with 1 mil plastic wrap for an average covering of 6 mils. After 10 weeks, additional cores were taken on each bale to determine forage quality and mold counts and identification.

RESULTS & DISCUSSION

Moisture & Forage Quality. Actual moisture content of baled forage was sometimes less than the 20-25% and 30-35% target moistures. Protein, fiber, ADF, NDF, and DE were similar at baling for the three target moistures. For forage baled at 15% moisture, wrapping the bales did not affect moisture or quality of these bales between June-September. There were treatment effects ($P < 0.05$) on forage quality for hay baled at 20-25% moisture. Both moisture and protein decreased from baling in June to sampling in September. Wrapping resulted in an increased equine digestible energy (DE) compared to bales that were not wrapped in some treatments. The application of an organic acid blend did not result in the maintenance of forage quality throughout the experiment at the higher moisture levels (20-25% and 30-35%).

Mold Populations. Moisture at time of baling had a significant ($P < 0.05$) effect on mold counts, with hay having <15% moisture resulting in lower mold counts. Wrapping significantly lowered mold counts in all moisture ranges. The moisture by wrapping interaction was also significant ($P = 0.00$). The application of an organic acid blend did not result in reduced mold counts.

Because mold is naturally occurring in the environment, hay containing <500,000 cfu/g of mold is considered safe and poses little risk when fed to horses. Hay baled at <15% moisture and bales that were wrapped fall into this category (with the possible exception of the 30-35% wrapped bales). Hay containing over 1,000,000 cfu/g of mold should not be fed to horses (based on the recommendation to cautiously feed to bovines at the same level) and constitute treatments that were not wrapped in this experiment.