WISCONSIN - Effects of Propionic-Acid Based Preservative on Storage Characteristics

Wayne Coblentz, USDFRC, Kenneth Coffey, University of Arkansas, Michael Bertram, UW

For years, various formulations of organic acids have been marketed as preservatives, specifically for hay that could not be field-dried to moisture concentrations low enough to reduce or eliminate spontaneous heating during storage. These preservatives are often propionic-acid-based products formulated to create an unfavorable environment for growth of storage microflora and buffered to limit oxidative damage to expensive farm equipment. In the past, these preservatives have been applied to small-rectangular (100-lb) bales with some success, but more recent evaluations of these products in large-round bales of alfalfa hay at the UW-Marshfield Agricultural Research Station have been somewhat disappointing. Objectives: 1) evaluate effectiveness of applying commercial buffered propionic-acid-based preservative to large-rectangular (625 lb) bales of alfalfa-orchardgrass hay; and 2) evaluate digestibility of these cured hays in growing lambs.

The commercial preservative was applied at three application rates (0, 0.6, or 1.0% of wet bale weight) to hays baled at 19.6, 23.8, and 27.4% moisture. Bales were stacked individually on wooden pallets under a roof for 73 days. During this time, internal bale temperatures were monitored daily and summarized as heating degree days >86°F (an index that integrates the magnitude and duration of heating within the hays). Following the 73-day storage period, bales were shipped to the University of Arkansas, where hays were evaluated for digestibility in growing lambs.

The commercial preservative was very effective at reducing heating (HDD) during storage. Within the wettest hays (27.4%), there was a clear rate effect, with the 1.0% application rate suppressing heating more effectively than the 0.6% rate, but both rates offered substantial improvement relative to untreated controls. For drier hays (23.8 and 19.6%), both application rates produced comparable suppressions of heating that were far more desirable than untreated hays. Evaluation of in-vivo organic matter (OM) digestibility in growing lambs indicated that digestibility was depressed in a linear relationship with HDD. As a result, OM digestibility was decreased by about 0.5% for every 100 HDD accumulated during storage.

Therefore, application of commercial propionic-acid preservatives offers some insurance against spontaneous heating and/or combustion, and offers modest benefits with respect to digestibility. However, caution is advised in interpreting these results; in this trial, bales were stacked individually (without contacting other bales). These results cannot be extrapolated to large stacks without verification by replicated research trials.