

To B-Wrap or Not to B-Wrap: That is the Question!

Krishona Martinson, Alfredo DiCostanzo, and Craig Sheaffer, University of Minnesota

Feeding Round Bales. Large round bales are commonly fed to livestock, including horses, and can be stored in various ways. Outdoor storage can be advantageous for farmers with limited indoor storage; however, it has been well-documented that storing hay outdoors has negative impacts on quality and dry matter (DM) retention. The magnitude of loss is affected by many factors, including wrap type. Historically, large round bales were primarily tied with sisal or plastic twine; however, net wrap has grown in use due to faster binding times and reductions in DM losses. Recently, B-Wrap® (Ambraco Inc.) has emerged with potential to further reduce DM losses and retain forage quality. Additionally, reduced-lignin alfalfa varieties are now commercially available; however, little is known about the impact of their outdoor storage. We hypothesized that because of their increased forage digestibility, bales made from reduced-lignin alfalfa could be subject to greater losses when stored outside.



Researchers from the University of Minnesota determined changes in DM and forage quality and examined the economics of hay made from reduced-lignin and conventional alfalfa bound in twine, net wrap, and B-Wrap while in long-term, outdoor storage. We also determined the time required to bind round bales using the three wrap types.

How the Research was Conducted. Conventional (12 bales) and reduced-lignin (12 bales) alfalfa hay was harvested in June 2017 in Minnesota. For both alfalfa varieties, groups of four round bales were wrapped with either plastic twine (Case IH), net wrap (Ambraco Inc.), or B-Wrap. Bales were stored outdoors on wood pallets, on the rounded side, with ~5" between each bale. At the time of harvest and every 3 months for one year, individual bale weights were recorded. Stratified hay cores were taken from each bale, including the outer 6" and the inner 6-18".

Time to Bind Bales. Twine (56 seconds) required the most time to bind a bale, B-Wrap (28 seconds) was intermediate, while net wrap (18 seconds) required the least amount of time. Time to bind each bale started when the tractor paused to wrap the bale and ended when the bale was ejected from the baler.

Alfalfa Varieties. While alfalfa varieties did differ in neutral detergent fiber (NDF) and acid detergent lignin (ADL) at the time of baling, minimal differences were seen throughout the storage period; therefore, data were summarized across varieties. Additionally, minimal differences were observed in the inner 6-18" of the bales; therefore, only values of the outer 6" are discussed.

DM Losses. All bales began the storage period at a similar moisture. Starting on day 90, bales bound in twine and net wrap had a greater moisture concentration compared to bales bound in B-Wrap. After one year in storage, the moisture concentration of B-Wrap bales had not changed, while net wrap and twine bound bales had higher moisture concentrations (27%). Twine-tied bales lost 7% DM, net wrap bales lost 5% DM, while B-Wrap bales maintained DM. Maintaining DM is critical as that represents what farmers are harvesting, feeding, and buying and/or selling.

Forage Quality. Changes in forage quality were observed at ≥180 days of storage with a dilution of nonstructural carbohydrate (NSC) and a concentration of insoluble fiber components including NDF and acid detergent fiber (ADF) due to moisture penetration in bales tied with twine or bound in net wrap. After one year, NSC, NDF digestibility at 48 hours (NDFD48), and relative feed value (RFV) were greater in B-Wrap compared to twine-tied bales, while net-wrapped bales tended to be similar to both wrap types. B-Wrap bales were lower in NDF

and ADF concentration compared to twine-tied bales. Combined, these results indicate that B-Wrap was better at shedding precipitation and inhibiting moisture penetration compared to the other wrap types. This is critical as moisture can dilute beneficial nutrients leading to a concentration of insoluble fiber values.

Economics. The cost of a wrap type is a common concern for farmers. The estimated cost per large round bale when wrapped with B-Wrap is \$8.33, compared to net wrap and twine with estimated costs of \$1.17 and \$1.00/bale, respectively. Bale value was calculated using bale weight, RFV (\$1.28/RFV point), the material costs of the wrap types in excess of twine, and excluded round baler equipment costs and wrapping time. Starting at 180 days of storage, B-Wrap bales had a greater individual bale value compared to net wrap and twine bound bales by \geq \$10.84.

Take Home Message. If storing hay outdoors for more than 90 days, B-Wrap appears to be superior to twine and net wrap in shedding moisture, which helps preserve DM, forage quality, and bale value. Additionally, minimal forage quality differences between conventional and reduced-lignin alfalfa varieties were found after long-term, outdoor storage. Regardless of wrap type, the “weathered layer” of the bales did not exceed 6", likely due to baling a solid, firm bale, and storing the bales on pallets.

This project was recently published in *Applied Engineering in Agriculture* and was funded in part by Midwest Forage Association, John Deere, and Tama Inc.