EQUIPMENT

Getting a Handle on Hay Moisture Prior to Baling

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t is time to be thinking about making those first bales of hay or possibly be looking toward second cutting. In order to make certain those bales are of the highest quality possible, measurement of hay moisture at baling and possibly again at storage is critical.

Effects of High Moisture on Baled Hay

Hay quality depends greatly on crop moisture at baling. Excessive heating of the bale due to high moisture content, combined with microbial activity, will degrade digestibility and/ or energy contained within the baled hay.¹ Dry matter losses due to excessive bale heating can be 5% or more when hay is baled at >20% moisture. Not only can this heating effect degrade hay feeding quality, but it can generate enough heat to cause a bale to self-ignite. If this happens after the hay has been stored, the entire content of the hay storage facility or location can be lost. Finally, hay baled or stored wet is susceptible to further degradation of feed quality due to mold growth.

Accurately Measuring Hay Moisture Content at Baling and Storage

There are several methods for determining hay moisture. The first, and most time consuming method, is oven drying. The standard method for determining forage moisture content with oven drying requires the sample to remain in an oven 24 hours at 217°F.² Initial weights and post-drying weights are measured to determine the weight of water removed during drying. This method is difficult to use if the hay is already on the ground and drying.

Another method is utilizing a baler-mounted moisture meter. Sensing units contained within these devices are usually based on capacitance or electrical resistance, meaning they need two contact points on the hay to assess the bale moisture. Benefits of these baler-mounted units are they provide a continuous reading while the bale is made and also produce an average bale moisture value. A potential downside to these devices is a bale must be made to measure the hay moisture.

Figure 1. Different types of hay moisture measurement tools (hand-held probes, bucket probe, and moisture analyzer).



Figure 2. Compression fixtures for increasing accuracy of hand-held moisture probes.



Hand-held moisture meters solve this problem by allowing hay to be tested while it is still in the windrow. Hand-held meters are usually capacitive or resistive sensing as well, meaning they must be in contact with the hay. To ensure baling is done at the proper moisture content, collecting data with a combination of readings from hand-held and machine-mounted moisture meters is best.

Finally, moisture analyzers can be used, albeit at a significant cost, to determine forage moisture content. These devices integrate an oven or heating element and a scale into one unit and repeatedly measure sample weight as it dries. These devices provide an accurate assessment of the moisture content more quickly than the oven drying method, but less quickly than the moisture probes.

Improving the Accuracy of Hand-Held Moisture Probes

Maintaining consistent measurement conditions is key to accurately assessing hay moisture content with hand-held moisture probes. Assessing the hay "as it lays" in the windrow will not provide an accurate reading. Thaemert and Shewmaker (2003) from the University of Idaho recommend constructing a hay compression device consisting of a capped PVC tube with a smaller capped PVC tube as a tamper.³ The larger tube is loaded with hay and tamped to "simulate baling pressure" before readings are collected at four levels with the hand-held meter. Repeating this at multiple locations within a field will give you an idea of hay moisture content. Chesser Jr. et al. (2012) designed a fixture for achieving repeatable results with hand-held hay moisture meters when measuring switchgrass.⁴ The fixture consisted of an enclosed wooden box with holes drilled near the bottom for inserting the moisture probe. A platen capable of sliding inside the box is used to compress the hay by placing known weights on top. This method provides repeatable hay compression for more accurate readings.

Regardless of how you determine your hay's moisture before baling, know it is critical for maintaining feeding quality and for farm safety. Ensure you are baling below 20% moisture and allow the baled hay to heat (sweat) before moving it to the storage site or facility. Have a safe and productive growing season!

- 4 Chesser Jr., G. D., Davis, J. D., Purswell, J. L., & Lemus, R. (2012). Moisture determination in windrowed switchgrass using electrical resistance probes. Trans. ASABE, 28(5), 623-629.

 ¹ Collins, M., D. Ditsch, J. C. Henning, L. W. Turner, S. Isaacs, and G. D. Lacefield. 1997. Round bale hay storage in Kentucky. Publication No.: AGR-171. Cooperative Extension Service, University of Kentucky, Lexington, KY.
² ASABE. (2012). Moisture measurement – forages. Standard No.: S358.3. St. Joseph, Mich.: ASABE.
³ Thaemert, R. and G. Shewmaker. 2003. Sampling the moisture content of alfalfa in the windrow: A new tool helps. Publication No.: CIS 1107. University of Idaho Extension, Moscow, ID.