

MOISTURE MANAGEMENT IN HAY MAKING AND STORAGE

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Making hay in central Kentucky can be one of the most trying on farm endeavors a producer can undertake. Our plentiful moisture, rolling topography, and climate make Kentucky ideal for producing high quality forage for either grazing or hay making. However, that same moisture, either in the form of rain or high humidity, can sometimes make it devilishly hard to make hay here in Kentucky.

Having traveled this country extensively in the past sourcing high quality hay, I can say beyond the shadow of a doubt that we can produce as high quality a forage as anyone in the country but getting that hay in a package that can be stored appropriately or that can be shipped a long distance is where we here in Kentucky struggle.

Tools like mower conditioners, preservatives, tedders, multiple packaging options, etc. now give us the opportunity to make high quality hay here in Kentucky. Use of these new innovations and tools does not however totally eliminate the possibility of producing some “wet” hay.

After you cut your hay, the question then becomes, “When do I bale the hay and at what moisture level will it keep?” Research tells us that for small square bales we need to have a moisture level of 20% or less and for round bales 18% or less. Even if we reach those levels sometimes we can still have problems with hay heating, especially if not stored properly.

How do we check for moisture in hay that we need to bale? The most reliable and accurate way is by using the microwave method (Table 1). There are also commercially available moisture meters that do a good job of telling moisture levels. Bale a couple of small square bales or a couple of round bales and then use the moisture meters according to the supplied directions. (Some commercial testers also come with a temperature reading on them). This should give a fairly accurate moisture reading. If the hay is above the previous mentioned percentages put off baling until those levels are within the desired range. Preservatives will allow for baling at higher moisture levels however special care should always be taken when using preservatives and ALWAYS read and follow label directions.

Table 1. Determining Forage Moisture Content Using a Microwave Oven.

1. Chop fresh forage into 1 to 2 inch lengths for ease of handling.
2. Weigh out approximately 100 grams (3.5 ounces) of chopped forage.
3. Spread forage thinly on a microwave-safe dish and place into microwave. Putting a cup of water in the microwave will reduce the chance that this hay will ignite.
4. Heat for 2 minutes and reweigh.
 - a) If forage is not completely dry, reheat for 30 seconds and reweigh. (Microwaves vary considerably in drying capacity. It is better to dry for short intervals and reweigh until the last two weights are constant, than to overdry and run the risk of burning and damage to over.) Continue this process until back-to-back weights are the same or charring occurs.
 - b) If charring occurs, use the previous weight.
5. Calculate moisture content using the following equation:
$$\% \text{ Moisture Content} = \frac{W1 - W2}{W1} \times 100$$

W1 = weight of forage before heating
W2 = weights of forage after heating

Dry matter (DM) is the percentage of forage that is not water. DM equals 100% minus percent water.

Example: moisture content 14%

$$\text{DM} = 100 - 14 = 86\%$$

Results on an "as-fed basis" reflect total nutrient concentration including water of sample analyzed or to be fed.

(Source: Southern Forages 1996. D.M. Ball, C.S. Hoveland and G.D. Lacefield. Page 246.)

Now that the hay is in the bale is it dry enough and cool enough to put in the barn. Most hay goes through one or more heating cycles (a sweat) immediately after baling. It is not unusual for internal bale temperature to exceed 100 F and it may go as high as 130 F if enough moisture and oxygen are present. As moisture levels increase in the baled hay the probability of heating increases also.

As temperatures increase in the hay the risk of fire also begins to come into the picture. If you see temperatures rising above that 130 F level, it would be imperative to continue to monitor that hay on a daily basis. If temperatures continue to rise, begin to think about moving the hay out of your storage structure. When temperatures reach 150 F start moving hay immediately. If temperatures reach over 160 degrees call the fire department before moving the hay. At these higher temperatures, an influx of oxygen can ignite a fire and then it is probably too late to call the fire department for fire prevention but rather you will be calling them to put the fire that is burning your hay as well as your storage structure.

When building a hay storage structure be very careful to insure adequate ventilation which will allow for the proper curing of your hay crop. As hay cures, it emits warm moist air. That air rises and needs an escape route at the top of the building. That air needs to escape in order to prevent condensation on the roof which will in turn fall back onto the hay which can cause storage losses and can contribute to the risk of fire. If possible, it is desirable to allow for the inflow of air from the bottom of the building which can help with air flow to remove the warm moist air from the top of the building.

In order to facilitate the proper curing of your hay, store small square bales on edge with the cut side up. This will allow the warm moist air to escape the bale better and rise to and out of the top of the building. Rounds bales should be left outside until temperatures have approached ambient temperature.

In closing, moisture management is critical in packaging and storing hay. The two moisture levels that need to be monitored are baling at the point of baling and when put into storage. If you are relentless in your moisture management, your chance of producing a high quality hay crop is greatly enhanced.