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Don't let your hay be a "Barn Burner"

By Adam Speir
Madison County CEC

I always remember being at basketball games growing up and hearing that a close game by two very good teams would be called a "barn burner." With hay season just around the corner, farmers have the very real risk of dealing with a "barn burner" of a different, more dangerous sort. Improperly cured or stored hay could lead to a biological chain reaction that could result in spontaneous combustion and loss of hay, barn structures, or even life. Knowing the processes involved and when hay is "dry enough" is critical to avoid these issues as well as other potential problems such as mold and degradation in hay quality.

To understand how moisture can actually lead to a burning hay bale, let's understand the biology and chemistry that is driving it. Even after grass is first cut for hay, it is not "dead". The plant cells within the grass are still undergoing respiration, (the burning of plant sugars to produce energy) releasing a small amount of heat. The level of respiration, and amount of heat generated, is dependent on the moisture level of the grass. Usually, the heat generated due to respiration is inconsequential as related to hay bale temperature and quality (if hay is allowed to dry to sufficient moisture levels).

Meanwhile, there are microbes ever-present in the environment and on the hay that is being cut. Two fungal species in particular, Aspergillus and Fusarium, feed on carbohydrates both on and inside the grass stems and leaves. This activity can result in losses of forage (dry matter) and also results in the generation of heat through biological activity. These fungi also produce spores, which can become an issue in hay that is put up too wet.

If hay moisture is high enough, the combination of plant respiration and ideal growing conditions for a large population of fungi which are also respiring (producing energy) can quickly cause hay bales to reach temperatures of 130° to 140°F. In some instances, this is the highest temperature hay bales will experience and the bales will eventually cool to ambient temperatures. This is what is sometimes referred to as a hay bale "heat" or "sweat" and usually occurs within the first few days of baling. However, this "sweat" is a side effect of microbes feeding on the most digestible parts of the hay, which results in lower quality. For example, studies have shown that the total digestible nutrients (TDN) of bermudagrass hay decreases by 1% for every 10°F increase in temperature over 100°F. This means that a good bermudagrass hay crop that is put in the barn with a TDN of 58% will likely come out of the barn with a TDN less than 54% if it heated up to 140°F or more.

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Barn Burner Cont.

As we mentioned, hay can commonly reach temperatures of 130° to 140°F during the first few days of storage. This will often kill off many of the fungi and bacteria found in the bales, but hay becomes a potential fire hazard when those internal temperatures do not cool off after that first "sweat". This can occur when the conditions produced by the first set of microbes allow for the growth and multiplication of thermophilic (heat loving) microbes. The respiration of these fungi and bacteria can quickly raise the interior temperature of hay bales to 170°F or more. Temperatures this high bake the hay and convert it into a spongy carbon filled material with microscopic pores similar to charcoal. This material can react with oxygen and can self-ignite. If hay reaches an internal temperature of 175°F, fire is imminent and emergency steps should be taken.

How do we avoid these issues? Monitoring hay bale temperature is important, but checking hay moisture prior to and during baling is critical. Most research confirms that round bales should be baled at moisture levels of 15% or less while square bales should be kept less than 17%. These numbers are a good "rule of thumb"; but other factors can complicate these rules. The density of hay bales plays a major role in temperature. Advances in baling technology have allowed for much denser rolls, but higher density bales enables heat to build up much quicker than similar hay in a looser bale. Other factors, such as air circulation, relative humidity, and ambient temperature in the field and in the hay barn should be considered and play into how closely you monitor moisture levels at baling.

One should check hay bale temperatures twice a day for around six weeks after baling if the moisture levels were higher than recommended. If temperatures reach above 150°F, they are likely to go higher, running the risk of fire. If so, calling the fire department immediately is recommended. This should especially be done prior to relocating or handling any bales. The hay should be moved, but only once the fire department is there wetting down the hay as it is being removed. Moving hay introduces oxygen and this greatly increases the risk of fire.

Looking for Bermudagrass Spriggers in Georgia?

We have a list for that. Go to the website below for a list by county of who is available.

http://georgiaforages.caes.uga.edu/questions/spriggers.html

Upcoming Events

Georgia Forages Conference @ GA Cattlemen's
Mar. 29, 2017 | GA National Fairgrounds | Perry, GA

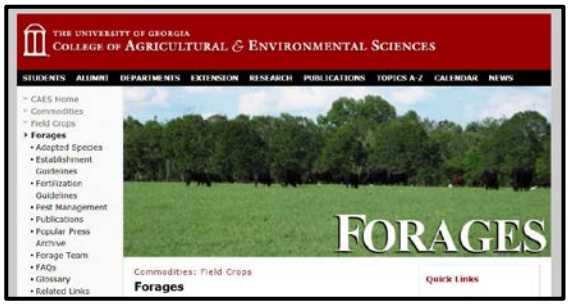
GA Mountain Field Day
April 7, 2017 | GA Mountain Res. & Educ. Center | Blairsville, GA

Corn Silage and Conserved Forage Field Day
June 15, 2017 | UGA Tifton Campus Conference Center | Tifton, GA

Georgia Grazing School
Sept. 19-20, 2017 | UGA Livestock Instructional Arena | Athens, GA

Looking for more forage information?

Be sure to visit **GeorgiaForages.com**!



Meet the newest UGA Grass Masters Graduates

The UGA Forage Team recently hosted the UGA GrassMasters series for Northeast Georgia at the UGA Livestock Instructional Arena in Athens. This was the second such program hosted by the Forage Team as part of a partnership with the Natural Resource Conservation Service. The goal of the program is to provide a more intensive series of classes focused on introduction-level forage production information. The NE GA program was attended by twenty five participants from eleven counties who received certificates for attending at least five of the seven classes. Participants also received a notebook with handouts and reference materials, a copy of "Management Intensive Grazing," and a grazing stick. Plans are to host at least two GrassMasters programs across the state each year.

Considerations for Seeding Warm Season Perennials

By Jeremy Kichler
Colquitt County CEC

This time of year, County Agents get questions about establishing warm season perennial forages from seed. Forage establishment can be expensive, especially if you have to do it twice. Let's discuss some things that ensure successful perennial forage establishment on the first try.

1. **Fertility.** Soil sampling should be done before a few months before attempting establishment. If the producer has to address soil pH issues then they need to be addressed in a timely manner. According to Southern Forges, if the area has a low soil pH then it may be advised to apply one-half of the recommended lime a few months in advance of planting and then till the field. After the tillage is completed then apply the reminder of the lime that is required. This helps distributes the lime throughout the soil profile.

2. **Planting Date.** Planting date plays an important role in forage establishment. Weather can delay establishment dates, which could be the difference between success and failure. The best time to plant bahiagrass is in the early spring on upland soils or in late spring on low, moist soils. Plantings made later in the summer can be successful but weed competition can be a problem. Seeded bermudagrass and bahiagrass can begin once soil temperatures reach and are expected to stay at 60 degrees.

3. **Seeding Rate.** Seeding cost is often a big psychological barrier in establishing forages. In the grand scheme of things, the cost of seed is trivial compared to the other costs of establishment, dealing with gaps in the stand during grow-in, and re-establishment. Seeding rate can be influenced by seeding method and seed quality. If broadcasting, seeding rates need to be increased by 20% compared to using a drill. Seeding rate recommendations are based on the assumption of high germination rates. If germination rates or vigor is questionable then increase seeding rates accordingly. In Table 1, seeding rates are shown for three perennial forage crops in Georgia.

Table 1: Seeding Rates for Three Warm-Season Perennial Forage Crops in Georgia.

Forage	*Seeding Rate in Pounds Per Acre*	*Seeding Depth in Inches*
Bermudagrass (Hulled)	5-8	0-1/4
Bahiagrass	12-15	¼ - 1/2
Sericea Lespedeza	15-20	¼ -1/2

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Seeding Perennials cont.

4. **Seedbed Preparation.** The seedbed should be relatively firm prior to planting. This is especially important for small seeded forages such as bermudagrass and bahiagrass. Firm the planting site with a cultipacker before seed is planted. If your planting site has ridges or depressions then they should be smoothed out, as they encourage moisture loss and may challenge seed placement. Footprints left by an average person on a properly prepared seedbed should not be more than ¼ inch deep.

5. **Seeding the crop!!** This is the hard part. A cultipacker seeder or a drill with a small seed attachment is helpful for seeding small seeded forage crops. Drills can be challenging because of the chance of planting too deep. A good rule of thumb is that seed should be planted no deeper than eight times the thickness of the seed. If the drill places the seed too deep even after adjustment, one may need to disconnect the tubes from the small seed box from where they enter the drill's shoes and secure the drop tubes behind the shoes or in front of the press wheels with wires or other means. This allows the small seed to be metered out on the soil surface and pressed down into the soil by the press wheels.

   An issue of ensuring sufficient seed to soil contact may challenge producers if they attempt to use the broadcast method of establishment. Conventional-till seedbeds should be firmed with a cultipacker before seed is broadcasted. Broadcast seeding on a prepared seedbed should be followed with adequate firming of the seedbed with a cultipacker. This would ensure good seed to soil contact.

   If you are using a spinner seeder to broadcast small seeded forages keep in mind that the low seeding rates might cause some challenges. Seed can be mixed with coarse sand or some other inert material that is similar in size and weight. Large volumes of smaller seeds should not be mixed with larger seeds in the hopper or seed boxes because the smaller seeds could settle to the bottom.

   Once you have seeded your forage crop, table 2 below shows a check list of potential issues that producers could face.

Table 2. A Checklist of Potential Problems during Forage Establishment.

Failure to Germinate	Seed Germination but seedling did not emerge from soil	Seedlings emerged but did not survive
Dry Seed Bed Non-viable Seed Hard or dormant seed Unfavorable temperature Herbicide Residue Waterlogged Soil	Planted Too Deep Soil crusted at surface Poor seedling vigor Insects or diseases Extreme temperature – Hot or cold	Soil too acid or low fertility Insects or diseases Drought Weeds No legume nodulation Winterkill Heaving from freezing and thawing soil Sandblasting of seedlings Grazing too early.

**Southern Forages, Fourth Edition…

Look out for Moldy Hay

By Lucy Ray
Morgan County CEC

Mold in livestock hay can be a significant problem, particularly in years where we have had a lot of moisture and humidity during harvest. The summer of 2016 was not overrun with moisture, however, when we have a shortage of hay, many producers are forced to feed less than ideal quality hay and mold can once again become a challenge.

Mold can grow on hay with moisture levels above 14-15%. Mold growth produces heat and can result in large amounts of dry matter and TDN (total digestible nutrients) loss. In some cases, that heating can be enough to cause spontaneous combustion and fire. Drying of stored hay is enhanced by increased ventilation, creating air spaces between bales, and reducing stack size. However, dry hay will draw moisture from humid conditions, particularly on the outer 6-12" of the exposed surface. Any moisture level above 20% on the exposed surface can result in mold growth and levels greater than 30% can result in the stack's entire surface becoming covered in black sooty mold.

Molds are more of a hazard in non-ruminant animals than in ruminants. Horses, in particular, are noted as being susceptible to moldy forages. Mold can cause respiratory issues such as RAO (recurrent airway obstruction) and is thought to be a contributing factor to COPD (Chronic Obstructive Pulmonary Disorder). This is doubly true if forage is not fed in a well-ventilated area or if it is extremely dusty. Mold can also cause significantly higher rate of digestive upset or colic issues in horses due to the anatomy of their digestive tract. Slightly to moderately moldy hay, (spore counts up to 1 million cfu/gram) is relatively safe if fed to cattle and small ruminants. While cattle are less affected by mold, certain molds can result in mycotoxins that can cause abortions or aspergillosis. For more information on hay quality contact your local UGA Extension Agent.