

## Hay Quality Sensory Evaluation Guidelines

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Grass, legume, and mixed hays contribute to natural resource conservation, diversity in crop rotations, livestock health and performance, and economic returns from sustainable agriculture. Although conditions for producing excellent hay are generally favorable in the West, hay lots vary widely in nutritional value for ruminant livestock and horses. Hay quality is defined by nutritional density and animal response, as well as by physical and sensory factors of value in specialty and conventional markets. Requirements for specific nutrient levels and sensory properties vary widely with livestock class and performance targets. Growers and end-users can more cost-effectively produce, market, and secure appropriate hays if quality targets are well-defined and understood.

Laboratory analysis of hay nutritional value has traditionally been based on fiber, crude protein, and mineral levels. More recent approaches include determinations of digestibilities of dry matter (DM) and fiber. Energy, the most important nutrient in hay DM, is largely determined by fiber characteristics. Fiber is a large component (30-70%) of hay DM and is only partially digestible in ruminants and horses. Fiber and fiber digestibility are central to many laboratory analyses and ration formulation approaches because a) ruminants and horses have a fiber requirement for normal digestive function and health; and b) knowledge of fiber digestibility, which varies widely among hay lots, improves predictions of forage energy availability. Laboratories with proficiency in forage testing via conventional wet chemistry and near-infrared reflectance spectroscopy (NIRS) are listed with the National Forage Testing Association at [www.foragetesting.org](http://www.foragetesting.org) and/or the NIRS Forage and Feed Testing Consortium at [www.uwex.edu/ces/forage/NIRS/home-page.htm](http://www.uwex.edu/ces/forage/NIRS/home-page.htm).



Laboratory testing is essential for matching hay lots with livestock requirements, but does not reveal many important characteristics that impact marketability, livestock response, or the potential for introduction of weed seeds to new areas. These include ease of bale handling, transport, and stacking; anti-quality properties associated with toxic plants or heating and spoilage of wet hay; disagreeable odor; presence of dust, mold, weed seeds, or other impurities or injurious substances; leaf concentration, attachment, and pulverization; texture, color, and taste; and presence and dimensions of flower buds and seedheads.

A series of hay evaluation sheets accompanies this bulletin. These may be used in conjunction with laboratory analysis and may also serve as decision-making aids in judging and purchasing hay. Points assigned to entries in hay contests are typically apportioned among laboratory and sensory scores, such as 70 and 30 percent, respectively, of total points for dairy alfalfa. Hay contests present excellent opportunities to relate quality characteristics to management and economic value, but should clearly

define what hay or grower characteristics are being rewarded. Ideally, contestants might be judged on abilities to consistently produce hay that meets particular end-use requirements. More often, hay contests rank entries on their apparent feeding value, or value in specialty markets in which appearance may be more important than nutritional density.

Hay evaluation may involve considerations of trade-offs among forage species, DM production, stand longevity, and nutritional and economic values. This can lead to designations of hay classes intended for use in total mixed rations, and those with lower nutritional densities such as seed and grain straws, feeder and feed store hay, mid-summer cuttings, and establishment-year mixtures with companion crops.

The following general hay characteristics may be evaluated via the accompanying sheets:

- **Package functionality** describes how well bales can be handled, transported, and stacked safely and effectively as a function of shape, density, and structural integrity.
- **Odor** can indicate heat damage (tobacco-like odor) and mold from spoilage of hay that was too wet at baling. Excessive wetness is more readily determined via bale moisture probes than by lab analysis of cored samples. Odor can also indicate use of preservatives such as propionic acid (vinegar-like odor) to minimize heating and spoilage of wet hay, and soil contamination from overly-aggressive raking.
- **Maturity stage** is directly related to fiber, digestible energy, and crude protein levels in hay; fiber increases while digestible energy and protein decrease with advancing maturity in grasses and legumes. In some specialty timothy hay markets, presence and length of seedheads are economically valuable in spite of low nutritional density. *When energy value is important, maturity ratings should be weighted more heavily on the accompanying sheets if laboratory analyses are not available.* Immature (pre-bud) alfalfa can have

insufficient fiber and excessive protein for dairy applications, and may have no additional market value than hay cut at early- to mid-bud stages.

- **Foreign material** includes dust, plant mold and rust, soil, and stones; noxious and poisonous weeds; manure; old alfalfa crowns from stand re-seeding; stubble or older growth from a previous cutting; and non-crop species and materials, particularly those with barbed, sharp (such as cereal grain awns), hard, abrasive, or other features that could harm livestock or feeding equipment. While dust from soil, mold, or rust is typically more objectionable than dust from pulverized leaves, dusty hay should not be fed to horses.
- **Texture and condition** relate to the ease with which hay may be consumed by livestock without discomfort or injury to mouth, face, and eyes; respiratory or other health disorders; or waste due to sorting in feedbunks or leaf losses onto the ground. Leafiness describes leaf concentration in the bale; attachment describes degree to which leaves are retained by stems and flakes as bales are fed; and shatter describes extent of pulverization of baled leaves. Bale flakes also vary in the extent to which they retain their structure or disintegrate when handled. Texture and condition can vary widely among hay lots due to pre-baling differences in the crop canopy, conditioning (crimping), tractor wheel traffic, and mechanical handling operations at differing DM levels.
- **Color** is largely an appearance factor that is not strongly related to feeding value, although it can indicate presence of pre-harvest plant diseases or dead leaves; post-harvest molds from excessively-wet hay; leaching of soluble sugars from rained-on hay; and high levels of leaf loss from raking, turning, and baling excessively-dry material.

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