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Hay Quality Sensory Evaluation Guidelines

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Grass, legume, and mixed hays contribute to natural resource conservation, diversity in crop rotations, and livestock health and performance. Although climatic conditions for producing hay are generally favorable in the West, baled hay varies widely in nutritional value for ruminant livestock and horses. Hay quality is defined by nutritional density and animal response as well as physical and sensory factors that define value in conventional and specialty hay markets. Growers and end-users can more cost-effectively produce, market, and secure appropriate hays if quality targets are well-defined and understood. Assessment of quality depends on end-use applications as well as traditions and perceptions that vary among regions and livestock enterprises. Requirements for specific nutrient levels and sensory properties vary widely with livestock class and performance targets, which broadens opportunities for marketing and utilizing hay with differing characteristics.



Laboratory analyses of hay nutritional value for comparison with livestock needs have traditionally been based on fiber, crude protein, and mineral levels. More recent approaches include determinations of digestibility of dry matter and fiber as explained in a companion bulletin. Energy is the most important nutrient in hay dry matter (DM), followed by crude protein and minerals. Fiber is a large component (35-70%) 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.

While laboratory testing is essential for matching hay lots with particular end-uses, it does not reveal many important characteristics that impact marketability and livestock response. These include ease of bale handling, transport, and stacking; anti-quality properties associated with heating and spoilage of wet hay; disagreeable odor; presence of dust, mold, weeds, weed seeds, or other impurities or injurious substances; extent of leaf capture, attachment, and pulverization; texture, color, and taste; and presence and dimensions of flower buds and seedheads.

A series of hay sensory evaluation sheets has been developed to accompany this bulletin. These may be used alone, or in conjunction with laboratory analysis, to give a more complete picture of hay characteristics. They may also serve as educational and decision-making aids in judging and purchasing hay. Points assigned to entries in hay contests are typically proportioned among laboratory and sensory scores, according to local custom. For example, laboratory and sensory scores may comprise 60 and 40 percent, respectively, of total points for a class such as dairy alfalfa. Hay contests present excellent opportunities to observe and discuss differing quality characteristics and relationships to management and economic value, but should clearly define what hay or grower attributes are being rewarded. Ideally, contestants might be judged on abilities to consistently produce hay that meets particular end-use requirements, and on overall farm-management skill.

More commonly, hay contests rank entries on their apparent feeding value, or economic value in specialty markets in which appearance may be of more concern than nutritional density.

Hay evaluation should include consideration of trade-offs among sensory properties and forage species, DM production, stand life, and nutritional and economic values. Such considerations could lead to designation of classes for hay produced specifically for inclusion in total mixed rations and hay 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 hay can be handled, transported, and stacked safely and efficiently as a function of bale 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 hay wetness is more readily determined via bale moisture probes than lab analysis of cored samples. Odor can also indicate use of 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 physical attributes 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.* Very immature alfalfa hay can have insufficient fiber and excessive protein for dairy applications. This is reflected in the scoring for maturity stage on the accompanying alfalfa form, which assigns highest value to late bud stage.
- **Foreign material** includes dust, mold and rust, soil, and rocks; weeds, particularly invasive noxious and poisonous plants; 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, hard, abrasive, or other features that could harm livestock or feeding machinery. 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** relates 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 remain attached to stems or flakes as bales are opened and fed; and shatter describes extent of pulverization of baled leaves. Hay also varies in the extent to which bale flakes retain their structure or disintegrate when handled. Texture and condition can vary widely among hays due to pre-baling differences in the crop canopy, conditioning (crimping), tractor wheel traffic, and mechanical handling and baling 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 in legume hays from raking, turning, and baling excessively-dry material.

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