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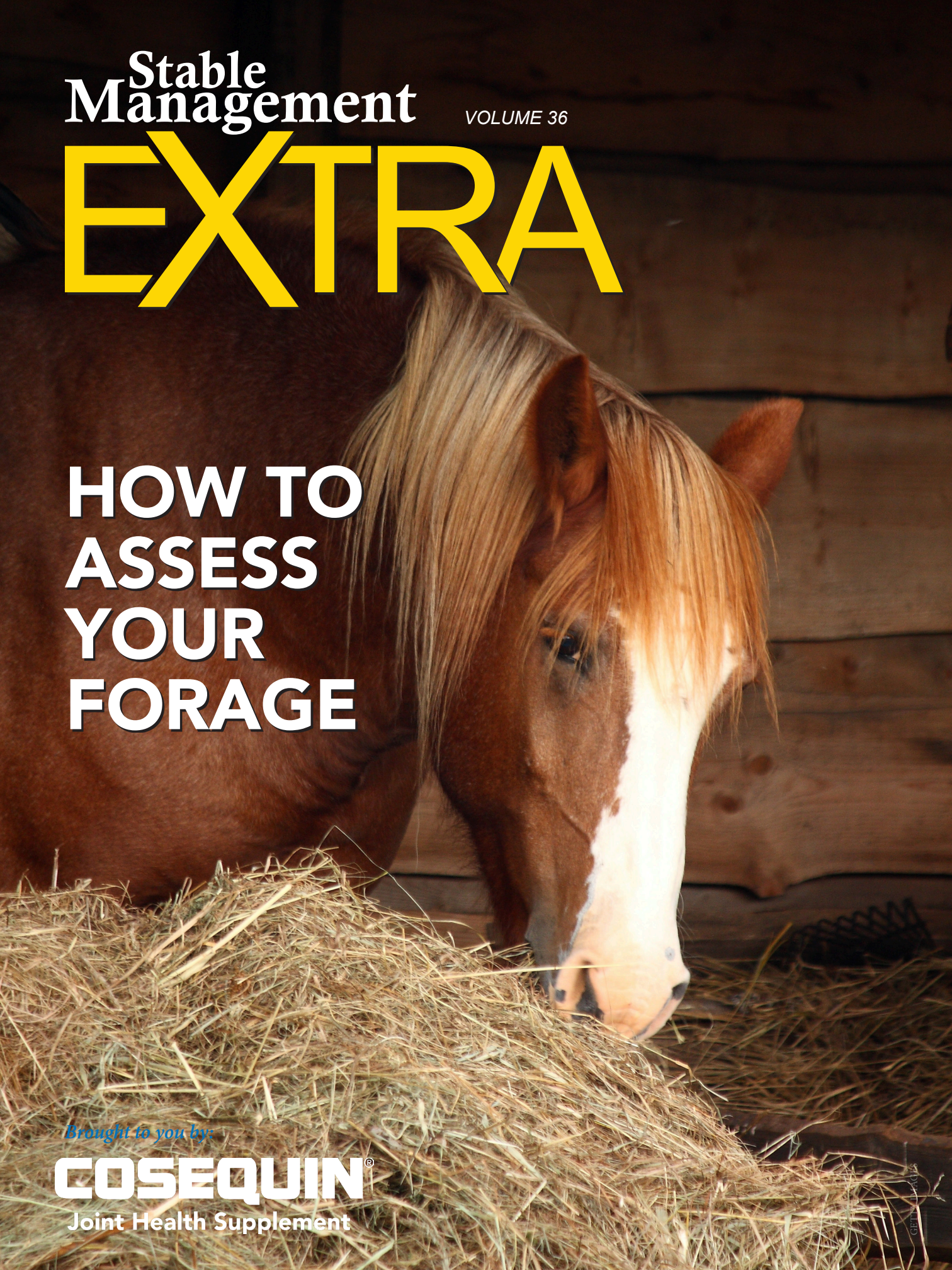
HOW TO ASSESS YOUR FORAGE



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How To Assess Your Forage

5 key physical indicators of forage quality and how to gather and interpret a chemical analysis

Debbie Powell, PhD, PAS

Is green always good? What if it's brown? How do I know if it meets my horse's nutritional needs? These are just a few of the questions owners might ask when trying to assess their horses' forage.

Forage can be divided into two types: harvested (hay) and unharvested (pasture). It supplies horses with energy, crude protein, vitamins, and minerals at varying levels depending on the plant species and its nutritive value. The plant's maturity at the time eaten or harvested, as well as the soil in which the plant grew, influence the nutrition it offers.

"It is the forage nutritive value in combination with visual and physical assessment of the forage that supplies the best information when it comes to understanding how to assess forage for your horse's needs," says Amy Parker, MS, equine nutritionist and technical services manager at McCauley's Feed, in Versailles, Kentucky. "Remembering that horses are herbivores and hindgut fermenters means that they have an inherent need for fiber in order to keep the gut moving normally."

This is why we must feed appropriate amounts of hay when grazing is not feasible. The two major types of hay we feed horses are legumes (e.g., alfalfa, clover) and grasses (e.g., timothy, orchardgrass).

Legumes are generally higher in nutritive value than grasses, says Parker. When harvested at the same stage of maturity, legumes tend to contain higher amounts of crude protein, digestible energy, and

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When assessing and selecting hay, take into consideration its color, smell, stage of maturity, leafiness, and presence of foreign matter.

calcium and lower amounts of fiber. When comparing grasses, cool-season species (e.g., timothy, orchardgrass) tend to offer higher amounts of nonstructural carbohydrates (NSCs) and lower amounts of calcium, while warm-season grasses (e.g., bermudagrass, teff) tend to have lower amounts of NSCs and higher amounts of fiber, says Krishona Martinson, PhD, professor and equine extension specialist at the University of Minnesota, in St. Paul. Understanding these differences is key to matching forage type with a horse's individual nutrient needs.

A visual inspection of hay is as important as its chemical analysis, says Martinson. "Physical evaluation can help you determine the plant species in the hay, including the desirable forages, weeds, and poisonous plants," she says.

Consider the following five physical characteristics when selecting hay.

Color

Although hay color is preferably green, which can indicate the presence of nutrients, it should never be the primary focus, our sources say. Color can be a poor indicator of nutritive value because weeds tend to stay green when dried.

A light-yellow color on the outside of the bale indicates sun-bleaching, says Parker. Sun-bleaching does not reduce the hay's nutrient value if the bale is just bleached along the outside, with no moisture and no mold, and yellow does not penetrate the bale beyond ¼ to 1 inch. The sun-bleached section will simply be lower in carotene (the active source of vitamin A) and less palatable.

Yellow throughout the bale indicates it was overly mature at harvest, resulting in reduced nutrient value and palatability. A chemical analysis can tell you how much nutrient value the hay offers.

Dark brown to black hay might indicate the forage was harvested and/or baled wet. Storing wet hay allows bacteria and fungi to consume the nutrients, which produces heat, says Parker. The duration and intensity of the heat damages the hay, turning it brown to black and producing a distinctive sweet caramel odor. Heat-damaged hay has reduced nutritive value, palatability, and digestibility. In addition, it might still contain bacteria, mold, and fungi that can produce dangerous mycotoxins. The hay might also contain gray or black mold within the bale. For this reason, always open a bale to inspect it.

Note that red clover is naturally brown when dried for hay. This is a good reason to identify the plant species in your hay.

Smell

In general, says Parker, hay should have a sweet, clean, and fresh smell. It should not be excessively dusty, and you should not see any indication of mold. If you have a musty or stale-smelling bale or one creating dust clouds as you move it, best to pass on purchasing. Exposure to this type of hay can exacerbate respiratory ailments such as equine asthma.

Maturity

Stage of plant maturity or growth at the time of harvest might be the single most important aspect when evaluating how the hay will contribute to the diet. "Forage maturity and nutritive value are inversely correlated," says Parker—as the forage matures, the nutrition it offers decreases.

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Asking your hay supplier for hay analysis results or having the hay analyzed yourself helps you understand what you're feeding your horses.

The more mature the plant, the higher the lignin (an indigestible component) content in its cell walls, making it less nutritive (but potentially gastric-acid-buffering if it's alfalfa).

You can usually determine maturity by the size of the seedheads in grass hays and the number of flowers in legume hays. Low numbers of and small seedheads and few flowers indicate a less mature hay.

It is the stage of maturity at the time of harvest and not the hay cutting (e.g., first, second, third) that has the largest impact on a hay's nutritive value, says Parker.

Leafiness

Leaves contain about twice the nutrients and more protein and digestible carbohydrates than stems, says Parker. If the forage is leafy with green or brown leaves (remember, color varies with the plant species), contains few stems and seedheads, and is free of weeds, dust, and mold, it's high in nutritive value.

Texture is also important, says Parker. Horses usually prefer soft leaves rather than coarse stems. Legume leaves tend to be slightly coarser than grass leaves when baled at the same maturity.

Also note the stem thickness or coarseness. Hay that contains very thick, coarse stems was harvested at a mature state, while hay that contains fine stems was harvested at a less mature state. A hay with fine stems but few leaves might mean it was harvested at an immature state, but the leaves came off when the hay was lying in the field or during baling. Hay with "leaf shatter" like this might be of minimal nutritional value to the horse, says Parker, because stems contain few nutrients and lots of indigestible fiber.

Foreign Matter

Foreign matter is material that adds no nutritive value or is inedible or toxic to the horse. This can include weeds, insects (alfalfa weevil or toxic blister beetle in alfalfa), dead animals (birds, snakes, etc.) that can introduce the Clostridium botulinum neurotoxin that causes botulism, and trash (wire, paper, etc.) that can cause an impaction or gut puncture..

Getting a Hay Analysis

Talk to your hay supplier about harvest timing and conditions to better understand its quality. Parker says cool, wet growing seasons usually lead to increased fungi growth. Hay harvested, cured, and stored during a dry spell is much less likely to develop mold. Some hay producers submit their hay samples for analysis before market, so Parker suggests asking if your supplier has already performed an analysis he or she can share with you.

If not, having your hay analyzed helps you understand what you're feeding your horse, says Martinson. Testing can provide you with information such as calorie levels, individual nutrient measurements, nutrient deficiencies, protein levels, digestibility and palatability, and starch and soluble sugar content, which is important if your horse is overweight or metabolic.

A basic forage test includes values for dry matter, digestible energy, crude protein, fiber, NSCs, and some minerals. You can request additional testing to determine mold counts and other minerals and vitamins.

Forage test results are only as good as the sample submitted, says Martinson. A representative sample should include about 10% of the bales from a given hay lot (same field and cutting), our sources say. Use a tool called a hay corer to easily gather the recommended 5/8-inch samples of chopped forage without contamination from handling. The

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A hay analysis will not detect the presence of weeds or toxic plants. You must physically examine the hay to identify those contaminants.

corer attaches to a ½-inch drill. You can also use a hay probe, which is a long tube attached to a drill or operated manually. Insert it approximately 18 inches into the center of the short end of the bales you're sampling to get a cross-section of the bale that contains several flakes (TheHorse.com/139138). Take the sample to your local extension office, or send it to a reliable or certified laboratory (e.g., Dairy One Forage Laboratory; Equi-Analytical Laboratory Services).

Interpreting the Hay Analysis

Here are figures you might find on your analysis results and what they mean:

Moisture Hay appears dry but contains about 10% water. Hay with high moisture content (14-18%) can mold or spontaneously combust. Hay that's too dry (< 10%) can suffer leaf loss and become dusty.

Dry matter This is the percent of hay without moisture. On a forage report, the results are usually reported on an "As Fed" (essentially, as sampled) and a "Dry Matter" basis. Feeds differ in their moisture content and, thus, will dilute the nutrient concentrations. Therefore, it is best to compare feeds more accurately by using dry matter percentage values.

Crude protein (CP) Crude protein is determined based on the amount of nitrogen within the feed. Crude protein of hay can range from 5 to 25% and is highly dependent on the type and maturity of the hay being analyzed. A higher percentage usually indicates the plants were younger when cut. It might also indicate the forage type; for example, legume hays typically have higher CP than grass hays.

Acid detergent fiber (ADF) This is a measure of hay's indigestible portion. ADF includes cellulose (a type of fiber that is less digestible in horses) and lignin. The lower the ADF percentage, the more digestible the hay. Hays with ADF of 35% or lower tend to be very leafy and high in nutritional value; legume hays are usually lower in ADF than grass hays.

Neutral detergent fiber (NDF) This is an indirect predictor of voluntary feed intake. A lower NDF (< 65%) tends to indicate a more consumable hay.

Digestible energy (DE) This is the amount of megacalories per kilogram of feed. The CP and ADF content of the hay provide a reasonable estimate of its DE. The more mature the hay, the higher its ADF and the lower its DE or caloric value.

Macrominerals The basic analysis will include calcium (Ca), phosphorus (P), magnesium (Mg), potassium (K), and sulfur (S). Calcium is usually higher in legumes. The Ca:P ratio is almost always 1:1 in grass hays and should be at least that but no higher than 6:1. Potassium must be low for horses with the muscle disease hyperkalemic periodic paralysis.

Microminerals (trace minerals) These might include iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), and selenium (Se).

Other nutritional components a hay analysis might include are crude fat, sugar, starch, and mycotoxins.

Because some horses (e.g., metabolic or laminitic) are sensitive to dietary starch and soluble sugars, NSC percentage might be important. Avoid feeding hay containing greater than 10-12% NSC to these horses.

A hay analysis will not detect the presence of weeds or toxic plants, says Martinson. You must physically examine the hay to identify those contaminants.

"Physical evaluation is best used to get a first impression of hay quality and should always be followed up by chemical analysis," she says. **SM**