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HAY FEEDERS AND THE POTENTIAL TO REDUCE HAY WASTE

Forage is an important component of a horse's diet and thus a large portion of their diet may consist of hay. It is generally suggested that horses have access to forage 24/7, so hay feeders can play a key role in ensuring your horse has constant access to hay. Hay feeders come in many different shapes and sizes and range in price between $150-$3,200 (2021 prices). There are feeders designed to feed small quantities of hay and feeders designed to feed whole bales (ranging from small square bales to large round bales). Some are considered "slow feeders" because the horse can only grab a small amount of hay with each bite, and some are considered "free choice" feeders which provides the horse more access to the hay and allows them to take as much as they wish. Sometimes a hay net will be combined with a free choice feeder to slow the rate of eating and reduce hay waste at the same time. Hay feeders can typically be bought from livestock equipment dealers.

One major benefit to using a hay feeder is that it reduces the amount of hay lost due to waste. A study conducted at the University of Minnesota found that using round bale feeders results in significantly less hay wasted by horses. Nine different commercial round bale feeders were all found to reduce hay waste when compared to round bales fed directly on the ground. When the bales were fed on the ground, researchers found that 57% of the hay was wasted, compared with 5-33% hay waste when using different types of hay feeders. Furthermore, financially the feeders paid for themselves in 1-20 months when the amount of hay that would have been lost without the use of the feeder was considered. A similar horse study was conducted at Sam Houston State University with round bales and ring feeders (a specific type of round bale feeder). When hay was fed in a ring feeder, only 5.5% of the hay was wasted, but when the hay was fed without a ring feeder, about 35% of the hay was wasted. Another study at the University of Minnesota (read more) found that when hay was fed in small square bale feeders (such as basket, slat, and bunk feeders), less hay wastage occurred (1-5% wastage) compared to when horses were fed hay on the ground (13%). Because hay (and money) was saved with the use of any type of small square bale feeder, the feeders paid for themselves between 9-12 months. While hay wastage when feeding from small bales has been observed to be lower than that from round bales, it is clear that hay feeders can reduce the waste of hay in your pastures and dry lots no matter the size of hay bale you plan to feed.

The online survey of Pennsylvania equine caretakers found that the size of hay bale being fed appeared to affect whether a hay feeder was used or not. When caretakers fed large bales (round or square), hay feeders were used on average by 58% of horse caretakers (it ranged from 37% to 79% depending on if the hay was fed in a stall, dry lot, or pasture).

However, when feeding small square bales or flakes, only 34% of caretakers used a hay feeder (it ranged from 31% to 37% depending on if the hay was fed in a stall, dry lot, or pasture). This wide range in use of hay feeders in Pennsylvania, particularly for large bales, may be due to the fact that these bales were fed in a variety of locations on the farm. The finding that more caretakers used feeders when feeding from large bales was interesting since feeding small square bales in hay feeders has also been found to significantly reduce hay waste.

Not only does the use of hay feeders save money but they can also decrease the risk of horses consuming spoiled hay, which might cause gastrointestinal issues. This is particularly true when feeding from large bales outside. When horses eat from bales of hay placed directly on the ground without a hay feeder, the amount of hay waste is high because horses will pull large amounts from the bales and then drop some of it on the ground. The hay then becomes trampled and contaminated with urine and manure. If consumed, horses may experience digestive upset and other health-related issues. The combination of horse feces and hay waste may also create an ideal environment for filth fly development, increasing the number of flies on that horse farm, which is a common nuisance for horse owners.

Additionally, not protecting the hay in a feeder with a roof can leave hay exposed to rain and moisture which may encourage mold growth. Consuming moldy hay can lead to a number of respiratory and digestive issues in horses. Feeders should be cleaned regularly to avoid mold growth on any remaining fine pieces of hay. Properly using hay feeders decreases the risk of horses consuming spoiled hay and protects horse health.

Recently, there has been speculation that the height of the hay placement may affect horse health. Horses consuming hay with a high head and neck posture has been proposed to suffer detrimental health issues. This could happen, for example, when tying hay nets above the horse's head in the stall or trailer. While studies have shown that feeding from hay nets at a position above the ground causes different back posture in horses, no negative effects other than an unnatural feeding posture have been found to date. Tying hay nets at or below head level or using feeders that are placed on the ground will better simulate natural posture in horses but could pose a risk of legs or shoes getting caught in the net. Generally, feeders for large bales are designed to sit lower to the ground, which allows horses to eat in a more natural head and neck position.

Hay feeders can also raise concerns with regards to dental health. Choose hayfeeders that do not involve horses' teeth coming into contact with metal grating as this can damage or wear teeth. For example, when choosing a restricted access/slow feeder, use one that has soft mesh. Regular upkeep of feeders will ensure that horses do not accidentally hurt themselves on any sharp edges.

The use of hay feeders when providing any amount of hay to horses helps to prevent hay wastage, reduce the risk of horses consuming contaminated hay, and can save caretakers money. Therefore, it may be something that horse owners should consider implementing to make the most of their horse hay supply.

Penn State Extension

ADDING SALT TO YOUR HORSE'S DIET DURING SUMMER

Make sure you choose the right type and amount of salt to support your horse's health—especially during extreme heat.

Q: I live in the southern U.S., where it gets extremely hot during summer. I've been adding a tablespoon of plain salt to my horses' feed once per day. My three horses drink nearly 100 gallons of water daily—though some days it's less. When adding salt to my horse's feed, is it better to use iodized or plain salt? Do I need to buy salt from a feed store, or is grocery store salt acceptable for horses? How much salt should I add per feeding?

A: Horses should always have free-choice access to salt (sodium chloride), along with added salt in their daily concentrate ration to meet their sodium requirements. An average 500-kilogram (1,100-pound) horse at maintenance needs about 2 U.S. tablespoons of salt daily to meet baseline sodium needs. That requirement increases with exercise and in hot weather and can vary based on body weight and sweat loss.

The amount of salt required increases as both sodium and chloride, along with other minerals such as potassium, magnesium and calcium, are lost in sweat. When a horse is sweating, electrolytes should be supplemented in addition to their daily salt intake.

Sodium and chloride are electrolytes as they are minerals that carry an electrical charge when dissolved in fluid. However, electrolyte supplements differ from regular salt because they are designed to replace what is lost in sweat. A quality performance electrolyte will contain sodium, chloride, potassium, magnesium, and calcium. Equine nutritionists recommend adding electrolytes to replenish what your horse is losing in their sweat.

When choosing salt for your horse, you have several options: blocks, licks, loose table salt, sea salt, and Himalayan salt. Salt blocks or licks offer convenient free-choice access, but horses often don't consume enough of these forms to meet their needs. Adding loose salt directly to their feed helps prevent sodium deficiency.

When selecting loose salt for meals, equine nutritionists generally recommend iodized salt—the added iodine helps balance the horse's overall ration. You can purchase this salt at the feed or grocery store. If your horse prefers the taste of sea salt or Himalayan salt, those serve as acceptable substitutes for iodized salt. However, if you are not feeding iodized salt, it is recommended to check the guaranteed analysis on your horse's concentrate to ensure iodine is listed.

However, if your horse receives a kelp-based supplement, avoid iodized salt. Kelp typically provides more than enough iodine on its own.

Keep in mind that mineralized salts—the brown blocks or loose salt containing trace minerals—do not provide minerals in high enough amounts to meaningfully impact your horse's nutrition requirements. Therefore, they can be offered as a salt source but should not be relied on to meet your horse's trace mineral requirements.

Take-Home Message

For horses at maintenance, feed a minimum of 2 U.S. tablespoons of loose salt daily in the feed ration alongside a free-choice salt source. In hot climates or when working, horses' salt requirements increase. The exact amount depends on factors such as body weight, workload, and sweat loss. In general, if it's hot enough for your horse to sweat, you should also provide supplemental electrolytes in addition to their daily salt.

The Horse

STARCH, HORSE GUT HEALTH, AND BEHAVIOR

An equine nutritionist explains how starch affects horse gut health and can influence equine behavior.

Q: How does the starch content in commercial concentrates affect gut health and behavior in performance horses?

A: Starch is a nonstructural (or soluble) carbohydrate composed of chains of glucose molecules. Plants store starch to use as an energy source. While grains contain higher levels of starch, almost everything your horse eats, including forage, contributes to the total amount of starch consumed per day. The horse's small intestine primarily breaks down starch using the enzyme amylase, and his body absorbs glucose into the bloodstream. In healthy horses this rise in blood glucose triggers the pancreas to release insulin, which enables glucose to enter insulin-sensitive cells, such as muscle. All horses need some starch to fuel essential body functions and exercise.

It seems the "carb issue" has become the defining nutritional debate of the past 20 years or so. Let's review what the science tells us about the effects of starch on horse gut health and behavior.

Starch and Horse Gut Health

Too much dietary starch can overwhelm the small intestine's digestive capacity, causing it to spill into the hindgut, where microbes rapidly ferment it, producing, among others, lactic acid. This can in turn create dysbiosis, where existing bacteria in the gut experience unexpected growth and fiber-digesters might die off. This can cause digestive upset, colic, and in severe cases, kick off the cascade of laminitis.

How much starch is too much? Researchers agree the amount of starch per meal should be limited to less than 2 grams/kilogram of body weight (BW) to avoid starch overload (for context, that would be equivalent to a 500-kg horse eating a 2.2-kg meal of oats). To take a more conservative approach and potentially reduce the risk for gastric ulceration, cut that recommendation in half to less than 1 g/kg BW/meal. For the most sensitive metabolic horses, reduce starch to less than 0.3 g/kg BW/meal (which still allows for 2.5-kg meals of low-starch concentrates). Levels horse owners might interpret as high starch would be considered by most equine nutritionists as moderate starch and could be beneficial for healthy performance horses when it comes to maintaining energy levels for work and for efficiently replenishing muscle glycogen after more intense exercise.

Starch and Horse Behavior

Turning our attention to the behavior part of the equation, less solid data exists, and the effects of starch on a horse's behavior often differ between individual horses. There is a physiological basis to the generalization that soluble carbohydrates provide more readily available energy, and fats and fibers are cooler burning. However, that does not necessarily mean sweet feed will make a horse hot, and a high-fat feed will not. The main driver of how much "energy" a horse has is their total calorie intake. The more calories available beyond their needs, the more fuel for activity or weight gain, whether that comes from carbs or fat. If I am attempting to give a horse a bit more zip or inspiration, I might try shifting his fuel sources toward more carbohydrates with less reliance on fat, and vice versa if the goal is to help a horse be more relaxed.

Take-Home Message

Some horses with specific health issues, often benefit from low- or very low-starch diets. However, healthy performance horses can handle and might benefit from a moderate amount of starch in the diet. We might see a shift back toward the center, with more horse people acknowledging that a moderate amount of dietary soluble carbohydrate can be useful rather than something to be avoided at all costs.

The Horse

HOW TO ASSESS YOUR HORSE'S FORAGE

Learn about 5 key physical indicators of forage quality and how to gather a hay sample and interpret a chemical analysis.

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 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.

Consider the following five physical characteristics when selecting hay.

1. 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.

2. 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.

3. 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.

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 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.

4. 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.

5. 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.

Interpreting the Hay Analysis

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.

The Horse

HOW TO CALCULATE A FERTILIZER RATIO

Sometimes a fertilizer ratio is specified on soil test reports or in fertilizer recommendation sheets. The fertilizer ratio indicates the proportion of nitrogen, phosphate, and potash in the fertilizer product, and is determined by dividing each of the three numbers in the fertilizer grade (listed on the container) by the lowest number in the grade. For example, when each number in a fertilizer grade of 18-6-6 is divided by 6 (the lowest number in the grade), the proportion is determined as: three parts nitrogen to one part phosphate, to one part potash. Thus, the fertilizer has a 3-1-1 ratio.

If your soil test report recommends applying 1.5 lb of nitrogen, 0.5 lb of phosphate, and 0.5 lb of potash per 1000 sq ft, you should apply a fertilizer with a ratio of 3-1-1 since you need three times as much nitrogen as phosphate and three times as much nitrogen as potash. The simplest method of determining a ratio is to divide the weights of nitrogen, phosphate, and potash listed on the soil test report by the lowest weight of the three.

Example

To determine a fertilizer ratio for a soil test recommendation of 1.5 lb of nitrogen, 0.5 lb of phosphate, and 0.5 lb of potash, divide the weight of each of the three nutrients (1.5 lb, 0.5 lb, 0.5 lb) listed on the report by the lowest nutrient weight (0.5 lb in this case).

1.5 / 0.5 = 3

0.5 / 0.5 = 1

0.5 / 0.5 = 1

Thus, the fertilizer ratio that best fits this recommendation is 3-1-1. As demonstrated in the first paragraph, you can match the fertilizer ratio for this recommendation with a fertilizer grade by dividing each number in the fertilizer grade by the lowest number in the grade.

Example

Determine ratios for the following fertilizer grades: 21-7-7, 22-6-8, and 18-5-9.

Grade = 21-7-7	Grade = 22-6-8	Grade = 18-5-9
21 ÷ 7 = 3	22 ÷ 6 = 3.7	18 ÷ 5 = 3.6
7 ÷ 7 = 1	6 ÷ 6 = 1.0	5 ÷ 5 = 1.0
7 ÷ 7 = 1	8 ÷ 6 = 1.3	9 ÷ 5 = 1.8
Ratio = 3-1-1	Ratio = 3.7-1-1.3	Ratio = 3.6-1-1.8

As you can see from these three examples, fertilizer grades for certain products do not always match the exact fertilizer ratio you are searching for. Thus, the goal is to find a product with a grade that is as close as possible to the specified ratio.

Penn State Extension

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