



There are several characteristics horse owner should use to evaluate and purchase hay for their horses.

## CONTENT / SPECIES

Determine the percent of grass and/or legumes in the hay (Figure 1). Common grasses include orchardgrass, bromegrass, timothy, fescue, reed canarygrass, and bluegrass. Common legume species include alfalfa, red clover, white clover, and sweet clover. In general, legumes (like alfalfa and clover) have a higher protein content than grasses, and leaves have more protein than other parts of the plant. Protein content of hay is also affected by stage of maturity at time of cutting, protein content decreases as the plant matures. In many cases, pure alfalfa hay has more protein than what the average horse needs. Although this will not affect the horse's health, it will increase water requirements and cause more urination that is high in ammonia. Some legumes are hard to dry (like red clover) when making hay, and therefore are at higher risk of molding.

## STAGE / MATURITY

As forage plants mature, the nutritional value changes. Plants have more fiber and less protein as they mature. Indicators of maturity for legumes are flowers, and seed heads for grasses (Figure 2). Thick stems in both cases

**Figure 1.** An alfalfa grass hay mix



are indicators of maturity. Grasses harvested at early boot stage (when the seed head is just starting to form), have excellent fiber digestibility and energy availability, and will produce leafy hay (Figure 3). The leaf to stem ratio is also important. Leaves have more protein and digestible energy and less fiber than stems (Figure 4).

## TOUCH

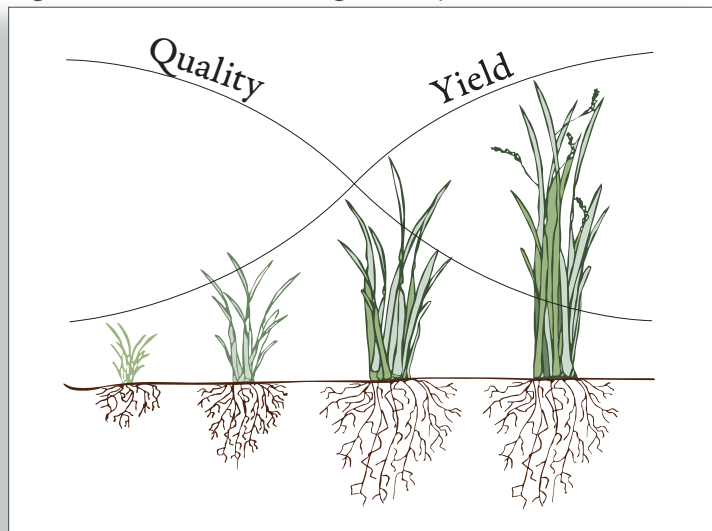
Horses' mouth, lips and tongue, are very soft; hence, softer hay will be consumed more readily, and there will be less waste. Even though some hay may meet or pass the nutritional requirements of a horse, it also has to be attractive and edible, or it will be wasted.

**Figure 2.** Mature Grass Hay (heads)



**Figure 3.** Young Grass Hay (no heads)



**Figure 4. Interaction of Forage Quality and Yield****SMELL**

Sweet smell is attractive to people and horses, and it is also a good indication of having readily available energy (sugar). Much like soft touch, a sweet smell is an incentive for the horse to eat the hay and get its full nutritional value.

**COLOR**

Green is more attractive to those of us taking care of the animals, and it also is a good indication of having vitamin A. Bleached color indicates exposure to sunlight or rain and very likely oxidation of vitamin A, but other very essential nutrients are still there! Despite the color, any type of hay needs to be supplemented with an appropriate vitamin-mineral mix. Don't be too concerned about color, since weeds are also green in color.

**RAIN**

Reduction in hay quality due to rain is greatest after the forage is partially dried. Dry matter losses of 22% were observed when alfalfa was exposed to 1 inch of rain after 1 day of drying. Similar hay without rain damage lost only 6.3%. Sugars and fructans are water soluble, so if the hay is rained on (or soaked in water), the overall non-structural carbohydrate (i.e. sugar) content will be reduced. However, good quality, rained on hay can actually benefit horses that

are sensitive to forage sugar content. Bottom line, quality, rained on hay can be fed to horses.

**CUTTING**

Just knowing whether the hay is 1st, 2nd or 3rd crop does not predict nutrient content. The stage of maturity at which the hay was cut is the foundation of its nutritional value. Plants that grow under cooler temperatures build more digestible fiber. Therefore, 1st crop hay may have more fiber, and the fiber will be easier for the horse to digest and use.

**MOISTURE**

Horse quality hay should be baled between 13 and 17% moisture. Hay over 18% is at risk of molding, and hay baled above 25% is at risk of severe heat damage and serves as a potential fire hazard. The use of propionic acid can be used to help prevent molding of hay at time of baling, and is usually used when the hay is between 17 to 25% moisture. Propionic acid treated hay can have a slight acidic smell, however, it is safe for horses.

**MOLD**

Virtually all feed has some mold spores. The presence of excessive mold if inhaled by the horse may cause coughing, heaves or allergic reactions. Horses with heaves are often particularly sensitive to mold spores or dust. Before purchasing hay, be sure to inspect the inside of at least one bale. If the hay has been stored inside and is not moldy, then the risk of it getting moldy is very low. Even though little research has been conducted on the effect of feeding moldy hay to horses, it is not recommended to feed horses moldy hay.

**BALE TYPE**

Hay can be baled in a variety of ways, and depending on your storage and feeding methods, each type has pros and cons. Small square bales (40 to 80 lbs.) are easy to handle and store, and are a common bale type used by horse owners. Small square bales, if stored and fed properly, usually have less waste than round bales and medium or large square bales. However, small square bales can be very labor intensive.



Round bales (800 to 1,200 lbs.) are also commonly used by horse owners, but because of their size, a tractor or skid loader is usually required for movement. Round bales can be less labor intensive compared to small square bales, but excessive waste can be an issue if they are stored improperly or fed without being placed in a feeder. It's also important to have enough horses (i.e. more than one) feeding off a round bale to reduce the amount of waste over time. Medium or large square bales (800 to 1,200 lbs.) have gained popularity with horse owners over the past few years, and have the same advantages and disadvantages of round bales. However, medium or large square bales tend to stack better and can be more easily "flaked" off for individual feeding compared to round bales.

## STORAGE

When it comes to hay storage, there are a few things horse owners can do to help guarantee their hay will stay in good condition and have minimum losses.

1. **WATER/ANIMAL PROOF** the area. If you stack hay under a leaky roof, it will grow moldier with each rain. Plug rat and mouse holes and attempt to detour larger wildlife, such as raccoons, from moving in during winter months. Not only do these animals deposit feces, but they can also chew through twine, making a mess out of your hay storage area.
2. **DO NOT STACK HAY DIRECTLY ON THE GROUND.** Stacking bales on pallets encourages air circulation beneath the bales and can help prevent the bales from "wicking-up" condensation from the ground. Hay bales stored on wet surfaces can have as much as 50% spoilage.
3. **USE OLDER HAY FIRST.** As long as moisture entry is completely avoided from any direction, and the hay was adequately dry when put into storage, it should keep indefinitely (Table 1). In Midwest

climates, high humidity might increase moisture content and reduce storage life, so feeding hay within three years of purchase is recommended. Regardless, it's a good practice to always use older hay first.

**Table 1.** Longevity of Stored Hay

Hay Storage Options	Storage Longevity (Years)	Dry Matter Loss (%)
Conventional Shed	20	4 to 7
Tarped on Pallet	5	4 to 7
Net Wrap on Ground	1	15 to 25
Twine on Ground	1	25 to 35

4. **ROUND BALES** should be stored end-to-end in a "sausage" type formation to reduce waste. Stacking large round bales (on top of one another) usually increases losses, especially if they are stored outside. Stacking tends to trap moisture and limits drying from sun and wind. Studies have shown outdoor storage losses for round bales range between 5 and 35 percent depending on the amount of precipitation, storage site location, and original condition of the bale (Table 2). To help minimize this loss, buy dense bales as they will sag less and have less surface area in contact with the ground. Buy bales with

**Figure 5.** Net Wrapped Round Bale



plastic twine or net wrap (Figure 5) as they will resist weathering, insects, and rodents better than natural fiber twines (Figure 6). Store bales on a well drained site (if outside). Finally, never store round bales under trees or in low lying area. It is highly recommended that bales that are stored outside have some type of cover placed over them (a tarp). The outer four-inch layer of a six-foot diameter round bale contains about 25 percent of the total bale volume and is most likely to be damaged by weather if stored improperly or unprotected (Table 2). Storage losses are usually reduced by approximately two-thirds with indoor storage and by one-half with good plastic covering outdoors.

**Table 2.** Percentage of Round Bale Volume Affected

Bale Dimensions		Depth of Weathered Layer in Inches			
		2	4	6	8
<i>Width</i>	<i>Diameter</i>	<i>% of bale volume weathered</i>			
4'	4'	16	31	44	56
4'	5'	13	25	36	46
5'	6'	11	21	31	40

**Figure 6.** Twine Wrapped Round Bale



**HAY TESTING**

Hay can be analyzed or tested to determine the following: moisture, protein, minerals, sugar, energy, and more. DHIA (320-352-2028), Dairyland (320-240-1737) and the Minnesota Veterinary Diagnostic laboratory (612-625-8787) can test hay for these qualities. Be sure to request an equine analysis and remember that the analysis is only as good as the sample you submit.

**OUT STATE HAY NEEDS**

The certified noxious weed seed free forage program is designated to assure that certified forage meets the minimum standards designed to limit the spread of noxious weeds. In Minnesota, there are no areas where certified forage (hay) must be used. When trail riding and camping in public parks, it is considered voluntary to use certified hay. However, if you are planning a trail ride or camping trip with your horse on public lands in the western U.S., then certified hay must be used. For a current list of producers of certified noxious weed seed free forage in Minnesota, please call the MN Crop Improvement Association at 800-510-6242.

**ADDITIONAL INFORMATION**

For more information, visit the U of M Horse Program Website ([www.extension.umn.edu/horse](http://www.extension.umn.edu/horse)) and the U of M Upper Midwest Hay List ([www.haylist.umn.edu](http://www.haylist.umn.edu)).

Some information taken from University of Kentucky, Virginia Tech, University of Wisconsin, and Pennsylvania State Extension.

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