ALFALFA

High-Quality Hay for Horses

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Introduction

Alfalfa is a widely adapted perennial forage legume and is the most important forage legume grown in the United States. It has the highest yield potential and feeding value of all adapted forage legumes. It produces more protein per acre than any other crop. Although predominantly fed to horses as hay, alfalfa can also be fed chopped (as chaff), cubed, or pelleted. Alfalfa and/or alfalfa grass hay is palatable and is often a hay of preference for horses. Quality alfalfa hay has high protein, energy, vitamins, and minerals. It is highly digestible and usually contains more digestible nutrients than grass hays, such as timothy and orchardgrass. Alfalfa is also a popular horse hay since it is widely available. It is the fourth most widely grown crop in the United States and is the only forage species produced and sold in every state.

This publication describes the factors affecting the nutritional value of alfalfa hay as well as the horse's digestive system and nutritional needs. It also has information on purchasing, storing, and feeding alfalfa hay; and uses science to discuss myths and facts of feeding horses.

Physical Characteristics of High-Quality Alfalfa Hay

Leafiness – High-quality alfalfa hay contains a high percentage of leaves and a low percentage of stems. Leaves contain 50-75% of the digestible matter, 75% of the protein, and 90% of the carotene found in hay. Leaves should be intact and not excessively brittle. Leaf loss reduces the nutritive value of hay.

Color – A bright-green color indicates proper curing and high carotene content and usually indicates the absence of weathering, mold, dust, and heat damage. However, color may be deceiving as hay can still be low in some nutrients even if it is green. Similarly, alfalfa hay bales with some exterior sun bleaching are often very nutritious and may even be green once opened. In general, color is more important to the person buying, selling, and/or feeding, than to the horse.

Foreign Material – Weeds and other foreign material (wire, dirt, rocks, insects, and sticks) lower the palatability and feeding value of alfalfa hay. The presence of blister beetles can be dangerous to horses (see page 9).

Odor and Condition – Odors in hay, such as musty or rotten odors, indicate lower hay quality and may reduce palatability. Odors result from storage of hay that is too moist or weather-damaged. Dust also reduces hay value as it can irritate the horse's respiratory tract and affect its exercise capacity. Musty, dusty, or moldy hay should not be fed to horses.

Forage Quality Terms, Definitions & Acronyms

The best way to assess the nutrient content of hay is to have a forage test performed. For a current list of certified forage testing laboratories, visit the National Forage Testing Association website at foragetesting.org.

Laboratories analyze forages by chemical analyses or near infrared reflectance spectroscopy (NIRS) methods. A forage test typically includes measurements of moisture, crude protein, acid detergent fiber, neutral detergent fiber, and relative feed value. A forage analysis may also contain measurements of certain minerals.

Moisture – Hay moisture content is important because the higher the moisture content, the lower the dry matter (DM) and nutrient contents per pound of feed. A high moisture content (>15%) increases the likelihood of mold damage during storage. A very low moisture content (<5%) may indicate that the hay is brittle and will shatter easily, especially the leaves.

Crude Protein (CP) – Crude (or total) protein is determined by measuring the nitrogen (N) content of the sample and then multiplying by 6.25 (protein in hay contains about 16% N, so 6.25 is a conversion factor). The overall nutritional value of hay is closely associated with CP, but it is not the main factor affecting digestibility.

Acid Detergent Fiber (ADF) – ADF contains cellulose, lignin, and silica, and is an important part of the cell wall structure of the plant, especially the stem. ADF is only about 30-40% digestible by horses, so high ADF values mean lower-quality, less-digestible hay.

Neutral Detergent Fiber (NDF) – NDF contains ADF as well as hemicellulose and it is also considered part of the cell wall structure. Hemicellulose is more digestible than cellulose or lignin, so NDF is more digestible than ADF. However, as NDF concentrations increase, both digestibility and intake are expected to decrease, therefore, higher NDF values indicate a lower-quality hay. In general, grasses have more NDF than legumes.

Relative Feed Value (RFV) – RFV is an index developed to compare various hays for ruminant feeding programs. It includes a calculation for both digestibility and intake and is based on the chemical analyses listed above. An RFV of 100 is representative of a full-bloom alfalfa hay; a higher RFV means a higher-quality hay. RFV may not apply to horses in exactly the same way as it does for cattle, but it can be used to identify very low- (RFV <80) and very high- (RFV >140) quality hays.

Growth Stage Affects Forage Quality

Of all the factors affecting nutritional quality of alfalfa hay for horses, "stage of maturity" at harvest is the most important. As the alfalfa plant matures from vegetative stage to flowering, the amount of fiber increases, while protein decreases (Figure 1; Table 1). Early cut alfalfa hay (bud, early bloom) is also more digestible and palatable, so horses may consume more. Early maturity hay is usually leafier and has finer stems resulting in better textured (softer to the touch) hay.

Figure 1. Maturity stages of grasses and legumes and effects on nutrient value and yield. With maturity, yield (tons/ac) increases but the increase in fiber and decrease in protein result in fewer digestible nutrients per pound of forage.

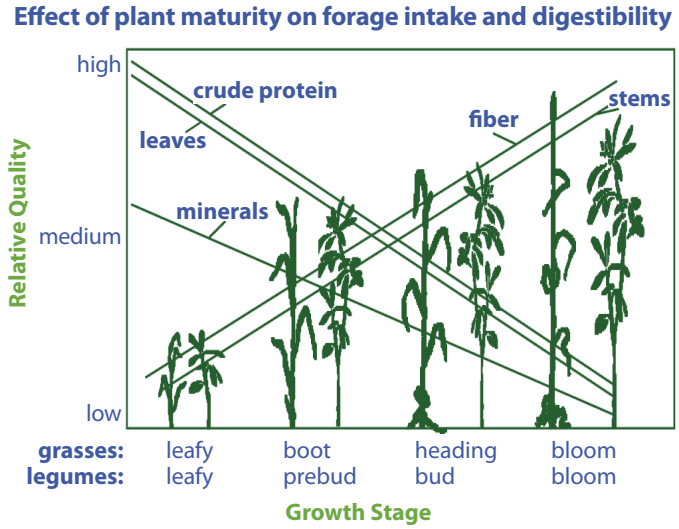

Figure originally published in "Understanding Forage Quality" Ball et al., 2001.
Adapted from Blaser, R., R.C. Hammes, Jr., J.P. Fontenot, H.T. Bryant, C.E. Polan, D.D. Wolf, F.S. McClaugherty, R.G. Klein, and J.S. Moore. 1986. Forage–animal management systems. Virginia Polytechnic Institute, Bulletin 86-7.

Table 1. Relationship of the stage of maturity of alfalfa at harvest to CP, ADF, NDF, and RFV.

	CP (%)	ADF (%)	NDF (%)	RFV
Pre-bud	22	27	35	180
Bud	20	32	38	160
⅒ bloom	18	35	40	140
½ bloom	16	38	44	125
Full bloom	15	42	52	100

Equine Digestion of Forages

Horses evolved as grazing animals. Their lips and teeth are well-adapted to selecting, nipping, and grinding forage into smaller particle sizes. Once swallowed, feed travels through the esophagus to the stomach. Relative to its body size, the horse has a small stomach with limited ability to expand. These characteristics of the stomach make horses poorly adapted to eating one or two large meals per day and better adapted to continuous grazing or hay throughout the day.

Compare the size of a horse's stomach (Figure 2) to the volume of 10 lbs of hay and 3 lbs of concentrate – it is easy to see why horses should be allowed access to forage throughout the day. Food passes relatively rapidly through the stomach and then enters the small intestine, the site of enzymatic digestion of protein, carbohydrates, and fats. While some forage components will be digested in the small intestine, it is a more important site for digestion of nutrients found in concentrates. In grain-based concentrates, starch is the major source of calories. Ideally, any starch consumed by horses will be digested in the

Figure 2. Model of the stomach from a mature horse next to 10 lbs of hay and 3 lbs of concentrate. The small inelastic stomach of the horse is poorly suited to consuming a meal of this size at one time.

small intestine and absorbed as glucose. However, research has demonstrated that when large amounts of starch are fed, the capacity of the small intestine will be overloaded and undigested starch can then enter the large intestine (hindgut).

The hindgut is populated by a diverse microbial community that digests the fibrous components of hay and pasture and produces compounds (volatile fatty acids) that are absorbed and used by the horse for energy. The horse's digestive tract is generally not as efficient at digesting fiber as that of a cow or sheep. However, for high-quality hays such as early bloom alfalfa, the difference between horses and ruminants is much smaller than for lower-quality hays such as late-maturity grasses. The microbial community of the hindgut can also ferment any starch that bypasses the small intestine. Fermentation of starch is less energetically efficient than digestion in the small intestine. If a large amount of starch reaches the large intestine, it can disrupt the microbial community and lead to digestive disturbances. For horses with high nutrient needs, it is desirable to use high-quality forages that minimize the amount of concentrate fed.

Nutritional Needs of Horses

A horse's age and production state affect nutrient requirements. Diets fed to growing horses have to be nutrient-dense to meet the animals' high nutrient requirements and limited intake capacity. As horses age, fewer nutrient-dense diets are usually required. Lactating mares and horses with strenuous physical activities have much higher requirements than horses kept at maintenance or those used for light recreational riding.

Table 2 shows the approximate amount of several nutrients required on a daily basis by horses in different physiological stages. These values may need to be adjusted for specific horses, particularly if they are exposed to unusually hot or cold environmental conditions.

Table 2. Recommended nutrient intakes for horses with an expected mature body weight (BW) of 1100 lbs[a].

Class of Horse	Digestible Energy (Mcal/day)	CP (lbs/day)	Calcium (grams/day)	Phosphorus (grams/day)
Recreational[b]	18	1.6	25	16
Performance				
Moderate	24	1.8	35	21
Very Heavy[c]	35	2.2	40	29
Pregnant	21	2.0	36	26
Lactating	32	3.4	59	38
Weanling	17	1.7	38	22
Yearling	19	1.9	38	21

[a]Adapted from NRC (2007) "Nutrient Requirements of Horses" and expressed as total daily intakes.
[b]Used for light riding a few hours a week.
[c]Racing.

Typical DM intakes for horses (per 100 lbs of BW) are shown in Table 3. Also shown are the amounts of DM from forage and concentrate in typical diets. Forage should be the cornerstone of horse diets and can comprise the majority of the diet for many mature horses, particularly those used for light recreational activities and horses at maintenance. For horses with elevated nutrient needs, such as growing horses, broodmares, and performance horses, some forage will be replaced by concentrate, which is more nutrient-dense than forage. The guidelines in Table 3 for feed intake are best applied when mid-maturity forage is used. When early maturity forage is used, the amount of concentrate in the diet can usually be reduced, whereas, when late-maturity forage is used, more concentrate may be necessary.

Table 3. Expected DM intakes by horses (lbs of dm per 100 lbs of body weight (BW)[a].

Class of Horse	Total Feed Intake (lbs DM/100 lbs of BW)	Forage Intake (lbs DM/100 lbs of BW)	Concentrate Intake (lbs DM/100 lbs of BW)
Recreational[b]	2.0	1.75-2.0	0.0-0.25
Performance			
Moderate	2.25	1.5-1.75	0.50-0.75
Very Heavy[c]	2.5	1.25-1.75	0.75-1.25
Pregnant (last trimester)	2.0	1.25-1.75	0.25-0.75
Lactating	2.5	1.25-2.0	0.5-1.25
Growing	2.5	1.25-2.0	0.5-1.25

[a]Adapted from NRC (2007) "Nutrient Requirements of Horses."
[b]Used for light riding a few hours a week.
[c]Racing.

Feeding Mature Horses at Maintenance & Horses Used for Light Recreation

Many horses are kept for recreational use (weekend riding, occasional showing, etc.) where the horse is exercised at slow speeds for less than 3-5 hours a week. Horses used for recreational activities have low nutrient requirements in comparison to other types of horses, and nutrient deficiencies are relatively rare. Typically, the biggest nutritional problem facing these horses is excess calorie intake, which can result in obesity.

Table 4 shows three example diets using either alfalfa or timothy hay that meet, or slightly exceed, the needs of a mature 1100 lb horse used for recreational riding. All diets meet the nutrient needs of the horse, but which diet is best? One consideration might be cost; Diet C uses the most hay and the most concentrate so it may be the most expensive. Another consideration might be total feed intake. Diet A has a lower feed intake than Diet B or C. Lower feed intake means shorter eating time and more idle-time, which could lead to increased stall vices, such as wood chewing. Since Diets A and B rely on alfalfa hay as the forage source, they provide more protein and calcium than are required for recreational horses. Most nutritionists agree that exceeding the protein and calcium requirements will not be detrimental to normal healthy horses.

When good- to high-quality forages are offered free choice, some maintenance and recreational horses will get fat. These forages are not only more digestible and more nutrient-dense than later-maturity forages, they are usually more palatable, so horses eat more. A 1100-lb gelding offered leafy early maturity alfalfa hay free choice might consume 25-30 lbs per day. This intake would exceed its calorie requirements by about 50-60% and could result in a weight gain of 150-200 lbs in a year! Because obesity increases the risk for a variety of health disorders, feeding practices should be aimed at providing adequate but not excessive calories.

Table 4. Example diets (as fed basis) for 1100 lb horses used for recreational riding or competitive performance[a].

	Early Maturity Alfalfa Hay	Mid-Late Maturity Alfalfa Hay	Late Maturity Timothy Hay	Commercial Concentrate
Recreational Horse[b]				
Diet A	15-17 lbs			1 lb[c]
Diet B		17-19 lbs		1 lb[c]
Diet C			20-22 lbs	1-3 lbs[c]
Performance Horse[d]				
Diet X	15-17 lbs			4-6 lbs
Diet Y		17-19 lbs		4-6 lbs
Diet Z			15-17 lbs	6-8 lbs

[a] These diets apply to horses with no pasture access. If pasture is available, the hay component can be reduced.
[b] Note that Diet A and Diet B provide feed intakes below 2 lbs per 100 lbs of body weight.
[c] When concentrate intakes are below 3 lbs per day, a vitamin-mineral ration balancer pellet should be used instead of a typical commercially manufactured concentrate formulated for performance horses.
[d] Example is for a horse that receives regular moderate exercise (trotting, cantering, jumping, etc). Rations for elite equine athletes (racing, polo) would contain larger amounts of concentrate.

Feeding Mature Horses Used for Sport & Competition

Horses in training for competitive activities (polo, show jumping, and racing) have higher nutrient needs than horses used for light recreation (Table 2, page 5). Owners and trainers of horses used for racing and other types of strenuous activities often report that horses do not eat enough feed to maintain BW. A key to increasing feed intake in these horses is to use palatable feeds. High-quality hay is more palatable than low-quality hay. In one study, horses consumed more high-quality alfalfa hay (34.1% NDF) than medium-quality Matua bromegrass hay (61.4% NDF) or low-quality timothy hay (74.4% NDF).

Table 4 shows some example diets that meet the needs for moderate sport and competitive performance activities. Note that when higher-quality alfalfa hay is used, the horse can consume less concentrate to meet its nutrient needs. Feeding higher-quality hay and less grain may lower the potential for colic or other digestive disorders.

Some horse owners have concerns about the level of protein and calcium present in high-quality alfalfa hay. There is no research evidence that high-protein diets hurt performance horses. When alfalfa hay is used, the amount of protein in the concentrate fed to performance horses can be as low as 10-12%. However, if a low-quality grass hay is fed, a higher level of protein in the concentrate will be necessary.

Feeding Broodmares

Good nutrition plays an important role in reproductive efficiency and is a key component of broodmare management. Broodmares in early gestation have nutrient requirements at, or just slightly above, maintenance, and may be fed diets similar to those recommended for recreational horses. However, after about 5 months of gestation, nutrient requirements increase. If additional nutrients are not available from the diet, mares will mobilize their own body stores to meet the needs of fetal development. In general, the amount of DM consumed by pregnant mares does not increase at the end of gestation even though their nutrient needs escalate. Consequently, their diets must be adjusted to ensure nutrient needs are met. Once a mare foals, her nutrient needs increase greatly compared to gestation (Table 2, page 5). Again, if nutrient demand for milk production is not met, the mare will mobilize body stores.

Body condition can affect reproductive efficiency in mares. A condition scoring system has been developed that scores horses from 1-9, where 1 is an extremely thin horse and 9 is an extremely fat horse. Horses in moderate body condition (5) have ribs that are not visible, but can be easily felt. Mares with body condition scores of 5 or above have higher pregnancy rates than mares with body condition scores below 5. Mares with a body condition score of 6 (Figure 3) have a reserve of fat to use if the weather turns cold or if they are unable to consume enough feed to meet their requirements in late gestation or lactation. There is no advantage to having mares in an extremely fat condition.

Table 5 shows diets for pregnant and lactating mares fed different hays. As the nutrient content of the forage decreases from bud alfalfa to full-bloom alfalfa to timothy, it is necessary to feed more concentrate, and in some cases, a highly fortified concentrate. Depending upon the cost of the hay and the grain, one diet may be much more economical than another. When large amounts of concentrate are needed, it is best to divide portions into 2 or 3 meals per day.

Figure 3. Pregnant mares with body condition scores of 6. These mares will have a reserve of body stores entering the winter and the end of their gestation period.

Table 5. Example diets (as fed basis) for 1100 lb broodmares[a].

	Early Maturity Alfalfa	Mid-Late Maturity Alfalfa	Late Maturity Timothy	Commercial Concentrate[c]
Late Gestation[b]				
Diet A	14-16 lbs			4-6 lbs
Diet B		14-16 lbs		4-6 lbs
Diet C			13-15 lbs	7-8 lbs
Early Lactation[d]				
Diet X	18-20 lbs			7-9 lbs
Diet Y		16-18 lbs		10-12 lbs
Diet Z			14-16 lbs	12-14 lbs

[a] These diets apply to horses with no pasture access. If pasture is available, the hay component can be reduced.
[b] In early gestation broodmares can be fed diets similar to those shown for the recreational horse in Table 4.
[c] A commercial concentrate formulated for broodmares should be used.
[d] In the third month of lactation, the mare's milk production will decline so nutrient needs will decrease. However, at 2-3 months of age, the foal will likely be eating forage and concentrate, so the total amount of forage and concentrate fed to the mare-foal pair will not decrease and may increase.

Feeding Growing Horses

Nutritional programs for growing horses focus on promoting steady, even growth and optimal skeletal development. Nutrient deficiencies and imbalances can result in an increased incidence of developmental orthopedic diseases affecting the ability of a horse to perform as an athlete. Most foals will start to eat solid food shortly after birth, and will be able to consume enough forage and concentrate to meet nutrient needs at weaning (4-6 months of age). Young horses should be fed high-quality forage, which is high in digestibility and nutrient density to meet the needs for tissue growth. As foals age, rate of growth slows, although most horses continue to grow through their first 3 years. Table 6 shows typical feeding programs for weanlings and yearlings, based on DM intake of 2.5% of BW. Recommended diets utilize alfalfa hay or an alfalfa-grass mix. A benefit of including alfalfa is a reduced need for protein in the concentrate. When mature grass hay is used, the amount of concentrate needed is much higher.

Table 6. Example diets (as fed basis) for weanlings and yearlings that have an expected mature BW of 1100 lbs[a].

	Early Maturity Alfalfa	Mid-Late Maturity Alfalfa	Late Maturity Timothy	Commercial Concentrate[b]
Weanling[c]				
Diet A	7-9 lbs			5-7 lbs
Diet B		6-8 lbs		6-8 lbs
Diet C			6-8 lbs	8-10 lbs[d]
Yearling[c]				
Diet X	11-13 lbs			5-7 lbs
Diet Y		9-11 lbs		7-9 lbs
Diet Z			9-11 lbs	9-11 lbs[d]

[a] These diets apply to horses with no pasture access. If pasture is available, the hay component can be reduced.
[b] A commercial concentrate formulated for growing horses should be used.
[c] Weanlings and yearlings should have access to free exercise every day. When kept outdoors in harsh climates, more feed may be necessary to maintain moderate, even growth.
[d] Because of the high amounts of concentrate needed when mature grass hay is fed, these diets are not recommended.

Choosing Alfalfa for Horse Feeding

Alfalfa hay is available in many package sizes and shapes, including small, medium, and large rectangular bales; round bales; cubes; pellets; and haylage/baleage.

Small Rectangular Bales – Bales weighing 40-120 lbs are conveniently sized and easy to handle. Most owners prefer small rectangular bales that can be easily divided into individual portions (flakes). Price per ton is usually higher due to the extra time and labor involved in harvesting and increased transportation costs.

Large Bales (Round and Rectangular) – The reduced labor of large package haying equipment has increased the availability of these types of bales. However, since they generally weigh over 500 lbs each, they may be more difficult for small horse operations to handle. They are difficult to divide into small portions for individual horses.

Large bales usually work best in situations where many horses are being fed together and the hay is eaten within a few days after the bale is placed in the paddock. In all cases, only bales that have been stored under cover should be used. Ideally, large bales should be placed in a feeder that protects the hay from precipitation during feeding (Figure 4). Failure to contain the bale in a feeder and protect it from precipitation results in waste due to trampling and mold (Figure 5).

Cubes – Alfalfa cubes (about 1½" x 2") are made from coarsely chopped alfalfa hay and are often available in 50-lb bags. They are similar to long-stem hay in digestible energy, CP, calcium, and phosphorus. Although they are usually more expensive, cubes offer the benefits of being less dusty, easily handled and transported, and requiring less storage space than hay. Waste is reduced when feeding cubes as a result of reduced selectivity. When used for horses with low nutrient requirements, cubes should not be fed free choice or horses may gain too much weight.

Pellets – Pellets are made from finely ground hay pressed into smaller units usually around 3⁄16-¾" in diameter. Alfalfa pellets can be an excellent source of nutrients in horse diets and are best used to provide supplements for lower-quality hay and to extend short hay supplies. Alfalfa pellets may be included in some concentrate feeds to increase the protein and fiber content. Because of their higher cost and their small particle size, pellets are not usually recommended as the sole forage source in the horse diet. For horses that are confined and/or not exercised, increased incidences of "stall vices" (wood chewing, etc.) may be observed when cubes are the only forage source.

Haylage/Baleage – Haylage/baleage is plant material that has been fermented in a silo or plastic bag or wrap. It plays an important role in ruminant livestock feeding programs, especially dairy, but is not used to any extent in horse feeding programs in the United States. It is difficult to handle for many horse operations where individual portions are needed. When group-fed in bunks, it can become moldy if not eaten rapidly. In addition, poorly preserved haylage/baleage has been associated with some health problems in horses.

Figure 4. Hay feeders reduce waste and preserve hay quality.

Figure 5. Use of large hay bales without a feeder increases waste.

Other Considerations When Selecting Hay for Horses

Cleanliness – Before feeding, inspect hay for dust, mold, or other contaminants. Moldy, dusty hay should never be fed to horses, as it may irritate the respiratory tract. The most severe form of this problem is referred to as recurrent airway obstruction, chronic obstructive pulmonary disease, or heaves. Heaves can result in permanent lung damage, making the horse less useful for most types of athletic activities. Signs of heaves (coughing, difficulty breathing) may be minimized by controlling dust and mold in a horse's environment. Three common management techniques include good ventilation, soaking hay in water to prevent dust, and using hay cubes instead of long hay. But, preventing heaves is the best management practice, which includes using only clean hay and bedding with no dust or mold, and feeding in a well-ventilated area.

Differences in cuttings – Most hay is cut (harvested) from an alfalfa field several times during a growing season. The first harvest is referred to as the first cutting, the second harvest as the second cutting, and so on. Horse owners sometimes ask "Which cutting of alfalfa hay should I buy?"

First-cutting hay may be lower quality if spring weather delays harvest or causes rapid growth so plants reach a more advanced stage of maturity before being cut. In some areas, first cutting hay may have more undesirable weeds and may get rained on before baling, which can lower quality. Second and later cuttings may be able to be cut on time and have better haymaking weather; however, weather-related problems can occur with any cutting. Hay can be harvested at different maturity stages during any harvest.

Overall, the most important characteristic affecting nutrient value is not "cutting," but the stage of maturity when the hay was harvested (see Figure 1, page 4).

Preservatives – Preservatives (organic acids, yeast cultures, enzymes, etc.) have been used to prevent mold growth in alfalfa hay baled at higher moistures. Organic acids, with the most common being "buffered propionic acid," have proved effective in preserving hay up to approximately 25% moisture. In feeding trials where horses were offered a choice, acid-treated hay was not as palatable. However, when not given a choice, they consumed similar amounts of treated and untreated hay. Propionic acid a naturally occurring compound in the GI tract and propionic-treated hay is safe for horses as long as no mold or dust is present.

Blister beetles – Blister beetles (ash, gray, black, margined, and striped) contain cantharidin, a toxin that can irritate and blister body tissues. As few as 25 beetles consumed by a small horse may kill it, while larger horses may suffer serious internal damage. Blister beetles are a serious problem in the South and West, and occasionally a problem in the Midwest. Beetles typically cluster together, and therefore, may affect only a few bales from a field. They tend to be more of a problem in late summer than in spring or early summer. Blister beetles are more likely to be present in years when large numbers of grasshoppers occur, since their larval stages develop on grasshopper eggs.

Blister beetles are attracted to flowering plants and weeds. Therefore, harvesting alfalfa before it flowers will help minimize beetle populations in the hay. Hay harvested without the use of a mechanical conditioner can also help as it allows beetles to crawl off onto the ground. Certified blister-beetle-free hay is available in some areas.

Purchasing Hay

Using the information in this publication, horse owners can estimate the type and amount of daily hay consumption per horse, and from there, calculate the total amount needed for any given period. The storage space available will determine whether the required hay can be purchased at one time or in several loads.

Since bale weights can vary, it is better to purchase hay by weight (pounds or tons) than by the bale. Fifty bales weighing 100 lbs each will provide twice as much hay as 50 bales weighing 50 lbs each. Similarly, a bale that costs $5 may seem a bargain compared to a bale that costs $8, but not if it weighs half as much.

Most of the problems relating to buying and selling hay arise from poor communication between buyers and sellers. Hay buyers should have a clear understanding of the type of hay they want to buy and they must be able to communicate their needs to sellers. Many hay characteristics, such as cleanliness, color, and texture, are subjective and thus, precise descriptions should be used (e.g., no more than 5% weeds). Hay sellers need to know their product, describe it fairly and accurately, and have test results to verify their descriptions. In almost all cases, communication is improved if a forage analyses of the hay available and buyers and sellers understand the results of reports.

Storing & Feeding Hay

Storage of alfalfa hay in a barn or hay shed is the best option to preserve quality. Covering bales with vinyl or plastic tarps is second best. Tarps must be firmly tied down and edges set out, allowing water to drip away from the stack. Store bales where water will drain away from the stack. Place bales on a gravel pad, wood pallets, or tires to break the contact between the hay and the soil or concrete. Ground moisture can ruin as much hay as leaving the top uncovered.

Hay may be fed in racks, nets or tubs, or it may be placed on the ground. When hay is fed on the ground, more than 50% may be wasted. Putting hay in a rack or a tub usually reduces waste, especially when groups of horses are fed together. When alfalfa is fed on the ground, or from hay nets, leaf loss may be high. Leaf loss is important, since leaves are nutrient-dense. When using hayracks or mangers, be sure they allow enough space for all horses in an enclosure to eat comfortably at the same time. If there is inadequate feeder space, some horses will be

Figure 6. Suspending a hay net above a tub will help contain particles that fall from the net. Nets with smaller holes can be used to reduce waste and slow eating rate. Collection areas under hay nets or hay racks should be cleaned regularly to prevent the accumulation of mold, dirt, or other contaminants.

Figure 7. Large round or rectangular bales can be used for horses if they have been properly harvested and stored. Any string or netting should be removed before the bales are offered to horses.

excluded or injuries may occur as they compete for space. The rack or manger should be placed in a location allowing safe and easy access for horses and humans. Hay feeders must be cleaned regularly to prevent buildup of material that can mold when wet. Hay can also be placed in hay nets or bags. Hay nets are available in different sizes and with different size holes. Nets with small holes reduce leaf loss and also slow the rate of hay consumption by horses. When hay nets are used, they should be tied high enough that a horse cannot become entangled in the net (usually at wither height or above). Suspending the net over a tub (Figure 6) will help contain any particles falling from the net.

Large-package bales (round or rectangular) may be used for horses under some circumstances. Large bales stored under cover (Figure 7) are safe to feed if they are mold-free. Bales stored outside should only be used if weather-damaged material is removed and the interior material is mold- and dust-free. Twine or netting on the outside of the bale must also be removed. Large bales are most effective for feeding large groups of horses where the hay is consumed rapidly. Large bales that stay in the paddock for several days are likely to become wet and moldy unless they are in a covered feeder.

When hay is fed in a pasture or paddock to several horses at the same time, it is helpful to group horses by physiological state. This will allow the appropriate matching of the nutrient needs of the horses to the amount and quality of forage offered. For example, if a 600-lb idle pony and a 1200-lb pregnant mare are allowed free access to the same hay, it is likely that either the pony will be overfed, or the pregnant mare will be underfed. In most situations, very high-quality alfalfa hay (early maturity) should not be fed free choice. Since it is highly palatable and nutrient-dense, free access often results in obesity in horses with moderate- to low-nutrient requirements (most horses kept for recreational purposes). A better hay choice for these horses would be full-bloom alfalfa hay or an alfalfa-grass mix hay.

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First Edition 2005; Revised Edition 2019

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Myth versus Fact

Debunking 5 Common Alfalfa Myths

Myth	Fact
Excess protein in alfalfa hay will damage the horse's kidneys.	Normal healthy horses can metabolize and excrete the extra protein in alfalfa hay without damaging their kidneys. However, horses consuming high-protein diets may consume more water and produce more urine as part of the normal excretion process. All horses should have access to clean water at all times.
Alfalfa is too rich for horses.	As with any feed, the nutrient content of hay should be matched to the nutrient needs of the horse. Early maturity alfalfa hay is very nutrient-dense and is suitable for mares and growing horses. If fed to recreational horses, the intake of early maturity alfalfa hay must be restricted. Late-maturity alfalfa hay or alfalfa-grass mix hay would be less nutrient-dense and more suitable for horses with lower nutrient requirements.
Calcium content of alfalfa is too high, especially for young growing horses.	Calcium has been fed at more than five times the requirement without detrimental effects, provided the phosphorus level is adequate.
Alfalfa makes horses cough.	Any hay (alfalfa or grass) that contains dust or mold may make a horse cough. Horses should only receive hay that is free of dust and mold. Ventilation in the feeding area can greatly reduce the effect of dust in hay on horses. If dust-free hay is not available, the hay can be soaked in water prior to feeding to reduce airborne particles.
Preservative-treated hay isn't safe for horses.	Most preservatives applied to horse hay contain organic acids that are the same as those found in the horse's gastrointestinal tract. Application of preservative helps produce mold-free hay. Initially some horses may prefer hay without any preservative, but if they are not given a choice, horses will consume the same amount of preservative-treated and non-treated hay.