

Selecting Quality Hay for Horses

ID-190

**Mark A. Russell, Department of Animal Sciences and
Keith D. Johnson, Department of Agronomy
Cooperative Extension Service
Purdue University
West Lafayette, IN 47907**

Introduction

Many horse owners select hay for their horses based on what they think looks good or on what they have been told is good. Opinions vary all the way from believing that timothy is an essential part of every horse ration to that which insists on alfalfa for all horses. Forage should be the foundation of every horse ration. The quality of that forage, the composition of the hay, and the way the hay is delivered to the horse are all fundamental for good horse feeding. This publication reviews decisions important in developing a healthy ration.

Horses are herbivores, animals made to live primarily on plants (forages). About 65 percent of the digestive capacity of the horse is in the lower gut, or the cecum and colon. The cecum and colon contain large microbial populations which allow for the digestion of fibrous feeds, much like the digestive tracts of cattle and sheep (ruminants). Evidenced by the size of the lower gut and the presence of bacteria, the horse is designed to digest primarily forages. Horses have fewer digestive upsets and behavioral vices, such as wood chewing and cribbing, when hay is the main portion of the ration.

For proper digestive tract function, horses require a minimum of 1 percent of their body weight per day in long-stem dry matter. This can be done in any form that is convenient and economical. When the total ration particle size is below 1 inch in size, problems with rate of passage, digestibility, and behavioral vices occur.

Forages are most healthfully offered as pasture during the growing season. Conditions such as limited acreage, low productive pastures, seasonal rainfall variations, and the need to house horses separately or indoors restricts the ability to utilize pasture and necessitates the feeding of hay as the primary forage. In order for pasture to provide the majority of the nutrients for a horse, at least two acres should be allocated per horse.

Under most situations, rations are more economical when based primarily on hay rather than on concentrate mixtures to provide the bulk of the nutrients. The horse requires an absolute amount of specific nutrients per day, regardless of the feedstuff. The value of hay is determined by the composition of nutrients in the hay rather than the hay's appearance. The closer the nutrient composition of the hay matches the requirements of the horse being fed, the fewer supplements needed and the more economical the total ration.

Traditional Selection Criteria

When horsemen are asked for a definition of good hay, they often list:

- * The hay must be green.
- * There should be no dust or mold.
- * There must be fine stems and lots of leaves.
- * There can be no weeds.
- * It must not have blister beetles.
- * The hay cannot have been rained upon.
- * There has to be at least 70 percent alfalfa.
- * Hay must be less than \$1.50 a bale.

The above list shows what horsemen often look for in good hay, but a more detailed look at the importance of these criteria is needed. It is impossible to always meet all of the criteria; however, some are much more important than others.

These criteria are valuable as long as they are put into perspective. A detailed look at the validity and importance of these criteria is needed.

Forage Quality

Forage quality is an expression of the characteristics affecting consumption, nutritive value, and resulting horse health and performance. Even though many factors affect forage quality, no single factor, including color, can be used to make predictions. Maturity stage at harvest, forage species and variety, leafiness, harvest and storage conditions, and the presence of foreign objects, weeds, and pests are all important factors affecting quality. A closer examination helps the horse manager economically select the best hay for their situation.

Color

The vitamin A precursor in plants is greater when hay is green. A beige color is an indication of sub-bleaching and leaching of nutrients by rainfall that occurred after harvest. Color is a poor indicator of forage quality as bright green weeds may have lower nutrient composition than brown alfalfa.

Maturity

Plant maturity is visually determined by the amount of seed heads of grasses or the flowers of legumes present at the time of harvest. Forages in the vegetative stage will not have visible seedheads or flowers. As plants progress through seedhead and flower bud emergence, pollination, and seed formation, the concentration of structural carbohydrates and lignin increases and crude protein decreases. The structural carbohydrates, cellulose, and hemicellulose are partially digested by the bacteria in the horse's lower gut, but lignin, another component of plant fiber, is not digested at all. As lignin increases one percent, the digestibility of the forage dry matter decreases three to four percent.

Forage digestibility is indirectly measured by determining the level of acid detergent fiber (ADF) in the hay. As the plant matures, ADF (cellulose and lignin) increases, and digestibility decreases. Neutral detergent fiber (NDF), a measure of cell wall content, increases as the plant matures and is an indirect measure of how readily a forage is consumed.

Immature hay is more easily digested by the horse (lower ADF percent) and more readily consumed (lower NDF percent), thus it is worth more to the horse owner. The maturity of the plant is not related to a particular cutting, but rather to the stage of maturity of the plant when cut.

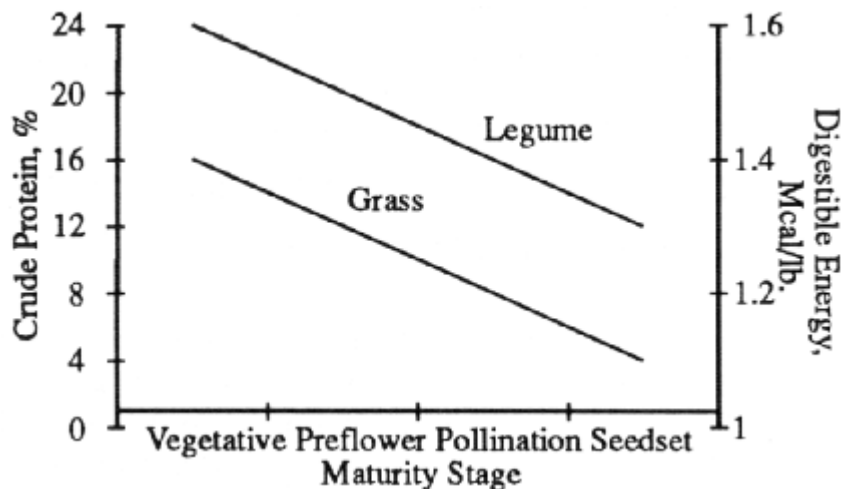


Figure 1. Maturity effect on the crude protein and digestible energy of legume and grass hays.

Species and Variety

Hay composition is highly affected by the species of forage present in the hay. Grass hays include the cool-season species of timothy, smooth brome grass, orchardgrass, tall fescue, and redtop. Commonly used legumes include alfalfa and red clover, and occasionally lespedeza and birdsfoot trefoil. Legumes are usually higher in protein and calcium than

the grasses, but may not be much different in energy (Megacalories per pound) or phosphorus levels (see Table 1).

Table 1. Typical composition of mid-bloom legume and grass hays.

Forage type	Diges. Energy Mcal/lb	C.P. %	Ca %	P %	Vit A IU/lb.*
Legume, mid-bloom	.94	17	1.24	.22	19,090
Grass, mid-bloom	.80	8.6	.43	.20	8,620
Mixed-50/50	.87	12.8	.83	.21	13,855

*International units per pound.

Some types of hay bring with them potential feeding problems. Moldy sweet clover hay can contain high levels of dicoumerol, an anticoagulant, produced by the action of molds on coumerol, a natural component of sweet clover. Dicoumerol ties up Vitamin K and causes the blood not to clot.

Broodmares consuming tall fescue that is infected with the endophytic (within plant) fungus can result in prolonged gestations, thickened placentas at birth, aglactia (lack of milk production), and dystocia (difficult birth). The endophyte is in the seed, stem, and leaf sheath but not leaf blades. Thus, second and third cuttings of hay should be of less concern (less than 5 percent infection). Low-endophyte varieties of tall fescue are available. For gestating mares, it is best to use low-endophyte varieties of fescue mixed with a legume. The Animal Disease Diagnostic Laboratory (ADDL: phone 812-678-3401) at the Southern Indiana Purdue Agricultural Center (SIPAC, Dubois County) can test live tall fescue tissue for the presence of the endophyte.

Although sudangrass and sorghum hybrids can cause prussic acid toxicity on pasture, the hay of these species appears not to cause a problem, but would only be recommended when other species are not available.

When selecting hay, compare the needs of the horse with the nutrient content of the hay. Horses being maintained, mares in the first two-thirds of gestation, and mature horses working at light or moderate levels can do nicely on immature grass hay. Young foals and mares in the first three months of lactation can benefit by the best legume hay available. A grass-legume hay is recommended for most horses; however, hay can vary widely in nutrient compositions.

Leafiness

Leaves contain more nonstructural (digestible) carbohydrates and protein than stems. Nonstructural carbohydrates, which include plant sugars and starches, are highly digestible. When forage plants mature, the leaf to stem ratio decreases. Hay baled at ideal moisture levels (17 to 20 percent) has more leaves because fewer shattered and fell off when the forage was too dry or became moldy if the forage was too wet. Leaf diseases

can cause premature leaf drop and reduce the leaf to stem ratio. Alfalfa weevil, an insect that feeds upon alfalfa leaves, lowers the leaf content. Forages with greater amounts of leaves are higher in quality.

Presence of Pests or Foreign Matter

Insects and some weeds are responsible for reduced forage quality. The insects most responsible for problems to horses are blister beetles. These beetles (*Epicauta pennsylvanica*, *E. malculata*, *E. immaculata*, and *E. lemniscata*) contain a toxin called cantharidin that is severely irritating to the gastrointestinal and urinary tracts. Usually this is only a problem in arid, droughty conditions and in years following heavy grasshopper infestations. Use of a mower-conditioner has made the blister beetle a greater concern because the crushed beetles are retained in the windrow. Be sure to examine hay carefully, especially if it is from an area with dry climatic conditions. Ideally, walk the fields of hay that you intend to use for horses before you harvest the hay or commit to purchase.

Some weeds present no problem to the horse, but other weeds when present in significant quantity can be very toxic or can reduce forage quality. Hay also should be inspected for the presence of other foreign matter such as wire or nails and the presence of dust or molds. A musty odor indicates that the hay was put up too moist which allowed molds to grow. Horses are especially sensitive to dust and molds as they can result in respiratory health problems.

Harvesting

Hays experience a decrease in highly digestible sugars and starches during the curing process because of continued plant respiration after harvest. Decreases in digestible dry matter can also occur from the leaching of soluble nutrients during rainfall and the physical loss of leaves at harvest. Management techniques that minimize curing time (use of the mower-conditioner, drying agents and/or preservatives) can minimize this loss. Preservative products consisting of propionic acid and acetic acid have successfully preserved alfalfa hay baled at moisture levels up to 35 percent without affecting intake. Preservative-treated hay has been fed to horses without problems. Hay should not be packaged when moisture content is greater than 20 percent and an effective preservative is not used. Heating will occur and may reduce forage quality, resulting in musty or moldy hay; and in the worst case, it can cause spontaneous combustion. Light rain on hay, occurring within several hours after mowing when the hay is properly dried to less than 20 percent moisture before baling, is not as damaging as rain falling on dry hay in the swath or windrow.

Forms of Harvested Forage

Forage is an important part of a horse's diet, not only as an economical source of nutrients, but to maintain normal digestive health in the horse. The presence of material

of one inch in particle size is important to minimize colic and digestive upsets, and abnormal behavior. Forage can be safely provided in a wide variety of forms.

Square bales. Small (40-80 lb.), square bales of hay are most commonly used in the horse industry. Horse owners can easily handle these bales, and storage is flexible. Bales should be stored under a cover in a way to minimize heat generation and weather damage.

Big round bales. These 800-1200 lb. rolled bales of hay can save great amounts of labor and can efficiently be used in drylots with large numbers of horses. Indoor storage or keeping the bales on a well-drained base, such as crushed rock, and wrapped with plastic is the key to success with big bales. Use a feeder that keeps the hay contained and controls wastage. Make certain there are enough horses to consume the entire bale so waste does not occur.

Hay cubes. Normally, hay cubes are 2 inch by 2 inch cubes and made from coarsely chopped hay. Cubes can be made from a variety of hay types and can be bagged and purchased with a composition guarantee on the bag. Storage and handling ease, and decreased wastage are advantages that may offset the increase in purchase price. Cubes made from coarsely chopped (>.5 in.) hay appear to provide adequate particle size to eliminate wood chewing. Caution should be used when adapting horses to cubes. They may gulp, or bolt, hay cubes quickly and choke.

Chopped hay. Hay chopped to a length of one inch can be very successfully used in a total mixed ration by adding the grain mixture directly to the hay. This makes feeding easier if handling equipment is available. One can easily vary the forage- to-grain ratio without changing the feedstuffs when the horse's requirements change. Chopped hay may become dusty and need molasses or vegetable oil to keep down the dust.

Pellets. When fed as the sole feedstuff, pellets do not provide adequate particle size to maintain normal digestive health and behavior in horses. When hay or hay and concentrate are ground and then pelleted, horses chew wood, trees, and tails. Horses have an increased rate of digesta passage; consequently, they feel less full, and eat more total pounds of feed. These negative effects can be overcome by feeding 1 percent of the horse's body weight per day in long-stem hay along with any pelleted concentrate mixture or complete feed.

Silage. Forages harvested at moisture levels from 50 to 70 percent can be stored and fed as silage, but the risk of spoilage and toxic substances is higher. Successful preservation of such high-moisture forage is dependent on the exclusion of air for proper fermentation and a resulting low pH. Only under expert management and when feeding enough horses to quickly consume all of the forage that is exposed to air should silage be considered for horses. Numerous problems can occur from the ingestion of spoiled feeds, especially in young horses.

Forage Testing

Regardless of the form of the forage, visual and sensory appraisal of hay is not adequate to predict nutrient composition. Once the factors that determine forage quality have been measured, a more accurate ration can be formulated to meet individual needs.

Methods of Forage Testing

Methods of estimating or analytically determining nutrient content of forages include visual appraisal, chemical analysis, and near infrared reflectance spectroscopy. Each method has strengths and weaknesses for use in selecting hay for horses.

Visual appraisal is the oldest and most common method of selecting hay. Forage appearance is evaluated by color, leafiness, maturity, and the presence of foreign material (insects, weeds, and dust). Visual appraisal includes feel and smell as well as sight. The texture of the hay involves stem coarseness and maturity of heads; odor indicates mold or weed presence. Visual appraisal is very subjective and no two people will evaluate the same hay exactly the same way. It is very difficult to communicate descriptive terms when using this method. Even though visual appraisal is quick and inexpensive, color, texture, and odor do not necessarily relate to nutrient composition.

Chemical analysis is the most accurate method to assess nutrient make-up. The chemical analysis of a forage identifies nutritionally strong and weak points so that proper supplementation can be planned. This method is the most accurate, but it is expensive and the turn-around time for results is slow. Often horse managers need to know the levels of trace minerals or vitamins and only a chemical analysis provides that information.

Near Infrared Reflectance Spectroscopy (NIRS) is a quicker and less expensive method to determine the major chemical constituents in forages. The major organic components of forage have specific absorption characteristics in the near-infrared region of the spectrum that make their identification and measurement possible through mathematical relationships. The forage can be analyzed in less than ten minutes. NIRS is the method of estimating composition that is accurate and has the shortest turn-around time.

Taking a Representative Sample

Taking a representative sample is essential if forage testing is to be of value. The samples must be taken at the right time and from locations representing the hay being analyzed. The proper time to sample forages is as near as possible to the planned time of feeding. One week for NIRS analysis and three weeks for chemical analysis should be allowed.

A bale probe or core should be used to collect samples in square bales or big round bales. The probe should be 12 to 18 inches long, hollow and at least 3/8 inch in diameter. Most

probes attach to an electric drill or brace. Many feed companies and Cooperative Extension Service Offices can help locate probes, assist in preparing the sample, and provide a list of labs. A minimum of 20 average looking conventional square bales or ten big round bales should be used. Take one core drilling from the end of each square bale, place drillings in a clean plastic bucket, thoroughly mix drillings from all 20 bales together, put one quart in a plastic bag and send to a laboratory. If a bale probe is not available, reach into each bale and carefully remove a handful of forage. Cut up with shears and send to a lab. If there are several lots of hay from different fields, cuttings, or sources, then each lot should be sampled and submitted separately. For more detail see AY-460, *Forage Testing-Why, How, and Where*.

Interpreting the Analysis Report

The type of analysis will vary depending on what specific nutrient compositions are needed. Often horse managers need to know the levels of trace minerals or vitamins and only a chemical analysis provides that information. Most of the time a NIRS analysis will be the most practical.

The report will provide the horse owner with the percent Crude Protein (CP), Dry Matter (DM), Calcium (Ca), Potassium (K), and Phosphorus (P), Acid Detergent Fiber (ADF), Neutral Detergent Fiber (NDF), and Relative Feeding Value (RFV). Dry matter measures the amount of water in a sample and is subtracted from 100. Most hays will be about 90 percent dry matter.

Crude protein indicates only the level of amino acids and total nitrogen in the forage. It is not a good predictor of energy availability in the hay. Crude protein is not likely to be limiting except in lactating mares and growing foals. Levels of Ca, P, and K indicate the percent of these minerals in the forage. These can vary greatly and levels in the forage should determine the minerals needed in the concentrate mixture.

ADF is composed of cellulose, lignin, and other poorly digested components. The lower the ADF value, the more digestible the nutrients in the hay. Levels above 45 percent are of little nutritional value and samples with less than 31 percent ADF are excellent. The higher the percent NDF, the less the horses will consume. NDF levels below 40 are excellent and those above 65 will likely not be eaten by most horses. A high relative feeding value (RFV) reflects higher quality, greater intake, higher digestibility, and fewer concentrates needed to supplement the diet. When buying horse hay, RFV should be a prime consideration.

Table 2. Quality standards from Hay Market Task Force of American Forage and Grassland Council for hay.

Quality standard ^a	Analysis ^b			DDM ^c %	DMI ^d % of BW	RFV ^e
	CP	ADF % of DM	NDF			
Prime	>19	<31	<40	>65	>3.0	>151
1	17-19	31-35	40-46	62-65	3.0-2.6	151-125
2	14-16	36-40	47-53	58-61	2.5-2.3	124-103
3	11-13	41-42	54-60	56-57	2.2-2.0	102-87
4	8-10	43-45	61-65	53-55	1.9-1.8	86-75
5	<8	>45	>65	<53	<1.8	<75

- a. Standard assigned by Hay Market Task Force of American Forage and Grassland Council.
- b. Analysis associated with each standard; CP = crude protein, ADF = acid detergent fiber, and NDF = neutral detergent fiber. CP is not used in calculation of RFV.
- c. Dry matter digestibility (DDM, %) = $88.9 - 0.779 \text{ ADF (\% of DM)}$.
- d. Dry matter intake (DMI, % of body weight) = $120/\text{forage NDF (\% of DM)}$.
- e. Relative Feed Value (RFV) calculated from $(\text{DDM} \times \text{DMI})/1.29$. Reference hay of 100 RFV contains 41% ADF and 53% NDF.

Meeting Requirements with Hay

Depending on the use or the classification of the horse, 50 percent to 100 percent of the horse's nutrients can be supplied by hay. Horse rations are usually calculated on the basic fact that they will eat only about 2.5 percent of their body weight everyday in dry matter. This depends on the forage quality fed. Mature forages with high NDF values limit intake and require that more nutrients be provided in the form of concentrate supplements. There are five nutritional classifications of horses.

Maintenance. This class of horse is mature, is maintaining its body weight, and is not pregnant, lactating, breeding nor being exercised. This class of horse can often meet all of its requirements with forage. Minimum requirements are 10 percent Crude Protein, .3 percent Calcium, .2 percent Phosphorus, and 1 Mcal of Digestible Energy per pound of the total ration.

Pregnancy. The nutritional requirements during the first eight months of pregnancy are the same as for a mare being maintained. During the ninth, tenth, and eleventh months of pregnancy, the energy requirements increase 11 percent, 13 percent, and 20 percent respectively. Minimum requirements in the last month of pregnancy are 11 percent Crude Protein, .5 percent Calcium, .4 percent Phosphorus, and 1.1 Mcal of Digestible Energy per pound of the total ration.

Lactation. During the first three months after foaling, mares can produce milk equivalent to 3 percent of their body weight per day and 2 percent per day during months four to six. The requirements for energy are about 80 percent above maintenance for the first three months and 50 percent above maintenance for the next three months of lactation. Minimum requirements during the first three months of lactation are 14 percent Crude Protein, .6 percent Calcium, .4 percent Phosphorus, and 1.2 Mcal of Digestible Energy/lb. of total ration.

Growth. Growing foals require feeds of higher quality than what mature horses require. The age of the foal and the average daily gain determine the requirements. Horses are still growing past 24 months of age, and longer in the slower maturing breeds. The optimum growth rate has not been established, but overfeeding can cause developmental orthopedic diseases and underfeeding can cause permanent stunting. Minimum requirements for a six month old, moderately growing foal are 15 percent Crude Protein, .7 percent Calcium, .4 percent Phosphorus, and 1.4 Mcal of Digestible Energy/lb. in the total ration. These decrease as the foal ages and the rate of gain decreases.

Work. The level of exercise or work the horse is doing determines the amount of nutrients needed. Energy is the fuel for work, and as the intensity or duration of the work increases from light to moderate to intense, the requirement for energy increases 25 percent, 50 percent and 100 percent above maintenance, respectively. Minimum requirements for a mature horse doing moderate work are 11 percent Crude Protein, .35 percent Calcium, .25 percent Phosphorus, and 1.2 Mcal of Digestible Energy/lb. of total ration.

Feeding Programs Based on Hay

As an example to determine how far hay will go to meet the requirements of a horse's diet; a lactating mare that weighs 1200 lb. and is in the first three months after foaling requires the following:

Diges. Energy	Crude Protein	Calcium	Phosphorus	Vit. A
30.7 Mcal	3.4 lb	61 gm	40 gm	32,659 IU

Presume a mare is being fed a hay as the only feedstuff and that 30 lbs. of the hay, her daily intake, will provide the following nutrients:

Table 3. Nutrient amounts provided by three types of hay in a lactating mare's ration.

Nutrient	Hay type		
	Mid-bloom grass	Mid-bloom legume	50-50 Mix mid-bloom grass and legume
Diges. energy, Mcal	25.5	28.2	27.3
% met with hay	83	92	89
Crude Protein, lbs.	2.8	5.1	3.5
% met with hay	82	150	102
Calcium, grams	34.5	168	101
% met with hay	56	275	166
Phosphorus, grams	34	29	35
% met with hay	85	87	89
Vitamin A, IU	219,000	571,000	378,000
% met with hay	670	1753	1157

From the above comparisons, it is clear that even grass hay provides over 50 percent of the nutrients needed even for a lactating broodmare. The grass hay would have to be supplemented with all nutrients except Vitamin A. Any green forage fed to horses provides enough beta-carotene to ensure that the horse does not need supplemental Vitamin A. The mixed hay needs to be supplemented with more energy, phosphorus, and possibly protein; the requirement for calcium is met. The legume provides nearly all the energy needed (92 percent), an excess of protein and calcium, but still needs additional phosphorus.

These rations can be balanced using a wide variety of feedstuffs. The important consideration is to base the ration on the nutrients provided in the base forage being used. One should balance the ration to meet the nutrient needs of the horse by using the most economical sources of these nutrients. Local costs of hay and concentrate supplements vary, thus it is critical that the horse owner calculate rations and daily feed costs. Under normal circumstances, the more nutrients that can be provided as hay, and the fewer as concentrates, the less expensive the ration. Your Cooperative Extension Agricultural agent has a computer program called PU Ration designed to help you balance the ration and account for feedstuff prices, changes in horse requirements, and determine daily recommended feeding programs and daily feed costs.

Purchase and Storage of Hay

Hay should be purchased and sold by weight rather than by volume. It is important to weigh half a dozen representative bales to establish an average weight. The difference between buying 60- pound bales and 80-pound bales can increase the cost of hay by one third. Negotiate price on a per-ton-basis by determining bale weight, the number of bales in a ton (2000-pound) and then multiplying the price per bale times the number of bales in a ton. See Figure 2.

3.50	\$175	\$117	\$88
3.00	\$150	\$100	\$75
2.50	\$125	\$83	\$63
2.00	\$100	\$67	\$50
1.50	\$75	\$50	\$38
	40#	60#	80#
	Bale Weight, lb.		

Figure 2. Relationship between price paid per bale, weight of the bale, and the price per ton of hay.

Inspecting the hayfields prior to purchase of the hay is the ideal way to purchase hay. If the hayfield can be inspected before harvest then determinations of species mixture, the presence of pests and weeds, and the maturity of the plants can be made. The hay purchased and picked up directly out of the field should be priced lower than hay that has already been put in the barn, stored and handled because of the labor involved. The horse owner will need adequate storage for the entire year and will bear the risk of storage molds. If on the other hand, the hay seller provides storage and delivery labor of the hay until it is needed, the horseman should be prepared to pay for the service involved as well as for the hay.

The other issue that cannot be evaluated unless the hay has been sampled and analyzed is that hay of higher nutrient composition should be worth more to the horse owner. What is really being purchased is nutrients rather than a bale of hay. If the same price is paid for mature grass hay (quality standard five) as for prime, immature alfalfa, then something is not right. If both types of hay cost \$100 per ton, then the horse owner is paying \$.29 per pound of crude protein and \$.53 per 100 Mcal of digestible energy in the alfalfa and \$.58 per pound of crude protein and \$.63 per 100 Mcal of D.E. in the grass hay. The composition of high-quality hay may make the additional cost well worth it if the hay has been analyzed. Knowing the forage quality of the hay types to be potentially purchased helps the buyer and seller negotiate price per ton. Figure 3 shows the relationship between hay quality and price per nutrient.

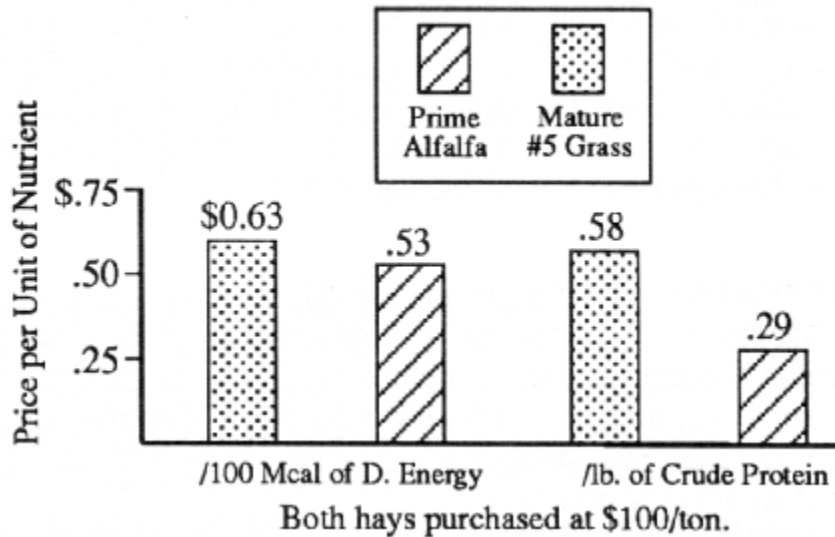


Figure 3. Price per unit of energy and protein in hay of different compositions.

It is not the case that all horses need alfalfa hay nor that grass is always better, but the closer the forage composition matches the requirements of the horses being fed, the fewer nutritional problems will occur as a result. The diet can be supplemented if only poor-quality hay is available, a high-quality hay can be diluted if the nutrient composition exceeds requirements, but both of these approaches require extra knowledge. Obesity can occur on good hay just as unthrifty conditions can occur on poor-quality hay.

Storage Conditions

Hay should be kept out of the weather and on a dry surface. Do not store hay directly on concrete indefinitely as moisture can be absorbed through the floor. The sun can bleach the outer edges, and the hay will lose color and some Vitamin A (carotene) but can be stored indoors under good conditions indefinitely without losing significant nutrient content. Hay takes a lot of space to store (about 200 cubic feet per ton). If a 1100-pound riding horse is going to eat two percent of its body weight per day as forage for nine months, it will eat three tons of hay which will take up 600 cubic feet of storage space. This is about the same as a 10 foot by 10 foot stall that is 7 feet high. If hay with excessive moisture is packaged and stored, mold may develop. Mold producing organisms generate heat through respiration and reduce hay quality dry matter digestibility. The mold spores can certainly create a respiratory problem or aggravate existing heave problems. Another problem is spontaneous combustion which can occur when storing hay at moisture levels greater than 20 percent. The heat created from hay being put into a stack can get hot enough to cause spontaneous combustion and burn the hay and/or barn.

Conclusion

Meeting the requirements and maintaining the horse's health as economically as possible are the primary objectives on which horses feeding programs should be based. Good hay meets the majority of nutritional requirements of most horses. In fact, horses are healthier when fed predominantly forage. Usually forages are cheaper sources of nutrients than concentrates. If additional assistance is desired to select hay, to sample hay for composition analysis, or to balance a horse's ration, contact the Cooperative Extension Agricultural agent in your area.

Related References

AY-260 Forage Testing - Why, How, and Where

ID-167 Maximizing the Value of Pasture for Horses

AS-429 Nutritional Management for Horses

AS-460 Recognizing and Maintaining the Healthy Horse

ID-189 Moldy Corn Poisoning in Horses (Equine Leukoencephalomalacia)

AS-434 Introduction to Horse Management

AS-440 Should I Buy a Horse for My Child