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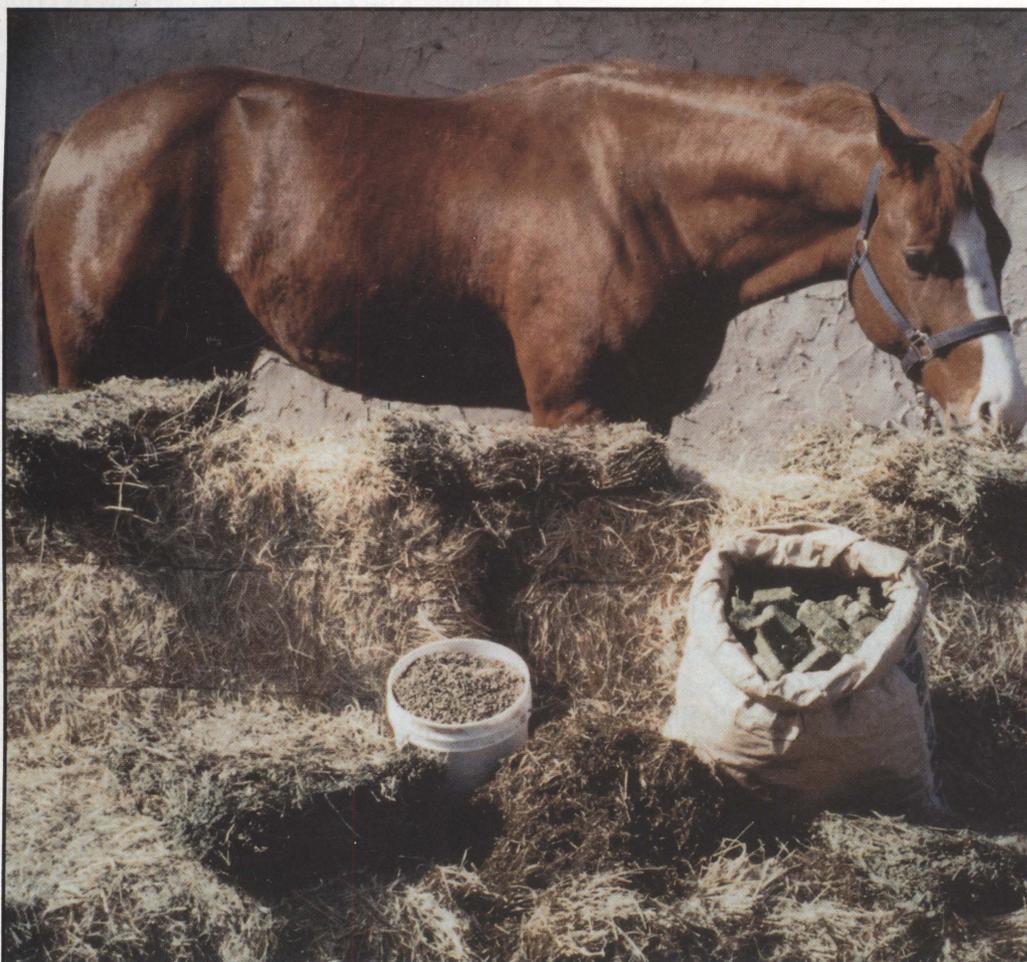
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Selection and Use of Roughage in Horse Feeding

Pete G. Gibbs and Karen E. Davison*



One of the biggest challenges facing the horse owner is identifying and properly using top quality roughage. Roughage must be fed regularly to keep the horse's digestive system functioning properly, to minimize vices such as wood chewing and to help meet some percentage of the horse's daily nutrient requirements²⁹. Since roughage is the foundation of a safe and successful feeding program, the effort given to selecting the best roughage available is well worth the time involved.

*Associate professor and Extension horse specialist, Department of Animal Science, The Texas A&M University System; and Extension associate, The Texas A&M University System.

Roughage Selection

Careful selection of roughage is important to ensure maximum nutrient supply per dollar spent and to avoid purchasing inferior quality feedstuffs. Characteristics of good quality roughage include 1) a high leaf to stem ratio, 2) fresh smell and appearance, 3) cleanliness (free of weeds, dirt, trash) and 4) color^{8,28}.

When roughage is cut at a mature growth stage it is very stemmy, which makes it significantly less nutritious and digestible. Overly mature hay has higher levels of crude fiber and lignin, which decrease its feeding value, and are not digested as well by the horse^{10,19}. Therefore, fine stemmed, soft, leafy hay should be selected over

extremely stemmy, fibrous hay². High quality hay provides more nutrients and is less apt to cause the impaction type colic that is sometimes associated with coarser, lower protein roughages³⁴.

In addition to maturity, the season in which hay is harvested also affects its quality. Digestibility is highest for forage harvested in the spring. It declines in mid to late summer and then rises slightly in autumn². Therefore, if all other factors are the same, hay cut in the spring will be of higher quality than hay cut in mid or late summer.

Although leafiness and softness are good indicators of quality, hay should be analyzed for actual nutrient content. When hay is being purchased on a weight basis (by the ton), a core sample should be analyzed for protein, fiber and moisture. In most states, the county Extension office can provide assistance in obtaining samples and determining where to send the hay for quick analysis. This will help verify hay quality and more accurately determine its value. It is not necessary to analyze processed roughages because many of them are sold with a guaranteed analysis of some nutrients.

A fresh smell and appearance are important, regardless of nutrient content. Roughage that smells the least bit moldy or musty should always be avoided. A white or bluish, powdery appearance and excessive dust may also indicate mold. Horses that are not overly hungry often refuse to eat moldy roughage if given a choice. However, hungry horses will consume moldy hay, which can cause health problems. Mold can easily develop in the bottom row of stored bales, even in a barn. On round bales, the outer layer of spoiled or weathered hay may need to be removed before feeding²³.

In addition to the risk of becoming moldy, roughage that is harvested at too high a moisture content will produce heat. While it is normal for freshly baled hay to feel slightly warm down inside the bale, bales that reach temperatures from 120 to 140 degrees F are at risk for spontaneous combustion. Because of the possibility of fire, fresh, green hay should never be stored tightly against older, dry hay².

The presence of dirt, dust and trash in roughage may indicate that it was harvested carelessly. Dirt and excessive dust can be harmful to the horse^{2,6}. First cutting hay sometimes contains a higher percentage of weeds than later cuttings, but this normally does not pose a problem unless the hay is extremely weedy.

A bright green color usually indicates that the hay is rich in vitamins, particularly carotene which is converted to Vitamin A by the horse. Color also indicates what the harvesting conditions were and how long the hay has been stored²⁸. However, hay should not be turned down simply because it is not bright green on the outside. The inside of a bale often has good color.

Even after a load of hay has been carefully selected, each bale should be checked for mold or foreign objects as it is fed.

Daily Roughage Intake

Horses without access to a good source of grazing should receive roughage in amounts equal to about 1 percent of their body weight daily. This will usually satisfy a horse's need for adequate gut fill and chewing, helping to minimize wood chewing or cribbing. Horse owners should make sure daily roughage intake does not go below 0.75 percent of body weight, because inadequate roughage can make horses more susceptible to digestive problems. It is also important to realize that roughage can go far in maintaining some classes of horses. Mature, idle horses and mares in early pregnancy that are already in suitable body condition often can be maintained quite well on roughage alone at 1.5 to 2.0 percent of body weight daily. When no other supplemental feed is provided, roughage intake may need to be as high as 2.5 percent of body weight daily for some horses¹. These are average guidelines. Actual amounts depend a great deal on the status of the horse and the quality and type of roughage being fed. For those horses that do receive supplemental feed, roughage still makes up a significant portion of the daily diet²⁹. When grazing is not available, baled or processed roughage normally represents at least 50 percent of the daily diet for brood mares, horses doing light or moderate work and 2-year-old horses (Table 1).

To feed hay on a percentage of body weight basis, the horse's weight must be estimated. If a set of scales is not available, the following formula may be used to get a fairly accurate estimate of weight⁵.

$$\frac{[\text{heart girth (in.)} \times \text{heart girth (in.)} \times \text{body length (in.)}]}{330} = \text{body wt. (lbs.)}$$

Heart girth is the distance around the body at the highest point of the withers, and body length is measured from the point of the shoulder to the point of the buttock on the same side.

Legume Roughages

Alfalfa

The legume roughage used most for horse feeding is alfalfa. It is available in a variety of forms including square baled, round baled, chopped and bagged, cubed, wafered and pelleted. Each baled or processed form of alfalfa can be used in many ways to: 1) meet or help meet a horse's need for roughage; 2) provide supplemental nutrients; 3) provide added bulk to energy rich grain mixes; or 4) serve as the major source of nutrients for some horses.

Alfalfa products are popular with horsemen because horses usually consume such feedstuffs very readily. Alfalfa can even be used to promote the intake of feeds that horses are otherwise reluctant to eat⁴. Because of this, alfalfa is often the preferred roughage for young horses, who at times can be finicky eaters, as well as for brood mares nursing foals. Alfalfa also is richer in nutrients than some other roughages and is especially helpful in supplying crude protein, fiber and calcium¹⁵.

Alfalfa Quality

The stage of maturity at which alfalfa is harvested greatly affects its nutrient content^{28,29} (see Table 2). The highest quality alfalfa is that which is cut before becoming overly mature.

Alfalfa and processed alfalfa products are not actually considered protein supplements, but they are relatively high in crude protein content. On the average, they contain 30 percent or more protein than many grass hays and can actually be a more economical source of protein than other roughages. Alfalfa products normally cost more than grasses on a per pound of dry matter basis, but they may actually cost from 15 percent to 35 percent less than grasses on a per pound of crude protein basis¹⁴. This can be an important consideration when planning feeding programs for young, growing horses and brood mares that need more protein than idle horses or performance horses.

Alfalfa has an almost 6:1 ratio of calcium to phosphorus, so it can be used to adjust the inverted calcium:phosphorus ratios of cereal grains and decrease the amount of mineral supplement needed in a grain mixture. Furthermore, because alfalfa normally contains between 20 and 28 percent crude fiber, it can be an important source of bulk in the horse's diet. Although roughages are not considered to be rich in energy, alfalfa does contain more energy than most grasses. This extra energy, along with the higher

protein content, is partially responsible for the added "bloom" many horse owners recognize when alfalfa hay is part of the daily feeding program.

Chopped Alfalfa

Roughage is being marketed in various physical forms, and studies have shown that processed hays can be used effectively in horse feeding programs^{9,18,25}. One type of processed alfalfa is chopped hay, made from long stem hay usually chopped to 1/2 inch or 3/4 inch lengths. The nutrient content of most commercially chopped and bagged alfalfa is consistent with that shown for dehydrated alfalfa in Table 2. Research has shown that the nutrient digestibility of high quality chopped roughage is significantly higher than that of average quality chopped roughage¹⁶. Consequently, high quality chopped alfalfa can help provide the additional protein needed by young, growing horses and brood mares.

Chopped and bagged alfalfa is also convenient for horsemen with limited transportation and storage facilities. Some people consider the square bags easier to handle and haul, and the bags protect the feed from sunlight and rain.

Chopped hay can be mixed with energy dense grains such as corn or barley to regulate the rate of feed intake and to add needed fiber. Horses eat grain feeds more slowly when they are mixed with chopped hay²¹. This feeding management practice can be helpful in feeding rapid eaters more safely and possibly decreasing their chances of developing colic or founder. Compared to oats, it takes less than half as much processed alfalfa to provide the same amount of bulkiness (fiber) to an energy dense feedstuff such as corn or barley. Chopped hay may be mixed with cereal grains as a "total mixed ration" that might be fed with no additional long stem roughage³¹. Table 3 shows a total ration containing 67 percent chopped alfalfa that is designed to be fed in wafered form.

Table 1. Diet proportions for horses and expected daily feed consumption.*

| Type of horse | % of total diet | | % of body weight intake | | |
|--------------------|-----------------|-----------------|-------------------------|-------------|----------|
| | Roughage (%) | Concentrate (%) | Roughage | Concentrate | Total |
| Mature, idle | 100 | 0 | 1.5-2.0 | 0 | 1.5-2.0 |
| Pregnant mares | 70-80 | 20-30 | 1.0-1.5 | .5-1.0 | 1.5-2.0 |
| Milking mares | 50-65 | 35-50 | 1.0-2.0 | .5-2.0 | 2.0-3.0 |
| Performance horses | | | | | |
| light work | 65 | 35 | 1.0-2.0 | .5-1.0 | 1.5-2.5 |
| moderate work | 50 | 50 | 1.0-2.0 | .75-1.5 | 1.75-2.5 |
| intense work | 35 | 65 | .75-1.5 | 1.0-2.0 | 2.0-3.0 |
| Growing horses | | | | | |
| weanling | 30 | 70 | .75-1.0 | 1.25-3.0 | 2.0-3.5 |
| yearling | 40 | 60 | 1.0-1.5 | 1.0-2.0 | 2.0-3.0 |
| 2-year-old | 50-65 | 35-50 | 1.0-1.5 | 1.0-1.5 | 1.75-2.5 |

*NRC, 1989.

Table 2. Nutrient content of alfalfa hay and alfalfa products (as fed basis).*

| Stage of maturity or form | Digestible energy (mcal/lb.) | Crude protein (%) | Calcium (%) | Phosphorus (%) |
|---------------------------|------------------------------|-------------------|-------------|----------------|
| Alfalfa hay | | | | |
| early-bloom | 1.02 | 18.0 | 1.28 | .19 |
| mid-bloom | .94 | 17.0 | 1.24 | .22 |
| full-bloom | .89 | 15.5 | 1.08 | .22 |
| Dehydrated alfalfa meal | | | | |
| 15% protein | .91 | 15.6 | 1.25 | .23 |
| 17% protein | .98 | 17.4 | 1.38 | .23 |

*NRC, 1989.

This ration was fed to some horses in a 30-day study, while others received a grain mix fed with long stem hay. There were no differences between the rations in daily feed intake, and no abnormal digestive behavior was observed with either. Although long-term changes in behavior such as wood chewing were not determined, the study concluded that such a ration can be safely fed, and that its nutritional value is comparable to that of a typical grain and hay diet.

Pelleted Alfalfa

Opinions vary widely on the use of pelleted feedstuffs for horses. One limited survey indicated that *30 percent of horse owners select pellets when purchasing commercial feed*¹⁷. Pellets do have several uses, provided they are composed of high quality ingredients and are properly made. The fiber, protein and calcium in alfalfa often can be easily incorporated into a grain mix by using pellets (Table 4).

Feeding trials utilizing 25 percent alfalfa in a pelleted grain have shown that pellet density is more important than pellet size¹³. Hard, crunchy pellets are consumed more slowly than soft, crumbly pellets. Horse owners should know the exact weight of pellets fed rather than relying on coffee can (volume) measures, and should bear in mind that pellets often are consumed more rapidly than grain mixes²².

Recent research has concluded that alfalfa pellets can be fed in lesser amounts than long stem alfalfa, primarily because the pellets usually contain a higher percentage of nutrient rich leaves³⁰. Other research has shown that pelleted alfalfa has a higher nutritive value index than long stem hay¹⁸. Horsemen have observed that less manure is produced when horses eat pelleted alfalfa versus long stem hay and at least one feeding study has confirmed this³⁰.

It is important to evaluate the eating behavior of horses when pellets are being fed. Horses kept in confinement and fed pellets may need additional long stem roughage to discourage bad habits such as wood chewing, cribbing or mane and tail chewing^{18,20,32}. Such

problems are certainly less likely when horses have some access to long stem hay or grazing.

Alfalfa Cubes

Horse owners sometimes need to give supplemental feed to certain horses. And sometimes conditions are less than ideal for feeding grain mixes, as when brood mares are being kept on native pasture and grass is fairly dormant or covered with ice and snow. Cubed alfalfa is one feedstuff that can be used effectively in such situations. Fed at 1 percent of body weight daily, cubes will provide 55 percent and 100 percent of the pregnant mare's (late gestation) requirements for energy and protein, respectively. The cubes are large enough that mares can usually pick them up without ingesting dirt or other foreign materials. Like pellets, cubes can also be mixed with grain based feeds at 10 to 20 percent of the total ration to supply additional calcium and fiber. And, when fed at about 1.5 percent of body weight, cubes can provide all of the energy and protein needed by mature, idle horses and mares during early pregnancy. Cases of choking in horses fed cubed hay appear to be very limited and studies suggest that choking is usually a problem only in horses that already have chewing problems²⁵. Horses spend less time eating cubes compared to long stem hay, but habits such as wood chewing have not been observed in feeding studies with cubes^{18,25}.

Table 3. Total mixed ration fed in wafered form.*

| Feedstuffs used | Percentage |
|---|------------|
| Chopped alfalfa | 67.0 |
| Cracked corn | 16.3 |
| Crimped oats | 10.0 |
| Dried cane molasses | 3.0 |
| Salt | 1.0 |
| Trace mineral premix | 0.1 |
| Vitamin premix | 0.1 |
| Nutri-binder, gelatinized grain sorghum | 2.5 |

*From Pipkin et al. 1991.

Table 4. Example herd ration (≈14% crude protein) for mature horses using pelleted alfalfa.*

| Ingredients | Percent | Lbs./ton |
|---------------------|---------|----------|
| Alfalfa pellets | 45.0 | 900 |
| Cracked corn | 47.5 | 950 |
| Soybean meal | 4.0 | 80 |
| Molasses | 2.5 | 50 |
| Dicalcium phosphate | .5 | 10 |
| Trace mineral salt | .5 | 10 |
| | 100.0 | 2000 |

* Ration may be fed with good quality grass hay to mature horses.

Horse Hage

A fairly new form of processed roughage developed in England is now being manufactured in the United States. Horse hage consists of chopped alfalfa that is vacuum packed at a high moisture level²⁹. It has a distinctive aroma and is processed to preserve freshness for a long time. Research on this high moisture roughage is limited, but field observations indicate that horses take 2 or 3 days to adapt to the feed²⁷.

Potential Problems with Alfalfa

Blister beetles sometimes enter alfalfa fields and can end up in the harvested product. The beetles contain the toxin cantharidin, which severely irritates the horse's digestive tract and often causes death. Although there are no guarantees, hay that is mowed and windrowed without conditioning rollers may be less likely to contain beetles than hay that is cut with a self-propelled mower conditioner³. Furthermore, inspections of hay fields in the Midwest indicate that second, third and fourth cuttings are more apt to contain striped beetles than other cuttings³. Many hay

producers are now aware of the potential for blister beetle contamination and try to harvest alfalfa with the horse owner in mind. Horse owners should talk with alfalfa producers and suppliers to learn the details of harvest date, method of harvest and other factors.

Other Legumes

Other legume hays used in horse feeding are red clover, birdsfoot trefoil and lespedeza²⁹. Sun-cured red clover hay is intermediate in protein content compared to grasses and alfalfa, and contains about the same energy as many grasses. It is very similar to alfalfa in both its level and ratio of calcium and phosphorus. Red clover hay often appears somewhat stemmy and does not possess the bright green color of other legumes. Limited studies indicate that horses are less susceptible than other livestock to problems such as slobbering caused by consuming clover. However, horses can be affected by dicoumarin, which is present in moldy or improperly cured sweet clover.

Birdsfoot trefoil is similar in protein content but higher in energy content than clover. It is often less stemmy than red clover^{21,29}.

Lespedeza grows well in certain areas of the U.S. and can be used as a source of roughage. It often contains less protein and energy than alfalfa, red clover or other legumes, but is somewhat comparable to alfalfa in calcium and phosphorus content.

With any legume roughage, horse owners should always monitor eating behavior and other signs on a regular basis. Since most legumes are higher in energy and protein than grasses, it is not uncommon to see slight differences in water consumption, feed intake, urination and defecation. Sometimes the feces will be looser and greener when horses eat legumes, especially



Alfalfa pellets vary in size and usually have a guaranteed nutrient content.



Alfalfa cubes are one feedstuff that can be used to supplement horses on poor or limited pasture.

when the roughage is first introduced. Therefore, it is always a safe management practice to introduce new feedstuffs gradually over a period of several days.

Grass Hays

There are many grass and small grain hays. They vary greatly in nutritive value and palatability, depending on the particular variety, where it is grown and its stage of maturity at harvest. The grass hays generally provide less protein and energy than good quality legumes. The protein content of excellent quality grass hays may be as high as 15 percent, but the average is closer to 8 percent or less³⁵. Because of their fiber content and relatively low nutrient content, grass hays may be safely fed free choice to horses. Grass hays are frequently mixed with legume hays to provide roughage that is very palatable, moderate in nutrient content and safe to feed ad libitum. Grass hays most commonly fed to horses include coastal bermudagrass, timothy, prairiegrass, orchardgrass, smooth brome grass, Kentucky bluegrass, oat hay, tall fescue and sudangrass, although other varieties may be fed. Regardless of the variety, good quality grass hay should be leafy, soft and pliable to the touch, have no or comparatively few seed heads and be free of mold, dust and weeds²⁹.

Bermudagrass

Bermudagrass is very popular in the southern United States. Coastal bermudagrass is more often grown for hay because it grows taller than common bermuda, which is generally too short for good hay yields. The nutrient content of bermudagrass is almost the same as that of early bloom timothy (Table 5). Horses that are being shipped to different regions of the country are often given bermuda as a substitute for timothy because of the similarities. The protein in both is higher than in typical cereal grain hays such as oats or barley (Table 5).

Bermudagrass is sometimes blamed for impaction colic in horses⁸; however, fertilized bermudagrass hay baled at 3- to 4-week intervals is usually high in protein and easily digestible. Because a large number of horses are fed bermudagrass, many

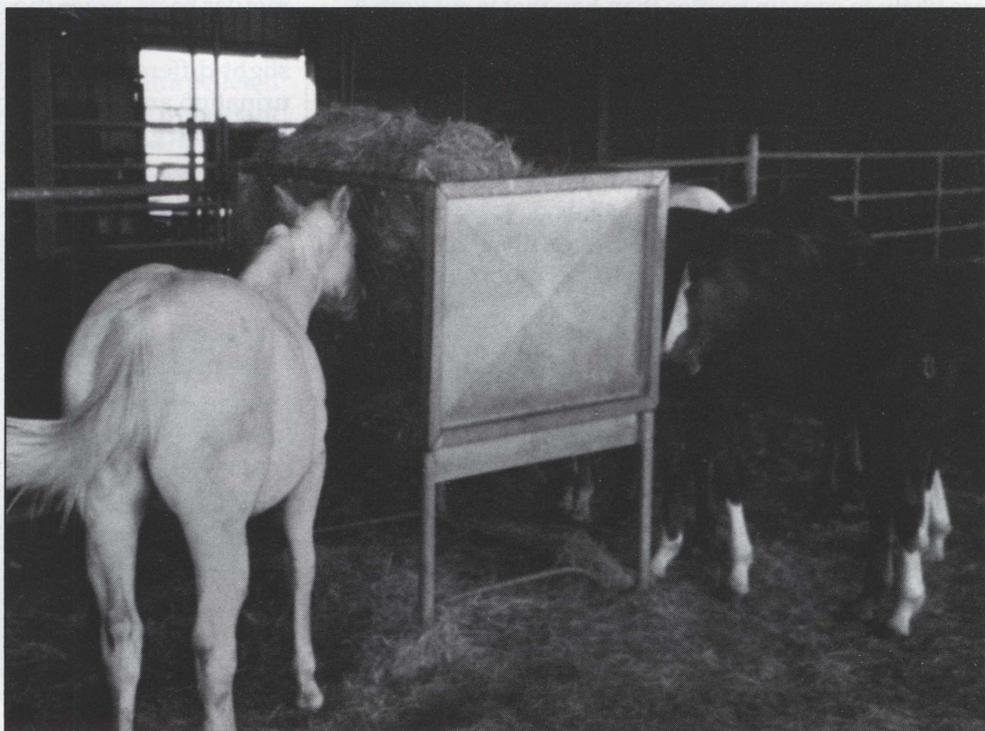
may receive hay that is overly mature. Coastal bermudagrass hay intended for horses should be cut at a 15-inch height for the first cutting and every 21 to 28 days thereafter for subsequent cuttings. Research with horses has shown that good quality bermudagrass hay is actually more digestible than average quality alfalfa hay¹⁶.

Timothy

The best quality timothy hay is normally grown in the northern part of the country. Relative to other grass hays timothy has an average nutrient content (Table 5), but it tends to remain free from dust and mold. Timothy is highest in nutrient content and palatability when cut in the pre-bloom or early-bloom stages, and is frequently grown with a legume to increase the total nutrient value of the harvested roughage³⁵.

Sorghum

Sudangrass, johnsongrass and sorghum/sudan hybrids are all members of the sorghum family. Johnsongrass is a tall, rank growing grass often regarded as a weed⁷. Johnsongrass hay has more calcium (Table 5) than most other non-legume hays, but has little protein and is often coarse and largely unpalatable. Sudangrass hay is similar to johnsongrass hay in many respects and, if cut too early, may contain toxic levels of prussic acid. Some newer varieties have low levels of prussic acid, but these hays probably should be tested before feed-



Good quality grass hays are an excellent source of roughage.

ing⁷. A recent report indicates that sudangrass hay and sorghum/sudan hybrids may cause the urinary tract inflammation known as cystitis in horses. Careful management and harvesting are necessary to avoid these problems.

Fescue

This grass is grown extensively in the midwestern and southeastern United States. Fescue hay has the reputation of being fairly unpalatable to horses, regardless of the stage at which it is harvested. Endophyte-infected fescue can pose serious reproductive problems for brood mares, including prolonged gestations, abortions, thickened placentas and agalactia (no milk)^{2,8}. Therefore, it is commonly recommended that mares not be given fescue hay or allowed to graze fescue during the last 90 days of pregnancy or during lactation. Fescue can be tested to determine whether or not the fungus is present, and endophyte-free seed is available for reseeding new stands.

Bromegrass

Smooth bromegrass is the most common type of bromegrass fed to horses. This grass grows extensively in the Great Plains but does not do well in the southern U.S. It is best when harvested in the mid-bloom stage. Bromegrass is highly palatable and can have a feeding value comparable to bermudagrass. Consequently, it is a reasonably desirable choice of roughage².

Kentucky bluegrass

Popular in mideastern states, particularly Kentucky, bluegrass can provide good quality roughage. Bluegrass hay that is cut prior to heading out can have a protein content similar to that of good quality alfalfa. However, because of its low yield potential, it is often not harvested until it is quite mature, resulting in a much lower feeding value^{2,8}.

Prairiegrass

Prairie hays, used mainly in the mid and western United States, are a mixture of wild, native grasses.

Table 5. Nutrient content of some varieties of grass hays (as fed basis).*

| | CP (%) | DE (mcal./lb.) | Ca (%) | P (%) |
|----------------------------|--------|----------------|--------|-------|
| Bahiagrass | | | | |
| sun-cured, late vegetative | 8.9 | .77 | .25 | .19 |
| Coastal bermudagrass | | | | |
| 15-28 days | 10.6 | .87 | .35 | .24 |
| 29-42 days | 10.9 | .89 | .30 | .19 |
| 43-56 days | 7.3 | .79 | .24 | .17 |
| Kentucky bluegrass | | | | |
| full-bloom | 8.2 | .72 | .24 | .25 |
| Smooth bromegrass | | | | |
| mid-bloom | 12.6 | .85 | .25 | .25 |
| mature | 5.6 | .71 | .24 | .20 |
| Kentucky fescue | | | | |
| full-bloom | 11.8 | .86 | .40 | .29 |
| mature | 9.8 | .80 | .37 | .27 |
| Oat hay | 8.6 | .79 | .29 | .23 |
| Orchardgrass | | | | |
| early-bloom | 11.4 | .88 | .24 | .30 |
| late-bloom | 7.6 | .78 | .24 | .27 |
| Italian ryegrass | | | | |
| late vegetative | 8.8 | .71 | .53 | .29 |
| Sorghum, johnsongrass | | | | |
| hay | 6.7 | .68 | .80 | .27 |
| Timothy | | | | |
| early-bloom | 9.6 | .83 | .45 | .25 |
| mid-bloom | 8.6 | .80 | .43 | .20 |
| late-bloom | 6.9 | .72 | .34 | .13 |
| Wheat hay | 7.7 | .76 | .13 | .18 |

* NRC, 1989.

When these grasses are cut in the early stages of growth, they can provide protein in the range of 6 to 8 percent. However, the quality is variable because of the many different types of grasses that comprise prairiegrass hay³⁵.

Orchardgrass

Produced in many areas of the country, orchardgrass can be of fairly good quality if cut in the early bloom stage. If cut later it can be unpalatable and of little nutritive value. Good quality orchardgrass hay will average about 9 percent crude protein².

Kleingrass

Kleingrass has become popular in the Gulf Coast area and is the third most widely grown forage on improved pastures in Texas³⁶. While cattle grazing kleingrass have been shown to gain as much or more weight than cattle grazing bermudagrass⁶, horses do not appear to perform as well. In one study, horses offered free choice kleingrass hay would consume only 0.29 percent of their body weight, whereas these same horses ate 1.49 percent of their body weight when offered coastal bermudagrass hay³⁶. There is some indication of potential liver damage in horses eating kleingrass hay, even when hay quality is good¹².

Bluestem

This grass variety grows throughout the Central Plains region of the United States. The most common types used for hay are big and little bluestem. Both make highly palatable horse hays of acceptable quality (about 8 percent crude protein), but contain slightly more fiber than comparable quality timothy or bermudagrass³⁵.

Wheatgrass

Crested wheatgrass, normally grown for pasture, is used some for hay in the Northern Plains states. Wheatgrass is hardy and, if cut pre-bloom, produces good quality roughage averaging 9 percent crude protein. As this grass matures, its quality and digestibility decrease rapidly and it becomes tough and fibrous³⁵.

Bahiagrass

Bahiagrass is grown widely over much of the southern Coastal Plain, primarily for grass and secondarily for hay⁷. Therefore, hay is often made only from surplus pasture growth, which results in overly mature, poor quality hay. This mature hay also can cause Ergot poisoning¹¹. However, good quality bahiagrass hay, cut before heading out, can be somewhat comparable to good coastal bermudagrass hay in feeding value⁷.

Ryegrass

Ryegrass is commonly planted in the south and southeastern United States to provide winter grazing. Ryegrass pastures have high nutrient value and produce excellent animal gains². Excess pasture growth is sometimes cut for hay. Ryegrass can make good hay (Table 5) if it is allowed sufficient drying time before baling.

Cereal Grasses

The cereal grass hays are made from the common cereal grain crops. Oat hay is cut while the crop is still green, usually in the dough stage, and the grain remains part of the hay⁷. When cut at the appropriate stage of maturity oat hay can be a very satisfactory roughage (Table 5). Field observations indicate that horses may prefer small grain hays in the order of oats, barley, wheat and rye². Rye hay, however, is generally considered to be low in palatability and quality.

Other Roughage Sources

Other fiber sources are used in livestock rations, but little information is available about their use in horse diets so it is difficult to make exact recommendations.

Straws

Grain straws (oat, wheat or ryegrass straws) are low in palatability and feeding value for horses. They have a high fiber content and may be used to add bulk to a completely pelleted diet. Although mature ponies have been shown to maintain body weight when fed ryegrass straw as 68 percent of the total diet, it is recommended that straws comprise no more than 10 percent of the diet so that they don't severely reduce the energy content and fiber digestibility of the diet⁸. Research has shown that straw treated with ammonia, sodium hydroxide or acid followed by yeast inoculation is more digestible for horses than untreated straw²⁴.

Hulls

Both oat hulls and rice hulls are very poor quality feeds but may be used to add bulk to a completely pelleted horse diet. As with straws, hulls should be limited to 10 percent of the diet and only high quality hulls that are free from dust, mold and foreign materials should be used⁸. Sunflower hulls have a negative feeding value for horses but will provide bulk and satisfy the appetite²⁶. Research has shown that weanlings fed a diet of 50 percent soybean hulls and 50 percent concentrate gained as much weight as weanlings fed 50 percent alfalfa and 50 percent concentrate²⁶. Cottonseed hulls have relatively little nutritive value

for horses but may be used to add fiber or bulk to the diet⁸. Peanut hulls are easily contaminated by aflatoxin and are, therefore, rarely fed to horses. But if they are free of aflatoxin and dust they can be used as a fiber source in the diet.

Corn plants

Whole corn plants can be pelleted and fed to horses for an energy source, but supplemental protein, vitamins and minerals may be needed²⁶. Without added protein, horses fed whole corn plants will have a reduced appetite and will practice coprophagy (eating of feces)^{8,29}. Ground corn cobs contain 50 to 70 percent as much digestible energy as the average grass hay and can be used as a source of fiber and bulk.

Summary

Careful roughage selection is a critical component of a successful feeding program for horses, and owners have a variety of roughages to choose from. In deciding whether to use a legume, a grass or a mixture of both several factors must be considered. These include the availability, cost and quality of roughages, the method by which they will be handled and hauled, the storage capacity available, the nutrient requirements of horses and the type of concentrate or grain mix being fed. In addition, horsemen should be aware of the potential health hazards related to some roughages (Table 6).

By taking the time to carefully select top quality roughage and continually monitor horses' consumption patterns, owners can be sure their horses are receiving the best possible diets.

Table 6. Forage-related disorders and poisonous plants.

| FORAGE-RELATED DISORDERS | | | |
|---|------------------------|--|--|
| Forage | Agent or compound | Cause | Manifestation |
| Fescue | endophyte fungus | present in seed | thickened placenta, prolonged gestation, foal death, agalactia |
| Kleingrass | unknown | photosensitization | liver damage |
| Alfalfa | cantharidin | blister beetle | digestive tract damage, death |
| Sweet clover | dicoumarin | improper curing of hay | reduced palatability, reduced intake, reduced performance |
| Foxtail millet | alkaloids | unknown | kidney and joint disorders |
| Lespedeza | tannins | | reduced digestibility, reduced intake, reduced performance |
| Sorghums, sudans, sorghum/sudan hybrids | glycoside-prussic acid | hard frost, fast growth after drought | rapid breathing, suffocation |
| | nitrates | heavy nitrogen fertilization followed by drought | labored breathing, staggering, muscle spasms, death |
| SOME POISONOUS PLANTS | | | |
| Ornamental shrubs | | Black locust | Perilla mint |
| Night shades | | Braken fern | Pokeweed |
| Locoweed | | Castorbean | Jimsonweed |
| Pearine | | Oleander | Horsechestnut |

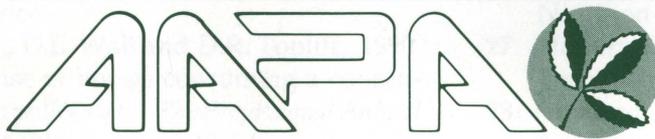
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