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FEEDING PRACTICES IN THE UNITED STATES

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Introduction

The population of horses in the United States as of January 1, 1999 was estimated at 5.32 million. Represented in these 5.32 million are horses of many different sizes and breeds and intended uses. From a practical standpoint, the physiological functions of horses can be roughly divided into the following categories: maintenance, work (performance), growth, breeding stallions, pregnancy and lactation.

The Nutrient Requirements of Horses (NRC, 1989) lists nutrient requirements based on physiological function and mature body weight. It is clear that horses with different physiological functions require nutrients at different levels in the diet. For example, the daily nutrient requirements of growing horses are certainly different from horses performing light exercise. On the other hand, horses with identical physiologic function and body weight would share a common daily nutrient requirement. Therefore, an 1100 lb (500 kg) mare in her tenth month of pregnancy would have the same daily nutrient requirements whether the mare lived in New Jersey or California. Although the nutrient requirements are the same for horses living in different areas of the United States, the feedstuffs used to satisfy these requirements and the feeding strategies are quite different.

Different Regions - Different Ingredients

Climatic conditions dictate which feed ingredients are commonly grown in different areas of the United States. Specifically, temperature, humidity, annual rainfall, and soil conditions influence crop production. In many animal production systems, the ability to grow an ingredient is the primary factor in determining its inclusion in a diet. Feeding horses in the United States is somewhat different from other animal production units in that most horse operations do not grow their own feeds. The one notable exception to this statement is pasture. Grain concentrate and stored forage are routinely purchased from suppliers that may have obtained the ingredients out of the immediate geographical area. For example, it is now common to find hay being fed in the East that was grown in the West or grain concentrates blended in the Midwest that are fed on the West Coast. Despite the ability to transport specific ingredients anywhere in the United States, many regional differences do exist in ingredient availability. These regional differences in feed ingredients influence price of the horse feed and ultimately influence which ingredients are commonly used in horse diets. The following is a brief discussion of some notable differences in ingredients used in different areas of the United States.

Northeast United States

Climatic conditions in this region favor the production of grass, both as pasture and as stored hay. Unfortunately, many horse operations are starved for space and pasture availability is limited or nonexistent. Common grasses utilized for hay production include timothy and orchardgrass. Legume plants, including alfalfa and clover, can also be grown in this region. Most of the pure alfalfa hay finds its way into diets of ruminant animals with some mixed legume/grass hay being utilized for horse feed. The vast majority of hay being fed to horses in this region is some type of grass hay. Table 1 presents an average nutrient profile for hay being fed in the region. Stage of maturity at harvest significantly influences nutrient profile of the hay. Therefore, the values presented in Table 1 can vary from year to year based on weather conditions that may delay harvesting. In years when hay quality suffers due to a poor growing season, it is common for horsemen to supplement their hay program with alfalfa pellets or cubes from the western United States or from Canada.

Table 1. Nutrient profile of northeast hay (dry matter basis)

Type of Hay	Crude Protein (%)	Nutrient NDF (%)	Ca (%)	P (%)	Cu (ppm)	Zn (ppm)
Legume Hay	17.5	46	1.25	0.25	9	22
Mixed - Mostly Legume	15.5	52	1.10	0.25	9	24
Mixed - Mostly Grass	11.5	61	0.74	0.23	8	25
Grass	10.5	63	0.58	0.22	9	27

The type and amount of grain fed in the Northeast varies greatly. Of the straight grains fed to horses, oats is the traditional favorite. Small amounts of other straight grains or grain byproducts are also fed and include corn, wheat bran, flaxseed, soybean meal and sugar beet pulp. Most horse owners have abandoned the practice of mixing straight grain on the farm to form their horses' grain diet. Many choose to feed commercial grain concentrates that are fortified with protein, vitamins and minerals. The notable exception to this trend is the Thoroughbred racing industry where mixing of many different ingredients is still popular. The physical form of the grain concentrates being fed is a mixture of textured sweet feeds, pellets and extruded products. As a rule, the amount of molasses being used on textured feeds in the Northeast (7-10%) is greater than commonly used in the West (4-7%). Complete feeds containing the forage, grain and vitamin/mineral portions of the diet are popular with Northeast horse owners. Unfortunately, most horse owners ignore the feeding instructions and feed these products at low levels that do not provide an adequate diet.

Southeast United States

High heat, high humidity and a long growing season are common in the Southeast. This type of climate favors growth of tropical and subtropical grasses. Grasses such as bahiagrass, coastal bermudagrass and pangolagrass make up a large percentage of the forage consumed by many horses in this area of the country. Southeastern states that are situated farther north have many varieties of cool-season grasses; the most common are fescue and bluegrass. High humidity is not conducive to hay production since it is difficult to get the forage plants properly dried prior to baling. Therefore, grazing is the primary method of utilizing natural forages. Grazing can normally be sustained from March through November during most years. During the time of year when stored forage must be fed, coastal bermudagrass and forage imported from other areas of the country are fed. Alfalfa production is generally considered to be low in the Southeast. However, peanut hay, another legume plant, is harvested and can be fed to horses. Table 2 presents an average nutrient profile of forages commonly fed in the Southeast. Again, growing conditions and stage of maturity at harvest will influence the nutrient profile of the forage.

Table 2. Nutrient profile of southeast forage (dry matter basis)

Type of Plant	Crude Protein (%)	Nutrient NDF (%)	Ca (%)	P (%)	Cu (ppm)	Zn (ppm)
Bahiagrass	11	75	0.29	0.25	10	34
Coastal Bermudagrass	12	73	0.36	0.27	6	25
Peanut Hay	10.5	61	1.23	0.16		
Bluegrass Hay	9	63	0.26	0.25	9	27
Fescue Hay	12	65	0.43	0.32	28	35

The Southeast has grains and grain byproducts that are unique. Sorghum, cottonseed meal, cottonseed hulls, cane molasses, rice bran and peanut hulls are some products often used in the Southeast. Sorghum can be utilized in horse feed once it is processed to increase digestibility. Unfortunately, palatability problems have been reported with the use of sorghum in horse feed. Cottonseed meal can be utilized as a protein source. It is lower in lysine than soybean meal and can contain gossypol, a substance that can interfere with the absorption of other minerals. If cottonseed meal is utilized in the diet, lysine should be added and care should be taken to insure it is a variety with a low gossypol content. Cottonseed hulls and peanut hulls are two byproducts that contain high levels of fiber. These fiber sources have a high lignin content and are low in digestibility. Rice bran is a byproduct of the rice milling industry. When heat stabilized immediately after separation from the rice kernel, rice bran is a high fat energy source for horses. The popularity of feeding stabilized rice bran to horses has caught on throughout the United States.

Midwest United States

The Midwest typically has a longer growing season than the extreme Northeast and less rain and humidity compared to the Southeast. Different areas in the Midwest rely on irrigation to grow crops, while other areas have enough rainfall to sustain crop production. These differences in growing conditions translate into many different types of forages and grains that can be grown in the region. In the upper Midwest, the predominant forage is grass pasture or grass hay. Farther south, heat and lack of rainfall make it more difficult to grow cool season grasses for utilization by horses. In these areas alfalfa can be grown with the help of irrigation systems. Throughout the Midwest, pastures consisting of native grasses are common. Some of the common grass types include brome, reed canarygrass, orchardgrass, ryegrass, and crested wheatgrass. It is not uncommon for these native pastures to have a low protein and energy content due to increased plant maturity at the time of grazing. Legume plants including alfalfa, clover, and birdsfoot trefoil are common and can be grown in the Midwest.

Corn is the king of grain in the Midwest. Corn is a high energy, low fiber, low protein grain that is common in horse diets. The corn kernel is typically processed prior to inclusion into horse feed to maximize small intestine digestion of starch. From time to time concern is expressed over the potential for mycotoxins in corn. However, the incidence of moldy corn poisoning in horses is limited compared to the number of horses who eat at least a portion of their grain diet as corn on a daily basis. The level of mycotoxins is elevated in corn that has been stressed by drought or excessive moisture. Further, the incidence of mycotoxins is more common in corn screenings from damaged corn kernels than from high quality, whole kernel corn. The other type of grain produced in abundance in the Midwest is the soybean. Soybean meal is the most common protein source used in horse diets in the United States. Soybean meal contains an excellent amino acid profile and is quite palatable. Soybean hulls are an excellent source of highly digestible fiber and also are used in horse diets. Finally, soybean oil is a common source of dietary fat in horse diets. Leaving all the components of the soybean together is also common by utilizing full-fat, roasted soybeans in horse diets.

Western United States

Many inland areas of the western United States depend on irrigation to grow crops. Irrigation allows the West to grow extremely high quality hay. Drying of hay is made simple with high temperatures and low humidity. Hay grown in the Western United States is exported to many horse production units throughout the country and the world. Of the hay grown in the West, alfalfa is the most common. Three cuttings of alfalfa per year are the norm in Washington, four cuttings are common in Idaho and up to seven or eight cuttings are possible in the desert Southwest. Most of the highest quality alfalfa finds its way into the dairy market, but significant amounts of alfalfa hay are fed to horses. Other types of hay that can be grown in the West include timothy, oat, orchardgrass and a variety of

native grasses. One particular area in Washington is famous for high quality timothy hay, while several areas in California produce large amounts of oat hay. Oats are used as a cover crop and the entire plant is harvested in the late milk or dough stage for production of hay. Another type of hay that is very popular in the western United States is mixed (alfalfa/grass) hay. The most popular grass to mix with alfalfa is orchardgrass. Table 3 presents an average nutrient profile for forage fed in the western United States.

Table 3. Nutrient profile of western forage (dry matter basis)

Type of Hay	Crude Protein (%)	Nutrient NDF (%)	Ca (%)	P (%)	Cu (ppm)	Zn (ppm)
Alfalfa	21.0	34	1.40	0.21	9	20
Alfalfa/Orchardgrass	15.0	52	0.90	0.35	9	20
Timothy	11.0	61	0.51	0.30	7	25
Oat	9.5	63	0.32	0.25	6	22

The most predominant grains grown in the western United States are barley, wheat and canola. Barley is a high energy, moderate protein, low fiber grain. It has an energy value intermediate between corn and oats. Like corn, barley is processed prior to being fed to horses to maximize the digestion of starch in the small intestine. In the West, barley is utilized in horse feed to the same degree corn is utilized in horse feeds in the Midwest. The appearance of corn in horse feeds in the West is less than in the Midwest, Southeast or Northeast. Wheat is also grown in large amounts in the West. Processed wheat in the form of wheat bran and wheat middlings are common components of pelleted grain concentrates for horses. Due to availability wheat is often a low cost energy source for equine diets. Canola meal is a protein source that is unique to the West. Canola meal typically is lower in protein quantity and quality compared with soybean meal. However, a combination of canola and soybean meals can be used as an economical protein source for horses.

Feeding Strategy

Just as the ingredients commonly fed to horses differ from region to region in the United States, so do the feeding strategies. Guidelines for both the total amount of feed (hay and grain) consumed by horses and the ratio of forage to grain in the diet are provided by the Nutrient Requirements of Horses (NRC, 1989). The amount of feed a horse can reasonably consume in a day is a finite amount. The estimates set forth in the NRC (1989) are reasonable (Table 4). However, the ratio of forage to concentrate can vary significantly depending on the availability, palatability and, most importantly, energy content of the forage. For example, if one compared an 1100 lb (500 kg) performance horse in light work housed in Virginia with the same horse housed in California very different strategies can be used to feed the same horse. The NRC (1989) suggests in its Table 5-4 a total

feed intake (90% DM) of 1.5 to 2.5% of body weight. Further, Table 5-2a in the NRC (1989) publication suggests a hay to concentrate ratio of 65% hay to 35% grain. This ratio works extremely well (Figure 1) when the horse is eating approximately 2% of its body weight as timothy hay and a grain concentrate formulated for use in Virginia.

Table 4. Expected feed intake and diet proportions for different classes of horses as established by NRC, 1989.

Class of Horse	Diet Proportion		Feed Intake
	Hay	Grain	% of B.W.
Maintenance	100	0	1.5 - 2.0
Stallions	70	30	1.5 - 2.0
Pregnant Mares			
9th Month	80	20	1.5 - 2.0
10th Month	80	20	1.5 - 2.0
11th Month	70	30	1.5 - 2.0
Lactating Mares			
Early	50	50	2.0 - 3.0
Late	65	35	2.0 - 2.5
Working			
Light	65	35	1.5 - 2.5
Moderate	50	50	1.75 - 2.5
Intense	35	65	2.0 - 3.0
Growing			
Weanling	30	70	2.0 - 3.5
Yearling	40	60	2.0 - 3.0
2-yr-old	65	35	1.75 - 2.5

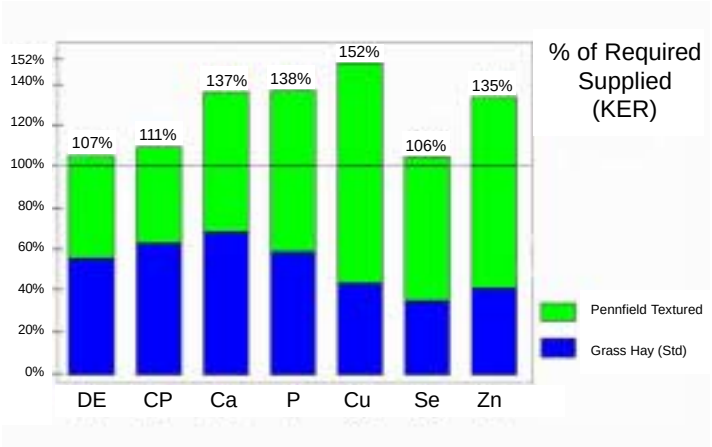

Figure 1. Diet for 1100 lb (500 kg) horse performing light exercise. Diet consists of 14.5 lb of timothy hay and 7 lb of Pennfield Textured Sweet Feed.

A diet for the same horse in California being fed alfalfa hay likely would depend more on the contribution of the high-energy alfalfa and less on grain concentrates. Figure 2 is an example of a diet featuring the horse eating 1.8% of his body weight in feed (90% DM) with the diet consisting of 83% forage and 17% concentrate.

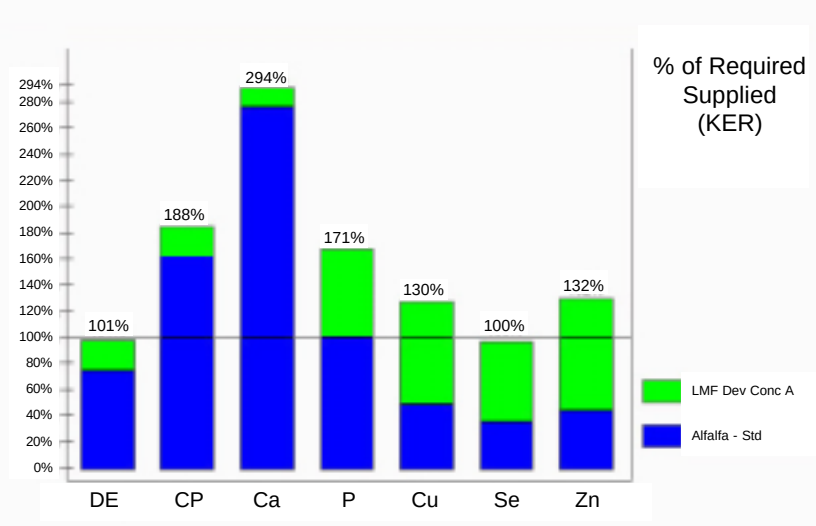

Figure 2. Diet for 1100 lb (500 kg) horse performing light exercise. Diet consists of 16.5 lb of alfalfa hay and 3.5 lb of LMF Textured Sweet Feed.

An even more likely diet scenario (Figure 3) would be the California horse eating a total of 2% of its body weight, consisting of 95% alfalfa and 5% supplement pellet. This diet consists of 20 lb of alfalfa hay and 1 lb of supplement pellet. The supplement pellet is added only to adjust vitamin and mineral levels in the diet.

These same western United States feeding scenarios in which the use of forage is maximized while grain intake is minimized also are common for pregnant and lactating broodmares and young growing horses. Table 5 reflects realistic diet proportions and daily feed intakes for horses consuming legume (alfalfa) forages. As the performance horse example illustrated, the availability of different feed ingredients in different regions of the country and underlying differences in feeding strategies make it difficult to utilize a fixed forage to grain ratio. The use of high energy forage in the western United States dictates a necessary change when considering an appropriate hay to grain ratio in a horse's diet.

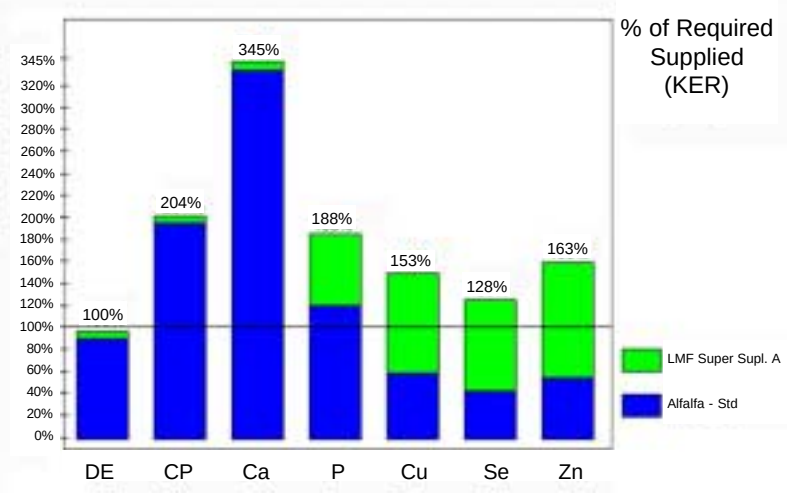

Figure 3. Diet for 1100 lb (500 kg) horse performing light exercise. Diet consists of 20 lb of alfalfa hay and 1 lb of LMF Supplement Pellet.

Table 5. Expected feed intake and diet proportions for different classes of horses consuming legume (alfalfa) forages.

Class of Horse	Diet Proportion		Feed Intake
	Hay	Grain	% of B.W.
Maintenance	95	5	1.5 - 2.0
Stallions	80	20	2.0 - 2.5
Pregnant Mares			
9th Month	95	5	2.0 - 2.5
10th Month	85	15	2.0 - 2.5
11th Month	80	20	2.0 - 2.5
Lactating Mares			
Early	80	20	2.5 - 3.0
Late	85	15	2.5 - 3.0
Working			
Light	85	15	2.0 - 2.5
Moderate	80	20	2.25 - 3.0
Intense	70	30	3.0 - 3.5
Growing			
Weanling	60	40	3.0 - 3.5
Yearling	70	30	3.0 - 3.5
2-yr-old	70	30	2.25 - 3.0