

TRENDS IN HORSE HAY

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INTRODUCTION

A recent survey by the American Horse Council (AHC) suggested that there is continued growth in the U.S. horse population. Many horses are kept in environments where pasture is unavailable and it is likely that the percentage of the U.S. horse population that is maintained in urban or suburban environments will increase in the future. These trends in the horse industry should increase the demand for "horse" hay. Horses can consume a variety of feeds but most nutritionists agree that diets that are high in good quality forage promote normal equine digestive function. Long-stem (baled) hay is the most common form of stored forage fed to horses. Hay cubes may also be used, although a survey by the USDA National Animal Health Monitoring Service (NAHMS, 1998) indicated that fewer than 10% of horse operations in the U.S. use hay cubes as a primary source of forage. Many horse owners come from non-agricultural backgrounds and need help to understand and recognize the differences among different forage types. The local veterinarian is often the primary information source for horse owners. Education programs targeted at horse owners will be most effective if they also involve the veterinarian.

EQUINE DIGESTION AND FEEDING BEHAVIOR

The structure and function of the horse's digestive tract affects the selection of feeds that are used in horse rations. Equine digestion begins in the mouth. Horses use their lips to grasp and sort feeds. The horse's front incisors allow the horse to graze very close to the ground, and the molars are well suited to crushing stems or seeds. Although they are not as selective as some species, horses can be selective eaters and this characteristic should be recognized in horse feeding programs. Once the food passes through the mouth, it goes to the stomach. The horse's stomach is relatively small and food is not retained there for long. The small size of the equine stomach suggests that horses are better suited to feeding schedules that allow free choice feeding or supply several small meals a day rather than two large meals a day. Horses acclimated to pasture or range conditions will spend more than 50% of their time grazing.

Easily digested nutrients (starch, some protein, some vitamins and minerals) are broken down and absorbed in the small intestine, but many of the nutrients found in forages are digested in the large intestine. The large intestine has several parts, one of which is the cecum. The large intestine accommodates a population of microorganisms that are similar

to those found in the rumen of a cow, and they function similarly to digest the fibrous components of forages. Although the microbial populations are relatively similar, horses are somewhat less efficient at utilizing forages than cattle. It is believed that this difference between horses and cattle may be due to the shorter time that feed particles are retained in the large intestine, compared to the rumen. This difference in retention time particularly affects the digestion of mature, more fibrous forages. Digestibility of leafy immature forages is similar in cattle and horses. However, cattle can utilize mature, stemmy forages much better than horses.

HAY QUALITY AND HORSES

When animal nutritionists talk about forage quality they usually mention the concentrations of crude protein, neutral detergent fiber (NDF) or acid detergent fiber (ADF) in the forage. These chemical characteristics are important to nutritionists because they relate to the nutritional value of the hay. When horse owners talk about hay quality they may be interested in the chemical characteristics that affect nutritional value. But, it is more likely that the horse owner will focus on the sensory characteristics of the hay such as color, smell, and cleanliness. Of these three characteristics, cleanliness is most important. Horses are susceptible to respiratory irritation from dust and mold, which can affect their ability to engage in athletic performance. Hay that is dusty or moldy should not be used for horses. The application of preservatives in the hay making process may result in a more uniform product for the horse hay market. When horses were given a choice between well-cured hay without preservative and similar hay baled with an acetic acid-propionic acid preservative, they preferred the non-preservative treated hay. However, when they were given no choice, they consumed just as much of the treated hay as non-treated hay (Lawrence, et al., 1987). Horse owners are starting to understand that the use of preservatives in hay-making can result in a more desirable product for their horse.

SELECTING HAY FOR HORSES

After cleanliness, hay should be selected to match the nutrient and behavioral needs of the horse being fed. Alfalfa, alfalfa-grass mix hays and grass hays cut at a very early stage of maturity are useful for horses with high nutrient requirements. Mid-to-late maturity grass hays are often suitable for horses with lower nutrient requirements. However, horses often find mature grass hays to be low in palatability. Horses will waste more hay if it is unpalatable.

Race-horses, lactating mares and growing horses have higher nutrient requirements than adult horses used for recreational riding. When mature grass hay is the forage, high levels of grain supplementation will be necessary to meet the nutrient needs of race-horses, lactating mares and growing horses. The amount of grain needed by lactating mares and growing horses can be reduced if alfalfa or an alfalfa-grass hay mix is substituted for the mature grass hay. Some horse owners have been told that alfalfa hay is "too rich" for horses. However, if the composition of alfalfa hay is compared to the composition of cool-season Spring grass pasture, there is not much difference, except for calcium content

(Table 1). The nutrient content of timothy hay (as an example of a cool season grass hay) is much lower than pasture, because the plant is cut at a later stage of maturity when it is harvested as hay.

Table 1: Composition of forages commonly fed to horses (100% dry basis)¹

	DE	(Mcal/lb)	%NDF	%CP	%Ca	%P
Spring pasture	1.15	47.9	21.0	0.53	0.45	
Alfalfa hay-mid-bloom	1.03	47.1	18.7	1.37	0.24	
Alfalfa hay- early-bloom	1.13	39.3	19.9	1.41	0.21	
Timothy hay - late bloom	0.82	69.1	7.8	0.38	0.15	
Timothy hay - early bloom	0.94	61.4	10.8	0.51	0.29	
Bermuda grass hay mid-maturity	0.95	75	12.0	0.32	0.20	

1. Source: NRC, 1989 (hays); L. Lawrence (pasture)

FEEDING THE RECREATIONAL HORSE

Good quality forage can provide almost all of the nutrition needed by many recreational horses. The "typical" horse in the U.S. is probably an adult that is ridden a few days a week. Horses that are kept as pets may receive little or no forced exercise. The diets of these horses should be designed to provide adequate dry matter intake without excessive calories. Because it is not possible for most horse owners to weigh their horses regularly, a condition scoring system may be used to monitor changes in fatness. The most commonly used system was developed by Henneke et al. (1983). Horses are scored from 1 (very thin) to 9 (very fat). A condition score of 5 is considered "moderate". A horse in moderate body condition has enough fat cover to create a smooth appearance of the neck and body. The ribs are not visible, but they can be easily felt when a horse is in moderate body condition. As human health concerns have focused on weight management, horse owners and veterinarians have begun to worry about the effects of excess fat in their horses as well. Selection of the right forage for adult recreational horses is an important tool in managing body weight in horses. Although hays that are high in nutrient density are suitable for growing, lactating and heavily worked horses, they are not necessary for the vast majority of horses. Let's take as an example a 9 year-old, Quarter Horse gelding (1100 lb) that is ridden 1-3 times a week and is kept in a dry-lot or paddock with minimal pasture. If this horse is given free access to early bloom alfalfa hay, he will probably consume about 25 pounds a day. Intake will be somewhat higher than average because of the high palatability of the hay. This amount of hay would provide about 50% more calories than he needs and significant weight gain would be expected. Over time he would probably become very fat. To avoid excess calorie intake, it would be necessary to restrict his intake of the early bloom alfalfa to about 16 pounds of hay per day, (or less if he is getting some grain in his diet). Although nutrient requirements will be met with this restricted amount of hay, the horse's behavioral needs might not be satisfied. Pastured horses normally spent about 50% of their time eating. When hay is restricted, eating time will also be reduced and this will increase the amount of idle time a horse will have each

day. It's hard to prove a cause and effect relationship between restricted dry matter intake and the development of vices by horses, but many people accept that a relationship does exist. So, rather than restricting the amount of very nutrient dense hay she gives to our example horse, the horse owner could provide clean hay with a lower nutrient density. If she allows the horse to have free access to mid-maturity grass hay, the horse will probably eat about 22 pounds per day. The 22 pounds of mid-maturity grass hay will provide just about the right amount of calories for the horse, and will provide more "eating time". In cases where a horse is already too fat, hay with a low nutrient density may be used as an effective means of reducing calorie consumption without radically reducing dry matter intake. If the example horse is fed 20 pounds of late maturity timothy hay a day, his calorie intake will be reduced by more than 40% in comparison to the 25 pounds of early bloom alfalfa.

CARBOHYDRATES IN FORAGES

The "low-carb" craze in human foods has spilled over into the horse feed market as well. This term (low-carbohydrate) has created a fair amount of confusion among horse owners, veterinarians, hay producers and animal nutritionists because different groups associate different meanings with the word "carbohydrate". There are many different types of carbohydrates. In human foods, the carbohydrates usually of the most interest are starch and sugar (mono and disaccharides). Most starch and sugar can be digested in the small intestine and absorbed as glucose into the body. Starch is an important component of the grains (oats, corn, barley) fed to horses, but there is very little starch in hay. The carbohydrates in forages are diverse and concentrations vary with stage of maturity and forage type (Hall, 2003; Hoffman et al., 2001). Cellulose and hemicellulose are the major components of the neutral detergent fiber (NDF) fraction that is shown on most forage analyses. Most forages are high in NDF (Table 1); therefore they are also high in carbohydrates. So, by definition, there are no "low carbohydrate" hays because hays are high in cellulose, a carbohydrate. However, cellulose and hemicellulose are digested much differently than starch and sugar. In humans, very little cellulose or hemicellulose can be digested at all. By comparison, horses can effectively digest much of cellulose and hemicellulose in hay and other forages. Cellulose, hemicellulose and other fibers can be digested in the horse's large intestine that contains a microbial population much like the rumen in the cow. An important difference between carbohydrate digestion in the small intestine and the large intestine is the end product that is produced. When carbohydrates are digested in the small intestine, glucose is produced and absorbed into the blood stream. When carbohydrates are digested in the large intestine, short chain fatty acids (not glucose) are produced and absorbed. This distinction between the types of compounds absorbed by the horse is important because a few horses have metabolic or hormonal disorders that affect their ability to metabolize glucose. Commercial horse feed manufacturers now offer concentrate feeds with higher fiber and fat levels that are often referred to as "low carb" foods. These feeds are not truly low in total carbohydrates because they contain various plant fibers that are types of carbohydrates. However, these feeds generally do contain lower levels of starch so they result in less glucose available for absorption. They might be more correctly referred to as "reduced starch feeds". Veterinarians sometimes recommend reduced starch diets for horses that have certain metabolic or hormonal disorders in an effort to affect blood

glucose levels. Horse owners have started to ask for "low sugar" hay to complement the reduced starch concentrates. There is no accepted definition of "low sugar hay". Plants produce sugar as a normal part of photosynthesis but most of the sugar is used up by the plant during periods of darkness or incorporated into cell walls. Therefore, most hays contain relatively low levels of free monosaccharides or disaccharides. Hays are also low in starch, so the amount of carbohydrate absorbed as glucose from hay is almost always very low when compared to a concentrate feed. Currently there is not a standard definition of the compounds included as "sugar" in a forage analysis. Also, the methods used by commercial laboratories to measure "sugar" in forage are not as standardized as the methods for measuring many other forage components. For some laboratories, the term "sugar" on a forage analysis may truly represent compounds that are available for absorption as monosaccharides (such as glucose). But for other laboratories "sugar" may include a much broader range of compounds, some of which are only digested by the microbial population in the gastrointestinal tract and absorbed as short chain fatty acids. Fructan is a type of forage carbohydrate that can be included in the "sugar" analysis of some laboratories. Some laboratories are working on methods that will specifically measure the fructan content of forage.

SUMMARY

The demand for horse hay will probably increase in the future. Horse hay should be free from mold and dust. Hays should be selected to match the nutrient needs of the specific horse. Early maturity hay that is high in nutrient density is ideal for competitive performance horses, lactating mares and growing horses. Mid and late maturity hay can be used effectively for horses with lower nutrient needs such as adult horses used for occasional recreational riding.

The relationship of forage carbohydrates to equine nutrition and health is a hot topic. However, there is a great deal of confusion due to inaccurate use of carbohydrate terms. Forages contain several types of carbohydrates. Some carbohydrates (such as cellulose) are broken down only by the microbes in the gastrointestinal tract. When carbohydrates are digested by the microbial population the end products are absorbed as short chain fatty acids and not as glucose. Most hays contain relatively low concentrations of compounds that are digested and absorbed as glucose.

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