

Gimmick or Good Groceries?

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The energy density in a performance horse's diet traditionally has been increased by adding grains such as oats, barley, or corn. However, most of the energy in grain is in the form of starch, and it is now recognized that excessive consumption of starch by horses can increase the risk of digestive upsets (e.g., colic) and some forms of exertional rhabdomyolysis (tying-up). This knowledge has spurred efforts to find alternative energy sources to reduce the starch content of the diet without compromising athletic performance or proper body condition. Of course, fat (vegetable oil) is one such alternative energy source that is now a very fashionable ingredient in horse feeds.

Another popular ingredient is sugar beet pulp, a by-product of the sugar beet industry. Depending on whom you talk to, beet pulp is either "the best thing since sliced bread" or "nasty stuff" that under no circumstances should be added to horse diets. In part, this discord stems from a lack of understanding about the nutritional merits of beet pulp and how to incorporate this ingredient in a horse's ration.

What Is It?

Beet pulp is the fibrous material remaining after the extraction of simple sugars from sugar beets. This extraction process is very efficient, such that the remaining pulp contains little, if any, sugar. Beet pulp is a very popular ingredient in dairy cow rations; in some areas, it's so popular that not much is available for horse feed.

Beet pulp shreds (or flakes) are suitable for feeding to horses as a stand-alone feed or for inclusion in concentrate mixes. Beet shreds might be sold "as is" (plain beet pulp) or with the addition of a bit of molasses. Molasses is added to reduce the dustiness of the product and to increase palatability. Bear in mind that only a small amount of molasses is added--usually 5% by weight. In most situations, this amount of molasses is not enough to raise concern of a "sugar high," but, as discussed below, if the elimination of sugar from the diet is important, plain beet pulp should be fed.

Nutritional Value

Visually, beet pulp shreds are fairly unimpressive, if not ugly! But what about their nutritional value? That beet pulp is both high in crude fiber (22%) and low in crude protein (7-9%) might suggest that it is the nutritional equivalent of very average grass hay. Indeed, it is reasonable to view beet pulp as a forage replacement, and several commercial complete feeds (those designed to deliver all the needed nutrients and fiber in one feed) use beet pulp as a forage substitute. However, the fiber in beet pulp is considerably more fermentable than more standard sources of fiber such as grass hay. In other words, the horse is able to extract a larger amount of the energy contained in beet pulp compared to standard grass hay--horses get more calories per pound of feed.

How is this possible? Consider that fiber comes in two main forms--soluble and insoluble. Insoluble fiber includes lignin, the undigestible portion of hay. Poor-quality (e.g., overly

mature) hays are high in lignin and thus provide relatively little energy to the horse. High-quality fiber sources such as beet pulp and immature forages have a lower lignin content and contain more highly fermentable soluble fiber, such as pectin. Soluble fiber is fermented by the microbes living in the horse's intestinal tract, the end result being energy for the horse.

So, should we feed beet pulp as a substitute for forage or for grain/grain concentrate? The answer is--both! For example, for a horse on an all-forage diet, the substitution of some of the hay with beet pulp will increase the energy density of the diet. This is useful if weight gain is desired. Alternatively, for horses on a hay and grain diet, the inclusion of beet pulp in the ration allows for a decrease in the amount of grain (and starch) fed without compromising the overall energy density of the ration.

Studies have shown that the addition of sugar beet pulp to the diet can increase the nutrient value of concurrently fed hay, especially hay of low protein content. One theory is that beet pulp increases the general fermentation activity of the intestinal microbial population, with an overall increase in the efficiency of fiber digestion.

Although beet pulp is a good source of energy, it's far from the complete nutritional package. As stated, crude protein is rather low (and the protein is fairly poor-quality), and beet pulp is a poor source of many of the essential vitamins and minerals. Although a reasonable source of calcium, beet pulp is quite low in phosphorus. Thus, rations containing beet pulp must be balanced by good-quality hay and other supplements that bolster and balance the protein, mineral, and vitamin content of the diet.

Calm Energy?

The current buzz in the equine nutritional world is "glycemic index." The glycemic index of a feed or feed ingredient refers to the extent of increase in blood glucose (and the hormone insulin) concentration following its consumption. In general, feeds high in starch and/or simple sugars have a high glycemic index. For example, a meal of oats (which are about 50% starch) will result in a substantial increase in blood sugar, whereas blood glucose is largely unchanged after a meal of grass hay (which is very low in sugar and starch).

Although the link between feed type and behavior is uncertain, for some horses high-glycemic feeds might increase excitability (i.e., they are "hot-headed") and the propensity to repeatedly tie up during exercise. There also is evidence that feeding lower-glycemic feeds to these horses has a calming effect and decreases the number and severity of tying-up episodes.

Plain beet pulp is a low-glycemic feed--there is little rise in blood glucose as most of the energy is provided in the form of volatile fatty acids, products of the fermentation occurring in the cecum and large colon. Therefore, beet pulp can be classified as a source of "calm energy."

However, it should be noted that adding molasses to beet pulp shreds (5% by weight) results in a glycemic response not different from an equivalent amount of oats. Therefore, for horses with sensitivity to dietary sugar (e.g., horses with polysaccharide storage myopathy or recurrent exertional rhabdomyolysis), plain beet pulp rather than beet pulp with molasses should be fed.

Fueling Exercise

There have been few studies of exercise responses in horses fed diets supplemented with beet pulp. However, the results of recent studies have provided evidence that the substitution of oats with beet pulp might spare muscle glycogen and lower anaerobic energy metabolism during heavy exercise. Carina Palmgren Karlsson, MSc, PhD student, and colleagues from the Swedish Agricultural University compared two diets in a crossover study published in 2002 involving four Standardbred geldings. One ration was a fairly traditional oat (about eight pounds, or 3.5 kg, per day) and hay mix; the second ration had the oat provision reduced to 4.5 pounds (2 kg) per day and substituted 3.3 pounds (about 1.5 kg) of sugar beet pulp with molasses. Each diet was fed for 21 days with a treadmill exercise test performed by the horses at the end of each diet period.

The exercise test included a high-speed component in which the horses completed 1.6 miles (2,600 meters) at a 2.5% incline at near maximal speed. Muscle biopsies were obtained before and after this test to measure glycogen and lactate concentrations. Blood samples were taken for measurement of plasma lactate concentrations.

The main findings were that peak plasma and muscle lactate concentrations were lower in the horses fed the beet pulp diet, whereas muscle glycogen was higher after exercise on this diet. Thus, the inclusion of beet pulp in the diet (or the concurrent reduction in starch intake) of horses might reduce the rate of anaerobic energy metabolism during exercise. This could provide a performance advantage during high-intensity exercise because lactate accumulation in muscle is one factor associated with the development of muscle fatigue. Further studies involving a larger number of horses are required to verify these findings.

Hydration Aid

Beet pulp in the diet should boost water consumption by horses and, potentially, increase the size of the fluid reservoir in the horse's large intestine. It has been proposed that this reservoir can be drawn upon during prolonged exercise to help offset sweat fluid losses during exercise. Thus, dietary treatments that expand this fluid reservoir could help maintain hydration in endurance horses.

Certainly, it is well recognized that water intake in horses is proportional to fiber intake--the more fiber consumed, the more water consumed--and there is evidence that horses fed beet pulp drink more water when compared to horses on a lower-fiber diet.

The soluble fiber in beet pulp also has high "water-holding capacity," meaning that much of the water drunk will be stored in the large intestine. And feeding soaked beet pulp can boost water intake in horses which aren't drinking.

For these reasons, beet pulp is very popular among endurance riders--although many riders feed commercial concentrates that contain beet pulp, it is also common for endurance horses to receive additional amounts on a daily basis.

Feeding Beet Pulp

There are no hard and fast rules on the ideal amount of beet pulp to add to the diet. In the research setting, horses have been fed rations in which beet pulp comprises up to 45% of the total diet. The amount of beet pulp in commercial "concentrate" feeds will vary from less than 10% to as much as 30% of the feed. The latter would most likely be a complete feed--

these feeds can be useful for horses which have allergic respiratory disease ("heaves"). The intent is to substitute beet pulp for hay in the diet, thus avoiding aggravation of the respiratory complaint due to exposure to dusts, molds, and other allergens in hay. However, it is also common for owners to use these high beet pulp feeds like concentrates, feeding them along with hay.

One advantage of these commercial feeds is that they are formulated to deliver the right amount and balance of other nutrients. However, if you take the non-commercial route, it's safe to include beet pulp at up to 25% of a horse's ration if the diet is nutritionally balanced. For example, if a horse is eating 20 pounds (9.1 kg) of feed per day (as hay and concentrate), up to five pounds (2.3 kg) of this ration could be beet pulp.

To soak or not to soak, that is the question! Beet pulp has often received a bad rap because of fears that it causes choke (esophageal obstruction) or, worse, stomach rupture (especially if it is fed dry). This is more myth than reality.

Yes, beet pulp can cause choke, but so can a large number of other feeds. And yes, it is *generally* recommended that plain beet pulp shreds, when fed as a stand-alone feed, be thoroughly soaked in water before feeding. However, beet pulp shreds can be safely fed *without soaking*. Huge amounts of dry beet pulp-based feeds are consumed by horses without apparent harmful effects.

Choke occurs when a bolus of food becomes lodged in the esophagus, causing extreme discomfort until the blockage is resolved (see article #28 at www.TheHorse.com). It is important to recognize that feeding behavior rather than the nature of the feed is probably the biggest contributing factor to choke. Greedy horses which figuratively "inhale" their feed ("bolters") with minimal chewing are much more likely to choke than horses which consume their ration at a more sedate pace. For these greedy eaters, the feeding of dry beet shreds is not recommended. Similarly, for all horses, the feeding of beet pulp pellets that are designed for cattle is not recommended. These dry pellets can also increase the risk of choke in some horses.

Some owners are also concerned that the feeding of dry (or inadequately soaked) beet pulp might cause distension and rupture of the stomach, or some other form of colic. As mentioned, water consumption by horses is tied to fiber intake--for each 2.2 pounds (1 kg) of dry matter intake, horses will drink approximately one gallon (three to four liters) of water. However, when beet pulp is soaked prior to feeding, this same ratio applies--complete hydration or expansion of 2.2 pounds (1 kg) of beet pulp occurs with the addition of one gallon (three to four liters) of water. So, providing horses have access to plenty of fresh, clean drinking water, they will voluntarily consume enough water to facilitate hydration of the beet shreds and there should be no problem with gastrointestinal function if moderate amounts (1-1 1/2 pounds, or 0.5-0.7 kg) of dry beet shreds are fed as a single meal.

How long should beet pulp be soaked prior to feeding? Perhaps mostly for convenience, many people will soak it for eight to 12 hours, i.e., overnight for the morning feed (12 hours) or during the day for the afternoon or evening meal (eight hours). In most situations, this is the best approach. However, in very hot weather, the feed can sour (becoming unpalatable) with this duration of soaking. Conversely, the end result of soaking in the frigid north might be a very large ice block! In these situations, it is more practical to feed commercially

available beet pulp-based rations rather than plain shreds or soak the shreds indoors until feeding time.

The bottom line on beet pulp is that plain shreds won't hurt horses (except possibly causing choke when fed dry to horses that bolt their feed), and they can benefit horses in many ways. If you're considering adding beet pulp to your horse's diet, work with an equine nutritionist to settle on the right amount. Then rest easy, knowing that you are giving your horse a safe feed.

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