

The Myths and Reality of Beet Pulp

Beet pulp is not only one of the most gratifying, but also one of the most frustrating feeds for an equine nutritionist. Few feeds have as many myths and evil predictions associated with it. "It'll swell up and rupture the horse's stomach", "It'll make them choke", "It has too much sugar", and "It has no nutritional value whatsoever" are just a few of the diabolical warnings floating around, none of which are in fact accurate. As with any other type of feed, understanding a little more about beet pulp's nutritional content and effects on the body will help a horse owner understand where this useful feed can most profitably be incorporated into an equine ration.

Beet pulp is the by-product resulting from the extraction of simple sugars in the manufacture of table sugar. Extraction processes being as efficient as they are, the remaining pulp has little or no sucrose (table sugar) left in it and in fact, many feed manufacturers will add varying amounts of molasses to increase the palatability and reduce pulp dust. Although many horse owners are concerned about feeding "too much sugar" in the form of molasses, 5% in ten pounds of beet pulp is equivalent to only 86 grams of simple sugars-about the same as that contained in a few apples.

Feeds are most commonly categorized as either a forage, an energy feed or a protein supplement. Feeds with fiber content higher than 18% crude fiber are considered a forage and include feeds such as all types of hay (including dairy-quality alfalfa or meal made from alfalfa), soybean hulls, almond hulls and ground corn cobs. Feeds that contain less than 18% crude fiber and less than 20% crude protein are categorized as an energy feed and include all cereal grains, wheat and rice bran, fats and molasses. Feeds which contain less than 18% crude fiber and more than 20% crude protein are categorized as a protein supplement and include feeds such as meals derived from soybean, linseed or cottonseed, brewers yeast, fish meal, sunflower seeds and dehydrated milk.

Familiarity with these simple definitions is very helpful when comparing commercial feed mixes which often have vague or elusive label names or descriptions. Rather than trying to puzzle out whether a bag of Aunt Tilly's Super Barnyard Rocket Fuel is really going to help your horse gain weight or is just another bag of lawn clippings, a quick look at the crude fiber and protein content will identify whether the product is an energy feed or just fifty pounds of high-priced hay.

So where does beet pulp fit into these categories? In fact, beet pulp doesn't quite fit neatly into either the forage or the energy feed categories. At 10% crude protein and 18% crude fiber, beet pulp sits right on the edge between being a forage and an energy feed. Most nutritionists will refer to and utilize beet pulp as a forage, and therein lies much of the advantage. Compare the energy content of beet pulp with other grain and forage sources:

Feed Type	Energy (Mcal/kg)	Comparison to beet pulp
Vegetable oil	8.98	385%
Corn grain	3.38	145%

Wheat bran	2.94	126%
Oat grain	2.85	122%
Beet pulp, dry	2.33	100%
Alfalfa hay, early bloom	2.24	96%
Alfalfa hay, full bloom	1.97	85%
Bermuda hay, 29-43 days growth	1.96	84%
Timothy hay, mid bloom	1.77	76%
Oat hay	1.75	75%
Orchardgrass hay, late bloom	1.72	74%

Notice that although beet pulp is higher in calories than any of the forages, it is lower in energy than any of the cereal grains commonly fed to horses. Does this mean that beet pulp is less valuable for providing calories than any of the cereal grains? Not necessarily. While beet pulp is lower in energy pound for pound than grain, it is also lower on the glycemic index than any of the cereal grains. The glycemic index is a comparative indication of the simple sugar content of a food source, and of its relative effect on plasma glucose. Feeds with a high glycemic index, such as corn (which is high in starch), break down enzymatically to glucose very rapidly in the small intestine, quickly elevate the blood glucose levels and in some horses, may contribute to "hot" behavior that make early-morning, high-octane starts about as much fun as riding the Space Shuttle bareback. More importantly, under some circumstances, high glycemic index feeds may create a condition referred to as cecal acidosis, which can contribute to colic, enterotoxicity and laminitis.

Feeds with a low glycemic index, such as beet pulp, are those that cause little or no sharp rise to blood glucose levels and generally provide most of their energy in the form of volatile fatty acids, the energy by-product of fermentation in the equine cecum and large colon. With the exception of fat (which is high energy but does not directly affect blood glucose levels), the above table gives a general ranking of glycemic index-grains and grain by-products in general being the highest, forages the lowest and beet pulp midway between the two extremes.

Other than avoiding Rocket Rides, what difference does the glycemic index make? High-energy feeds like corn are still a more concentrated source of calories than beet pulp, right? Yes, they are-however, as mentioned above, high-glycemic feeds are also much more likely to cause nutritionally-related disorders such as colic, laminitis and polysaccharide storage myopathy. For these reasons, highly soluble *carbohydrate* sources must be fed in relatively small and carefully managed amounts to avoid the risk of intestinal upset. In contrast, the energy in beet pulp is primarily derived from both soluble and insoluble *fiber*-energy which is released relatively slowly after microbial fermentation in the cecum and large colon, as is the energy in other forage feeds such as hay. While hays can contain varying amounts of insoluble fiber, which affect its digestibility and energy content, a significant portion of the fiber in beet pulp is in soluble forms, such as pectin-the same substance that solidifies fruit juice into jelly. Pectin is still processed in the cecum, but is highly digestible and easily broken down to useable energy by the microbial flora. Since beet pulp does not contain large amounts of soluble carbohydrates which may cause intestinal upset, it can be safely fed in much larger amounts.

Therefore, although beet pulp contains somewhat less energy on a pound for pound basis than grains, it can provide more total calories to the horse when substituted for part of the forage portion of the ration, or used to extend and "dilute" a meal of grain. Although lower in fiber than most hays, beet pulp can be used to replace up to 50% of the forage portion of the ration—a feeding strategy which can significantly increase total calories without increasing the risk of colic or founder.

Contrary to popular belief, while beet pulp can and usually is soaked prior to feeding, it does not necessarily **have** to be. In fact, in some management situations, feeding beet pulp dry is the only alternative if beet pulp is to be fed at all. Horses consuming soaked beet pulp in hot weather may be unable to finish off a large portion before it begins to sour and becomes unpalatable. Likewise, horses in cold climates may not be able to finish their soaked beet pulp before it begins to freeze. Research conducted at several universities have fed dry beet pulp in amounts up to 45% of the total diet and saw no instances of choke or other adverse reactions. Likewise, many, many tons of dry beet-pulp based feeds are fed annually without incidence. Although beet pulp, particularly that in the pelleted form, **can** cause choke, the choke is often in response to the particle size and the horse's feeding behavior, not necessarily due to the actual feed itself. Horses which bolt their food without sufficient chewing, or do not have adequate access to water, are far more likely to choke, regardless of the type of feed, than horses which eat at a more leisurely rate. Efforts should be made to prevent gobbling in these "wolfers" by putting rocks into the feeder or mixing in other feeds such as chaff to slow intake and encourage chewing. In any case, it should be **clearly understood** that, for whatever reason, some horses are more prone to choking than others. Therefore, decisions to soak or not should be made on an individual basis, taking into consideration whether feeding dry beet pulp is a necessity, the feeding behavior of the horse, and competition from other horses which encourage wolfing. In some horses, feeding soaked beet pulp may be the only alternative.

Many horse owners are also concerned that, due to the amount of water that beet pulp soaks up, and the volume that it expands to, a large meal of dry beet pulp will somehow cause the stomach to swell up and rupture. A simple explanation of the equine stomach will allay this particular concern. The capacity of the equine stomach is 2-4 gallons, equivalent to approximately 4 ½ to 9 ½ pounds of dry beet pulp. Movement of food from the stomach to the small intestine can vary depending on a number of factors, but as the stomach begins to reach maximum capacity, stretch receptors in the walls of the stomach will trigger the release of motilin, a hormone which in turn stimulates the emptying of the stomach and passage of food into the small intestine, cecum and colon. As the capacity of the gastrointestinal system—approximately 38 to 48 gallons—is more than sufficient to adequately contain even a very large meal of beet pulp (or any other feed), the only horse in danger of a gastric rupture is one suffering from impaction or other severe lack of normal peristaltic movement.

Concerns about beet pulp "pulling water from the blood and into the stomach and causing dehydration" are also unfounded. Regardless of the type of feed, horses will generally drink approximately 3 to 4 liters of water for every kilogram of dry matter consumed (dry matter is what's left over in a feed after its own moisture content is disallowed). Assuming free access to clean, fresh water, horses will voluntarily consume enough water to adequately process any amount of beet pulp consumed. If soaked beet pulp is provided, drinking will be proportionately

less as the moisture content of the soaked pulp supplies considerable water. In either case, it is unlikely that fluid shifts from blood plasma to the interior of the gastrointestinal tract will be significantly different from those occurring with any other type of feed with similar moisture content.

Aside from its energy density, beet pulp is also a relatively good source of calcium. Though not as high in calcium as alfalfa at 1.2%, beet pulp is still a good source at .62%-higher than any other commonly fed horse feed except for dehydrated milk. While beet pulp probably does not contain sufficient available calcium to offset a high-phosphorus ration, due to beet pulp's oxalate content (which binds some of the calcium into an unavailable form), it is still a reasonable non-alfalfa source of calcium to help balance calcium-phosphorus ratios.

In addition, beet pulp does not contain excessive protein as does alfalfa. This adequate, but not excessive, level of calcium makes beet pulp a useful supplement for horses being fed a grass or cereal grain hay diet. Although most grass hays contain an acceptable ratio of calcium to phosphorus, orchardgrass, some grain hays and even individual crops of normally balanced hays can be slightly inverted below recommended levels. In addition, rations containing significant amounts of grain or bran (especially rice bran) can further create imbalances. By including several pounds of beet pulp as part of the daily ration, horse owners can supply an additional source of calcium to help ensure a balanced calcium-phosphorus ratio in the ration.

A final word on providing beet pulp to horses-it comes as no surprise that horses are creatures of habit and will often eye a new addition to their feed tub as Poison Until Proven Otherwise. Many owners have tried adding beet pulp to their horse's ration, only to have it stared at in horror, ignored or promptly dumped. Even if eventual plans are to feed the beet pulp dry, initially soaking a small amount of pulp until it becomes juicy and more palatable, and then mixing with grain or other already accepted feed, will usually help overcome reluctance on the horse's part to trying something new. Eventually, after a day or so, most horses will deign to try the new feed and will soon be climbing over fences to get their fair share (or preferably, more than their fair share). At that point, amounts may be gradually increased and soaking may be tapered off until dry pulp is accepted equally well. Once the pulp is being regularly consumed, it may also be utilized as a useful method for "hiding" many other additions such as vitamin supplements, fats or medications.

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