

Fantastic, Super Fibers: Find out which Fibers might Benefit your Horse.

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It's a bird! It's a plane! No, it's...super fibers! Well, they may not be able to leap tall buildings in a single bound like Superman, but super fibers are special in their own right. In fact, these fibers have virtually revolutionized horse feeding.

Inclusion of super fibers in feeds has allowed feed manufacturers to reduce the amount of starch-rich grains without compromising the calorie content. These fibers can also create an on-board reservoir of fluid and electrolytes, which is useful for horses competing in endurance racing, eventing, and those that spend long hours in and out of the show ring on a hot day. And senior feeds, which enhance the quality of life for older horses and assist horses convalescing from colic surgery, would be nonexistent without super fibers.

Super Glue?

Fiber is traditionally described as the plant cell wall material; however, not all fiber resides in the cell wall. In addition, fiber is not a single entity; rather it is made up of several types, each differing in its chemical composition.

The breakdown of fructans, found in cold-season grasses and hays, yields lactic acid that can increase the acidity of the horse's hindgut, which is believed to trigger events that can result in laminitis.

Cellulose and hemicellulose are the major types of fiber found in plant cell walls (Figure 1). Some plants need more cellulose and hemicellulose in the cell wall to maintain their structural integrity. For example, pasture forage and hay contain large quantities of cellulose and hemicellulose, which provides a framework and facilitates vertical growth. In contrast, other plant materials contain smaller amounts of these fibers, either because they do not grow very tall or because the plant does not require such additional support.

Super fibers reside outside of the cell wall, between plant cells (Figure 1). These fibers act like "glue" that sticks plant cells together. They include pectins, beta-glucans, mucilages, gums and some oligosaccharides, as well as fructans. These fibers are capable of being dissolved in water, which is why they are often referred to as soluble fibers. Their water-loving nature gives super fibers tremendous ability to soak up and hold water—a characteristic that can be exploited to maintain hydration in the horse. Some feeds possess more "glue" than others, making them good sources of super fiber.

Super Digestible

What makes these fibers so super? Primarily, it's because they are easier to digest than those found in traditional high-fiber feeds like forage. This means your horse can extract more energy (or calories) from feeds containing super fibers than he can from pasture or hay. In fact, some sources of these super fibers are so digestible that they contain the same amount of calories on a pound-for-pound basis as oats (Table 1).

All fibers, super or otherwise, are not digested directly by the horse. Instead, they are fermented in the horse's hindgut by millions of bacteria, protozoa and fungi. These microbes digest the fiber and produce byproducts called volatile fatty acids (VFA). VFA are an important energy source for the horse.

Cellulose is the most difficult fiber for the hindgut microbes to breakdown. When cellulose is bound to lignin, as occurs when forages become very mature before harvesting, it becomes virtually impossible to digest. By comparison, hemicellulose is digested with reasonable efficiency, yielding sufficient quantities of the VFA, acetate and propionate.

Super fibers are broken down even more rapidly and completely than hemicellulose. Microbial fermentation of most super fibers yield the VFA, acetate and propionate; however, fermentation of fructans can also generate lactic acid.

Super Fibers = Super Feeds

Beet Pulp

When it comes to super fibers, beet pulp is the king. Over half of the fiber contained in beet pulp is soluble fiber, most of which is in the form of pectin (Table 1). Beet pulp is the material left over when sugar and molasses are extracted from sugar beets. The pulp is then dried and sold as shreds or ground up and pelleted. A small amount of molasses (~3%) is often added back to the beet pulp before drying; but, unmolassed beet pulp can also be purchased.

Soybean Hulls

Soybean hulls are another good source of super fibers (Table 1). The hull is the outer fibrous coat of the soybean, which is removed when soybeans are processed for oil and protein meal. Almond hulls, although not widely available, are also an excellent source of super fiber. Hulls obtained from other oilseeds and cereal grains (e.g., oat hulls, peanut hulls, cottonseed hulls, rice hulls), do not contain the same high level of super fiber as soybean hulls and almond hulls (Table 1).

Super fibers have the ability to soak up and hold water; a characteristic that is helpful in maintaining hydration in the horse.

Alfalfa

Because forages are high fiber feeds, they also naturally contain small amounts of super fibers. However, the forage leading all others is alfalfa (Table 1). Alfalfa contains twice the amount of pectin as most grass hays (timothy, orchardgrass, Coastal bermuda, etc). A higher level of super fiber is one of the reasons why alfalfa is more easily digested and higher in energy than grass forage.

Super Useful

Recognizing the value of super fibers, many feed companies are now incorporating beet pulp and soybean hulls into their products. Although these ingredients can be purchased individually, the advantage of a commercially prepared feed is that it is also balanced with other essential nutrients the horse needs.

Beet pulp and soybean hulls are easy for the horse to digest. As a result, their addition to a commercial feed permits a reduction in the level of cereal grains needed in the mix. The overfeeding of starch-rich grains has been linked to gastric ulcers, colic and laminitis. Therefore, adding a high fiber ingredient, like beet pulp or soybean hulls, not only reduces the starch content of the feed, it also provides the necessary level of calories in a safer form (i.e., super fiber).

Low-starch feeds containing these super fibers are highly useful for horses with sensitivity to starch and sugar, such as those with insulin resistance, polysaccharide storage myopathy (PSSM), recurrent exertional rhabdomyolysis (RER) and Cushing's disease. In addition, beet pulp and soybean hulls can be used to safely put weight on a thin or older horse. These high fiber ingredients are also terrific fiber sources during drought or when hay or pasture is hard to find. Finally, beet pulp in the raw, unmolassed form is low in potassium, which makes it an ideal feed for horses afflicted with the genetic disorder hyperkalemic periodic paralysis (HYPP).

The Not So Super Fiber

Fructans and their potential role in pasture-induced laminitis in horses have received a lot of media attention. Fructans are made up of chains of fructose and various other sugars. The chemical bonds between the fructose units and other sugars cannot be broken by enzymes produced by the horse (or any other animal). Therefore, fructans are classified as a fiber.

Fructans share some of the same characteristics of other super fibers: they do not reside in the plant cell wall, they are capable of being dissolved in water, and they are rapidly digested by hindgut microbes. The main difference, however, lies in the byproducts produced during microbial fermentation. Microbial breakdown of super fibers yields predominantly acetate and propionate, whereas the breakdown of fructans yields lactic acid. This rapid production of lactic acid can increase the acidity of the horse's hindgut, which is believed to trigger events that can result in laminitis.

Fructans are not present in all forages. Warm-season grasses, such as bahiagrass and bermudagrass, store sugars in the form of starch. The same is true for legumes, such as alfalfa and perennial peanut. In contrast, cool-season grasses, such as timothy, orchardgrass, bromegrass and fescue, store sugars made from photosynthesis as fructans.

Cool-season grasses utilize the fructans to support growth. When growth is inhibited, such as during drought or cool and sunny weather, fructans can accumulate. Most horses will not have a problem with the small amount of fructans in most cool-season hays and grasses. But caution should be used when grazing cool-season grasses or feeding cool-season hays to horses that have a history of laminitis or a sensitivity to starch and sugar.