



Feedstuffs for Horses

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The six basic nutrients needed in every horse diet are water, protein, carbohydrates, fat, vitamins and minerals. This publication describes the common feedstuffs fed to horses that supply these nutrients.

All feeds need to be free of dust and mold. Molds can be toxic and, at the very least, unpalatable. Also, horses who inhale dust and mold are at an increased risk for developing respiratory problems such as heaves. Feeds should be protected from the light, heat and moisture, which can result in spoiled feed, reduced nutrient content or reduced palatability or lead to mold growth. Finally, avoid pasturing or penning horses with cattle consuming rations that contain ionophores because these feeds are toxic to horses.

Water

Water is the most important nutrient for horses, and a good-quality, palatable water source should be available at all times. A mature horse will drink as much as 12 gallons of water a day, and water consumption will vary depending on dry feed intake. Because lush, green grass contains 60 to 90 percent water, horses grazing lush, green forage often have greatly reduced water intakes compared with horses consuming hay. Thus, when switching to a hay-based diet, you may need to provide more water. Finally, water intake is positively correlated to feed intake; if water is restricted, feed intake will be reduced. Inadequate water consumption can lead to dehydration and increases the risk of impaction colic.

Inadequate water consumption can result from having snow as the only water source, faulty watering equipment or unpalatable water sources. High salinity (total dissolved salts) or high sodium concentrations also can reduce water consumption. Horses do not consume stale or dirty water as readily as fresh water; therefore, water should be changed at least twice a day if it must be carried to the horse. Water should be transparent and should not have a distinct mineral or sulfur taste. Also, water should not have an offensive odor and should be free of manure and bacterial contamination. For more information regarding water quality, see "Livestock and Water" (NDSU Extension Service publication AS-954).

Water troughs and buckets should be cleaned regularly because shared water sources are a common means of spreading diseases. Clean the community water sources if a sick horse is detected in a group, and immediately remove the sick horse and provide it with a separate water source.

Protein, Carbohydrate and Fat

Carbohydrates and fats are the main energy sources in the diet. Protein also can be used for energy; however, it is an expensive and inefficient energy source and is better utilized for growth and support of body functions. Energy and protein are the major factors used to evaluate a horse ration and are found in grains and forage. Underfeeding of either energy or protein will cause a reduction in health and performance. Overfeeding either nutrient will result in excessive feed costs. In addition, overfeeding energy can result in excessive fat deposition, and overfeeding protein is wasteful and can be harmful for horses with reduced kidney function.

Grain

A variety of grains and grain byproducts can be fed to horses. In general, grains are higher in energy than most forage and can be a useful addition to the diet of horses that are unable to maintain body condition on

forage alone. Grains also contain an inverted calcium-to-phosphorus ratio (see following section on Minerals), and calcium supplementation may be required for diets containing high levels of grain.

Grains may be processed prior to feeding, with grinding, cracking, rolling, crimping and steam flaking being the most common. Processing of soft-coated grains (such as oats) has little effect on total digestibility, while processing of hard-coated grains (such as corn) may be of benefit. Processing grains also may be beneficial for horses with poor teeth and young horses.

■ Oats

Oats are usually the safest of all grains to feed due to their relatively high fiber and low energy content per unit of weight. This combination makes consuming a large amount more difficult for horses. Consuming large amounts of energy-rich grains may lead to colic and founder. Oats also are less likely to have molds. Oats are sold based on their weight per bushel, with the heavier oats often referred to as “Premium Race Horse Oats.” Finding oats weighing 38 pounds per bushel in North Dakota is fairly easy. Oats weighing less than 35 pounds per bushel can be used but are slightly lower in energy. Oats can be fed whole, ground, rolled or steam processed. The cheapest method of feeding oats is whole.

■ Corn

Corn is a common and usually economical energy source for horses. Corn has higher energy, lower fiber and lower protein content compared with oats. It contains almost three times more energy than oats, and thus the amount of grain offered should be reduced if changing from oats to corn.

Corn can be fed on the cob or shelled; however, take care if feeding on the cob because horses can choke (especially those with bad teeth). Shelled corn can be fed whole, ground, cracked, flaked or rolled. Take care if feeding a high

percentage of ground corn because it passes through the small intestine rapidly, resulting in fermentation in the hindgut of the horse. This can lead to colic and founder.

Corn byproducts and coproducts such as corn gluten feed, corn gluten meal and corn distillers grains all can be fed to horses. These products tend to be much higher in protein and fiber than corn.

■ Barley

Barley ranks between corn and oats in energy and protein content. Because it is harder than oats, the grain should be rolled or crimped prior to feeding. Although barley can be fed as the only grain offered, it is less palatable than oats or corn and is best utilized in a grain mixture.

■ Wheat

Wheat generally is used for human consumption and not animal feed; however, at times it may be economical to use. Wheat is higher in energy than both corn and oats. The small, hard wheat kernel should be cracked, coarsely ground or steam flaked prior to feeding. As with barley, wheat is less palatable than oats or corn and is best utilized in a grain mixture.

Wheat byproducts such as wheat middlings (midds) and wheat bran are more commonly fed to horses. They are higher in fiber and protein but lower in energy compared with wheat grain. Wheat midds usually are fed in pelleted form because they are very fine in texture and difficult to feed alone. These byproducts also contain a high amount of the mineral phosphorus; thus, calcium supplementation often is necessary if a significant amount is being fed.

■ Rye

Although the nutrient composition of rye is similar to oats, rye should not constitute more than one-third of the grain fed to a horse because it tends to be unpalatable. Rye also is susceptible to ergot, which is toxic to horses.

Ergot is a fungus that appears as an oblong, slender, black shape slightly larger than the rye grain. Visually inspect rye prior to purchasing or feeding, and if ergot is suspected, do not feed the rye to horses.

■ Field Peas

Peas are high in energy and protein and are readily consumed by horses. A study completed at the NDSU Dickinson Research Extension Center showed that peas could safely replace up to 67 percent of the oats in a young horse diet without affecting growth.

■ Flax

Flax has a very high oil content and therefore rarely is fed as the main grain in a diet. Instead, it is included as a protein supplement (see Linseed meal). Flaxseed is hard and difficult to chew and should be ground prior to feeding if included in the diet.

Protein Sources

Not all protein sources are equal, and protein quality is important. The concept of “ideal protein” refers to formulating a diet that contains the amino acids (building blocks of protein) in the correct amounts and proper ratios to one another. Horses are presumed to have 10 essential amino acids, which are amino acids that the horse can’t synthesize in sufficient quantities and must be provided in the diet. Of those 10, lysine is considered the first limiting amino acid. If it is not present in adequate amounts, total protein production by the body can be disrupted.

Young, growing horses are most susceptible to protein deficiency and require feeds with the highest protein quality. Pregnant and lactating mares also should be offered feeds containing high-quality protein.

■ Soybean Meal

Soybean meal contains the highest quality protein of any of the plant-based protein supplements. It is the preferred protein supplement for growing horses.

■ Linseed Meal

Linseed meal is not as palatable and is lower in protein quality compared with soybean meal. However, it is a good supplement for mature horses. Linseed meal also can have a laxative and stool-softening effect.

■ Cottonseed Meal

Cottonseed meal is more palatable for horses than soybean meal, but it is not normally available in North Dakota. Also, the protein quality is lower than that of soybean meal.

■ Sunflower Seed Meal

Sunflower seed meal is a safe feed for mature horses, but it may decrease grain mix palatability if included at high levels.

■ Canola Meal

Canola meal is the only other protein supplement besides soybean meal that is suitable in protein quality for young, growing horses.

■ Distillers Grains

Distillers grains have not been used extensively in horses, but they do contain about 2.5 times more protein than oats. However, distillers grains only contain about half the protein content of the oilseed meals (soybean, linseed, cottonseed, sunflower seed and canola). Distillers grains also are considered a lower quality protein source and thus are inadequate for growing horses.

Fat Sources

A number of different sources of fat or oil can be added to horse feed. Plant or vegetable oils are the most common, and corn oil is generally the most palatable. Oils usually cost two to five times more than cereal grains; however, they provide approximately three times more available energy. Horses can utilize up to 20 percent added fat in the total diet or 30 percent in the grain mix. Higher levels of fat in the diet can lead to decreased palatability and loose stools.

Forage

The two main types of forage fed to horses are grasses and legumes. These can be supplied by allowing the horse to graze pasture, or by feeding hay or haylage. In North Dakota, the main grasses fed to horses are brome grass (east) and crested wheatgrass (west), and the main legume is alfalfa. In general, forages are lower in energy than cereal grains but higher in protein. However, energy and protein content both decrease as the plant matures. Therefore, nutrient content of forage is highly variable and horse owners are encouraged to submit samples for analysis. For more information regarding pastures, see "Horse Pastures" (NDSU Extension Service publication R-1062).

Voluntary intake of pasture by horses is approximately 2 percent of body weight (on a dry-matter basis), which equates to consuming approximately 100 pounds of pasture on an as-fed basis (if the pasture were 20 percent dry matter) per day for a 1,000-pound horse. Because hay contains much less water than fresh pasture, the same 1,000-pound horse would consume only 24 pounds of grass hay (84 percent dry matter for most grass hay) per day. When horses are consuming high-grain diets, forage intake should be maintained at a minimum of 0.75 percent of body weight (dry-matter basis).

Other Feeds

■ Molasses

Molasses is a good energy source. It is very palatable and can hide the taste of low-quality feeds and can reduce dustiness in overprocessed feeds. Molasses can be included as 5 to 10 percent of the ration, and generally should not exceed 10 to 12 percent. Clumping of feed can be a problem during cold weather at higher rates of molasses inclusion. Molasses adds moisture to the ration, and this added moisture will reduce storage time for the feed due to possible mold growth during warm weather. Feed these mixes within a couple of months.

Molasses should not be fed to horses afflicted with hyperkalemic periodic paralysis (HYPP) because the higher potassium concentration in this feed can exacerbate the symptoms of the disease.

■ Beet Pulp

Beet pulp is an excellent source of fiber and energy, but it is relatively low in protein. It often is included in high-performance rations to increase fiber intake while meeting energy requirements.

Vitamins

Vitamins are organic compounds that are required in small amounts but are essential for a healthy, active horse. Vitamins are divided into two broad categories: fat-soluble vitamins (vitamins A, D, E and K) and water-soluble vitamins (B vitamins and vitamin C). The fat-soluble vitamins are stored in the body and thus are at an increased risk for toxicity. Water-soluble vitamins are not stored in the body, and any excess is excreted in urine.

■ Vitamin A

The precursor of vitamin A is carotene. The vitamin itself or the precursor can be used to meet the horse's requirement. Lush, green pasture has higher levels of carotene than mature hays. However, even mature hay contains considerably more carotene than cereal grains. Feeding high-quality hay or allowing access to pasture usually can meet the vitamin A requirements of the horse. Hay stored more than a year is practically devoid of vitamin A and supplementation should be considered when feeding low-quality, weathered hay or year-old hay. Horses consuming late-season pasture also may require additional vitamin A.

■ B Vitamins

The B vitamins are a number of different vitamins, and supplementation rarely is needed for the average horse. Supplementation should be considered for race horses, mares during gestation and lactation, and other horses under heavy work. Feed sources of B vitamins are

brewer's yeast, distillers grains and green pasture. The B vitamins also are produced by the horse's intestinal microbes.

■ Vitamin D

Vitamin D is found in plants and animals; it also usually is found in low levels in most horse feeds. Sun-cured hay (especially alfalfa) and sunlight are two major sources of vitamin D for horses. Vitamin D is closely associated with the function of calcium and phosphorus and oversupplementation can result in bone growth problems.

■ Vitamin E

Concentrations of naturally occurring vitamin E vary widely in horse feeds. Good sources of vitamin E are fresh forages and hay. Like vitamin A, concentrations of vitamin E decline over time in stored feeds.

■ Vitamin K

Vitamin K is important for blood clotting, with green plants and intestinal bacteria providing vitamin K to the horse.

Minerals

The major mineral needs for the horse are calcium, phosphorus and salt. Occasionally copper, zinc, selenium and iodine also are considered. Deficiencies or toxicities of other minerals are rare if good-quality feeds and trace mineral salt are available.

Calcium and Phosphorus

Calcium and phosphorus are considered together because they work together and have an effect on one another's availability. A calcium-to-phosphorus

ratio of 1.5-to-1 is ideal (1-to-1 is considered adequate), and if calcium intake is lower than phosphorus intake, the absorption of calcium can be impaired. Adequate vitamin D also must be available for proper calcium and phosphorus utilization. Bone growth problems are a symptom of inadequate calcium, phosphorus and/or vitamin D.

Forage is normally a good source of calcium, while grains tend to be higher in phosphorus. One exception is orchard grass, which can have an inverted calcium-to-phosphorus ratio. An inverted ratio also can occur when grains and grain byproducts make up the majority of the diet.

Calcium and phosphorus can be supplemented by adding dicalcium phosphate, limestone or steamed bone meal to the diet. Some horses consider bone meal unpalatable, so add it to the ration gradually if it is to be used.

■ Salt (Sodium and Chloride)

The sodium content of most horse feeds is quite low; therefore, horses should have salt available at all times. Horses usually will meet their salt needs with access to a free-choice salt block; however, supplementation in the feed may be required for exercising horses (sodium is lost in sweat).

Other Minerals

■ Magnesium

Lush spring pasture may be deficient in magnesium and lead to grass tetany, a common problem in cattle. However, horses tend to tolerate levels of magnesium that cause tetany in cattle.

■ Potassium

Forages contain much higher levels of potassium compared with cereal grains; thus, horses fed diets consisting of a majority of forage will exceed their potassium requirement easily. The oilseed meals also contain high levels of potassium. Large amounts of potassium can be lost through sweat in an exercising horse; thus, supplementation may be beneficial. Potassium supplementation also has been shown to be beneficial during times of illness (diarrhea) and stress.

Potassium concentrations in feed must be monitored closely for horses afflicted with HYPP. For these horses, feeds that are high in potassium should be avoided.

■ Fluoride

The fluoride content of most forages and grains appears to meet the needs of horses. Excessive intake of fluoride can result when horses consume water with high mineral content; however, horses do appear to be more tolerant than cattle of high fluoride levels.

■ Selenium

North Dakota has both deficient areas and some areas with toxic levels of selenium. Certain plants are known to accumulate selenium, especially during drought conditions. Check with your county agent to see if you are in one of the areas where selenium levels may be of concern.

For more information on this and other topics, see: www.ag.ndsu.edu/ndsuaag

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