



What's in the bag?

Selecting horse-feed products requires clear understanding of nutrients in manufactured feeds

by Amy M. Gill, Ph.D.

EVER wonder what precisely is in the feeds formulated for horses?

Examination of the feed tag or list of ingredients on the bag can be a daunting task even for the trained professional. Basic ingredients such as oats, corn, and barley are clearly understood, but others are ambiguous. To further complicate the matter, if the feed tag does not list specific ingredients, it will list what are known as general collective terms.

When collective feed names are used, individual ingredients within a group are not listed on the label. For example, a feed-ingredient group called "plant-protein products" contains more than 30 different ingredients, from alfalfa meal to soybeans, peas, and yeast.

If the tag states "processed grain byproducts," nearly 40 ingredients are available to use in the formulation. Examples of ingredients in this list include brewers dried grains, distillers dried grains, corn gluten feed, wheat millings, and bran (rice and wheat).

The reason for using collective terms on tags is to allow for ingredient substitutions from batch to batch, based upon what is least expensive or most available at that time. This allows the nutrient analysis to remain the same, even though the ingredi-



ANSWERS ON THE TAG

Gaining a thorough understanding of information on feed-bag tags helps horse owners and farm managers select the best product available for the type of horse being fed

Denise Steffanus photos

ents may have changed.

Collective feed names are used to prevent the need to print new labels every time one or more ingredients are changed. They are used on feed labels when diets are developed based on least-cost formulation, which ensures a constant guaranteed analysis, but for the lowest cost. Least-cost diet formulation will select the most inexpensive ingredients to obtain the minimum

guaranteed analysis. As a result, the percentage of ingredients selected may vary with each diet formulation.

The problem with this least-cost formulation is that horses tend to dislike even the most subtle change and may go off feed if ingredients are swapped to keep the price low or the same between batches. Also, least-cost formulations do not take into account the quality of the ingredient for feeding to horses or the actual digestibility of the ingredient, which can vary widely, especially from species to species.

To select the best possible product for the type of horse being fed, a clear understanding of all the information on the tag is important.

Read the label

Labeling standards for feeds sold commercially are controlled by national and state regulations. In addition, the Association of American Feed Control Officials provides guidelines that assist feed manufacturers in providing uniform information on feed tags.

Every bag of commercially prepared feed is required by law to have a tag with an ingredient list and guaranteed analysis attached to it. The tag has information similar to that found on food for human and pet consumption and gives information as to what it will provide nutritionally for the horse. There are several reasons for purchasers to understand feed tags.

The tag will help select feeds that are appropriately balanced to the needs of the horse and whether it is complementary to the forage source currently in use. This is very important, because the forage should be considered the base of the diet, with the concentrate added only to make up for nutrients not provided by the forage.

The tag will help with cost comparisons of similar products. Be sure similar products are compared. (See feed tag examples.)

This protocol also works very well with overweight stallions and growing horses with developmental problems. For the latter, the idea is to slow growth but not hinder quality growth of bone and muscle by providing all needed nutrients except calories. (See feeding directions for Triple Crown 14% textured feed for further explanation.)

A feed tag lists the percentages of protein, fat, and fiber and concentrations of vitamins and minerals. One important nutrient the tag does not list is how many calories (digestible energy) are contained in the feed.


Other ingredients such as direct-fed microbials, inorganic versus organic minerals (better absorption for some minerals), enzymes, and other added-value ingredients that help improve digestibility and the overall well-being of the horse may voluntarily be added to the tag.

Additionally, information about the manufacturing process or facility may be offered by the manufacturer. For example, the Triple Crown Nutrition label states that the product is guaranteed to be free of restricted ruminant protein products, an ingredient useful in bovine feeds but detrimental to the health of horses.

These quality-control measures and special ingredients add to the value of the product and should be considered when making feeding selections.

After comparing these tags, it should now be clear how feeds are labeled and how the tag can tell you many facts about the feeds so that

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an appropriate choice can be made for a particular horse.

Four classes

There are four general classes of equine feeds: textured concentrates, processed concentrates, complete feeds containing forage and concentrate, and supplements.

Textured concentrates are composed of grains mixed with molasses. More contemporary textured feeds may contain forage or roughage products and higher fat to help replace

Commercial feed classification

- 1) Textured concentrates (traditionally referred to as "sweet feed")
- 2) Processed concentrates (pelleted or extruded)
- 3) Complete feeds containing forage and concentrate
- 4) Supplements (protein, vitamin, and mineral)

starch calories with fiber and fat calories. Grains may be whole or processed (crimped, cracked, rolled, or flaked) to improve digestibility. The mix may be fortified with a pre-mix to provide all necessary nutrients and to complement the forage portion of the diet. Traditional sweet feeds cause changes in blood-sugar levels in horses, which have been linked to excitability, metabolic, growth, and exercise-related disorders. Using textured feeds that contain beet pulp, alfalfa meal, or soybean hulls and vegetable oils is a safer, more appropriate way to feed textured feeds to all classes of horses.

Pelleting and extruding are two methods of processing concentrate products that help improve digestibility and intake. Pelleted feeds make it more difficult for horses to sort nutrients that they find distasteful. Extruded feeds are processed under extreme pressure that expand the feed nugget. Both processes help to make starch more digestible by exposing more of the surface of the granule to digestive enzymes in the stomach and small intestine. Pelleted and extruded feeds contain little molasses, are easy to handle in winter, and do not attract flies in warm months. They have a much longer and more stable shelf life compared with sweet feeds.

Complete feeds contain ingredients from concentrates and forages that are combined into one product. Complete feeds typically are used only when forage quality is poor or unavailable, or when medical conditions dictate, such as a geriatric horse with poor dentition or a horse with allergies. Soluble fibers such as beet

pulp, alfalfa meal, rice bran, and soy hulls elevate the fiber content of a complete feed. Due to their high fiber content, complete feeds contain less energy than concentrate mixes and can be fed at a much higher level of intake.

Protein, vitamins, and mineral supplements are designed to be fed with unfortified concentrate mixes when poor-quality forages are fed or when trying to achieve a slower growth rate in young horses without compromising quality of growth. They also work well in diets of overweight individuals that do not need calories from a concentrate.

Interpreting the tag

The guaranteed analysis provides concentrations of specific nutrients. This is the information that should be used to correctly pair a concentrate with the type of forages being fed to fully meet the horse's nutrient requirements. Feed manufacturers are required to list minimum levels of crude protein, crude fiber and crude fat (expressed as percentages), minimum and maximum percentages of calcium, and minimum values for phosphorus (percent), copper (parts per million or ppm), zinc (ppm), selenium (ppm), and vitamin A (International Units) per pound.

As mentioned earlier, some companies sometimes list other ingredients, such as specific amino acids, biotin, or vitamin E, particularly if the feed is specialized to deal with a growth, metabolic, or exercise-related disorder, but these are not required to be reported on the tag.

Minimum percentage crude protein

Protein is added to equine diets to provide amino acids so the horse can make other proteins in its body. It is not added to be used as an energy source, a common misconception in the horse world.

Energy is calories, and in horse feeds, carbohydrates and fats are the main sources. Energy or calories are needed to drive the biochemical process of making protein, as well as many other processes such as muscular contraction.

Protein should not be used to judge the caloric density of a feed or how "hot" a horse feed is. Horses get "hot" or excited from many variables, including but not limited to stress, being fed too much starch and sugar, being confined to stalls, and not getting enough exercise—but not from being fed the correct amount of protein in their diets.

Protein is also not the cause of developmental problems in growing horses. Rapid growth rates from excessive caloric intake, particularly from starch, nutrient imbalances

WIDE VARIETY

Broodmares and foals, stallions, and horses in training all require different feeding programs, and a close analysis of available products and matching them up with the respective needs are the keys to ideal nutrition

such as too little protein or minerals, and genetic predisposition are all factors in orthopedic disorders. Deliberately restricting protein intake, as with any essential nutrient, is counterproductive when attempting to correct growth, metabolic, or exercise-related disorders.

Protein comes in many different forms, and it is important that the type used in horse feeds provides amino acids that the horse can use.

For example, cows can use feathers as a source of protein because the microorganisms in the rumen are capable of degrading the protein and liberating nitrogen, but horses have no such mechanism in their stomachs. A cow feed with the source of protein as feathers might guarantee protein at 12%, which is accurate for a cow, but the same feed would be protein-deficient for a horse.

Source of protein is very important. Typically, soybean meal is used as the protein source in horse feeds. Milk proteins are also very available, but adult horses cannot tolerate high levels of milk products in the diet as they are lactose intolerant. Steer clear of any product that uses meat or fish products as a protein source for horses. Not only are they less digestible but also very unpalatable.

Minimum percentage crude fat

Percentage of crude fat gives a good indication how energy dense the feed is.

Fat contains nearly 2.5 times as many calories, by weight, as carbohydrates or protein. The higher the minimum percentage of crude fat, the higher the calories provided per pound of feed will be.

Most grain-based concentrate mixes without added fat generally range from a minimum of 2% to a maximum of 4% fat. Many contemporary commercial feeds contain 5% to 10% supplemental fat to help replace calories from starch. This is a much healthier way to feed calories to all classes of horses because high-starch feeding is directly linked to colic, laminitis, performance disorders, behavioral problems, and growth disorders.

Maximum percentage of crude fiber

The crude fiber level on a feed tag can be an indicator of energy content.

Insoluble fiber provides little energy when compared with soluble carbohydrates or fat and serves mostly as bulk filler in the diet. Most grains are relatively low in fiber, whereas forages are high in fiber. Grain fiber content ranges from 2% for energy-dense grains such as corn, to 12% or 14% for bulk grains such as whole or crimped oats that contain hulls (which are highly indigestible and are often seen in manure, though the oat itself has been digested).

More contemporary rations with fiber levels higher than 10% include very useful forage and roughage

products such as alfalfa meal, beet pulp, soybean hulls, and rice bran. These super fibers are very soluble and easy for hindgut microbes to ferment. The resulting product, volatile fatty acids, can then be used

by the horse to make glucose for energy, so these fibers are an indirect source of calories for the horse, not just filler.

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Feed tag example—Least-cost formulation

BLUEBIRD 14% TEXTURED HORSE FEED FOR MAINTENANCE OF MATURE HORSES

Guaranteed Analysis

Crude Protein (Min)	14%
Crude Fat (Min)	3.0%
Crude Fiber (Max)	12.0%
Calcium (Min)	1.0%
Calcium (Max)	5%
Phosphorus (Min)	1.0%
Copper (Min)20 PPM
Zinc (Min)40 PPM
Selenium (Min)	0.1 PPM
Vitamin A (Min)	2,000 IU/LB

Ingredient Statement: Grain Products, Plant Protein Products, Processed Grain Byproducts, Molasses Products, Roughage Products 25%, Vitamin A Supplement, Vitamin D3 Supplement, Vitamin E Supplement, Vitamin B12 Supplement, Ribo-flaven Supplement, Pyridoxine Hydrochloride, Folic Acid, Biotin, Thiamine, Calcium Carbonate, Salt, Dicalcium Phosphate, Manganous Oxide, Ferrous Sulfate, Copper Oxide, Magnesium Oxide, Zinc Oxide, Ethylenediamine Dihydroiodide, Cobalt Carbonate, Potassium Chloride.

Feeding Directions: Feed ½ lb. of feed per 100 lb. of body weight for the maintenance of mature horses. Feed good, clean hay at the rate of 1 to 1½ lb. per 100 lb. body weight daily. Provide fresh, clean water at all times, except to hot, tired horses. Important: Feed hay along with this ration, as per directions.

Manufactured by BlueBird Feed Mill, Anytown, Oklahoma 77777 50 lb. Net Weight (22.68 kg)

(Source: Feed Tag Information for Commercial Feeds for Horses, David W. Freeman, Ph.D., Oklahoma State University Extension Equine Specialist)

Feed tag example—Fixed formulation

TRIPLE CROWN 14% PERFORMANCE FORMULA (TEXTURED)

Crude Protein (min.)	14.00%	Copper (min.)	55.00 ppm
Lysine (min.)	0.75%	Vitamin A (min.)	6000 IU/lb
Methionine & Cystine (min.)	0.45%	Vitamin D (min.)	1000 IU/lb
Threonine (min.)	0.50%	Vitamin E (min.)	180 IU/lb
Crude Fat (min.)	10.00%	Vitamin C (min.)	48 mg/lb
Crude Fiber (max.)	6.50%	Biotin (min.)	0.34 mg/lb
Calcium (min.)	0.75%	Lactobacillus Acidophilus	1.75 million
Calcium (max.)	1.25%	Bacteria (min.)	CFU/gm
Phosphorus (min.)	0.50%	Saccharomyces	3.5 million
Magnesium (min.)	0.55%	Cerevisiae (min.)	CFU/gm
Iron (min.)	200.00 ppm	Cellulase (min.)	150 CMC-
Potassium (min.)	0.80%	ase units/lb	
Selenium (min.)	0.55 ppm	Protease (min.)	0.6 Northrup
Zinc (min.)	180.00 ppm	Units/lb	
Manganese (min.)	125.00 ppm		

Free from Restricted Ruminant Protein Products (per Title 21, CFR 589.2000)

Crimped Oats, Whole Oats, Cracked Corn, Barley, Heat Processed Soybeans, Dehulled Soybean Meal, Wheat Middlings, Rice Bran, Ground Flax Seed, Shredded Beet Pulp, Cane Molasses, Ground Limestone, Dicalcium Phosphate, Monocalcium-Dicalcium Phosphate, Monosodium Phosphate, Salt, Sodium Bicarbonate, Sodium Sesquicarbonate, Magnesium Oxide, Calcium Carbonate, Hydrated Sodium Calcium Aluminosilicate, Manganous Sulfate, Magnesium Proteinate, Manganese Proteinate, Zinc Sulfate, Zinc Proteinate, Ferrous Sulfate, Iron Proteinate, Copper Sulfate, Copper Proteinate, Cobalt Sulfate, Ethylenediamine Dihydroiodide, Selenium Yeast, Vitamin A Supplement, Vitamin D3 Supplement, Vitamin E Supplement, Menadione Sodium Bisulfite Complex (Source of Vitamin K Activity), Ascorbic Acid (Source of Vitamin C), Riboflavin Supplement, Niacin Supplement, Calcium Pantothenate, Vitamin B12 Supplement, Choline Chloride, d-Biotin, Thiamine Mononitrate, Pyridoxine Hydrochloride, Folic Acid, Beta Carotene, Calcium Lignin Sulfonate, Trichoderma Longibrachiatum Fermentation Extract, Yeast Culture, Brewers Dried Yeast, Dried Yeast Fermentation Solubles, Lactobacillus Acidophilus Fermentation Product, Enterococcus Faecium Fermentation Product, Dried Saccharomyces Cerevisiae Fermentation Solubles, Bacillus Subtilis Fermentation Extract, D. L. Methionine, L-Lysine, Soybean Oil, (Propionic Acid, Sodium Benzoate, Potassium Sorbate (Preservatives)), Yucca Schidigera Extract, Kelp Meal, Lecithin, Anethole, Fenugreek Seed.

Triple Crown 14% Performance Formula is a high energy grain mix designed to be fed to young performance horses, broodmares, breeding stallions, weanlings, and yearlings.

Performance horses: Feed Triple Crown 14% Performance Formula as the sole grain source at a rate that will maintain the horse's desired body condition and energy level. Broodmares and breeding stallions: Feed Triple Crown 14% Performance Formula at a rate that maintains the mare's or stallion's desired body condition. If feeding less than 6 pounds of Triple Crown 14% Performance Formula to breeding stallions, also feed 1 to 2 pounds of Triple Crown 12% Supplement per day in combination with Triple Crown 14% Performance Formula.

Weanlings and yearlings: The amount of Triple Crown 14% Performance Formula fed per day should be adjusted in order to control the rate of growth and body condition within desired limits. If feeding less than 4 pounds per day of Triple Crown 14% Performance Formula to growing horses, also feed 1 pound of Triple Crown 30% Supplement per day. Note: Provide plenty of fresh, clean water at all times. Keep product fresh in cool, dry storage. Examine product daily for mold or insect contamination. Do not use product that is old, molded, or insect contaminated.

Examples of collective feed terms

Grain products	Barley, corn, oats, wheat, rice, rye
Animal-protein products	Fish meal, hydrolyzed poultry feathers, meat meal, dried whole milk, skimmed milk, dried whey
Plant-protein products	Cottonseed meal, linseed meal, soybean meal, soybeans (heat-processed), yeast (cultured)
Processed-grain byproducts	Brewers dried grains, distillers dried grains, corn gluten feed, wheat millings, bran (rice and wheat)
Forage products	Alfalfa meal (dehydrated or sun-cured), grass hay (species name included), lespedeza meal
Roughage products	Apple products (dried), barley hulls, beet pulp (dried), hulls (soy bean, oat, peanut, rice)

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Percentages of calcium and phosphorus

Calcium and phosphorus probably are two macro minerals required to be guaranteed on feed tags.

These minerals are vital for development, maintenance, and repair of the musculoskeletal system. Lactating mares and growing horses require higher intakes of calcium and phosphorus than mature horses at maintenance. For example, a wean-

ling ration should provide at least 0.7% calcium and 0.4% phosphorus, whereas a mature horse can consume a ration that contains 0.3% calcium and 0.2% to 0.5% phosphorus.

Many commercial products contain added levels of calcium and phosphorus, generally in the range of 0.8% to 0.9% calcium and 0.6% to 0.8% phosphorus.

Calcium should always be fed at a higher percentage than phosphorus to prevent skeletal disorders. In other words, the amount can vary,

but the ratio of the two minerals should remain within 1.1:1 to 2:1 parts calcium to phosphorus in the total ration.

Horses can tolerate large amounts of calcium because they can eliminate excesses in the urine. (Ever see that cloudy whitish urine in a horse being fed excellent quality alfalfa hay?) However, recent studies have shown that excessive calcium intakes can cause higher excretion rates of magnesium, causing low serum magnesium levels in affected horses. This can affect bone formation. Recently, low serum magnesium also has been linked to insulin resistance in humans and may be a causative factor of the syndrome in horses.

Feeds may be formulated to take into account the calcium and phosphorus content of forages being utilized. Legume hay (such as alfalfa) has higher calcium content than grass hay. Therefore, feeds formulated to be fed with grass hay will contain a higher percentage of calcium than a feed designed to be fed with alfalfa. Some feed labels will go into detail as to which forage is most appropriate to be fed with such a concentrate.

Minimum copper, zinc, and selenium

Micro minerals are required in smaller amounts compared with calcium and phosphorus. Copper and zinc are important for growth and normal bone and joint development. Selenium is linked with vitamin E as a powerful antioxidant combination and an immunity booster.

Because the content of these minerals in hays and forages is variable, commercial feeds commonly are formulated with small amounts added to ensure adequate intakes. Optimum concentrations are copper, 50 ppm; zinc, 150 ppm; and selenium, 0.1 ppm if in the inorganic form or 0.3 ppm if in the safer, more available organic form.

Salt (sodium, chloride)

Salt is generally added to concentrate mixes at the rate of 0.5% for idle horses and 1% for working horses. Horses will consume one to three ounces of free-choice salt daily if provided with a salt block or loose salt. White salt is preferable to trace-mineralized salt, because the latter contains excessive amounts of iron, which the normal equine diet already provides for adequately. Excessive iron intake has been implicated in development of insulin resistance in humans and rats.

With all the feed products and supplements available, selecting the right products for an individual horse or stable of horses requires a complete understanding of what the horses' level of performance is and what type of forage is available, and then selecting concentrates and supplements to balance the whole diet.

Through close analysis of available products and matching them to the needs of the horse, optimum nutrition can be obtained. *

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