

What's in the Bag?

Demystifying ingredients used in horse feeds

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

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 doesn't list specific ingredients, it will list what are known as "general collective terms". When collective feed names are used, individual ingredients within a group aren't listed on the label. For example, a feed ingredient group called "Plant Protein Products" that contains more than 30 different ingredients, from alfalfa meal, to soybeans, peas and yeast. If the tag states "Processed Grain By-Products", again 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 ingredients 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 specie to specie. Therefore, some companies will also produce a "fixed formulation" which guarantees the ingredients remain the same no matter what. These products tend to change in price depending on the cost of the ingredients. They are generally better quality than least cost formulations, and are more consistent.

In order 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.

Side Bar 1

Examples of Collective Feed Terms

Grain Products	Barley, corn, oats, wheat, rice and 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 By-Products	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 (soybean, oat, peanut and rice)

Read the Label

Labeling standards for feeds sold on a commercial basis are controlled by national and state regulations. In addition, the Association of American Feed Control Officials (AAFCO) 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 you to select feeds which are appropriately balanced to the needs of the horse and whether it is complimentary to the forage source currently in use. This is very important as 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 you are comparing similar products! (See side bar 2)
- The tag may provide guidelines on feeding directions. This is very important. If you cannot feed the horse according to the directions, the horse is being fed the wrong product. For example, let's say we have a broodmare that has just been weaned and tends to carry too much weight. She is pregnant again, so supplying protein, vitamins and minerals to support not only herself at maintenance but also the developing fetus is crucial. It would not be correct to

feed her a concentrate feed that the manufacturer suggests should be fed at a rate of a minimum of 6 pounds per 1000 pound horse. She would have to consume too many calories from 6 pounds of this feed in order to obtain the correct amount of protein, vitamins and minerals she requires at this stage of pregnancy. Instead, a protein, vitamin and mineral *supplement* without added calories from carbohydrates and fats can be fed in very small amounts to obtain the correct levels of these nutrients. 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 need nutrients except for calories (See feeding directions for Triple Crown 14% Textured feed in side bar 2 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 also 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.

Side Bar 2 Example Feed Tag – 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 By-Products, 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 1/2 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 1 1/2 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)

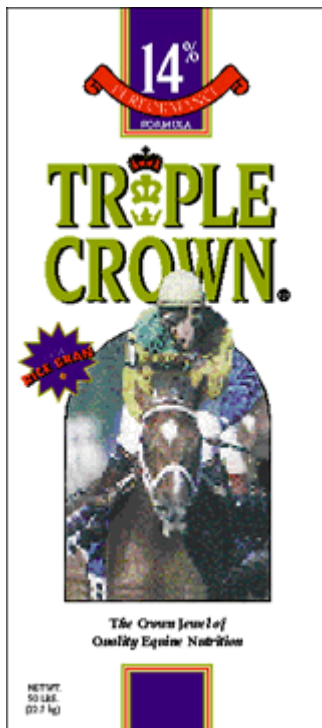
(Source: Feed Tag Information for Commercial Feeds for Horses, David W. Freeman OSU Extension Equine Specialist **ANSI-3919**)

Example Feed Tag – Fixed Formulation

Triple Crown 14% Performance Formula (textured)

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

Saccharomyces Cerevisiae (min.)	3.5 million CFU/gm
Cellulase (min.)	150 CMC-ase units/lb
Protease (min.)	0.6 Northrup Units/lb



(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 Dihydriodide, 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.

After comparing these tags, it should now be clear how feeds are labeled, and how the tag and tell you many facts about the feed so that an appropriate choice can be made when choosing a product for a particular horse.

Side Bar 3 Commercial Feed Classification

There are four general classes of equine feeds:

- 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).

Textured concentrates are composed of grains mixed with molasses. More contemporary textured feeds may also contain forage or roughage products and higher fat to help replace 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 compliment the forage portion of the diet. Traditional sweet feeds cause changes in blood sugar levels in horses, which has 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 all classes of horses.

Pelleting and extruding are two methods of processing concentrate products which help improve digestibility and intake. Pelleted feeds make it harder for

horses to sort nutrients that they find distasteful. Extruded feeds are processed under extreme pressure that expands 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 as compared to sweet feeds.

Complete feeds contain ingredients from concentrates and forages which are combined into one product. Complete feeds are typically 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 will 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 that the horse can make other proteins in its body. It is **not** added to be used as an energy source. This is a major 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. Also, protein is not the cause of developmental problems in growing horses: rapid growth rates from excessive caloric intake, particularly from starch, nutrient imbalances 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 feed 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 carbohydrate 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 percent to a maximum of 4 percent fat. Many contemporary commercial feeds contain between 5 percent to 10 percent 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 to 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 percent for energy-dense grains such as corn, to 12 or 14 percent 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 percent 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.

Minimum and Maximum Percentage of Calcium, Minimum Percentage of Phosphorus

Calcium and phosphorus are two macro minerals required to be guaranteed on feed tag. 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 weanling ration should provide at least 0.7 percent calcium and 0.4 percent phosphorus, whereas a mature horse can consume a ration that contains 0.3 percent calcium and 0.2 to 0.5 percent phosphorus. Many commercial products contain added levels of calcium and phosphorus, generally in the range of 0.8 - 0.9 percent calcium and 0.6 - 0.8 percent phosphorus. Calcium should always be fed at a high 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 up 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 and recently, low serum magnesium 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 in Parts Per Million (ppm)

Micro minerals are required in smaller amounts compared to 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 anti-oxidant combination and for increasing immunity. As 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 (Sel-Plex™ made by Alltech, Inc., sponsors of the 2010 World Equestrian Games in Lexington, KY).

Salt (sodium, chloride)

Salt is generally added to concentrate mixes at the rate of 0.5 percent for idle, non-working horses and 1.0 percent for working horses. Horses also will consume 1 to 3 ounces of free-choice salt daily if provided with a salt block or loose salt. White salt is preferable to trace mineralized salt as the latter contains excessive amounts of iron, which the normal equine diet already provides for adequately. Excessive iron intake has also been implicated in development of Insulin Resistance in humans and rats.

With all the feed products and supplements available today, selecting the right products for an individual horse or stable of horses requires a complete understanding of what the level of performance required is, what type of forage is available and then selecting concentrates and supplements to balance the whole diet. By closely analyzing available products and matching them to the needs of the horse, optimum nutrition can be obtained.