

# Common Feed Ingredients in Poultry Diets

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The major ingredients in poultry diets provide the protein and energy required for poultry to maintain health, grow, and produce eggs. (For more information about the nutritional requirements of poultry Refer to the article "[Basic Poultry Nutrition](#).")

## Energy Sources

Common energy sources in poultry feeds include cereals and fats and oils.

### Cereals

**Cereals** are grasses that produce edible starchy grains, many of which can be used in poultry diets as an energy source. Although the starch in corn is highly digestible, most of the other grains contain **antinutritional factors** that interfere with digestion and/or the absorption of nutrients. These antinutritional factors include the **nonstarch polysaccharides**, often referred to as NSPs. NSPs cannot be broken down by the digestive enzymes poultry normally secrete in the small intestine (referred to as endogenous enzymes). As a result, the NSPs gel, increasing the viscosity of the intestinal contents. The increased intestinal viscosity reduces the availability of the nutrients in the feed. In addition, the presence of NSPs typically results in sticky droppings, which increase the moisture content of the litter. Litter that has a high moisture content can adversely affected air quality within the poultry house.

- **Barley** is commonly used in poultry diets in some regions of Canada and Europe. This cereal is grown on areas of both irrigated and dry land in the United States. It is an early-maturing crop that offers agronomic advantages when used in crop rotation. Barley is considered a medium-energy grain. It has a low starch content, a high fiber content, and some antinutritional factors.
- **Corn**, also called maize, is native to the Americas and was first cultivated by the American Indians. The corn plant is efficient at converting large amounts of sunlight into stable forms of chemical energy stored as starch, cellulose, and oil. Corn is the grain most routinely used in commercial poultry diets in the United States because it has a good energy content and is easy to digest. The amino acid profile of the protein in corn complements the amino acid profile of the other ingredients, such as soybean meal, typically used in feed. Alternative grains are typically evaluated in relation to corn.
- **Sorghum**, also called milo and guinea corn, is a highly drought-resistant crop that is grown in many areas of the world, including the United States. Sorghum is only 3% to 5% lower in feeding value than corn. It is often less expensive than yellow corn. The level of tannins in sorghum limit its use in poultry diets. However, tannin-free varieties are now available, and as a result, sorghum can be substituted for corn in poultry diets with only minor changes in the amounts of other ingredients.

- **Wheat** is often used in poultry diets in western Canada and parts of Europe. The husk of wheat detaches from the grain during threshing (unlike conventional barley and oats where the husk remains attached) reducing its fiber content.

## Fats and Oils

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Fats and oils provide a concentrated source of energy. Sources of fat include the following:

- **Tallow:** Derived primarily from the rendering of beef offal
- **Lard or choice white grease:** Derived primarily from the rendering of pork offal
- **Poultry fat:** Derived from poultry offal
- **Feed-grade animal fat:** Derived primarily from a mixture of rendered beef, pork, and/or poultry raw material
- **Yellow grease:** Derived primarily from reprocessed restaurant grease and cooking oil
- **Blended animal-vegetable fat:** Includes blends of different types and amounts of animal fats and vegetable oils from restaurant grease

In addition to providing concentrated energy, fats provide the following benefits:

- Improved physical characteristics of feed
- Decreased dustiness (feed loss is reduced by effective dust control)
- Improved palatability of feed
- Increased lubrication value of feed
- Reduced particle separation, which helps maintain a uniform mixture of each ration
- Possible contribution of linoleic acid, an essential fatty acid

## Protein Sources

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The many possible protein sources for poultry feeds include the following:

- Canola
- Fish meal
- Field peas
- Meat and bone meal
- Soybeans
- Cereal by-products

### Canola

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**Canola** is a variety of rapeseed that is low in glucosinolates in the oil and eruric acid in the meal. The name *canola* was coined to distinguish the plant from rapeseed, though in Europe canola is often referred to as double-zero rapeseed. Canola meal is a by-product of oil extraction from canola seeds.

### Fish Meal

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There are two basic types of **fish meal**. The first type is derived from fish, such as salmon and tuna, caught specifically for human consumption. The second type is derived from fish, such as herring, menhaden, and pollack, caught specifically for the production of fish meal. In the United States the fish most often used for fish meal is menhaden.

### Field Peas

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**Peas** are grown in temperate regions but are used as a food source worldwide. Traditionally peas rejected from the food industry were used in poultry diets. Now there are varieties of field peas grown specifically for animal feeds. Different varieties of field peas are available.

## Meat and Bone Meal

**Meat and bone meal** are derived from slaughter by-products recycled for use in animal feeds. They are pressure cooked (rendered) to produce a nutritional and economical feed ingredient.

## Soybeans

**Soybean meal** is the dominant protein supplement used in poultry diets and is considered the standard to which alternative sources of feed protein sources are compared. Soybean meal has a high protein content, especially compared to other plant protein sources.

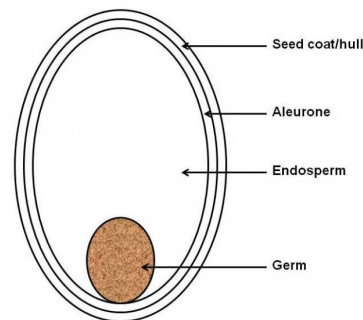
## Cereal By-Products

Many of the cereal grains used as animal feed are also used for human consumption or the development of industrial products. The grains are cleaned and then either dry or wet milled. Dry milling removes the outer fibrous coating of the seed and is used in the production of flour. Wet milling is used in the production of sugar, starch, syrup and/or oil. Many of the by-products of both dry and wet milling are suitable for inclusion in poultry feeds.

Understanding the by-products generated by dry and wet milling requires a basic understanding of the parts of the cereal grain. All grains have four basic parts: seed coat, aleurone, endosperm, and germ.

*Diagram by Jacquie Jacob, University of Kentucky*

The **seed coat** can exist in the form of a hull. For those cereals without a hull, the seed coat is in the form of the pericarp. The function of the seed coat is to protect the grain from moisture, insects, and fungal infection. The seed coat must be broken to allow for the digestion of the nutrients contained within the seed. The seed coat does not supply nutritional value, but depending on the particular type of cereal, the seed coat can dilute the amount of starch in the diet. In oat grains, for example, the hull represents 25% of the seed (on a dry matter basis). In sorghum, however, the seed coat represents only 3% to 6% of the grain weight and has little effect on the nutritional value of the grain.



The **aleurone** is a layer surrounding the endosperm. The **endosperm** is the location of most of the starch, which provides energy to the animals consuming it and is also the source of flour. The aleurone contains fiber and protein. The **germ** is the embryo of the seed and the location of protein and oil.

## Common Cereal By-Products

- **Grain hulls** are the outer covering of the grain seed. The most common hulls are from oats and rice milling. Grain hulls are low in energy and crude protein but high in crude fiber. Hulls are typically classified as roughage and not widely used in feeds for poultry that require growth or high production.

- **Bran** is the coarse outer covering of a seed. It also contains a little of the flour. The most common brans are corn, rice, and wheat. Nutritionally, bran contains fiber and protein.
- The **germ** is the embryo of the seed. Germ meal is high in lipids and protein. The most common feed germ meals are derived from corn and wheat.
- **Gluten feed** and **gluten meal** are by-products of wet milling. Gluten is the substance remaining after removal of the germ and the starchy endosperm. Gluten feed and meal are considered protein sources. The most common cereals used in gluten feed and meal are corn and sorghum.
- **Middlings** (also referred to as midds) are by-products from the production of flour. They include the bran, shorts, germ, flour, and tailings. Rye and wheat are the most common middlings available. The maximum allowed levels of crude fiber in rye and wheat middlings are 8.5% and 9.5%, respectively.
- **Grain screenings** are a mixture of different materials that contain a minimum grain content of 70% and a maximum ash content of 6.5%. Grain screenings can include various combinations of dust, chaff, weed seeds, broken grains, unsound grains, and any other materials separated during the cleaning and processing of the grain. **Mixed screenings** must contain no more than 27% crude fiber and 15% ash.
- **Groats** are the grain seeds without the hull. The most common are oat and rice groats. Groats have a relatively low crude fiber content and contain a higher percentage of protein than the original grain.
- **Mill run** (also known as mill by-product) consists of bran, shorts, germ, flour, and tailings. It is a by-product of most of the cereal grains. There are specific minimum crude fat and maximum crude fiber limits that mill runs can contain, and these requirements vary depending on the cereal grain involved.
- **Corn hominy feed** includes corn bran, germ, and flour. It contains a higher percentage of both crude protein and fiber than the original corn grain. Compared to other by-products, however, corn hominy feed is lower in crude fiber content. Hominy feed must contain at least 4% crude fat.
- **Barley malt sprouts** are by-products from the malting industry. They are classified as a protein source and must contain a minimum of 24% crude protein. Malt sprouts consist of roots, sprouts, and malt hulls.
- **Rice polishings**, as the name suggests, are the residue created when polishing to produce white rice (versus brown rice). Rice polishings are low in crude fiber are high in crude fat and are a good source of the vitamin thiamin.
- **Wheat red dog** is a by-product of milling wheat and includes tailings with some bran, germ, and flour. The maximum allowed fiber content is 4%.
- **Wheat shorts** are also a by-product of wheat milling and consist of bran, germ, flour, and tailings. The maximum crude fiber content for shorts is 7%.