Feed Ingredients Catalog

ADM

ANIMAL NUTRITION | RUMINANT | SWINE | POULTRY | AQUACULTURE | COMPANION ANIMAL

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Introduction to ADM

Archer Daniels Midland Company is a leading processor of livestock feed ingredients. Our core businesses of corn and oilseed processing, grain milling, and commodity merchandising provide the foundation for a dependable supply of these key ingredients. We understand the challenges facing producers and feed integrators and have developed ingredient solutions that include everything from basic commodities to a range of specialty ingredients to help our customers formulate diets that optimize production, profits, and animal health.

The Key Is Processing

Our feed ingredients include many co-products from the further processing of corn, oilseeds, and wheat. These co-products provide producers with protein, energy, fiber, carbohydrates, minerals, and vitamin alternatives to economically formulate feeds to meet any dietary requirements.

Using advanced fermentation technology, ADM converts dextrose derived from corn processing into the essential amino acids lysine and threonine. These amino acids are used by the swine and poultry industries to formulate diets that optimize performance, while addressing environmental concerns.

Our Commitment to the Feed Industry

Our knowledgeable and experienced technical and sales personnel are able to help you match the right products to fit your particular needs. Whether you want maximized profits, a more nutritious product, or improved palatability, ADM has a complete line of ingredients and the expertise to develop a plan that's right for you.

Because we are also committed to the food industry, which includes the products you produce, we can ensure you that our feed ingredients are processed to meet the highest safety and quality standards.

Behind the Scenes at ADM

Consistent, Quality Ingredients

At ADM, we know that quality control doesn't begin in the feedmill; it begins with the ingredients used to formulate feeds.

Livestock do not adapt well to changes in their diet, which is why it's important for us to maintain strict controls on the physical and nutritional aspects of our products. The slightest nutrient variation may not only be hard on animals, but also on the feedmill operators who have to reformulate feeds to compensate for an ingredient that has changed. That's why ADM is in control of everything from grain and oilseed selection to processing, packaging, and delivery. This helps ensure a more uniform product every time.

Because feed is the most expensive component of livestock production, optimizing consistency in product manufacturing is key to providing our customers with a quality product. You can be confident that ADM's ingredients have been through the strictest manufacturing processes.

Product Delivery on Time, Every Time

As one of the largest feed ingredient suppliers in the world, ADM can transport ingredients to wherever you need them. With the most efficient and expansive transportation system in agriculture, ADM's vast network of over-the-road trucks, railcars, river barges, and ocean-going vessels can assure customers of on-time delivery to virtually any location.

Research and Development

The livestock and feed ingredient industries are ever changing. Our research and development teams are continually looking for ways to improve upon our processes and products, so that we can meet your feed formulating challenges before they become costly problems. And our technical service team is swift and unsurpassed in responding to customers' needs.

If you're looking for a feed ingredient supplier that can improve the protein quality, nutritional standards, and production efficiency of your animal feed products, call ADM today.

ADM has the worldwide resources and technical and distribution capabilities to provide you with the feed products, technical support, and service that is unsurpassed.

Corn Processing

At ADM, we use two major processes to produce feed ingredients from corn: wet milling and dry milling.

The Wet Corn Milling Process

The wet corn milling process (Figure 1) begins when shelled corn is brought to the processing plant, sampled, cleaned, and then conveyed to large tanks called steeps. The corn is soaked in high temperature water containing sulfur dioxide, which helps separate the starch and the insoluble protein. During the steeping process, about 6% of the dry weight is dissolved. These dissolved components provide the nutritional value for condensed fermented corn extractives or corn steep liquor.

After steeping, the swollen corn kernel is coarse milled and the germ is removed. Oil is extracted from the germ and refined to make corn oil. The remaining germ is dried to form corn germ meal. With the germ removed, an impact mill pulverizes starch particles leaving fibrous material nearly intact. Bran is then screened from the starch and gluten protein.

The starch-gluten slurry that remains is pumped to centrifugal separators. The lighter gluten protein remains at the top and the heavier starch moves to the bottom. The gluten protein is concentrated, filtered, and dried to form corn gluten meal. The starch is separated a second time to reduce protein to less than 0.3%. A portion of the starch is dried, or modified and dried, to be sold to the food, paper, or textile industries. Corn sweeteners and ethyl alcohol are produced from the remaining starch.

Feed ingredients of the wet milling process include corn gluten feed (wet/dry), corn gluten meal, corn germ meal, condensed fermented corn extractives (steepwater), and corn oil.

The Dry Corn Milling Process

Corn is about two-thirds starch. The starch is converted to ethanol and carbon dioxide during a fermentation process. The remaining nutrients in corn, such as protein, fat, minerals, and vitamins are concentrated and end up as distillers grains or condensed distillers solubles.

The dry corn milling process (Figure 2) begins by grinding corn into a coarse flour. This flour is combined with water, then enzymes are added to convert the starch to sugar. This product, referred to as mash, is then cooked and sterilized.

After cooling, yeast is added to the mash, and sugar is converted to ethanol and carbon dioxide during the fermentation stage. The mash is sent to distillation and ethanol is extracted. The spent mash goes to a screen/press or a centrifuge where the liquid distillers solubles or thin stillage either goes back into the cooking system, is sold as livestock feed, or is partially dehydrated into a syrup called condensed distillers solubles. If the syrup is added to wet distillers grains and dried, the resulting product is distillers dried grains with solubles.

Feed ingredients of the dry milling process include corn distillers dried grains (wet and dry), corn distillers dried grains/solubles (wet and dry), and corn distillers solubles.

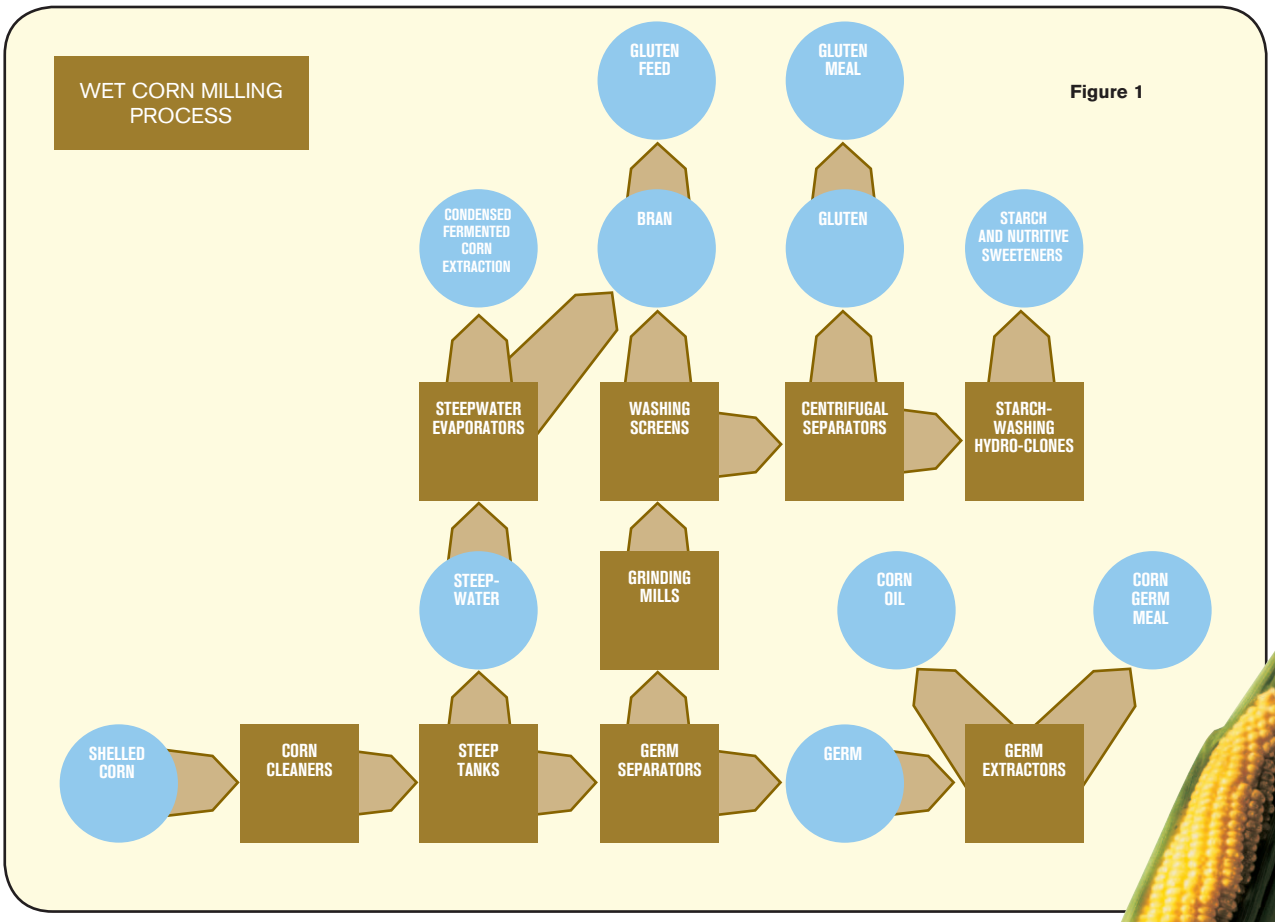


Figure 1

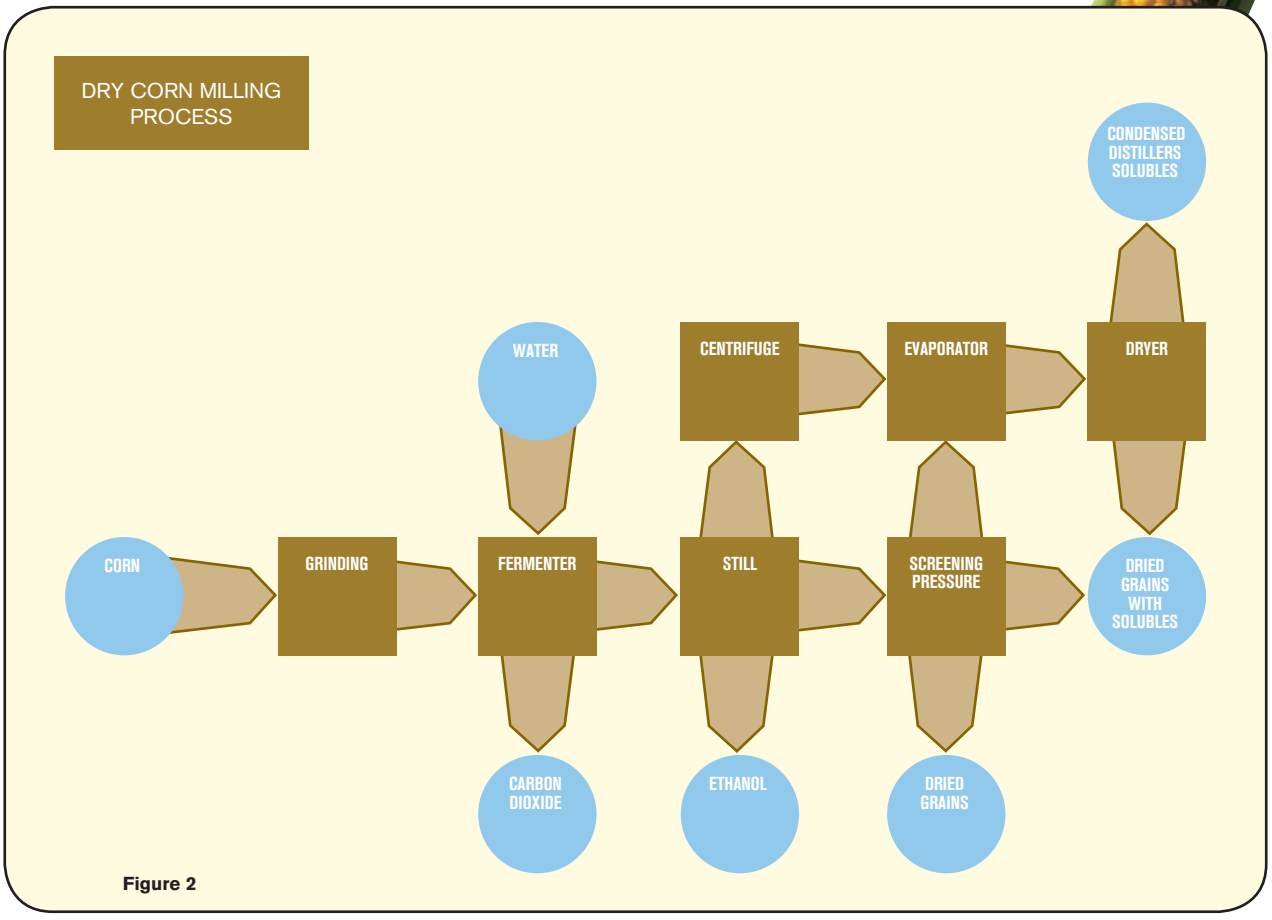


Figure 2

Corn Co-Products

Corn Gluten Meal

Corn gluten meal, a co-product of the wet milling of corn, is a very palatable ingredient containing a high level of bypass protein (55%), so it performs well in high-producing dairy cattle diets. Providing high protein, energy, methionine, and cystine, corn gluten meal serves as an excellent protein source for both swine and poultry. In addition, its high level of xanthophylls makes it a valuable ingredient in pigmented broiler and layer feeding programs. Rich in highly digestible amino acids and containing no antinutritional factors, corn gluten meal also works as a replacement for fishmeal in aquaculture diets.

Corn Gluten Feed

A co-product of the corn wet milling process, corn gluten feed is a medium-protein, medium-energy feed ingredient. In beef cattle, studies indicate that corn gluten feed contains 87% of the feed value of dry corn. Low in fat and starch but high in digestible fiber, it serves as a valuable ingredient in dairy rations and provides an excellent source of fiber for mature dogs and equine. Containing 70% of the energy value of corn in swine diets, corn gluten feed works effectively in gestating sow diets. It's also used successfully in pullet, broiler-breeder, and layer diets.

Golden Gluten™ Wet Corn Gluten Feed

Golden Gluten™ wet corn gluten feed provides a cost-effective alternative to traditional feed. This protein and energy-rich product can make up between 20-50% of the dry matter in the total ration. Fed with silage, alfalfa hay, or haylage, its unique product characteristics stimulate digestion in the rumen for better protein utilization and improved feed efficiency. A highly digestible fiber, Golden Gluten wet corn gluten feed also appears to reduce sub-acute acidosis, which leads to higher feed intake.

Corn Germ Meal

When most of the oil has been removed from corn germ by solvent extraction, corn germ meal results. Palatable and containing a fiber component, it provides an attractive medium protein and energy ingredient for many ruminant applications. Rich in highly digestible amino acids, it offers a great alternative protein source for swine and poultry. In addition, its high level of hemicellulose fiber delivers good hydration and pelleting characteristics.

Condensed Fermented Corn Extractives (Steepwater)

ADM Liquid Gold® (steepwater) is the soluble portion of the corn kernel removed by the steeping process and concentrated to approximately 50% dry solids. It supplies an excellent source of amino acids, minerals, vitamins, and organic acids, while enhancing ration palatability and ration conditioning in ruminant diets.

Distillers Dried Grains with Solubles (DDGS)

DDGS, a co-product of the dry milling of corn, is a medium-protein and high-energy ingredient consisting of a grain fraction and whole stillage from the yeast fermentation of grain to ethanol. It contains numerous nutritional qualities, valuable for a variety of animal species. For ruminants, this palatable, low-starch product offers a high level of bypass protein, B vitamins, phosphorus, and highly digestible fiber. Its unique characteristics also perform well in swine and poultry diets.

Wet Distillers Grains (WDGS) & Modified Wet Distillers Grains (MWDGS)

These co-products of the dry milling of corn are economical and versatile forms of our DGS. These protein and energy-rich products can be used in ruminant diets up to 30% of the dry matter in the ration. These wet feeds at 35% and 50% dry matter help to balance diets and keep ration costs down for those able to accommodate handling wet ingredients.

Corn Oil

Corn oil provides a dense source of energy that can be utilized in ruminant and monogastric diets. It contains a high level of linoleic acid, an essential fatty acid for poultry. Corn oil can also be used to effectively reduce dustiness in some feeds.

Oilseed Processing

ADM processes a wide range of oilseeds into valuable high-protein meals, refined oils, and nutrient dense co-products. The following section will examine and describe the valuable products that come from each of these oilseeds: soybean, cotton, sunflower, canola, and flax.

Soybean Processing

Processing (Figure 3) begins with careful selection of top-grade soybeans. After cleaning, the beans are dried thoroughly so the hull can be easily removed. The soybean meat is then rolled into full-fat flakes and the oil is solvent extracted. The crude soybean oil undergoes a degumming process to remove the lecithin. The remaining oil is refined to make salad oil, margarine, and other oils.

The flakes left after the oil is extracted contain about 50% protein. The soy flakes can be ground to produce soy grits or soy flour. When the sugars are removed from the flakes, the result is a soy concentrate that contains about 70% protein. The flakes can also undergo a series of protein precipitations, producing a soy protein isolate with a protein level of 90%.

Soybean processing feed ingredients include soybean meal (dehulled), soybean meal (44%), soybean hulls, soy flour, soy protein concentrate, soy protein isolate, and soy oil.

Cottonseed processing

Cottonseed goes through many steps (Figure 4) to get the final products of cottonseed meal and cottonseed hulls. First, the harvested seed cotton is sent through a gin that mechanically separates the cotton fiber/lint from the cottonseed. The seed is cleaned, delinted, and separated into linters and whole cottonseed. Next, the cottonseed is dehulled leaving cottonseed kernels (meats) and hulls. After a conditioning, flaking, and expanding process, the cottonseed meats have the oil removed through a solvent extraction process. The remaining cottonseed flakes are finely ground into meal. Protein content of the meal can vary depending on the fiber content.

Cottonseed processing feed ingredients include whole cottonseed, cottonseed hulls, and cottonseed meal.

Canola Processing

Canola seed is cleaned and graded in preparation for processing (Figure 5). The selected seeds are preheated to 30-40° C, then flaked by roller mills. The flakes are cooked/conditioned by passing through a series of steam-heated, vertically stacked kettles. This step serves to thermally rupture remaining oil cells, coagulate the protein, and reduce oil viscosity. Cooking/conditioning adjusts the moisture and temperature of the flakes, which is important in the control of enzymatic activity. During cooking/conditioning the temperature is rapidly increased to 80-90° C to inactivate the myrosinase enzyme present in canola. In the next processing step, the cooked and flaked seed is passed through a screwpress or expeller. This removes between 60-70% of the seed oil content. The resulting very fine solid material is recycled back to the cooker/conditioner and formed into cakes. The 14-20% oil remaining in the meal cake is then removed by a solvent extraction method. Careful monitoring of heat and moisture during processing assures a quality meal product and helps minimize the effects of glucosinolates.

Canola processing feed ingredient: canola meal.

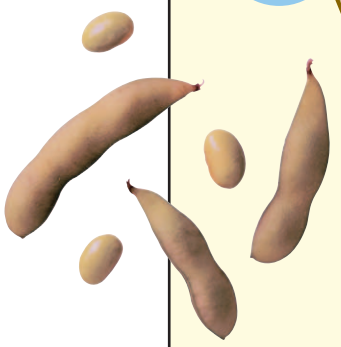


Figure 3

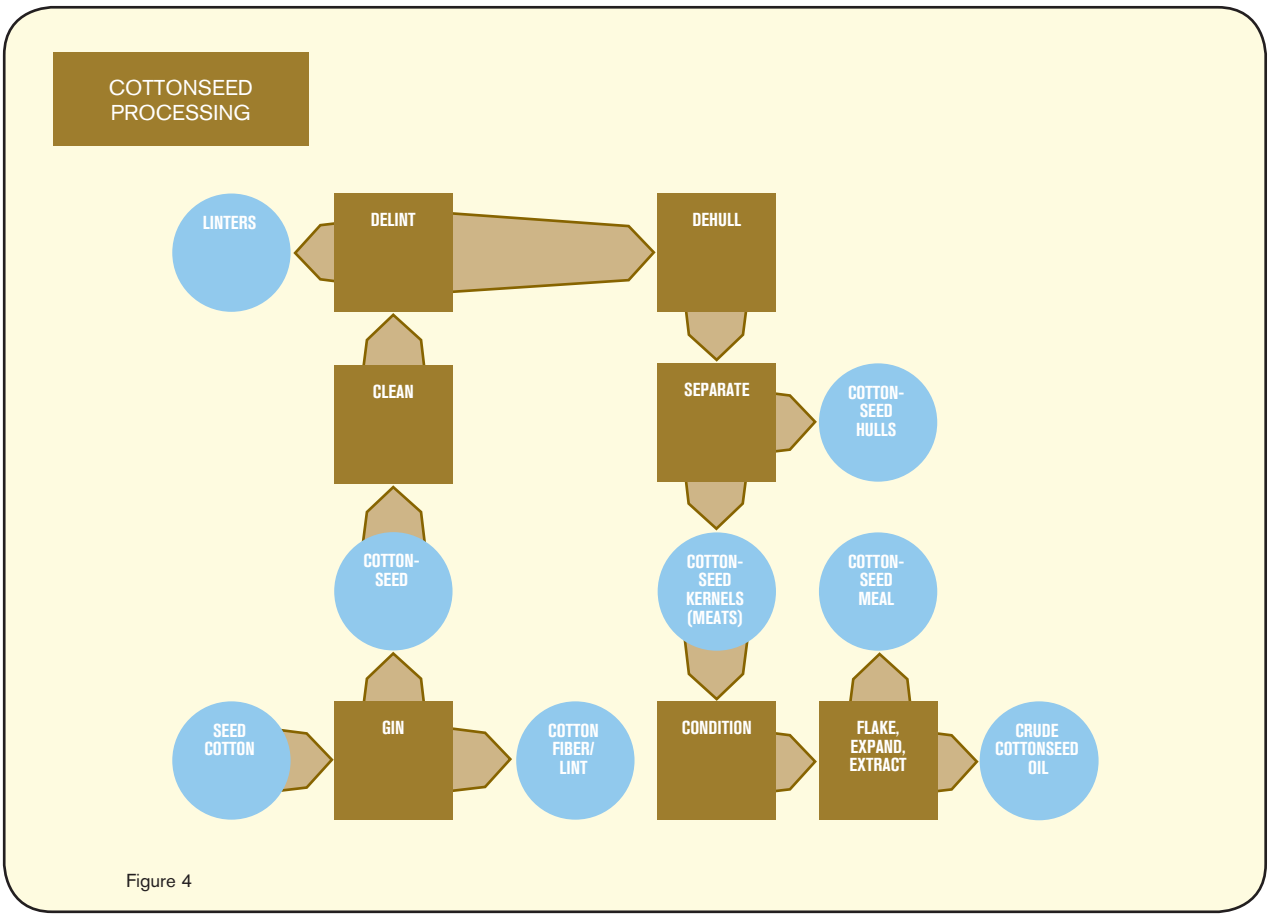


Figure 4

Oilseed Processing

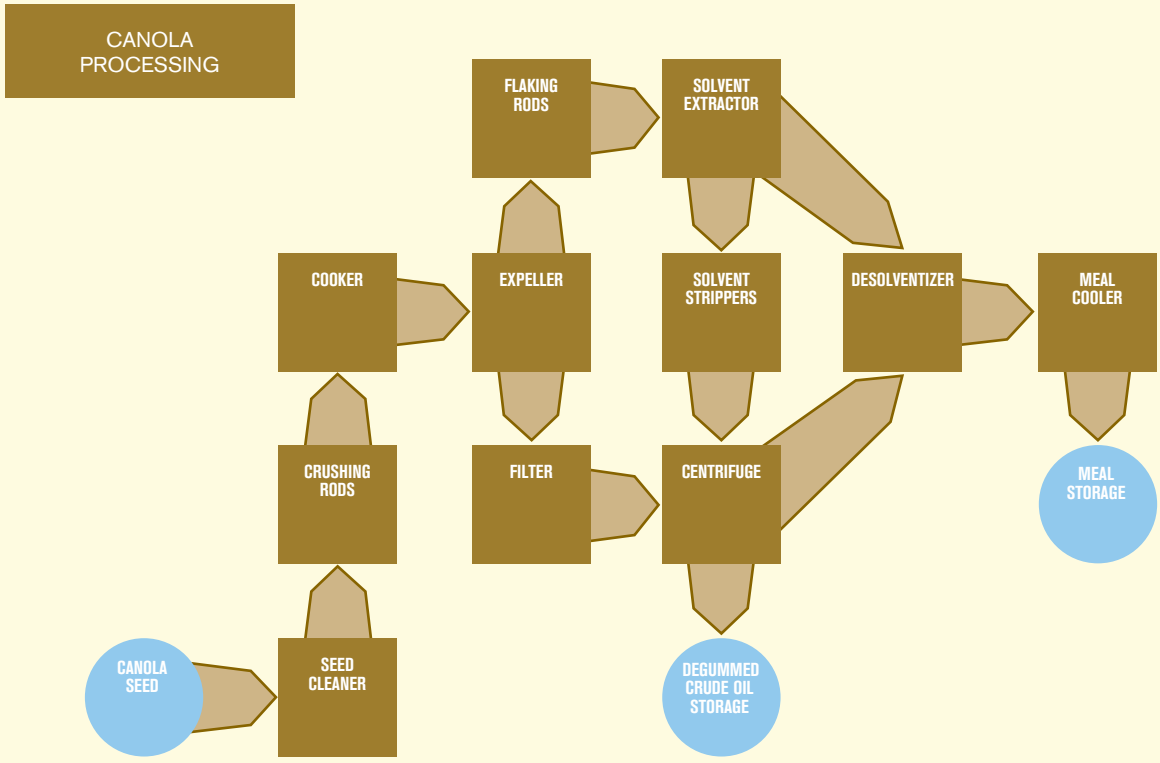


Figure 5

Sunflower Seed Processing

Sunflower seed is processed by a solvent extraction method similar to canola. Sunflower meal is obtained by grinding the residue remaining after extraction of most of the oil from whole sunflower seed by a solvent extraction process. Partially dehulled sunflower meal contains 34-36% protein, while sunflower meal with hulls contains 26-28%.

Sunflower seed processing feed ingredients: sunflower meal 30% or 35% crude protein.

Flaxseed Processing

Flaxseed, grown in various parts of the country, is the source of linseed meal and linseed oil. These products are obtained through a solvent extraction process similar to that used to process canola.

Flaxseed processing feed ingredient: linseed meal and flaxseed oil.

Oilseed Products

Soybean Meal

Soybean meal is obtained by grinding the flakes remaining after removing most of the oil from soybeans by the solvent extraction process. Widely available, actively traded, highly palatable, and rich in essential amino acids, solvent extracted soybean meal represents the "gold standard" for vegetable protein ingredients. Highly digestible for swine and poultry, the amino acids in soybean meal complement other ingredients to create a balanced diet. Because it's an excellent source of rumen degradable protein, soybean meal allows microbes to produce maximum levels of high-quality microbial protein. A good source of amino acids, soybean meal also functions as a widely accepted alternative to fishmeal in aquaculture diets.

Soy Hulls

Soy hulls consist primarily of the outer covering of the soybean and provide a highly palatable source of fiber, minerals, energy, and protein. The low lignin content makes them highly digestible to livestock. Readily fermented in the rumen, soy hulls supply both energy and protein. In addition, the highly digestible and palatable ingredients can be used as a fiber or energy source in swine diets. Soy hulls also provide companion animals an effective fiber source.

Canola Meal

Canola meal consists of the meal obtained from whole canola seeds after the removal of most of the oil by direct solvent or prepress solvent extraction process. An excellent source of vitamins and minerals and high in sulfur-containing amino acids, canola meal's nutrient profile complements ingredients in a wide range of livestock rations. In dairy rations, canola meal has gained widespread acceptance as a quality protein source. Additionally, in beef diets it can be used as the sole protein supplement in growing and finishing rations.

Cottonseed Meal

Cottonseed meal is obtained by finely grinding the flakes that remain after removal of most of the oil from cottonseed by the solvent extraction process. An excellent protein source for beef and dairy diets, cottonseed meal complements a variety of plant and animal proteins. Cottonseed meal also contains 40% bypass protein, which is valued in dairy lactation diets.

Cottonseed Hulls

Cottonseed hulls consist primarily of the outer covering of the cottonseed. They contain 2-8% highly digestible cotton linters (nearly 100% cellulose), and they are a very palatable and effective fiber source (low lignin). Cottonseed hulls are a superior ingredient for cattle receiver rations. They also fit well into feedlot and dairy rations to complement high concentrate ingredients. Available in loose or pelleted form, cottonseed hulls can also be fed to pasture cattle to limit intake of concentrates.

Whole Cottonseed

On an as-fed basis, whole delinted cottonseed contains approximately 18% ether extract and 20% crude protein. Providing a unique combination of slow release energy, protein, and effective fiber, whole cottonseed helps prevent rumen upset. It also serves as an excellent ingredient for high-performance lactation rations in dairy cattle.

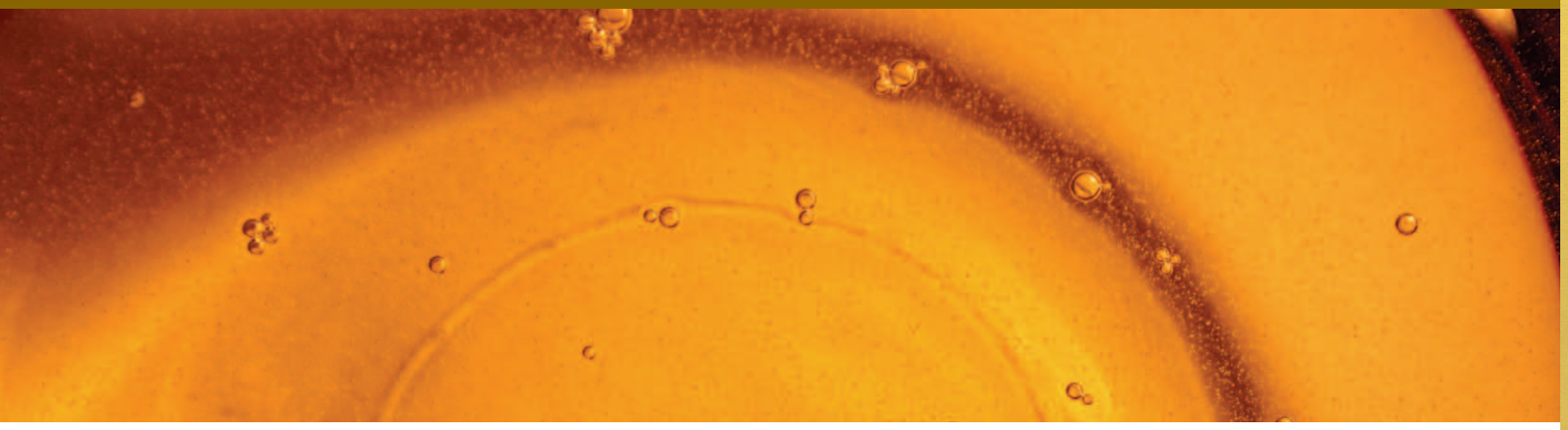
Sunflower Meal

Sunflower meal is obtained by grinding the residue remaining after extraction of most of the oil from whole sunflower seeds by a solvent extraction process. In beef and dairy diets, sunflower meal offers a palatable source of fiber and protein. It also contains a high "roughage factor," useful when designing beef and dairy nutrition programs. Furthermore, the nutrient profile of sunflower meal strongly complements soybean meal, creating a very effective combination in beef and dairy diets.

Linseed Meal

Linseed meal is a product obtained by grinding the flakes that remain after removal of most of the oil from flaxseed by the solvent extraction process. One of the oldest feed ingredients, linseed meal complements several ingredients in beef and dairy diets. Valued for its ability to produce sheen in the coats of cattle that consume it, linseed meal also contains mucilage compounds that positively affect rumen fermentation.

Oils/Energy Products



Vegetable Oil Refinery Lipid

Vegetable oil refinery lipid consists primarily of the salts of fatty acids, glycerides, and phosphatides from the refining of vegetable oil for edible use. A readily available source of energy for livestock, it acts in a similar manner to animal fat or vegetable oil in animal diets.

IFN 4-05-078 Vegetable oil refinery lipid

VEGETABLE OIL FATTY ACID PROFILE

	CORN OIL	SOY OIL	FLAX OIL
C:16 Palmitic	12.5	11.5	5.8
C:18 Stearic	2.5	4.0	4.2
C:18-1 Oleic	29.0	24.5	22.0
C:18-2 Linoleic	55.0	53.0	17.1
C:18-3 Linolenic	0.5	7.0	51.0
Iodine Value	125	125	183

Vegetable Oils (Soybean, Corn, & Flax)

Vegetable oil is obtained by extracting the oil from seeds commonly processed for edible use. Soybean and corn oil provide the main sources of vegetable oil available for livestock. Both soybean (51%) and corn (59%) oil contain high amounts of the essential fatty acid linoleic acid. These oils, primarily used to add energy to the diet, provide a high amount of unsaturated fatty acids, which may limit their use in ruminant diets. Vegetable oil supplies slightly more energy than animal fats and may be used to reduce dustiness in feeds. Another vegetable oil, flax oil, is starting to receive more interest because of its high alpha-linolenic acid (ALA, 18:3, w-3) content. ALA, a polyunsaturated omega-3 fatty acid, has many human health implications.

IFN 4-05-077 Vegetable oil

HFP

HFP high fat product is a consistent blend of corn and soybean co-products high in energy (fat) and fiber. Through a unique process, nearly half of the lipid content is rendered ruminally inert, resulting in a product that provides more energy into the dairy cow, without depressing fiber digestion. Almost one-half of the protein in HFP high fat product is rumen-bypass protein, so more natural intact protein gets into the small intestine and ultimately the cow. Highly palatable and available in an easy-to-handle pellet, HFP high fat product typically replaces some of the whole cottonseed or fat in dairy rations. It can be used in many types of animal feeds including high-energy equine rations due to its highly digestible fiber component and low starch level.

Wheat Processing

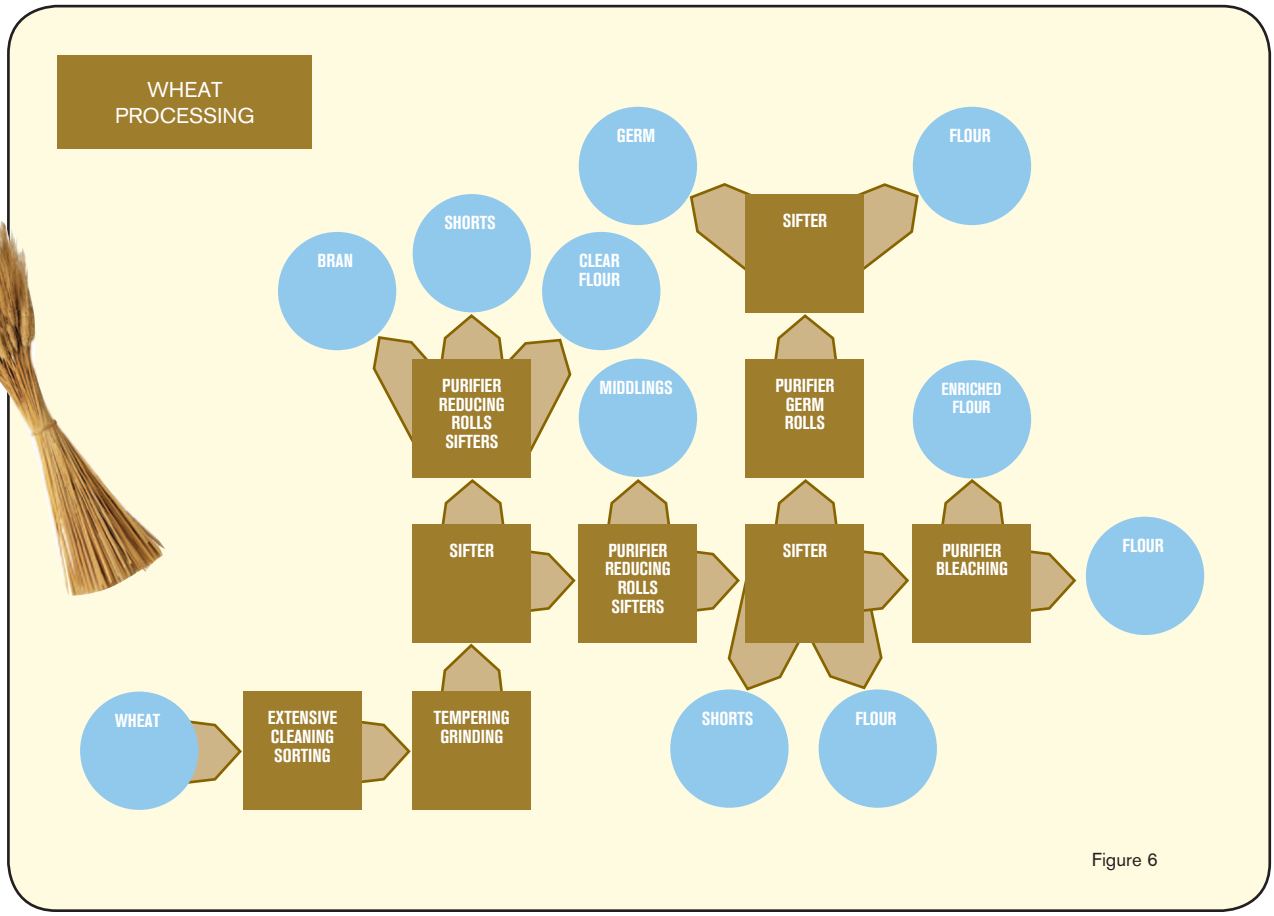


Figure 6

Wheat products for livestock and animal feed are obtained through the normal flour milling process (Figure 6). Wheat middlings consist of several grades of granular particles containing different proportions of endosperm, bran, and germ. Wheat red dog is a product that consists of the offal from the "tail of the mill" with some fine particles of wheat bran, wheat germ, and wheat flour. Wheat bran is the coarse outer covering of the wheat kernel that is separated from cleaned and scoured wheat in the milling process.

Wheat processing feed ingredients include wheat middlings, wheat bran, and wheat red dog.

Milling Products

Wheat Middlings

Wheat middlings are created from the commercial milling of wheat into flour. They consist of fine particles of wheat bran, wheat shorts, wheat germ, wheat flour, and some of the offal from the "tail of the mill." Utilized by ruminants for their protein, energy, and highly digestible NDF components, middlings often replace a portion of the grain and protein in diets. Widely used in swine diets, they improve pellet quality. Wheat middlings also provide a source of energy, protein, and minerals in equine and poultry diets.

IFN 4-05-205 Wheat flour byproduct less than 9.5% fiber

Wheat Red Dog

Wheat red dog is created from the commercial milling of wheat into flour. Consisting of the offal from the "tail of the mill" and fine particles of wheat bran, wheat germ, and wheat flour, red dog must not contain more than 4% crude fiber. Efficiently utilized by ruminants for its protein and energy, it typically replaces a portion of the grain and protein in diets. Wheat red dog also works effectively in swine and poultry diets, particularly pelleted diets where it improves pellet quality.

IFN 4-05-203 Wheat flour byproduct less than 4% fiber

Corn (Maize) Hominy

Corn hominy is produced from the manufacturing of pearl hominy, hominy grits, or table meal. A mixture of corn bran, corn germ, and part of the starchy portion of corn kernels, hominy typically replaces a portion of the grain in diets.

IFN 4-02-887 Maize grits byproduct (hominy feed)

Grain Sorghum Mill Feed (Milo Hominy)

Grain sorghum mill feed is produced from the manufacture of grain sorghum grits and refined meal and flour. A mixture of grain sorghum bran, grain sorghum germ, part of the starchy portion of grain sorghum kernels, or a mixture thereof, grain sorghum mill feed typically replaces a portion of the grain in diets.

IFN 4-04-385 Sorghum grits byproduct (milo hominy)

Corn (Maize) Screenings

Corn screenings are produced from the cleaning (screening) of corn. They contain 70% or more corn, including light and broken kernels, and provide a feed value much like that of corn. Screenings typically replace a portion of the grain in diets.

IFN 4-20-687 Maize screenings

ADM Malt Sprout Pellets

Made by removing and drying the rootlets and sprouts from malted barley for brewing, malt sprout pellets provide a nutritious and economical feed ingredient that can be incorporated into a variety of livestock rations. They can be used to meet the energy, protein, and fiber requirements in these diets.

Grains

ADM operates one of the largest and most advanced origination networks in the world. Our experienced trading and merchandising teams can originate what you need from grains produced in North America. Plus, our extensive transportation network delivers all over the country.

Corn (Maize) Grain

Corn grain is a major cereal grain used to supply energy in livestock diets. Considered the "gold" standard for cereal grains, corn grain offers a palatable energy source that is low in fiber. It contains no major anti-nutritional factors and can be fed with minimal processing. Ruminants efficiently consume whole, lightly cracked, rolled, or steam-flaked corn, while both swine and poultry consume corn that is rolled to a ground size of 600-900. Corn grain also works in some aquaculture and companion animal diets.

IFN 4-02-935 Maize yellow dent grain

Milo (Grain Sorghum)

Sorghum (milo) is a cereal grain primarily used in livestock diets to supply energy. Containing slightly more crude protein and similar energy to that of corn, sorghum is often used in a similar fashion as corn. The nutrient content of sorghum varies by region, variety, and growing conditions. Sorghum should be processed before use in livestock diets.

IFN 4-20-893 Sorghum grain

Wheat

Wheat is a cereal grain primarily grown for human food products, however a sizable amount is used in the feed industry. It contains slightly more protein and lysine but a similar energy value to that of corn. The feeding value performs slightly better than corn when fed in limited amounts. Avoid over processing because wheat has a tendency to flour and form small fine particles. Over processing will also reduce palatability and lead to consumption and handling problems. While wheat improves pellet quality, the non-starch polysaccharide (NSP) content may limit inclusion rate in poultry diets unless using enzymes.

IFN 4-05-268 Wheat hard grain

Barley

Barley is a palatable cereal grain primarily used in livestock diets to supply energy. It provides slightly more crude protein and fiber than corn. Although it contains less energy than corn, it can be used in a similar fashion. However, it should be milled before use in livestock diets. In addition, barley has a higher relative feed value to corn in ruminant diets than in swine and poultry because of its fiber content.

IFN 4-00-572 Barley grain, two row

Specialty Feed Ingredients Process

ADM's fermentation experience and abundant supply of raw materials make it possible to convert our resources into premium specialty products for the feed industry. ADM is committed to supplying superior amino acids worldwide. Our premium amino acids offer the user formulation flexibility, nutrient consistency, consistently lower formulation costs, and environmental benefits.

The process of large-scale commercial production of amino acids involves the isolation and development of microorganisms that oxidatively ferment glucose to amino acids.

ADM began large-scale production of amino acids at our Specialty Feed Ingredients plant, in Decatur, Illinois, in 1989. Thanks to in-house raw material (dextrose) for fermentation, the scale of the production operation, and energy from our co-generation plant, we are able to supply the industry quality, feed-grade amino acids.

Our ADM L-Lysine HCl, Liquid L-Lysine 50%, and ADM L-Threonine are all composed of 100% isomerically pure L-amino acids, which translates into 100% bioavailability for swine, poultry, and other animals.

In addition to amino acids, we create a range of high-value ingredients like lecithin, xanthan gum, organic acids, and more, which are derived from soy, corn, and wheat.

Special Use Products

L-Lysine, Supplemental

ADM produces two forms of supplemental lysine for use in the feed industry, L-Lysine Monohydrochloride 98.5% Feed Grade and L-Lysine Liquid 50% Feed Grade. L-lysine offers a cost-effective way to supplement feedstuffs that are low or deficient in lysine. Primarily used in swine and poultry diets, L-lysine also meets supplementation needs in aquaculture diets. Dairy cattle diets can also benefit from L-lysine supplementation. Transported in bulk and applied with a computer-controlled metering system, L-Lysine Liquid 50% offers a viable alternative to traditional dry L-lysine. Supplementing diets with L-lysine and L-threonine, which reduces dietary crude protein, can also lower nitrogen excretion and improve nitrogen efficiency.

IFN 5-19-118 L-Lysine Monohydrochloride
L-Lysine Liquid 21 CFR 582.5411

L-Threonine 98.5% Feed Grade

ADM L-Threonine 98.5% Feed Grade is a highly purified, granular form of supplemental L-threonine. Used with L-lysine, L-threonine helps formulate diets closer to animals' amino acid requirements, reduce dietary crude protein, decrease nitrogen excretion, and improve nitrogen efficiency. Recent threonine research supports increasing the use of supplemental L-threonine in swine and poultry diets.

IFN 5-08-092 L-Threonine

NovaXan™ Xanthan Gum

NovaXan™ xanthan gum, a polysaccharide, offers unique physical qualities as a stabilizer, emulsifier, thickener, and/or suspending agent in milk replacers and liquid feed applications. Its ability to gel and increase the viscosity of liquids helps hold ingredients in suspension that may otherwise settle out of the mix.

IFN 8-15-818 Xanthan gum

Organic Acids

Lactic and citric acids are organic acidulants that have been in the food industry for many years. In animal feeds, organic acids offer an alternative to antibiotics. By lowering the diet and gastrointestinal tract pH, these acids help reduce the acid-sensitive pathogen load. Lactic and citric acids can also be added to milk replacers and water to help adjust pH.

IFN 8-01-233 Citric acid
Lactic acid has been evaluated GRAS under 21 CFR 582.1061

Special Use Products

Ardex® Soy Protein Isolate

Ardex® soy protein isolate is a consistent, high-quality vegetable protein with low allergenicity characteristics. Manufactured from edible soy flakes through a series of unique processing steps, Ardex soy protein isolate contains 90% crude protein. Anti-nutritional factors are reduced or eliminated in the process, resulting in a high-protein soy product well suited for young animal diets and milk replacers. Ardex soy protein isolate also provides excellent water dispersion characteristics, a high protein content, and an excellent amino acid profile, which make it a great replacement for fishmeal in many diets.

IFN 5-24-811 Soy protein isolate

Decanox™ MTS-70 Mixed Tocopherols

Decanox™ MTS-70 mixed tocopherols are natural-source, fat-soluble antioxidants extracted and concentrated from edible vegetable oils. They contain an ideal mixture of d-alpha, d-beta, d-gamma, and d-delta tocopherols. Used in food, feed, and industrial applications, Decanox MTS-70 mixed tocopherols delay the onset of rancidity in fats and oils while extending shelf life and fulfilling stabilization needs.

Wheat Gluten

Wheat gluten is obtained from wheat flour by drying freshly washed gluten under controlled temperatures. Its high protein content (75%) makes it an attractive ingredient for young swine, aquaculture, dog, and cat diets. Wheat gluten also possesses unique hydration properties that make it ideal for many applications in dog and cat diets.

Wheat gluten has been evaluated GRAS under 21 CFR Part 184.1322

Special Use Products

Lecithin

Soy lecithin is a mixture of phospholipids obtained from soybean oil through the degumming process. It typically contains phosphatidylcholine (PC) 23%, phosphatidylethanolamine (PI) 14%, phosphatidic acid (PA) 8%, and other lipids. Lecithin's phospholipids content makes it a functional ingredient and an important source of phosphorus, choline, and energy. In addition, its emulsification properties aid in the absorption of fats and fat-soluble vitamins.

IFN 8-08-041 Lecithin

Soycomil® Soy Protein Concentrate

Soycomil® soy protein concentrate is a consistent, high-quality vegetable protein with low allergenicity characteristics. Manufactured from soy flakes through a unique combination of processing steps that remove the soluble sugars and anti-nutritional factors, Soycomil soy protein concentrate serves as an excellent protein source for young ruminant, swine, poultry, and aquaculture diets. Its high protein content (65% crude protein) and excellent amino acid profile make it an ideal replacement protein for fishmeal. Soycomil soy protein concentrate-based milk replacers offer an economical alternative to milk-based replacers. Available in both powdered and granular forms.

IFN 5-32-183 Soy protein concentrate


ADM
WHEAT
MIDD
ADM
HREONINE
ADM
SOYBEAN
MEAL
ADM
LYSINE
ADM
CORN GLUTEN
MEAL

TYPICAL NUTRITIONAL PROFILES

CORN CO-PRODUCT INGREDIENTS

NUTRIENT[1]	CORN GLUTEN MEAL	CORN GLUTEN FEED	WET CORN GLUTEN FEED	CORN GERM MEAL
DM	90.0%	90.0%	45.0%	90.0%
Crude Protein	60.2%	21.5%	7.45%	24.0%
Fat	2.0%	3.0%	1.6%	2.7%
Fiber	2.5%	10.0%	3.78%	9.5%
NDF	5.0%	33.3%	20.0%	62.0%
ADF	6.0%	10.7%	5.0%	17.7%
RUP[2]	55.0%	30.0%	25.0%	—
Ash	6.0%	7.8%	1.6%	2.8%
Ca	0.05%	0.16%	0.04%	0.01%
P	0.44%	0.83%	0.30%	0.43%
Avail P	15.0%	59.0%	—	—
K	0.20%	0.98%	0.68%	0.38%
Mg	0.08%	0.30%	0.23%	0.21%
S	0.80%	0.70%	0.22%	0.28%
Cu	26 ppm	48 ppm	2.0 ppm	6 ppm
Fe	282 ppm	460 ppm	110 ppm	60 ppm
Mn	4 ppm	24 ppm	6.0 ppm	9 ppm
Zn	33 ppm	70 ppm	20 ppm	70 ppm
NE m[3]	1.00 mcal/lb	0.88 mcal/lb	0.92 mcal/lb	0.80 mcal/lb
NE g[3]	0.69 mcal/lb	0.59 mcal/lb	0.62 mcal/lb	0.51 mcal/lb
NE L[3]	0.94 mcal/lb	0.87 mcal/lb	0.85 mcal/lb	0.77 mcal/lb
TDN[3]	89%	80%	82%	74%
ME Poultry	1686 kcal/lb	790 kcal/lb	—	750 kcal/lb
ME Swine	1744 kcal/lb	1184 kcal/lb	—	1360 kcal/lb
NE Swine	1159 kcal/lb	790 kcal/lb	—	900 kcal/lb
Lys	1.02%	0.63%	0.31%	0.94%
Met	1.43%	0.35%	0.14%	0.46%
Cys	1.09%	0.46%	—	0.40%
TSAA	2.52%	0.81%	—	0.86%
Thr	2.08%	0.74%	—	0.86%
Trp	0.31%	0.17%	—	0.23%
Ile	2.48%	0.66%	—	0.81%
Val	2.79%	0.94%	—	1.32%
Arg	1.93%	0.75%	—	1.58%

[1] As-is basis. [2] RUP = rumen undegradable protein. [3] Dry matter basis.

NUTRIENT[1]	DISTILLERS DRIED GRAINS/ SOLUBLES	WET DISTILLERS GRAINS (WDGS)	MODIFIED WET DISTILLERS GRAINS (MWDGS)	CONDENSED FERMENTED CORN EXTRACTIVES (STEEPWATER)
DM	91.0%	35.2%	48.0%	50.2%
Crude Protein	26.5%	10.0%	14.0%	17.0%
Fat	8.4%	3.1%	3.0%	2.7%
Fiber	8.5%			—
NDF	34.0%	17.21%	13.5%	—
ADF	16.3%	7.69%	7.5%	—
RUP[2]	56.0%	N/A	N/A	–
Ash	4.5%	2.27%	3.0%	5.8%
Ca	0.20%	0.01%	0.05%	0.03%
P	0.77%	0.17%	0.38%	0.94%
Avail P	77.0%			No value
K	0.84%	0.16%	0.58%	1.37%
Mg	0.19%	0.35%	0.16%	0.45%
S	0.60%	0.18%	0.45%	0.90%
Cu	57 ppm	2 ppm	3 ppm	2 ppm
Fe	257 ppm	31 ppm	72 ppm	54 ppm
Mn	24 ppm	3 ppm	11 ppm	18 ppm
Zn	80 ppm	13 ppm	34 ppm	61 ppm
NE m[3]	0.94 mcal/lb	0.33 mcal/lb	0.43 mcal/lb	1.00 mcal/lb
NE g[3]	0.64 mcal/lb	0.25 mcal/lb	0.29 mcal/lb	0.72 mcal/lb
NE L[3]	0.90 mcal/lb	0.30 mcal/lb	0.40 mcal/lb	0.90 mcal/lb
TDN[3]	85%	25%	39%	91%
ME Poultry	1125 kcal/lb			—
ME Swine	1275 kcal/lb			—
NE Swine	937 kcal/lb			—
Lys	0.62%			0.67%
Met	0.50%			0.32%
Cys	0.52%			0.18%
TSAA	1.02%			0.50%
Thr	0.94%			0.52%
Trp	0.25%			0.05%
Ile	1.03%			0.51%
Val	1.30%			0.80%
Arg	1.13%			0.79%

[1] As-is basis. [2] RUP = rumen undegradable protein. [3] Dry matter basis.

TYPICAL NUTRITIONAL PROFILES

SOYBEAN INGREDIENTS

NUTRIENT[1]	SOYBEAN MEAL DEHULLED	SOYBEAN HULLS	SOY FLOUR
DM	88.0%	89.0%	90.0%
Crude Protein	47.5%	10.0%	50.0%
Fat	1.0%	1.0%	0.8%
Fiber	3.5%	36.5%	3.0%
NDF	8.9%	61.0%	—
ADF	5.4%	45.5%	—
RUP[2]	31.0%	23.0%	—
Ash	6.0%	4.6%	5.0%
Ca	0.34%	0.45%	0.32%
P	0.69%	0.19%	0.75%
Avail P	23.0%	—	—
K	2.14%	1.16%	2.30%
Mg	0.30%	0.23%	0.28%
S	0.44%	0.08%	—
Cu	20 ppm	16 ppm	20 ppm
Fe	176 ppm	295 ppm	119 ppm
Mn	36 ppm	10 ppm	34 ppm
Zn	55 ppm	22 ppm	50 ppm
NE m[3]	0.98 mcal/lb	0.80 mcal/lb	0.79 mcal/lb
NE g[3]	0.67 mcal/lb	0.50 mcal/lb	0.53 mcal/lb
NE L[3]	0.91 mcal/lb	0.75 mcal/lb	0.75 mcal/lb
TDN[3]	87%	68%	—
ME Poultry	1109 kcal/lb	340 kcal/lb	1020 kcal/lb
ME Swine	1536 kcal/lb	400 kcal/lb	1405 kcal/lb
NE Swine	918 kcal/lb	290 kcal/lb	892 kcal/lb
Lys	3.09%	0.71%	3.30%
Met	0.68%	0.12%	0.70%
Cys	0.68%	0.21%	0.75%
TSAA	1.36%	0.33%	1.45%
Thr	1.81%	0.37%	2.16%
Trp	0.68%	0.08%	0.70%
Ile	2.19%	0.37%	2.25%
Val	2.26%	0.47%	2.45%
Arg	3.47%	0.48%	3.90%

[1] As-is basis. [2] RUP = rumen undegradable protein. [3] Dry matter basis.

NUTRIENT[1]	SOYCOMIL® SOY PROTEIN CONCENTRATE	ARDEX® AF SOY PROTEIN ISOLATE	HFP HIGH FAT PRODUCT
DM	90.0%	92.0%	90.0%
Crude Protein	65.0%	85.8%	17%
Fat	0.6%	0.6%	18%
Fiber	4.0%	1.0%	18%
NDF	—	—	38%
ADF	—	—	26%
RUP[2]	—	—	
Ash	6.5%	6.0%	9%
Ca	0.35%	0.15%	0.34%
P	0.80%	0.65%	0.40%
Avail P	30.0%	—	
K	2.20%	0.27%	0.88%
Mg	0.32%	0.08%	0.25%
S	—	0.71%	0.13%
Cu	13 ppm	14 ppm	2 ppm
Fe	110 ppm	137 ppm	
Mn	—	5 ppm	24 ppm
Zn	30 ppm	34 ppm	43 ppm
NE m[3]	—	—	1.10 mcal/lb
NE g[3]	—	—	0.80 mcal/lb
NE L[3]	—	—	1.00 mcal/lb
TDN[3]	—	—	83%
ME Poultry	1590 kcal/lb	—	
ME Swine	1590 kcal/lb	1618 kcal/lb	
NE Swine	909 kcal/lb	909 kcal/lb	
Lys	4.23%	5.26%	
Met	0.91%	1.01%	
Cys	0.98%	1.19%	
TSAA	1.89%	2.20%	
Thr	2.73%	3.17%	
Trp	0.78%	1.08%	
Ile	3.19%	4.25%	
Val	3.38%	4.21%	
Arg	4.94%	6.87%	

[1] As-is basis. [2] RUP = rumen undegradable protein. [3] Dry matter basis.

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TYPICAL NUTRITIONAL PROFILES

COTTONSEED INGREDIENTS

NUTRIENT[1]	COTTONSEED MEAL 41%	COTTONSEED HULLS	WHOLE COTTONSEED
DM	90.0%	90.0%	91.0%
Crude Protein	41.4%	3.8%	20.7%
Fat	1.5%	1.5%	18.4%
Fiber	11.0%	43.0%	22.0%
NDF	28.4%	82.0%	43.0%
ADF	19.4%	66.0%	35.3%
RUP2	43.0%	50.0%	27.0%
Ash	6.3%	2.6%	3.5%
Ca	0.19%	0.14%	0.13%
P	1.06%	0.08%	0.51%
Avail P	36.0%	—	—
K	1.40%	1.02%	1.04%
Mg	0.50%	0.13%	0.32%
S	0.31%	0.07%	0.18%
Cu	15 ppm	11 ppm	6 ppm
Fe	184 ppm	119 ppm	46 ppm
Mn	20 ppm	108 ppm	14 ppm
Zn	70 ppm	20 ppm	30 ppm
NE m[3]	0.81 mcal/lb	0.31 mcal/lb	1.01 mcal/lb
NE g[3]	0.53 mcal/lb	0.07 mcal/lb	0.70 mcal/lb
NE L[3]	0.79 mcal/lb	0.45 mcal/lb	1.01 mcal/lb
TDN[3]	75%	45%	90%
ME Poultry	880 kcal/lb	—	—
ME Swine	1052 kcal/lb	—	—
NE Swine	602 kcal/lb	—	—
Lys	1.72%	—	—
Met	0.67%	—	—
Cys	0.70%	—	—
TSAA	1.37%	—	—
Thr	1.36%	—	—
Trp	0.48%	—	—
Ile	1.30%	—	—
Val	1.78%	—	—
Arg	4.55%	—	—

[1] As-is basis. [2] RUP = rumen undegradable protein. [3] Dry matter basis.

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CANOLA, SUNFLOWER, & LINSEED MEAL

NUTRIENT[1]	CANOLA MEAL	SUNFLOWER MEAL 30%	SUNFLOWER MEAL 35%	LINSEED MEAL
DM	93.0%	90.0%	90.0%	90.0%
Crude Protein	36.5%	30.0%	35.0%	36.0%
Fat	3.5%	1.3%	0.8%	2.0%
Fiber	12.0%	25.0%	20.0%	10.0%
NDF	23.7%	42.0%	—	23.9%
ADF	17.0%	30.3%	—	15.0%
RUP[2]	28.0%	26.0%	28.5%	35.0%
Ash	6.8%	6.0%	6.0%	6.5%
Ca	0.62%	0.35%	0.35%	0.39%
P	1.03%	0.90%	0.95%	0.83%
Avail P	21.0%	3.0%	—	—
K	1.24%	1.10%	1.05%	1.26%
Mg	0.50%	0.60%	0.67%	0.54%
S	0.62%	0.30%	0.38%	0.39%
Cu	4 ppm	26 ppm	30 ppm	22 ppm
Fe	204 ppm	254 ppm	225 ppm	270 ppm
Mn	52 ppm	41 ppm	44 ppm	41 ppm
Zn	54 ppm	66 ppm	87 ppm	66 ppm
NE m[3]	0.73 mcal/lb	0.54 mcal/lb	0.65 mcal/lb	0.85 mcal/lb
NE g[3]	0.45 mcal/lb	0.24 mcal/lb	0.35 mcal/lb	0.56 mcal/lb
NE L[3]	0.71 mcal/lb	0.49 mcal/lb	0.61 mcal/lb	0.81 mcal/lb
TDN[3]	69%	58%	62%	78%
ME Poultry	940 kcal/lb	700 kcal/lb	1000 kcal/lb	—
ME Swine	1210 kcal/lb	850 kcal/lb	1100 kcal/lb	1231 kcal/lb
NE Swine	732 kcal/lb	560 kcal/lb	—	836 kcal/lb
Lys	2.16%	1.12%	1.25%	1.24%
Met	0.73%	0.69%	0.75%	0.59%
Cys	0.88%	0.57%	0.62%	0.59%
TSAA	1.61%	1.26%	1.37%	1.18%
Thr	1.56%	1.06%	1.22%	1.26%
Trp	0.45%	0.40%	0.42%	0.52%
Ile	1.5%	1.20%	1.39%	1.56%
Val	1.93%	1.51%	1.73%	1.74%
Arg	2.25%	2.36%	2.80%	2.97%

[1] As-is basis. [2] RUP = rumen undegradable protein. [3] Dry matter basis.

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TYPICAL NUTRITIONAL PROFILES

GRAIN INGREDIENTS

NUTRIENT[1]	WHEAT (SOFT RED) GRAIN	WHEAT MIDDLINGS	WHEAT RED DOG	WHEAT GLUTEN	CORN (MAIZE) GRAIN
DM	89.0%	89.0%	88.0%	91.8%	86.0%
Crude Protein	11.5%	14.5%	15.3%	75.2%	7.7%
Fat	1.9%	4.2%	3.3%	1.9%	3.7%
Fiber	3.3%	8.5%	2.6%		2.0%
NDF	0.8%	35.6%	18.7%		9.6%
ADF	12.0%	10.7%	4.3%		2.8%
RUP[2]	—	21.0%	—		—
Ash	1.8%	5.0%	2.2%		1.3%
Ca	0.04%	0.12%	0.07%	0.14%	0.03%
P	0.39%	0.93%	0.57%	0.26%	0.28%
Avail P	50.0%	41.0%	—		14.0%
K	0.46%	1.06%	0.63%		0.33%
Mg	0.11%	0.41%	0.16%		0.12%
S	0.16%	0.17%	0.24%		0.13%
Cu	8 ppm	10 ppm	6 ppm		3 ppm
Fe	32 ppm	84 ppm	46 ppm		29 ppm
Mn	38 ppm	100 ppm	55 ppm		7 ppm
Zn	47 ppm	92 ppm	65 ppm		18 ppm
NE m[3]	0.98 mcal/lb	0.73 mcal/lb	—		0.98 mcal/lb
NE g[3]	0.67 mcal/lb	0.45 mcal/lb	—		0.67 mcal/lb
NE L[3]	0.90 mcal/lb	0.71 mcal/lb	—		0.91 mcal/lb
TDN[3]	87%	69%	—		89%
ME Poultry	1415 kcal/lb	960 kcal/lb	1167 kcal/lb		1519 kcal/lb
ME Swine	1564 kcal/lb	1375 kcal/lb	1452 kcal/lb		1551 kcal/lb
NE Swine	1088 kcal/lb	964 kcal/lb	1017 kcal/lb		1086 kcal/lb
Lys	0.38%	0.64%	0.66%	1.30%	0.24%
Met	0.22%	0.25%	0.23%	1.19%	0.16%
Cys	0.27%	0.36%	0.37%	1.50%	0.17%
TSAA	0.49%	0.61%	0.60%	2.69%	0.33%
Thr	0.39%	0.52%	0.50%	2.31%	0.27%
Trp	0.26%	0.21%	0.10%	0.57%	0.06%
Ile	0.45%	0.53%	0.55%	2.33%	0.25%
Val	0.57%	0.78%	0.72%	2.76%	0.35%
Arg	0.50%	1.15%	0.96%	2.63%	0.35%

[1] As-is basis. [2] RUP = rumen undegradable protein. [3] Dry matter basis.

NUTRIENT[1]	CORN (MAIZE) HOMINY	CORN SCREENINGS	BARLEY (TWO ROW) GRAIN	MALT SPROUT PELLETS	SORGHUM (MILO) GRAIN	SORGHUM (MILO) MILL FEED
DM	87.0%	87.0%	89.0%	90.8%	89.0%	89.0%
Crude Protein	9.4%	7.7%	10.5%	17.7%	9.4%	11.0%
Fat	4.2%	2.9%	1.9%	1.9%	2.9%	6.4%
Fiber	6.0%	—	3.0%	13.3%	2.0%	6.9%
NDF	12.6%	12.4%	18.6%	43.3%	18.0%	12.5%
ADF	4.5%	3.7%	7.0%	18.14%	8.3%	5.5%
RUP[2]	—	—	—	N/A	—	—
Ash	1.6%	1.3%	2.6%	5.7%	1.8%	2.6%
Ca	0.02%	0.03%	0.06%	0.17%	0.03%	0.02%
P	0.26%	0.19%	0.36%	0.42%	0.29%	0.40%
Avail P	14.0%	—	30.0%		20.0%	—
K	0.32%	0.23%	0.47%	0.95%	0.35%	0.43%
Mg	0.11%	0.10%	0.12%	0.14%	0.15%	0.21%
S	0.13%	0.08%	0.15%	0.33%	0.08%	0.01%
Cu	2 ppm	3 ppm	8 ppm	9 ppm	5 ppm	3 ppm
Fe	64 ppm	92 ppm	88 ppm	195 ppm	45 ppm	69 ppm
Mn	10 ppm	7 ppm	16 ppm	48 ppm	15 ppm	24 ppm
Zn	15 ppm	14 ppm	15 ppm	53 ppm	15 ppm	17 ppm
NE m[3]	1.00 mcal/lb	0.85 mcal/lb	0.92 mcal/lb	0.68 mcal/lb	0.88 mcal/lb	1.02 mcal/lb
NE g[3]	0.69 mcal/lb	0.58 mcal/lb	0.62 mcal/lb	0.43 mcal/lb	0.59 mcal/lb	0.72 mcal/lb
NE L[3]	0.99 mcal/lb	0.84 mcal/lb	0.84 mcal/lb	0.66 mcal/lb	0.82 mcal/lb	1.01 mcal/lb
TDN[3]	89%	76%	83%	63.7%	81%	1.01 mcal/lb
ME Poultry	1316 kcal/lb	—	1197 kcal/lb		1491 kcal/lb	—
ME Swine	1459 kcal/lb	—	1319 kcal/lb		1514 kcal/lb	—
NE Swine	1027 kcal/lb	—	1047 kcal/lb		1022 kcal/lb	—
Lys	0.29%	0.24%	0.36%		0.22%	0.34%
Met	0.19%	0.18%	0.17%		0.17%	0.19%
Cys	0.22%	0.19%	0.20%		0.17%	0.22%
TSAA	0.41%	0.37%	0.37%		0.34%	0.41%
Thr	0.32%	0.28%	0.34%		0.31%	0.37%
Trp	0.08%	0.06%	0.13%		0.10%	0.09%
Ile	0.32%	0.27%	0.37%		0.37%	0.40%
Val	0.45%	0.38%	0.49%		0.46%	0.57%
Arg	0.47%	0.35%	0.48%		0.38%	0.57%

[1] As is basis—References: Swine NRC, 1998; Dairy NRC, 2001; ADM Data.
[2] RUP = rumen undegradable protein.
[3] Dry matter basis.

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TYPICAL NUTRITIONAL PROFILES

ORGANIC ACIDS

NUTRIENT	CITRIC ACID, ANHYDROUS*	POTASSIUM LACTATE 60%*	SODIUM LACTATE 60%*	LACTIC ACID 50%*	LACTIC ACID 80%*	LACTIC ACID 88%*
Grade	USP/FCC	FCC	FCC		FCC	USP/FCC
Concentration	99.5%	60%	60%	50%	80%	88%
Physical Form	Granular	Liquid	Liquid	Liquid	Liquid	Liquid

*Typical amount per 100 g.

TYPICAL NUTRITIONAL PROFILES

VEGETABLE LECITHINS

NUTRIENT	YELKIN	FEED-GRADE LECITHIN	YELKINOL FEED-GRADE DEOILED LECITHIN
Moisture	1.0%	2.0%	3.0%
Acetone insolubles, min.	62.0%	50.0%	95.0%
Appearance	Fluid	Fluid	Fluid
Phosphorous	1.9-2.0%	1.5-1.8%	1.9-2.2%
Phosphatidylcholine	14-17%	11-15%	20-23%
Phosphatidylinositol	8-10%	6-9%	8-10%
Packaging	204 kg drums 1 ton totes Bulk: tank wagons or railcars	Bulk: tank wagons or railcars	20 kg boxes 50 kg drums

*Typical composition.

TYPICAL NUTRITIONAL PROFILES

VEGETABLE OILS

NUTRIENT	CORN OIL	SOYBEAN OIL	VEGETABLE OIL REFINERY LIPIDS
DM	100%	100%	100%
Fat	99.5%	99.5%	99.0%
NE m[1]	2.36 mcal/lb	2.36 mcal/lb	—
NE g[1]	1.69 mcal/lb	1.69 mcal/lb	—
NE L[1]	2.65 mcal/lb	2.65 mcal/lb	—
TDN	177%	177%	—
ME, Poultry[2]	3989 kcal/lb	3989 kcal/lb	
ME, Swine[2]	3812 kcal/lb	3812 kcal/lb	3679[3] kcal/lb
NE, Swine[2]	2431 kcal/lb	2431 kcal/lb	2348 kcal/lb

[1] On a dry matter basis.
[2] Swine NRC Nutrient Requirements of Swine, 1998, Poultry NRC 1994.
[3] Calculated based on equation of Powles, et al. 1995.

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