

ADM INGREDIENTS CATALOG

FEED & PET FOOD



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INTRODUCTION TO ADM



ADM is one of the largest agricultural processors and ingredient providers in the world. An unwavering dedication to quality and innovation has made ADM Animal Nutrition™ a leading provider of nutritional supplements and feeds for livestock and specialty animal markets. 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 our industry and have developed ingredient solutions that include everything from basic commodities to a range of specialty ingredients that help our customers optimize production, profits and animal health.

THE KEY IS PROCESSING

Our feed and pet food ingredients include products processed from grains and oilseeds. These ingredients are used as sources of protein, energy, fiber, carbohydrates and functional ingredients to economically formulate feeds to meet dietary and production requirements.

Using 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 minimizing environmental impact.

OUR COMMITMENT TO THE FEED INDUSTRY

ADM's expansive ingredient sourcing network, manufacturing skills and blending capabilities provide valuable resources, allowing ADM Animal Nutrition to serve all sectors of the livestock, poultry, specialty and companion animal markets. Our vast ingredient offering and blending services provide excellent flexibility and efficiency opportunities for feed and pet food manufacturers. ADM's variety of ingredients and products for commercial livestock producers and integrators are developed to aid in the efficient production of meat, milk and eggs for human consumption.

RELIABLE, QUALITY INGREDIENT SOLUTIONS



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 and pet food.

Livestock do not adapt well to sudden 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 feed and pet foods 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.

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.

ON-TIME PRODUCT DELIVERY

As one of the largest feed and pet food 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/trailers, railcars, river barges and ocean-going vessels can assure customers of on-time delivery to virtually any location.

RESEARCH & DEVELOPMENT

The feed and pet food 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 and pet food 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 and pet food ingredient supplier that can help improve the quality, nutritional standards and production efficiency of your feed and pet food products, call ADM today.

WHEAT PROCESSING



Wheat products for feed and pet food are obtained through the normal flour milling process (Figure 1). 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 germ and wheat flour.

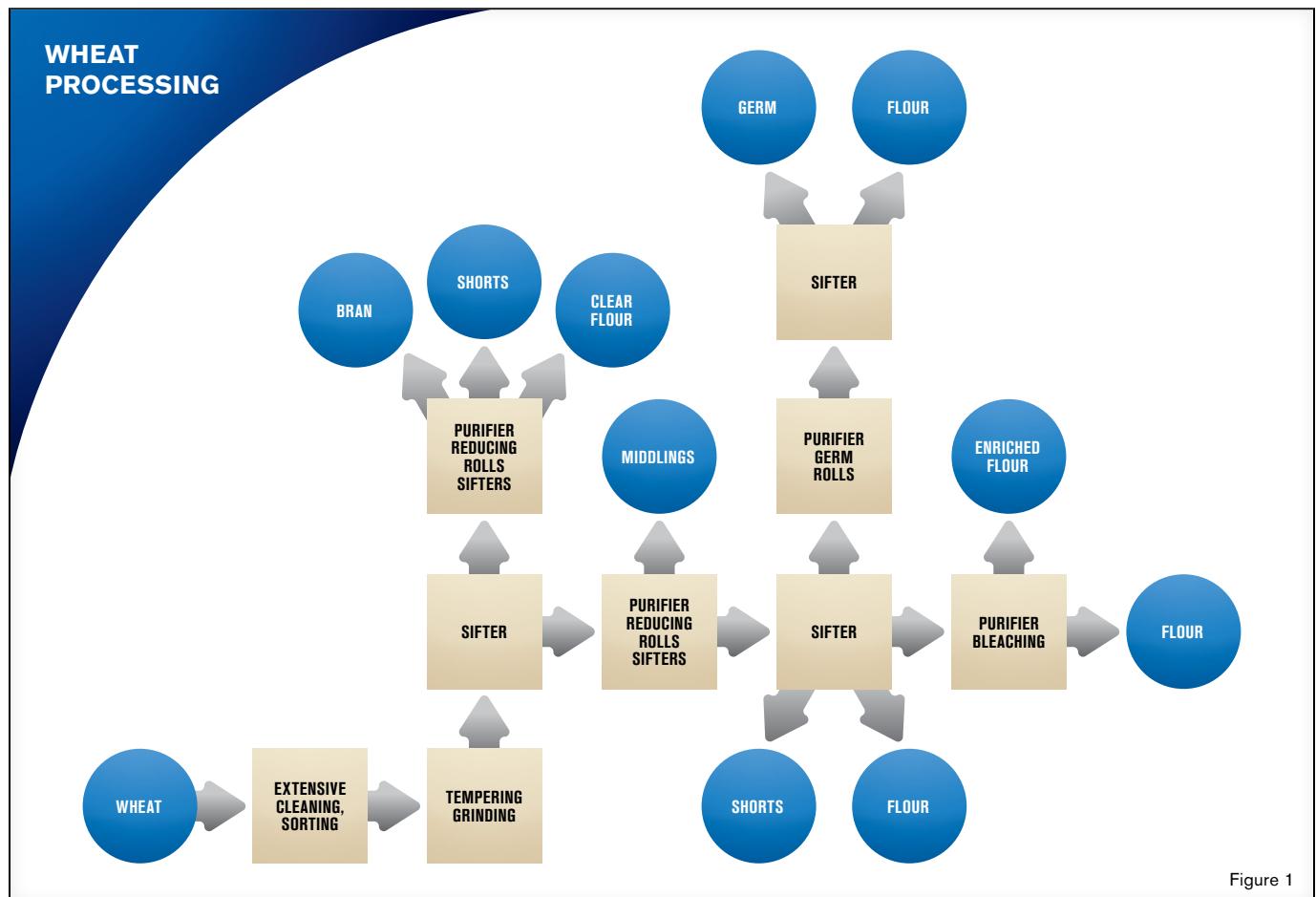


Figure 1

Wheat feed and pet food ingredients include wheat middlings and wheat red dog.

MILLING PRODUCTS



WHEAT MIDLINGS

Wheat middlings are created from the commercial milling of wheat into flour. They consist of fine particles of 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 neutral detergent fiber (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.

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 germ and wheat flour, red dog must not contain more than 4 percent 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.

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.

GRAIN SORGHUM MILL FEED (MILO HOMINY)

Grain sorghum mill feed and pet food is produced from the manufacturing 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.

CORN (MAIZE) SCREENINGS

Corn screenings are produced from the cleaning (screening) of corn. They contain 70 percent or more corn, including light and broken kernels, and provide a feed and pet food value much like that of corn. Screenings typically replace a portion of the grain in 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 globally. Plus, our extensive transportation network delivers all over the world.

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 microns. Corn grain also works in some aquaculture and companion animal diets.

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, and should be processed before use in livestock diets. While the nutrient content of sorghum varies by region, variety and growing conditions, red sorghum grains are best utilized for finishing beef, poultry and swine diets.

WHEAT

Wheat is a cereal grain primarily grown for human food products; however, a sizable amount is used in the feed and pet food 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. Because wheat has a tendency to flour and form small, fine particles, overprocessing can reduce palatability and lead to consumption and handling problems, and should therefore be avoided. While wheat improves pellet quality, the non-starch polysaccharide (NSP) content may limit inclusion rate in poultry diets unless using enzymes.

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 and pet food value to corn in ruminant diets than in swine and poultry because of its fiber content.

CORN PROCESSING

WET CORN MILLING PROCESS

The wet corn milling process (Figure 2) begins when shelled corn is brought to the processing plant, sampled, cleaned and then conveyed to large tanks called steepers. 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 percent 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 percent. 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. Yeast is recovered from the fermentation process used to produce alcohol, then dried.

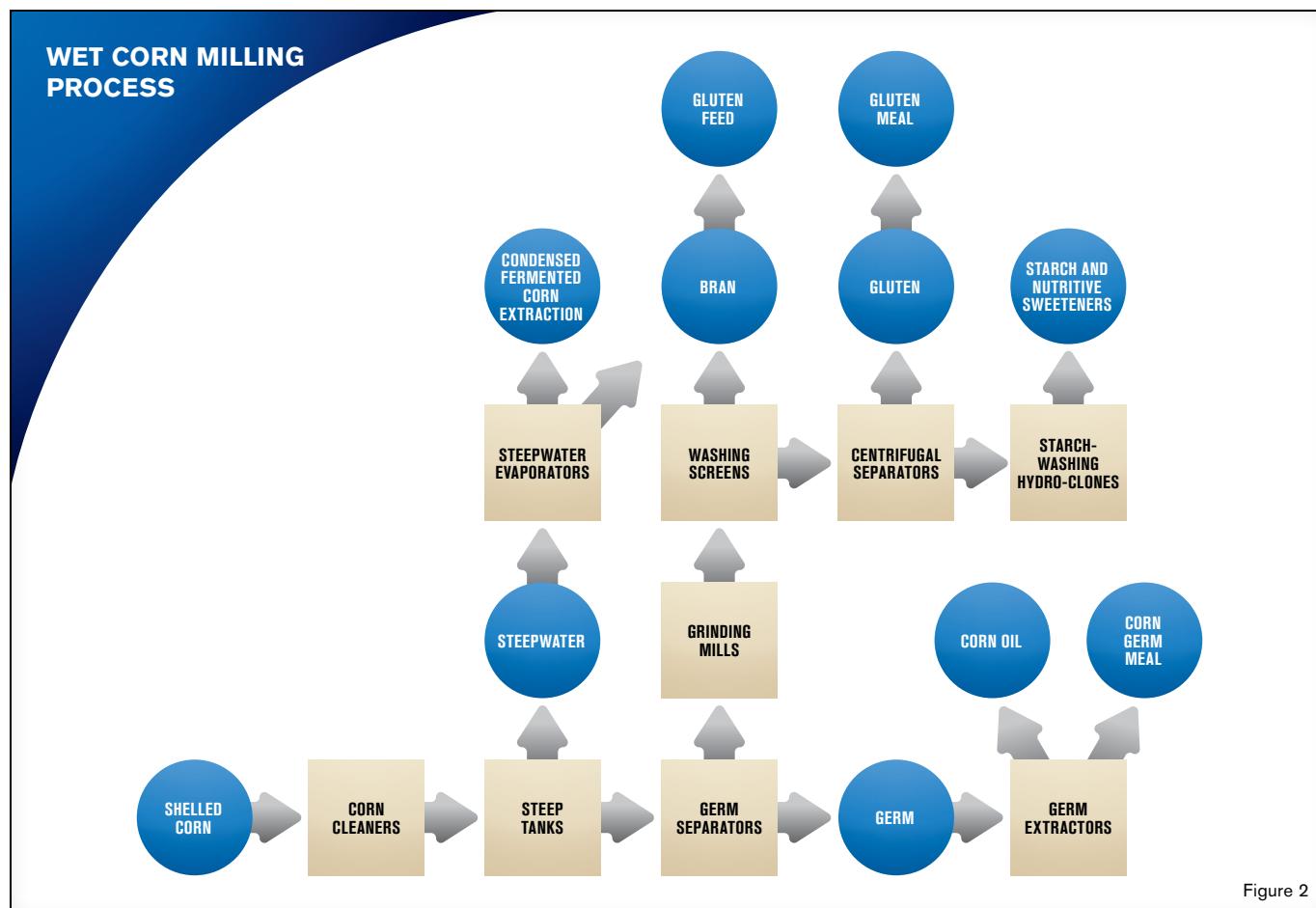


Figure 2

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

CORN PROCESSING (CONT.)

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 3) 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 the 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. During processing, some corn oil is removed to balance the protein and energy content of the final feed and pet food products.

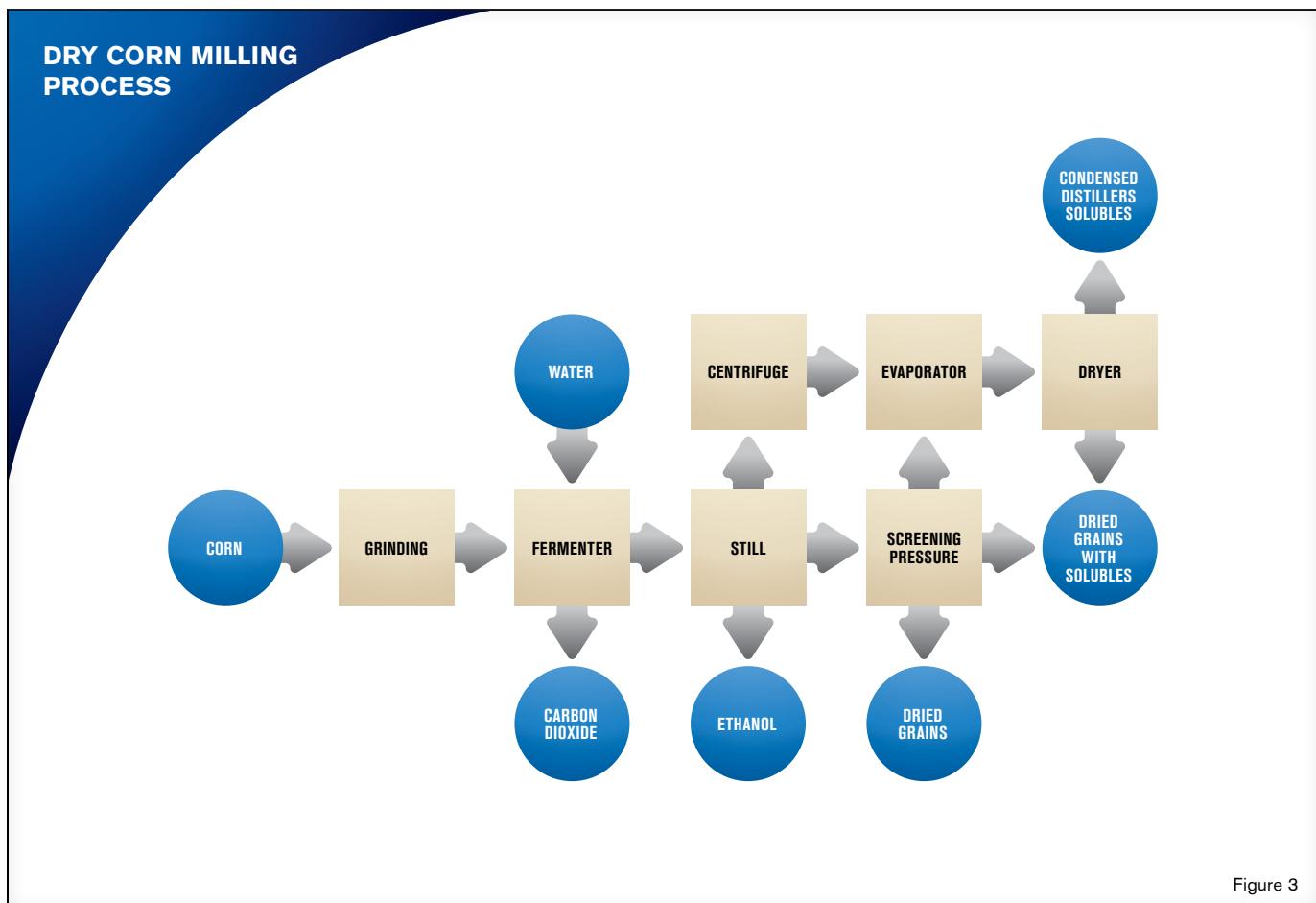


Figure 3

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

CORN INGREDIENTS



CORN GLUTEN MEAL

Corn gluten meal, a corn ingredient of the wet milling of corn, is a very palatable ingredient high in protein, energy, methionine and cysteine. Corn gluten meal serves as an excellent protein source for cattle 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 anti-nutritional factors, corn gluten meal also works as a partial replacement for fish meal in aquaculture diets. Corn gluten meal is also widely used in pet food because it's a high-protein, low-mineral ingredient.

CORN GLUTEN FEED

A corn ingredient of the corn wet milling process, corn gluten feed is a medium-protein, medium-energy feed and pet food ingredient. In beef cattle, studies indicate that corn gluten feed contains 87 percent of the feed value of dry corn. Because it is 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 percent 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 SYNERGY™

Golden Synergy™ is a proprietary blend of ADM modified distillers wet grains with solubles and Golden Gluten™ produced at our Columbus, Nebraska, facility. The blend is optimized to provide feeders with the advantages of both feedstuffs without having to manage two separate inventories. The roughage-sparing effects of Golden Gluten are maintained while increased energy and protein from the modified distillers add increased utility to the feedstuff.

GOLDEN GLUTEN™ WET CORN GLUTEN FEED

Golden Gluten™ wet corn gluten feed provides a cost-effective alternative to traditional feed for cattle. This protein and energy-rich product can make up between 20 and 50 percent 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 help minimize sub-acute acidosis, which leads to higher feed intake.

CORN INGREDIENTS (CONT.)



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 percent 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 corn ingredient made from 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. It also works well in certain aquaculture feeds such as catfish diets.

WET DISTILLERS GRAINS (WDGS) & MODIFIED WET DISTILLERS GRAINS (MWDGS)

These corn ingredients 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 percent of the dry matter in the ration. A greater percentage can be fed with a sufficient amount of ration fiber. These wet feeds at 35 and 50 percent dry matter help to balance diets and keep ration costs down for those able to accommodate handling wet ingredients.

DISTILLERS CORN OIL

Distillers corn oil is a crude corn oil mechanically separated from the whole stillage after distillation and before drying takes place. The corn oil is a high-quality feed fat which has utility for most species of livestock. The lower cost alternative to extracted vegetable oils offers an economic alternative for many livestock operations.

OILSEED PROCESSING

ADM processes a wide range of oilseeds into valuable high-protein meals, refined oils and nutrient-dense ingredients. 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 4) begins with careful selection of top-grade soybeans. After cleaning, the soybeans are dried thoroughly so the hull can be easily removed. The soybean meat is then rolled into full-fat flakes and the oil solvent is 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 percent 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 percent protein. The flakes can also undergo a series of protein precipitations, producing a soy protein isolate with a protein level of 90 percent.

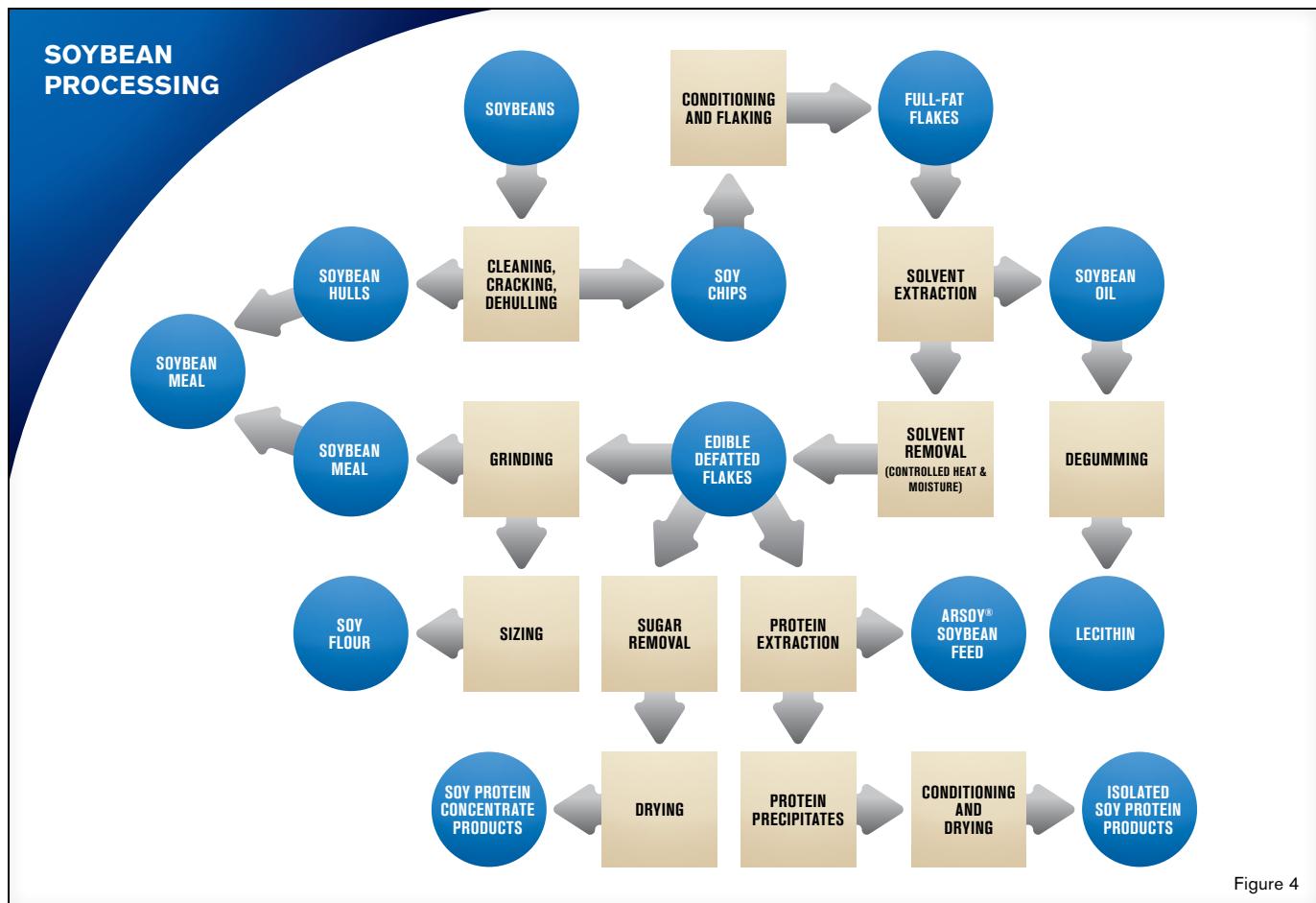


Figure 4

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

OILSEED PROCESSING (CONT.)



COTTONSEED PROCESSING

Cottonseed goes through many steps (Figure 5) 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. The cottonseed is then 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.

CANOLA PROCESSING

Canola seed is cleaned and graded in preparation for processing (Figure 6). The selected seeds are preheated to 30°C to 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°C to 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 and 70 percent of the seed oil content. The resulting very fine solid material is recycled back to the cooker/conditioner and formed into cakes. The 14 to 20 percent 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.

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 to 36 percent protein while sunflower meal with hulls contains 26 to 28 percent.

FLAXSEED PROCESSING

Flaxseed, grown in various parts of the U.S., 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.

COTTONSEED PROCESSING

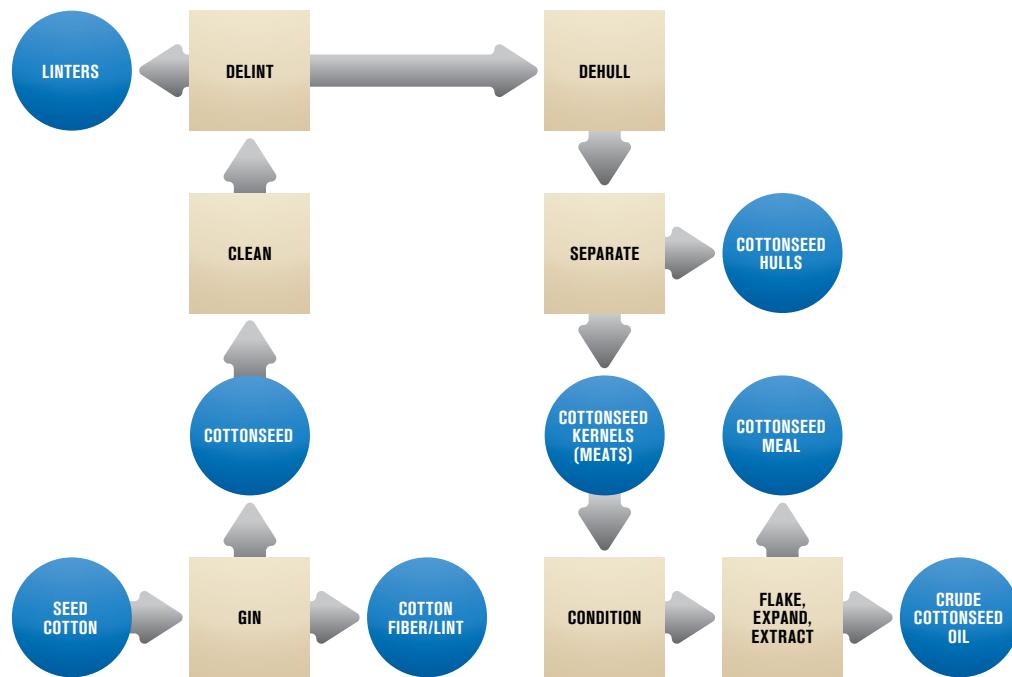


Figure 5

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

CANOLA PROCESSING

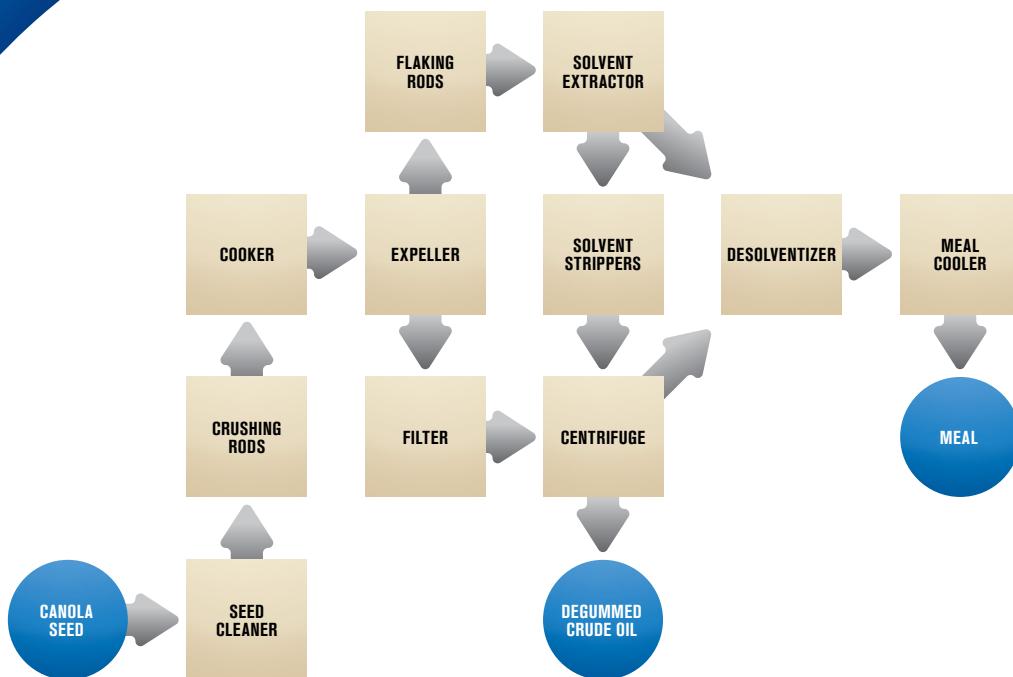


Figure 6

Canola processing feed and pet food ingredient: canola meal.

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 is valued in cattle diets to optimize rumen function and feed digestion. A good source of amino acids, soybean meal also functions as a widely accepted alternative to fish meal 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 and horses 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 processes. 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 bypass protein, which is valued in dairy lactation and growing beef/dairy cattle diets.

COTTONSEED HULLS

Cottonseed hulls consist primarily of the outer covering of the cottonseed. They contain 2 to 8 percent highly digestible cotton linters (nearly 100 percent 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 percent ether extract and 20 percent crude protein. Providing a unique combination of slow release energy, protein and effective fiber, whole cottonseed helps maintain good rumen function and feed digestion. It also serves as an excellent ingredient for high-performance lactation rations in dairy cattle.

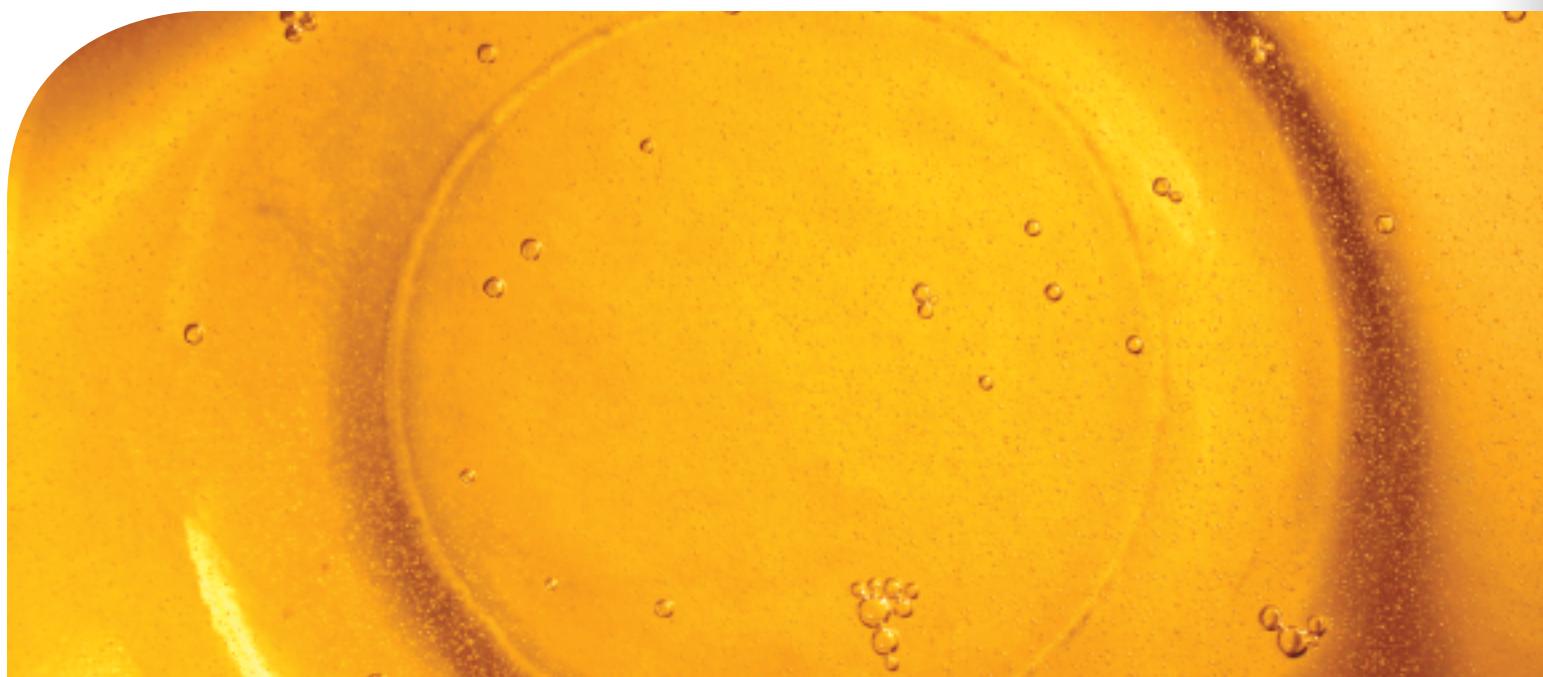
SUNFLOWER MEAL

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, dairy and equine diets. Valued for its ability to produce sheen in the coats of horses and 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.

VEGETABLE OILS (CORN, SOYBEAN, FLAX & CANOLA)

Vegetable oil is obtained by extracting the oil from seeds commonly processed for edible use. Corn and soybean oil provide the main sources of vegetable oil available for livestock. Both corn (55 percent) and soybean (53 percent) 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 feed and pet food. Another vegetable oil, flax oil, is starting to receive more interest because of its high alpha-linolenic acid content (ALA, 18:3, w-3). ALA, is a polyunsaturated omega-3 fatty acid.

VEGETABLE OIL FATTY ACID PROFILE

	CORN OIL	SOY OIL	FLAX OIL	CANOLA OIL
<i>C:16 Palmitic</i>	12.5	11.5	5.8	4.1
<i>C:18 Stearic</i>	2.5	4.0	4.2	1.85
<i>C:18-1 Oleic</i>	29.0	24.5	22.0	63.84
<i>C:18-2 Linoleic</i>	55.0	53.0	17.1	18.59
<i>C:18-3 Linolenic</i>	0.5	7.0	51.0	8.0
<i>Iodine Value</i>	125	125	183	109

SPECIAL USE PRODUCTS



PROTEINS & AMINO ACIDS

L-LYSINE, SUPPLEMENTAL

ADM produces two forms of supplemental lysine for use in the feed and pet food industry, L-lysine Monohydrochloride 98.5 percent Feed Grade and L-lysine Liquid 50 percent 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 percent 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.

L-THREONINE 98.5 PERCENT FEED GRADE

ADM L-threonine 98.5 percent 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. Research supports increasing the use of supplemental L-threonine in swine and poultry diets.

DIGESTIVE AIDS

NON-STARCH POLYSACCHARIDE (NSP) ENZYMES

Formulating swine and poultry diets with our non-starch polysaccharide (NSP) enzymes offers a practical solution to curtail increased diet costs. The inclusion of NSP enzymes in swine and poultry diets can ultimately have a positive impact on the producer's bottom line. Enzymes are an easy-to-implement strategy to reduce dietary energy costs by unlocking nutrient availability.

SPECIAL USE PRODUCTS (CONT.)



ANIMAL HEALTH PRODUCTS

NOVA-E™ NATURAL-SOURCE VITAMIN E

Chemically unique and biologically superior, Nova-E™ natural-source vitamin E (d-alpha tocopherol) is preferentially retained by body tissues. When compared to synthetic vitamin E, natural-source vitamin E is retained better and for a longer time in the body, making it more bioavailable. Vitamin E is an integral component of immune function. ADM is the largest producer of natural-source vitamin E and during stressful production stages, natural-source vitamin E may be especially beneficial.

DHA NATUR™

DHA Natur™ is a non-GMO dried algae that contains docosahexaenoic acid (DHA). It is a highly concentrated, vegetable-based DHA omega-3 source. DHA Natur has been developed from sustainable heterotrophic algae through advanced fermentation technology. DHA Natur is produced from a highly controlled, environmentally positive production system.

PREMIDEX™

Foster a healthy gastrointestinal environment with PremiDex™. PremiDex is an effective prebiotic that has a positive effect on intestinal health. The inclusion of PremiDex in the diets of pets, swine, poultry and aquaculture helps establish favorable intestinal microbial populations, leading to better production. This modified starch is produced using ADM's patented dextrinization process. PremiDex is a natural way to help favorably alter the microbial population in the gastrointestinal tract.

CITRISTIM®

A proven, truly unique whole-cell yeast beneficial for all animals at all life stages ... CitriStim® may help the animal in its defense against health challenges. CitriStim *Pichia guilliermondii* yeast adheres to pathogens and modulates immune activity. The overall result is production benefits and an animal that does not easily succumb to health challenges. CitriStim is the perfect addition to diets for all life stages and classes of animals. CitriStim has performance-proven health and production benefits.

CITRIC ACIDS

Citric acids are organic acidulants that have been in the food industry for many years. In animal feed and pet food, organic acids lower the diet and gastrointestinal tract pH. These acids help reduce the acid-sensitive pathogen load. Citric acids can also be added to milk replacers and water to adjust pH and aid digestion.

SPECIAL USE PRODUCTS (CONT.)

RUMINANT TECHNOLOGIES

BIURET

Biuret is an exclusive, cost-effective, controlled release, non-protein nitrogen source for ruminants. Biuret's predictable and safe rumen ammonia release pattern allows for greater formulation flexibility for both beef and dairy rations. Biuret is not hygroscopic and is superior to urea-based products for all applications where supplemental non-protein nitrogen (NPN) is required, including free-choice minerals, blocks and tubs, range cubes, conventional rations and liquid feed applications. The unique nature of biuret makes it easy to include in ruminant diets while lowering cost of production.

DIPTERACIDE®

Dipteracide® (ADM methoprene) is the most cost-effective choice to rid cattle herds of pesky, profit-robbing horn flies. Incorporating Dipteracide into cattle diets is not only easy, but highly effective. Cows become the applicator by consuming feed-through methoprene, which acts by inhibiting the development of horn fly larvae into adults. When considering the efficacy, cost and convenience of a horn fly control program, Dipteracide becomes the obvious solution to a pesky, high dollar problem.

THERMAL CARE™

Thermal Care™ offers a natural solution to deter the profit-robbing effects of heat stress. Encapsulated plant extracts and immune stimulants are incorporated in this patent-pending technology to help alleviate some of the physiological and immune challenges of heat stress that cause slower growth, lower milk production and compromised reproductive performance. Thermal Care is a nutritional therapy proven to lessen the costly effects of heat stress.

RUMENEXT®

Specially selected plant extracts in RumeNext® provide a natural solution of proven technologies to optimize rumen digestion for favorable production responses. This patent-pending technology is the result of a global research initiative studying the effects of plant extracts on rumen function. Beef and dairy formulas are substantiated with research-proven results. RumeNext pushes dairy and beef production to the next level.

ENERTIA®

Enertia® is a dry, rumen bypass fat produced from palm oil. Calcium salts of long-chain fatty acids are a high-energy ingredient that is highly digestible in the small intestine, does not interfere with rumen function and provides an optimum fatty acid profile. The use of Enertia in lactation diets provides energy to support body condition, milk production and reproductive efficiency. ADM's integrated supply chain ensures a dependable supply of high-quality, rumen bypass fat.

ENDO-FIGHTER®

Endo-Fighter® offers a beneficial, natural solution for cattle grazing fescue pastures to counter the harmful effects of fescue toxicosis which causes vasoconstriction, inducing heat stress and appetite suppression, resulting in serious economic losses in terms of lower gains, reduced body condition score, reduced milk production and impaired reproductive efficiency. The economic cost associated with fescue toxicosis is estimated to be up to \$1 billion annually. Endo-Fighter contains natural, functional ingredients that counter the challenges that arise when cattle consume endophyte-infected fescue forages. Endo-Fighter is comprised of a patented combination of components shown to favorably support production and well-being of cattle consuming endophyte-infected fescue forage.

SPECIAL USE PRODUCTS (CONT.)

SPECIALTY PRODUCTS

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 and pet food applications. Its ability to gel and increase the viscosity of liquids helps hold ingredients in suspension that may otherwise settle out of the mix.

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 percent 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 fish meal in many diets.

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.

LECITHIN

Soy lecithin is a mixture of phospholipids obtained from soybean oil through the degumming process. It typically contains phosphatidylcholine (PC) 23 percent, phosphatidylethanolamine (PI) 14 percent, phosphatidic acid (PA) 8 percent 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.

DEXTROSE

Dextrose is a white crystalline product able to fit many processing needs and is suitable for many feed applications. Some properties that make it a highly versatile sugar are mild sweetness, natural flavor enhancement, high fermentability and negative heat of solution.

SOY PROTEIN CONCENTRATE

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, soy protein concentrate serves as an excellent protein source for young ruminant, swine, poultry and aquaculture diets. Its high protein content (65 percent crude protein) and excellent amino acid profile make it an ideal replacement protein for fish meal. Soy protein concentrate-based milk replacers offer an economical alternative to milk-based replacers. Soy protein concentrate is available in both powdered and granular forms.

PROPLEX®-DY (DRIED YEAST)

PROPLEX™-DY is a high-quality, flowable protein meal applicable to the feed industry that is composed of dried Saccharomyces yeast. It is a good source of digestible amino acids and intended for use in fish, crustacean, swine and poultry feeds that require a high-quality protein with low anti-nutritional properties. PROPLEX-DY does not contain animal proteins.

WHEAT PROTEIN ISOLATE (PROLITE® 200)

Wheat protein isolate can be used as an egg white or whole egg replacer, as well as a dairy protein replacer. It adds resilience to baked products, can improve flexibility in pet treats and is soluble compared to vital wheat gluten.

WHEAT STARCHES (AYTEX® P & PAYGEL® 290)

Wheat starches are an ideal fit for pet treats and extruded foods. Aytex® P can be used for low cooking temperatures. Paygel® 290 provides a precooked, unmodified wheat starch that rapidly hydrates in cold water and is ideal for treat and low-heat applications.

SPECIAL USE PRODUCTS (CONT.)

FLOURS & OILSEED PROCESSING PRODUCTS

WHEAT GLUTEN (PROVIM ESP®)

Wheat gluten is obtained from wheat flour by drying freshly washed gluten under controlled temperatures. Its high protein content (75 percent) 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.

CORN STARCHES

ADM manufactures corn starches for various applications based on functional needs as raw starch or pre-gelatinized starches to meet customer needs for granular structure, solubility, thickening properties, protein content, resistance, viscosity and other specialized needs for pet food and specialty product applications.

WHOLE FLAXSEED

ADM is a processor of whole, full-fat flaxseed, which is an important source of alpha-linolenic acid (ALA), one of the major omega-3 fatty acids that have metabolic roles in cell wall integrity. ALA is converted in the body to EPA, another major omega-3 fatty acid that is necessary for brain function and vision. Whole flaxseed is often included in many pet food and equine diets.

WHOLE SUNFLOWER SEEDS

ADM is a processor of whole sunflower seeds, which are high in linoleic acid (an omega-6 fatty acid) and plays a major role in skin and hair health. Linoleic acid also plays a major role in cell wall structure and function.

SORGHUM FLOURS

ADM is a basic processor of grain sorghums. With feeding and digestion values similar to corn, white sorghum is ideal for non-corn pet food diets.

MALTED BARLEY FLOUR

ADM is a basic processor of malted barley flours. Malting is the process in which grains are soaked in water and allowed to germinate. The grains are then dried. This malting process converts most of the starches to sugars so malted grains will have less starch, more sugars—and a sweet malt taste. Typical inclusion rates would be 1 to 2 percent in pet foods to help provide a uniform color in finished pet foods.

NATURAL FLAVORS, COLORS & TASTE MODIFIERS

ADM offers an ever-expanding range of natural advantaged ingredient solutions including colors, flavors, taste maskers and modifiers for the pet food, snack and beverage industry to increase the well-being of pets and pet owner satisfaction for your brands and business.

Our offer includes:

- Natural Flavors including AAFCO Natural Flavors
- Natural Colors including AAFCO Natural Colors
- Natural Extracts & Distillates
- Natural Culinary Bases and Natural Foodstuffs
- Natural Taste Enhancers Masking and more

GRAIN INGREDIENTS

NUTRIENT ¹	WHEAT MIDLINGS	WHEAT RED DOG	CORN (MAIZE) HOMINY
<i>DM</i>	89.00%	88.00%	87.00%
<i>Crude Protein</i>	14.50%	15.30%	9.40%
<i>Fat</i>	4.20%	3.30%	4.20%
<i>Fiber</i>	8.50%	2.60%	6.00%
<i>NDF</i>	35.60%	18.70%	12.60%
<i>ADF</i>	10.70%	4.30%	4.50%
<i>RUP²</i>	21.00%	—	—
<i>Ash</i>	5.00%	2.20%	1.60%
<i>Ca</i>	0.12%	0.07%	0.02%
<i>P</i>	0.93%	0.57%	0.26%
<i>Avail P</i>	41.00%	—	14.00%
<i>K</i>	1.06%	0.63%	0.32%
<i>Mg</i>	0.41%	0.16%	0.11%
<i>S</i>	0.17%	0.24%	0.13%
<i>Cu</i>	10 ppm	6 ppm	2 ppm
<i>Fe</i>	84 ppm	46 ppm	64 ppm
<i>Mn</i>	100 ppm	55 ppm	10 ppm
<i>Zn</i>	92 ppm	65 ppm	15 ppm
<i>NE m³</i>	0.73 mcal/lb	—	1.00 mcal/lb
<i>NE g³</i>	0.45 mcal/lb	—	0.69 mcal/lb
<i>NE L³</i>	0.71 mcal/lb	—	0.99 mcal/lb
<i>TDN³</i>	69.00%	—	89.00%
<i>ME Poultry</i>	960 kcal/lb	1167 kcal/lb	1316 kcal/lb
<i>ME Swine</i>	1375 kcal/lb	1452 kcal/lb	1459 kcal/lb
<i>NE Swine</i>	964 kcal/lb	1017 kcal/lb	1027 kcal/lb
<i>Lys</i>	0.64%	0.66%	0.29%
<i>Met</i>	0.25%	0.23%	0.19%
<i>Cys</i>	0.36%	0.37%	0.22%
<i>TSAA</i>	0.61%	0.60%	0.41%
<i>Thr</i>	0.52%	0.50%	0.32%
<i>Trp</i>	0.21%	0.10%	0.08%
<i>Ile</i>	0.53%	0.55%	0.32%
<i>Val</i>	0.78%	0.72%	0.45%
<i>Arg</i>	1.15%	0.96%	0.47%

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

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GRAIN INGREDIENTS (CONT.)

NUTRIENT ¹	GRAIN SORGHUM MILL FEED (MILO HOMINY)	CORN (MAIZE) SCREENINGS	CORN (MAIZE) GRAIN
<i>DM</i>	89.00%	87.00%	86.00%
<i>Crude Protein</i>	11.00%	7.70%	7.70%
<i>Fat</i>	6.40%	2.90%	3.70%
<i>Fiber</i>	6.90%	—	2.00%
<i>NDF</i>	12.50%	12.40%	9.60%
<i>ADF</i>	5.50%	3.70%	2.80%
<i>RUP²</i>	—	—	—
<i>Ash</i>	2.60%	1.30%	1.30%
<i>Ca</i>	0.02%	0.03%	0.03%
<i>P</i>	0.40%	0.19%	0.28%
<i>Avail P</i>	—	—	14.00%
<i>K</i>	0.43%	0.23%	0.33%
<i>Mg</i>	0.21%	0.10%	0.12%
<i>S</i>	0.01%	0.08%	0.13%
<i>Cu</i>	3 ppm	3 ppm	3 ppm
<i>Fe</i>	69 ppm	92 ppm	29 ppm
<i>Mn</i>	24 ppm	7 ppm	7 ppm
<i>Zn</i>	17 ppm	14 ppm	18 ppm
<i>NE m³</i>	1.02 mcal/lb	0.85 mcal/lb	0.98 mcal/lb
<i>NE g³</i>	0.72 mcal/lb	0.58 mcal/lb	0.67 mcal/lb
<i>NE L³</i>	1.01 mcal/lb	0.84 mcal/lb	0.91 mcal/lb
<i>TDN³</i>	1.01 mcal/lb	76.00%	89.00%
<i>ME Poultry</i>	—	—	1519 kcal/lb
<i>ME Swine</i>	—	—	1551 kcal/lb
<i>NE Swine</i>	—	—	1086 kcal/lb
<i>Lys</i>	0.34%	0.24%	0.24%
<i>Met</i>	0.19%	0.18%	0.16%
<i>Cys</i>	0.22%	0.19%	0.17%
<i>TSAA</i>	0.41%	0.37%	0.33%
<i>Thr</i>	0.37%	0.28%	0.27%
<i>Trp</i>	0.09%	0.06%	0.06%
<i>Ile</i>	0.40%	0.27%	0.25%
<i>Val</i>	0.57%	0.38%	0.35%
<i>Arg</i>	0.57%	0.35%	0.35%

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

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GRAIN INGREDIENTS (CONT.)

NUTRIENT ¹	MILO (GRAIN SORGHUM)	WHEAT	BARLEY
<i>DM</i>	89.00%	89.00%	89.00%
<i>Crude Protein</i>	9.40%	11.50%	10.50%
<i>Fat</i>	2.90%	1.90%	1.90%
<i>Fiber</i>	2.00%	3.30%	3.00%
<i>NDF</i>	18.00%	0.80%	18.60%
<i>ADF</i>	8.30%	12.00%	7.00%
<i>RUP²</i>	—	—	—
<i>Ash</i>	1.80%	1.80%	2.60%
<i>Ca</i>	0.03%	0.04%	0.06%
<i>P</i>	0.29%	0.39%	0.36%
<i>Avail P</i>	20.00%	50.00%	30.00%
<i>K</i>	0.35%	0.46%	0.47%
<i>Mg</i>	0.15%	0.11%	0.12%
<i>S</i>	0.08%	0.16%	0.15%
<i>Cu</i>	5 ppm	8 ppm	8 ppm
<i>Fe</i>	45 ppm	32 ppm	88 ppm
<i>Mn</i>	15 ppm	38 ppm	16 ppm
<i>Zn</i>	15 ppm	47 ppm	15 ppm
<i>NE m³</i>	0.88 mcal/lb	0.98 mcal/lb	0.92 mcal/lb
<i>NE g³</i>	0.59 mcal/lb	0.67 mcal/lb	0.62 mcal/lb
<i>NE L³</i>	0.82 mcal/lb	0.90 mcal/lb	0.84 mcal/lb
<i>TDN³</i>	81.00%	87.00%	83.00%
<i>ME Poultry</i>	1491 kcal/lb	1415 kcal/lb	1197 kcal/lb
<i>ME Swine</i>	1514 kcal/lb	1564 kcal/lb	1319 kcal/lb
<i>NE Swine</i>	1022 kcal/lb	1088 kcal/lb	1047 kcal/lb
<i>Lys</i>	0.22%	0.38%	0.36%
<i>Met</i>	0.17%	0.22%	0.17%
<i>Cys</i>	0.17%	0.27%	0.20%
<i>TSAA</i>	0.34%	0.49%	0.37%
<i>Thr</i>	0.31%	0.39%	0.34%
<i>Trp</i>	0.10%	0.26%	0.13%
<i>Ile</i>	0.37%	0.45%	0.37%
<i>Val</i>	0.46%	0.57%	0.49%
<i>Arg</i>	0.38%	0.50%	0.48%

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

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CORN INGREDIENTS

NUTRIENT ¹	CORN GLUTEN MEAL	CORN GLUTEN FEED	GOLDEN SYNERGY™
<i>DM</i>	90.00%	90.00%	48.60%
<i>Crude Protein</i>	60.20%	21.50%	12.86%
<i>Fat</i>	2.00%	3.00%	2.75%
<i>Fiber</i>	2.50%	10.00%	—
<i>NDF</i>	5.00%	33.30%	15.64%
<i>ADF</i>	6.00%	10.70%	5.92%
<i>RUP²</i>	55.00%	30.00%	—
<i>Ash</i>	6.00%	7.80%	2.40%
<i>Ca</i>	0.05%	0.16%	0.02%
<i>P</i>	0.44%	0.83%	0.43%
<i>Avail P</i>	15.00%	59.00%	—
<i>K</i>	0.20%	0.98%	0.64%
<i>Mg</i>	0.08%	0.30%	0.18%
<i>S</i>	0.80%	0.70%	0.40%
<i>Cu</i>	26 ppm	48 ppm	6 ppm
<i>Fe</i>	282 ppm	460 ppm	44 ppm
<i>Mn</i>	4 ppm	24 ppm	8 ppm
<i>Zn</i>	33 ppm	70 ppm	29 ppm
<i>NE m³</i>	1.00 mcal/lb	0.88 mcal/lb	0.85 mcal/lb
<i>NE g³</i>	0.69 mcal/lb	0.59 mcal/lb	0.56 mcal/lb
<i>NE L³</i>	0.94 mcal/lb	0.87 mcal/lb	0.81 mcal/lb
<i>TDN³</i>	89.00%	80.00%	78.00%
<i>ME Poultry</i>	1686 kcal/lb	790 kcal/lb	—
<i>ME Swine</i>	1744 kcal/lb	1184 kcal/lb	—
<i>NE Swine</i>	1159 kcal/lb	790 kcal/lb	—
<i>Lys</i>	1.02%	0.63%	—
<i>Met</i>	1.43%	0.35%	—
<i>Cys</i>	1.09%	0.46%	—
<i>TSAA</i>	2.52%	0.81%	—
<i>Thr</i>	2.08%	0.74%	—
<i>Trp</i>	0.31%	0.17%	—
<i>Ile</i>	2.48%	0.66%	—
<i>Val</i>	2.79%	0.94%	—
<i>Arg</i>	1.93%	0.75%	—

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CORN INGREDIENTS (CONT.)

NUTRIENT ¹	GOLDEN GLUTEN™ WET CORN GLUTEN FEED	CORN GERM MEAL	CONDENSED FERMENTED CORN EXTRACTIVES (STEEPWATER)
<i>DM</i>	45.00%	90.00%	50.20%
<i>Crude Protein</i>	7.45%	24.00%	17.00%
<i>Fat</i>	1.60%	2.70%	2.70%
<i>Fiber</i>	3.78%	9.50%	—
<i>NDF</i>	20.00%	62.00%	—
<i>ADF</i>	5.00%	17.70%	—
<i>RUP²</i>	25.00%	—	—
<i>Ash</i>	1.60%	2.80%	5.80%
<i>Ca</i>	0.04%	0.01%	0.03%
<i>P</i>	0.30%	0.43%	0.94%
<i>Avail P</i>	—	—	—
<i>K</i>	0.68%	0.38%	1.37%
<i>Mg</i>	0.23%	0.21%	0.45%
<i>S</i>	0.22%	0.28%	0.90%
<i>Cu</i>	2 ppm	6 ppm	2 ppm
<i>Fe</i>	110 ppm	60 ppm	54 ppm
<i>Mn</i>	6 ppm	9 ppm	18 ppm
<i>Zn</i>	20 ppm	70 ppm	61 ppm
<i>NE m³</i>	0.92 mcal/lb	0.80 mcal/lb	1.00 mcal/lb
<i>NE g³</i>	0.62 mcal/lb	0.51 mcal/lb	0.72 mcal/lb
<i>NE L³</i>	0.85 mcal/lb	0.77 mcal/lb	0.90 mcal/lb
<i>TDN³</i>	82.00%	74.00%	91.00%
<i>ME Poultry</i>	—	750 kcal/lb	—
<i>ME Swine</i>	—	1360 kcal/lb	—
<i>NE Swine</i>	—	900 kcal/lb	—
<i>Lys</i>	0.31%	0.94%	0.67%
<i>Met</i>	0.14%	0.46%	0.32%
<i>Cys</i>	—	0.40%	0.18%
<i>TSAA</i>	—	0.86%	0.50%
<i>Thr</i>	—	0.86%	0.52%
<i>Trp</i>	—	0.23%	0.05%
<i>Ile</i>	—	0.81%	0.51%
<i>Val</i>	—	1.32%	0.80%
<i>Arg</i>	—	1.58%	0.79%

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CORN INGREDIENTS (CONT.)

NUTRIENT ¹	DISTILLERS DRIED GRAINS WITH SOLUBLES (DDGS)	WET DISTILLERS GRAINS (WDGS)	MODIFIED WET DISTILLERS GRAINS (MWDGS)
<i>DM</i>	91.00%	35.20%	48.00%
<i>Crude Protein</i>	26.50%	10.00%	14.00%
<i>Fat</i>	8.40%	3.10%	3.00%
<i>Fiber</i>	8.50%	—	—
<i>NDF</i>	34.00%	17.21%	13.50%
<i>ADF</i>	16.30%	7.69%	7.50%
<i>RUP²</i>	56.00%	—	—
<i>Ash</i>	4.50%	2.27%	3.00%
<i>Ca</i>	0.20%	0.01%	0.05%
<i>P</i>	0.77%	0.17%	0.38%
<i>Avail P</i>	77.00%	—	—
<i>K</i>	0.84%	0.16%	0.58%
<i>Mg</i>	0.19%	0.35%	0.16%
<i>S</i>	0.60%	0.18%	0.45%
<i>Cu</i>	57 ppm	2 ppm	3 ppm
<i>Fe</i>	257 ppm	31 ppm	72 ppm
<i>Mn</i>	24 ppm	3 ppm	11 ppm
<i>Zn</i>	80 ppm	13 ppm	34 ppm
<i>NE m³</i>	0.94 mcal/lb	0.33 mcal/lb	0.43 mcal/lb
<i>NE g³</i>	0.64 mcal/lb	0.25 mcal/lb	0.29 mcal/lb
<i>NE L³</i>	0.90 mcal/lb	0.30 mcal/lb	0.40 mcal/lb
<i>TDN³</i>	85.00%	25.00%	39.00%
<i>ME Poultry</i>	1125 kcal/lb	—	—
<i>ME Swine</i>	1275 kcal/lb	—	—
<i>NE Swine</i>	937 kcal/lb	—	—
<i>Lys</i>	0.62%	—	—
<i>Met</i>	0.50%	—	—
<i>Cys</i>	0.52%	—	—
<i>TSAA</i>	1.02%	—	—
<i>Thr</i>	0.94%	—	—
<i>Trp</i>	0.25%	—	—
<i>Ile</i>	1.03%	—	—
<i>Val</i>	1.30%	—	—
<i>Arg</i>	1.13%	—	—

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OILSEED INGREDIENTS

NUTRIENT ¹	DISTILLERS CORN OIL	VEGETABLE OIL REFINERY LIPID	VEGETABLE OILS (CORN, SOYBEAN, FLAX & CANOLA)
<i>DM</i>	—	100.00%	—
<i>Crude Protein</i>	—	—	—
<i>Fat</i>	—	99.00%	—
<i>Fiber</i>	—	—	—
<i>NDF</i>	—	—	—
<i>ADF</i>	—	—	—
<i>RUP²</i>	—	—	—
<i>Ash</i>	—	—	—
<i>Ca</i>	—	—	—
<i>P</i>	—	—	—
<i>Avail P</i>	—	—	—
<i>K</i>	—	—	—
<i>Mg</i>	—	—	—
<i>S</i>	—	—	—
<i>Cu</i>	—	—	—
<i>Fe</i>	—	—	—
<i>Mn</i>	—	—	—
<i>Zn</i>	—	—	—
<i>NE m³</i>	2.43 mcal/lb	—	2.56 mcal/lb
<i>NE g³</i>	1.67 mcal/lb	—	1.76 mcal/lb
<i>NE L³</i>	2.43 mcal/lb	—	2.56 mcal/lb
<i>TDN³</i>	175.00%	—	184.00%
<i>ME Poultry</i>	3900 kcal/lb	—	4000 kcal/lb
<i>ME Swine</i>	—	3818 kcal/lb	3818 kcal/lb
<i>NE Swine</i>	—	3436 kcal/lb	3436 kcal/lb
<i>Lys</i>	—	—	—
<i>Met</i>	—	—	—
<i>Cys</i>	—	—	—
<i>TSAA</i>	—	—	—
<i>Thr</i>	—	—	—
<i>Trp</i>	—	—	—
<i>Ile</i>	—	—	—
<i>Val</i>	—	—	—
<i>Arg</i>	—	—	—

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OILSEED INGREDIENTS (CONT.)

NUTRIENT ¹	SOYBEAN MEAL	SOY HULLS	CANOLA MEAL
<i>DM</i>	88.00%	89.00%	93.00%
<i>Crude Protein</i>	47.50%	10.00%	36.50%
<i>Fat</i>	1.00%	1.00%	3.50%
<i>Fiber</i>	3.50%	36.50%	12.00%
<i>NDF</i>	8.90%	61.00%	23.70%
<i>ADF</i>	5.40%	45.50%	17.00%
<i>RUP²</i>	31.00%	23.00%	28.00%
<i>Ash</i>	6.00%	4.60%	6.80%
<i>Ca</i>	0.34%	0.45%	0.62%
<i>P</i>	0.69%	0.19%	1.03%
<i>Avail P</i>	23.00%	—	21.00%
<i>K</i>	2.14%	1.16%	1.24%
<i>Mg</i>	0.30%	0.23%	0.50%
<i>S</i>	0.44%	0.08%	0.62%
<i>Cu</i>	20 ppm	16 ppm	4 ppm
<i>Fe</i>	176 ppm	295 ppm	204 ppm
<i>Mn</i>	36 ppm	10 ppm	52 ppm
<i>Zn</i>	55 ppm	22 ppm	54 ppm
<i>NE m³</i>	0.98 mc cal/lb	0.80 mc cal/lb	0.73 mc cal/lb
<i>NE g³</i>	0.67 mc cal/lb	0.50 mc cal/lb	0.45 mc cal/lb
<i>NE L³</i>	0.91 mc cal/lb	0.75 mc cal/lb	0.71 mc cal/lb
<i>TDN³</i>	87.00%	68.00%	69.00%
<i>ME Poultry</i>	1109 kcal/lb	340 kcal/lb	940 kcal/lb
<i>ME Swine</i>	1536 kcal/lb	400 kcal/lb	1210 kcal/lb
<i>NE Swine</i>	918 kcal/lb	290 kcal/lb	732 kcal/lb
<i>Lys</i>	3.09%	0.71%	2.16%
<i>Met</i>	0.68%	0.12%	0.73%
<i>Cys</i>	0.68%	0.21%	0.88%
<i>TSAA</i>	1.36%	0.33%	1.61%
<i>Thr</i>	1.81%	0.37%	1.56%
<i>Trp</i>	0.68%	0.08%	0.45%
<i>Ile</i>	2.19%	0.37%	1.50%
<i>Val</i>	2.26%	0.47%	1.93%
<i>Arg</i>	3.47%	0.48%	2.25%

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OILSEED INGREDIENTS (CONT.)

NUTRIENT ¹	COTTONSEED MEAL	COTTONSEED HULLS	WHOLE COTTONSEED
<i>DM</i>	90.00%	90.00%	91.00%
<i>Crude Protein</i>	41.40%	3.80%	20.70%
<i>Fat</i>	1.50%	1.50%	18.40%
<i>Fiber</i>	11.00%	43.00%	22.00%
<i>NDF</i>	28.40%	82.00%	43.00%
<i>ADF</i>	19.40%	66.00%	35.30%
<i>RUP</i> ²	43.00%	50.00%	27.00%
<i>Ash</i>	6.30%	2.60%	3.50%
<i>Ca</i>	0.19%	0.14%	0.13%
<i>P</i>	1.06%	0.08%	0.51%
<i>Avail P</i>	36.00%	—	—
<i>K</i>	1.40%	1.02%	1.04%
<i>Mg</i>	0.50%	0.13%	0.32%
<i>S</i>	0.31%	0.07%	0.18%
<i>Cu</i>	15 ppm	11 ppm	6 ppm
<i>Fe</i>	184 ppm	119 ppm	46 ppm
<i>Mn</i>	20 ppm	108 ppm	14 ppm
<i>Zn</i>	70 ppm	20 ppm	30 ppm
<i>NE m</i> ³	0.81 mcal/lb	0.31 mcal/lb	1.01 mcal/lb
<i>NE g</i> ³	0.53 mcal/lb	0.07 mcal/lb	0.70 mcal/lb
<i>NE L</i> ³	0.79 mcal/lb	0.45 mcal/lb	1.01 mcal/lb
<i>TDN</i> ³	75.00%	45.00%	90.00%
<i>ME Poultry</i>	880 kcal/lb	—	—
<i>ME Swine</i>	1052 kcal/lb	—	—
<i>NE Swine</i>	602 kcal/lb	—	—
<i>Lys</i>	1.72%	—	—
<i>Met</i>	0.67%	—	—
<i>Cys</i>	0.70%	—	—
<i>TSAA</i>	1.37%	—	—
<i>Thr</i>	1.36%	—	—
<i>Trp</i>	0.48%	—	—
<i>Ile</i>	1.30%	—	—
<i>Val</i>	1.78%	—	—
<i>Arg</i>	4.55%	—	—

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OILSEED INGREDIENTS (CONT.)

NUTRIENT ¹	SUNFLOWER MEAL 30%	SUNFLOWER MEAL 35%	LINSEED MEAL
<i>DM</i>	90.00%	90.00%	90.00%
<i>Crude Protein</i>	30.00%	35.00%	36.00%
<i>Fat</i>	1.30%	0.80%	2.00%
<i>Fiber</i>	25.00%	20.00%	10.00%
<i>NDF</i>	42.00%	—	23.90%
<i>ADF</i>	30.30%	—	15.00%
<i>RUP²</i>	26.00%	28.50%	35.00%
<i>Ash</i>	6.00%	6.00%	6.50%
<i>Ca</i>	0.35%	0.35%	0.39%
<i>P</i>	0.90%	0.95%	0.83%
<i>Avail P</i>	3.00%	—	—
<i>K</i>	1.10%	1.05%	1.26%
<i>Mg</i>	0.60%	0.67%	0.54%
<i>S</i>	0.30%	0.38%	0.39%
<i>Cu</i>	26 ppm	30 ppm	22 ppm
<i>Fe</i>	254 ppm	225 ppm	270 ppm
<i>Mn</i>	41 ppm	44 ppm	41 ppm
<i>Zn</i>	66 ppm	87 ppm	66 ppm
<i>NE m³</i>	0.54 mc cal/lb	0.65 mc cal/lb	0.85 mc cal/lb
<i>NE g³</i>	0.24 mc cal/lb	0.35 mc cal/lb	0.56 mc cal/lb
<i>NE L³</i>	0.49 mc cal/lb	0.61 mc cal/lb	0.81 mc cal/lb
<i>TDN³</i>	58.00%	62.00%	78.00%
<i>ME Poultry</i>	700 kcal/lb	1000 kcal/lb	—
<i>ME Swine</i>	850 kcal/lb	1100 kcal/lb	1231 kcal/lb
<i>NE Swine</i>	560 kcal/lb	—	836 kcal/lb
<i>Lys</i>	1.12%	1.25%	1.24%
<i>Met</i>	0.69%	0.75%	0.59%
<i>Cys</i>	0.57%	0.62%	0.59%
<i>TSAA</i>	1.26%	1.37%	1.18%
<i>Thr</i>	1.06%	1.22%	1.26%
<i>Trp</i>	0.40%	0.42%	0.52%
<i>Ile</i>	1.20%	1.39%	1.56%
<i>Val</i>	1.51%	1.73%	1.74%
<i>Arg</i>	2.36%	2.80%	2.97%

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SPECIAL USE PRODUCTS INGREDIENTS

NUTRIENT ¹	ARDEX [®] SOY PROTEIN ISOLATE	SOY PROTEIN CONCENTRATE	PROPLEX [™] -DY (DRIED YEAST)
<i>DM</i>	92.00%	90.00%	91.50%
<i>Crude Protein</i>	85.80%	65.00%	48.00%
<i>Fat</i>	0.60%	0.60%	3.60%
<i>Fiber</i>	1.00%	4.00%	3.10%
<i>NDF</i>	—	—	—
<i>ADF</i>	—	—	—
<i>RUP²</i>	—	—	—
<i>Ash</i>	6.00%	6.50%	3.10%
<i>Ca</i>	0.15%	0.35%	0.10%
<i>P</i>	0.65%	0.80%	0.61%
<i>Avail P</i>	—	30.00%	—
<i>K</i>	0.27%	2.20%	0.30%
<i>Mg</i>	0.08%	0.32%	0.70%
<i>S</i>	0.71%	—	0.38%
<i>Cu</i>	14 ppm	13 ppm	11 ppm
<i>Fe</i>	137 ppm	110 ppm	51 ppm
<i>Mn</i>	5 ppm	—	9 ppm
<i>Zn</i>	34 ppm	30 ppm	47 ppm
<i>NE m³</i>	—	—	—
<i>NE g³</i>	—	—	—
<i>NE L³</i>	—	—	—
<i>TDN³</i>	—	—	—
<i>ME Poultry</i>	—	1590 kcal/lb	1561 kcal/lb
<i>ME Swine</i>	1618 kcal/lb	1590 kcal/lb	1677 kcal/lb
<i>NE Swine</i>	909 kcal/lb	909 kcal/lb	—
<i>Lys</i>	5.26%	4.23%	2.60%
<i>Met</i>	1.01%	0.91%	0.95%
<i>Cys</i>	1.19%	0.98%	0.60%
<i>TSAA</i>	2.20%	1.89%	1.55%
<i>Thr</i>	3.17%	2.73%	2.08%
<i>Trp</i>	1.08%	0.78%	0.37%
<i>Ile</i>	4.25%	3.19%	2.18%
<i>Val</i>	4.21%	3.38%	2.70%
<i>Arg</i>	6.87%	4.94%	2.11%

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SPECIAL USE PRODUCTS INGREDIENTS (CONT.)

NUTRIENT ¹	SORGHUM FLOURS	MALTED BARLEY FLOUR
<i>DM</i>	—	—
<i>Crude Protein</i>	9.06%	—
<i>Fat</i>	1.47%	—
<i>Fiber</i>	7.83%	8.70 g
<i>NDF</i>	—	—
<i>ADF</i>	—	—
<i>RUP²</i>	—	—
<i>Ash</i>	0.47%	—
<i>Ca</i>	8.50%	37.00 mg
<i>P</i>	—	—
<i>Avail P</i>	—	—
<i>K</i>	—	107 mg
<i>Mg</i>	—	—
<i>S</i>	—	9 mg
<i>Cu</i>	—	—
<i>Fe</i>	0.40 ppm	3.14 mg
<i>Mn</i>	—	—
<i>Zn</i>	—	—
<i>NE m³</i>	—	—
<i>NE g³</i>	—	—
<i>NE L³</i>	—	—
<i>TDN³</i>	—	—
<i>ME Poultry</i>	—	—
<i>ME Swine</i>	—	—
<i>NE Swine</i>	—	—
<i>Lys</i>	—	—
<i>Met</i>	—	—
<i>Cys</i>	—	—
<i>TSAA</i>	—	—
<i>Thr</i>	—	—
<i>Trp</i>	—	—
<i>Ile</i>	—	—
<i>Val</i>	—	—
<i>Arg</i>	—	—

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ORGANIC ACIDS

NUTRIENT	CITRIC ACID ANHYDROUS*	SODIUM CITRATE DIHYDRATE	SODIUM CITRATE ANHYDROUS	POTASSIUM CITRATE
<i>Grade</i>	USP/FCC	USP/FCC	USP/FCC	USP/FCC
<i>Concentration</i>	99.50%	99.50%	99.00%	99.00%
<i>Physical Form</i>	GRANULAR	GRANULAR	GRANULAR	GRANULAR

*Typical amount per 100g.



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