

Qualifying Liquid Co-Products

Cane molasses is unique among liquid co-products suitable for use as animal feed. Its low moisture content and high organic matter content, particularly in terms of sugars, allow for reasonable transportation cost and high energy content when used. Cane molasses is very stable during prolonged storage periods and its viscosity drops significantly with the addition of urea. Animals find it uniquely palatable and yet tend not to “over indulge”.

The widespread use of molasses in commercial fermentation industries speaks to the positive role this ingredient can play in supporting the fermentation activity of rumen microbes. And research with both dairy and beef animals consistently shows the value of molasses in supporting intakes, digestibility, forage utilization, energy efficiency, and key measures of production and profitability across enterprises.

However, no feedstuff is a perfect match for the supplemental needs of cattle. Today’s liquid feed manufacturers have the ability to evaluate multiple other liquid co-products from various food and fuel industries, and incorporate those that complement molasses in meeting the nutritional and economic goals of our customers.

The table below lists some general nutritional information on ingredients that Westway Feed Products has qualified for inclusion in our products.

Commodity	%DM	Ash	All Values Except DM expressed on % Dry Matter Basis					
			Crude Protein	Crude Protein Equivalent	Fat	Organic Matter	Total Digestible Nutrients (TDN)	Sugars As Invert
Cane Molasses	73	13.0	4.9	0.0	0.10	87.0	75.0	60.0
Beet Molasses	75	11.0	9.0	1.0	0.10	89.0	79.0	63.0
Condensed Whey	20 to 40	10.0	12.0	0.0	1.00	90.0	81.0	40.0
Corn Steep Liquor	45	17.0	35.5	2.0	0.20	83.0	81.0	16.0
Concentrated Separator By-product	55 to 60	26.0	18.0	3.0	0.10	74.0	65.0	43.0
Corn Distillers Solubles	35 to 55	7.5	13.0	1.0	9.00	92.5	92.0	15.0
Amino Acid Fermentation By-product	45	55.0	88.0	60.0	0.00	45.0	24 to 34	0 to 10
Wood Molasses	55 to 60	9.5	3.0	0.0	1.00	90.5	73.0	27.0
Lignin Sulfonate	45 to 50	6.5	2 to 40	0 to 40	0.00	93.5	60.0	26.0
Soy Molasses	50 to 60	21.0	10.0	0.0	3.50	79.0	63.0	44.0
Glycerin	85 to 90	6	0.0	0.0	0.0	94.0	90.0	0

The materials listed above can contribute either significant concentrations of energy, protein or both to liquid supplement formulations. Some are also good sources of essential minerals. To better understand these ingredients we are providing some detail as to source, physical attributes and composition on the following pages.

Beet molasses is quite similar to cane molasses except that it results from the processing of sugar beets instead of sugar cane to yield granulated sugar. It is typically lower in viscosity than cane but slightly higher in sugar content. Its aroma is quite different than cane molasses. It lacks the sweet aroma of cane and has a more earthy smell, but animals accept it readily.

Concentrated separator by-product is the result of a further refining beet molasses such that a portion of the sugars are removed. This concentrates the protein and ash fractions which results in a slight decrease in energy concentration relative to beet molasses. It can contribute significant natural protein and sugar to a liquid supplement. The product has similar handling, physical and aroma characteristics to beet molasses.

Condensed whey results from the manufacture of cheeses from milk. During the cheese manufacturing process protein and fat portions of the milk are concentrated; this leaves the sugars (lactose) and some of the minerals in whey. Some portion of the initially high moisture content is removed by various processes to yield condensed whey. The lactose present is well utilized by ruminal micro-organisms; it has an energy value similar to grain on a dry matter basis and it is highly palatable. Lactose is a disaccharide very similar to sucrose, but when analyzed by the Invert Sugar procedure typically used on molasses-based products, only about ½ the concentration relative to sucrose is quantified. This fact has caused some liquid supplement manufacturers to make a separate declaration of lactose on labeling. For example if TSAI on a label was 28% and lactose was guaranteed at 4%, one could reasonably compare to a 30% “sugars” product.

Corn steep liquor is the common name for condensed fermented corn extractives. It results from the production of high fructose corn syrup. In this process corn is “steeped” in a mixture of water and sulfur dioxide. This process removes substantially all of the water soluble proteins, minerals and reducing sugars present in the grain to the “liquor” fraction. A natural fermentation takes place and the product is condensed to yield the steep liquor. The product is an orange-brown viscous liquid with a rather distinctive odor. Animals relish the aroma and the product is extremely palatable. Usage in liquid supplements provides a natural protein contribution, significant phosphorus contribution, and a well-utilized source of energy.

Corn distillers’ solubles (CCDS) results from the production of ethanol from corn grain via a “dry milling process”. The production process includes cooking a grain flour mash and adding an enzyme to convert the starch to a fermentable substrate (sugar). Yeast is then added to cause fermentation and conversion of the sugar to alcohol and carbon dioxide. The fermented mash is then passed through a distillation tower to extract alcohol. The residual from the distillation contains all of the vitamins, minerals, fats, fiber and proteins of the whole grain. After distillation the spent mash is separated into soluble and insoluble fractions. The soluble fraction is concentrated by evaporation. The material is equivalent or slightly superior to corn in terms of energy and protein value on a dry basis. It varies in color

from light tan to light brown, is syrupy in consistency and has a pleasing fermented odor. It is highly palatable to livestock.

Amino acid fermentation by-products result from processes designed to produce lysine and glutamic acid (or monosodium glutamate) for both animal and human food products. In these processes a high sugar substrate is inoculated with specialized microbial cultures which yield high concentrations of the respective amino acids under aerobic conditions. The culture media is then “digested” with concentrated alkali (ammonia) to facilitate recovery of the desired product. The residual is then neutralized with acid yielding a high crude protein (largely non-protein nitrogen) and high ash liquid co-product. Because the overall process is conducted under aerobic conditions, most of the carbohydrate in the culture media is consumed. Use in liquid supplements is limited by poor palatability of the product - but it can be included as a source of protein and as an intake limiter.

Wood molasses or **hemicellulose extract** is a by-product of the manufacture of pressed wood products. It is the concentrated soluble material obtained from treatment of wood at elevated temperature and pressure without the use of acids, alkalis or salts. It's composed of both pentose (5 carbon) and hexose (6 carbon) sugars that are readily utilized by microbial organisms. It is a dark brown color, has a “woody” odor and is quite viscous, particularly at low temperatures. It has particularly effective binding capabilities and can contribute energy to a liquid supplement.

Lignin sulfonates can be present as calcium, magnesium or ammonium salts are produced when wood is solubilized by processes used to transform it to wood pulp used to produce paper and cardboard by what is termed the “sulfite” process. In essence the liquor produced is neutralized by the material salts (calcium, magnesium or ammonium) and then concentrated. Residual sugars contained therein are well-utilized by animals, and the material has excellent binding properties in pelleting operations. Use in liquid supplements may be limited by relatively low palatability.

Soy molasses or **Soy solubles** is a product obtained by washing soy flour or flakes with water at a PH of 4.2 to 4.6. The wash water is then concentrated. It is a creamy liquid with the consistency of molasses and a neutral aroma. In liquid supplements it mixes well, contributes significant amounts of protein, and provides readily available sugars—particularly “stachyose” which is known to simulate the growth of “probiotic” micro-organisms.

Glycerin or **Glycerol** is a by-product of creating biodiesel from fat. It is a clear, colorless, odorless liquid with a thick, syrupy texture. It is oily to the touch and very sweet tasting. Chemically it is $C_3H_8O_3$, a sugar alcohol, and it is soluble in water and alcohol, but not oils. Glycerin is a highly concentrated energy source, functioning in ruminants as a glucose precursor. It is very high in dry matter, creating formulation opportunities in combination with low-DM ingredients.