DSM Carbohydrases

Maximize your energy

ANIMAL NUTRITION AND HEALTH

- ESSENTIAL PRODUCTS
- PERFORMANCE SOLUTIONS + BIOMIN®
- PRECISION SERVICES

DSM
BRIGHT SCIENCE. BRIGHTER LIVING.

DSM Enzymes – Your first choice for feed enzymes

RONOZYME® designates the unique global Feed Enzymes Alliance between DSM and Novozymes – both preeminent leaders in their field and committed to success based on collaboration and innovation.

By pooling their market and technical expertise, extensive experience and a focus on quality, the Alliance has developed the broadest range of innovative feed enzyme products to counter highly variable feed costs in a sustainable way.

All products under the brand name of DSM are backed by comprehensive and independent scientific research of the highest level to confirm efficacy, reliability and safety in a wide range of feed manufacturing situations and applications. DSM and Novozymes are committed to setting the industry standards for feed enzyme formulation and product performance.

The companies share activities, and build on individual strengths to deliver outstanding products and innovative solutions.

Novozymes provides knowhow in enzyme screening, strain development, formulation, and production, while DSM brings expertise of animal nutrition and feed technology, as well as a global reach in premix manufacture and sales and marketing.

Whether you require a specific enzyme or a carefully selected blend, you need look no further than DSM Enzymes

The energy challenge

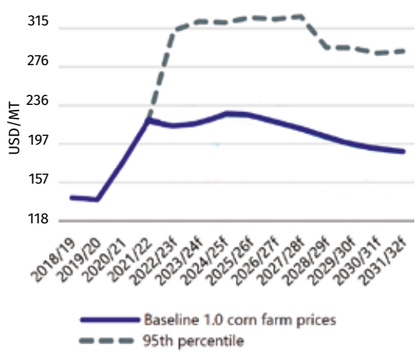
Feed continues to be the major cost of animal production. Energy is very important for animals and the carbohydrates found in cereal and defatted protein crops are a key source of energy in livestock diets. To feed livestock cost effectively the objective must be to maximize the utilization of energy present in the diet.

The release of energy captive in dietary carbohydrate is therefore of critical importance.

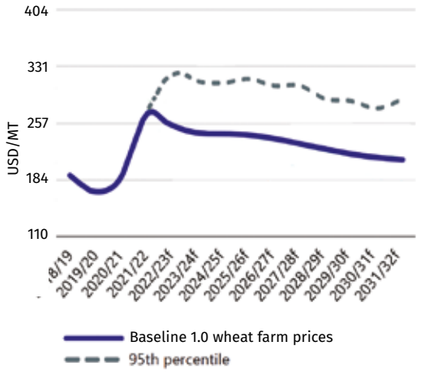
It has always been true that if energy in feed can be used more efficiently with more actually utilized by the animal, then producers' returns will increase. At the same time the environmental impact of livestock production can be reduced if more dietary nutrients are retained by the animal.

This is now more important than ever because increased demand for the crops used to supply the energy in animal feed has lead to increasing price volatility and tighter supply.

US corn farm prices,2018/19-2031/32f



US wheat farm prices,2018/19-2031/32f



Source: USDA, Rabobank 2022

Understanding Carbohydrates

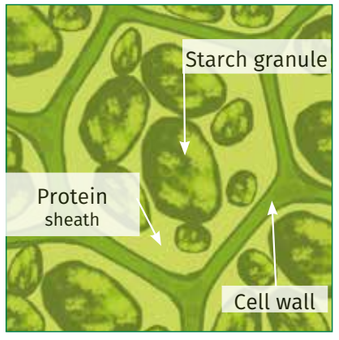
Carbohydrates are the primary source of energy in cereals and defatted protein crops and are present in a variety of forms – starch, sugars and fiber.

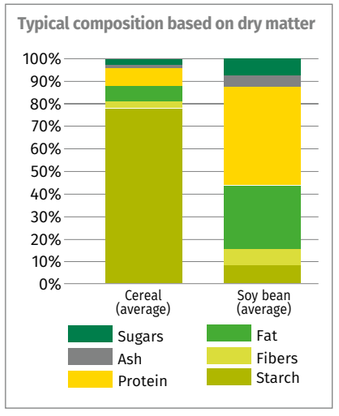
Carbohydrates fall into two categories:

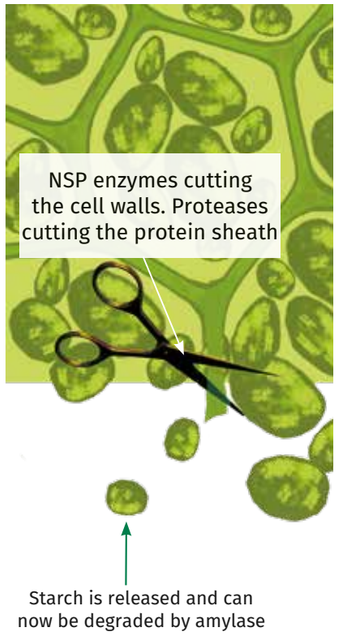
Non-structural carbohydrates such as starch and simple sugars. Starch makes up around 75% of the dry matter in cereals and is the major source of energy in pig and poultry diets, so achieving optimal digestive efficiency is crucial. Starch is a polymer of glucose molecules linked to form either amylose or amylopectin.

Structural carbohydrates are dietary fibres which are commonly referred to as non-starch polysaccharides (NSP). They are primarily located in the cell walls that surround every cell in the plant and are largely undigested by monogastric animals.

Getting at the starch







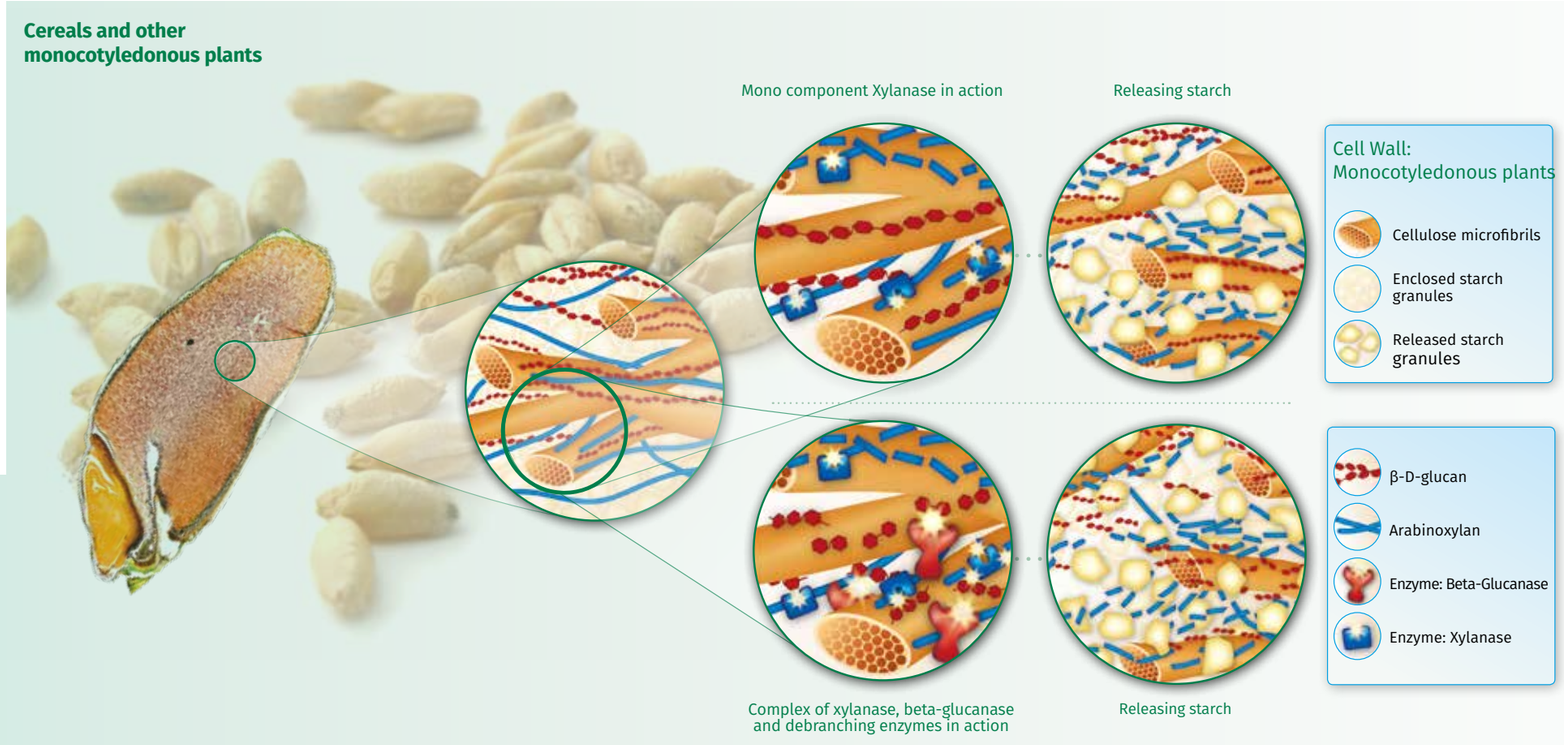
In plants, the starch and protein is located in the endosperm of the seed and is present as starch granules which are surrounded by a protein matrix which is itself encapsulated by the cell wall.
To access and utilize the starch and protein the animal must break down any cell wall. Typically the digestibility of starch in broiler and growing pig diets is 92-95% meaning there is an opportunity to extract even more energy from the diet. Any improvement in utilization will have a significant impact on overall energy efficiency.
However the composition of the cell wall varies in different plant types meaning that different kind of carbohydrases are required to start the process of nutrient release.

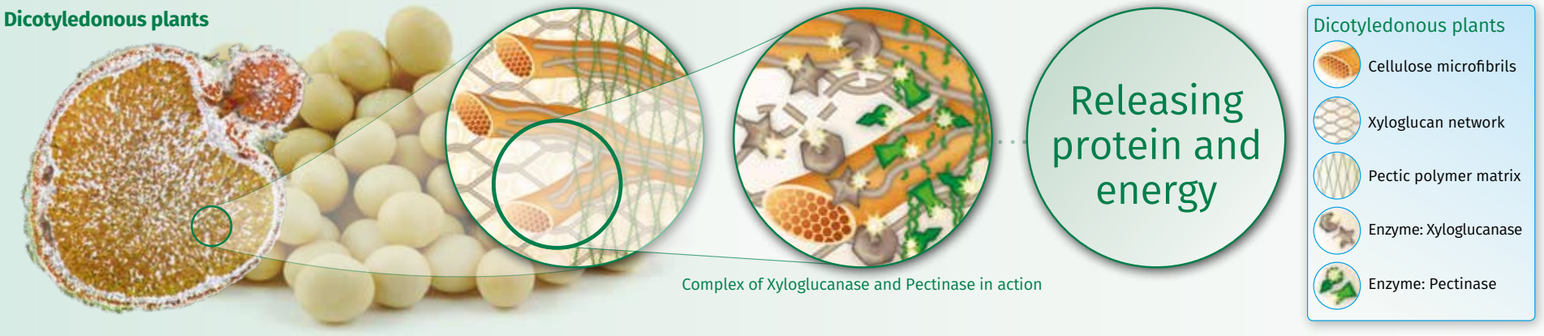
In cereals and other monocotyledonous plants (corn, wheat, barley, millet, rye, oat, rice, triticale) the cell wall is mainly made up of arabinoxylans and beta-glucans.
The precise chemical nature of these will vary from plant species to species and is also influenced by local growing conditions. To successfully break down the cell walls of monocotyledonous plants the animal requires a broad scope of exogenous enzymes; xylanases, beta-gulcanases and additional debranching enzymatic activities.

In dicotyledonous plants such as the main protein crops (e.g. sunflower, rape, canola, soy) the cell wall is mainly made up of xyloglucans and pectin.
It is more complex to break down these cell walls. Therefore enzymes including xyloglucanases and pectinases are required.

Once the cell wall has been degraded it is possible for proteases to break down the protein sheath, so making the caged nutrient granules accessible for digestion, and increasing the energy available to the animal. Once the nutrient is released it can be utilized by the animal.

Improved cell wall degradation is essential to allow greater utilization of energy. Different approaches need to be used for different plant species to maximize the benefit. The reward is better overall energy utilization and improved producer returns.





More than energy and nutrient release

Monogastric animals do not have endogenous NSP hydrolyzing enzymes. Degradation of this carbohydrate class is dependent on enzymatic, chemical and fermentative break down in GIT which is highly affected by many factors related to host and diet. In addition to alleviation of antinutritional effects of NSPs stated previously, exogenous carbohydrases are also capable to break down some of these antinutritional compounds into functional oligosaccharides (e.g. AXOS, MOS). Fermentation of the NSP subunits and SCFA formation in the lower intestinal tract is an additional benefit of NSP enzymes which is contributing gut health improvement.
This additional mode of action reveals unnoticed added value of exogenous carbohydrases.
Precise and smart management of dietary fiber fractions and exogenous carbohydrase usage in feed formulation is a cost-effective opportunity for producers to manage gut health and physical improvement of GIT together with maximizing dietary energy and nutrient utilization sustainably.

DSM Carbohydrases - Maximize your energy

Exogenous carbohydrases can be added to the diet specifically to increase the digestion of otherwise unavailable nutrients, so optimizing energy availability to the animal.
These carbohydrases can be specifically developed to improve energy utilization of different feed raw materials by different species.

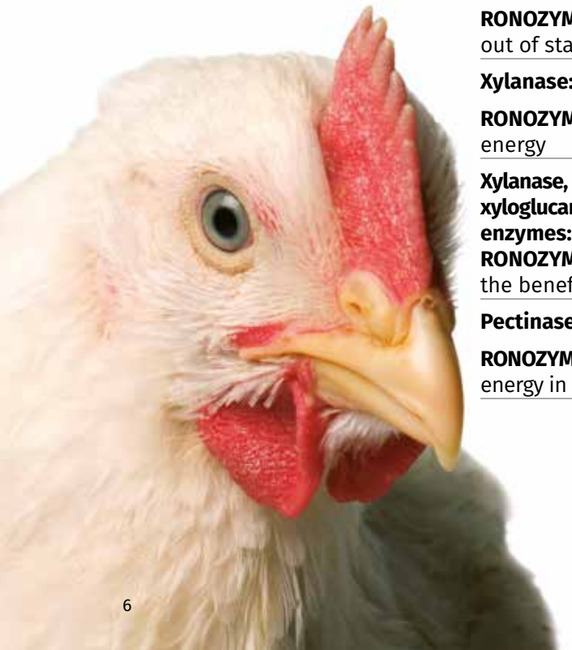
They include:

Enzyme	Degradation of:
Xylanases	Arabinoxylans
xyloglucanases	Xylo-Glucan network
beta-glucanases	(1>3), (1>4) beta-D-Glucan
Pectinases	Pectic polymer matrix
Mananases	Beta-mannans
Cellulases	Cellulose
Amylases	Starch

Efficiency of utilization of energy is maximized when the correct carbohydrases are fed in the appropriate balance to optimize the rate and extent of cell wall breakdown. This depends on the ingredients used in the diets and the proportions included. The DSM carbohydrase product range offers a portfolio of enzymes that can be used either alone or in combination to achieve outstanding energy and nutrient release across a wide variety of dietary raw materials.

DSM offers the broadest range of feed enzymes specifically developed to improve the nutritive value of cereal and protein crops in monogastrics diets. Individual enzymes can be used alone or in combination with other products in the carbohydrase range, or with our proteases or phytases to improve the efficiency of protein and phosphorus utilization.

The DSM Carbohydrases range:



Amylase:

RONOZYME® HiStarch - Get more out of starch

Xylanase:

RONOZYME® WX - Harvest the energy

Xylanase, beta-glucanase, xyloglucanase and de-branching enzymes:
RONOZYME® Multigrain - Multiply the benefits

Pectinases and mannanases

RONOZYME® VP - Release the energy in vegetable proteins

All DSM carbohydrases are produced to exacting standards, and are supplied as fine coated thermostable granules (CT or GT) for ease of handling through the whole feed production process. Outstanding flowability ensures optimal particle distribution in premixes and finished feeds. All DSM carbohydrases are stable during processing and storage.

Some DSM Carbohydrases are also available in liquid form for post-pelleting or post-extrusion application. Whatever your requirements, there is a DSM carbohydrase to help improve efficiency of energy utilization and producer returns, whether used alone or in combination with other DSM enzymes.

Recommended inclusion levels*

	Ronozyme® MutiGrain (g/mT)[1]	Ronozyme® WX (g/mT feed)[2]	Ronozyme® VP (g/mt)[3]	Ronozyme® HiStarch (g/mT feed)[4]
Poultry for fattening	100-120	50-150	100-400	100-200
Turkeys for fattening	100-150	50-150	200-400	100-200
Poultry for laying	80-120	50-75	150-400	100-200
Piglets (weaned)	100-150	100-150	100-500	165-250
Pigs & Sows	80-120	100	200-400	100-200
Aquatic species	100-200	75-150	200-400	165-200

* Exact values are dependant on substrate quantity and accessibility. Inclusion rate may vary regarding the application type and product form used. Please contact your DSM Expert to have further information.

[1] Doses are given in standard product form, Ronozyme® MultiGrain (GT), Please use the conversion factor 1.19 for Ronozyme® MultiGrain (L) to include same amount of enzyme activity for liquid applications

[2] Ronozyme® WX: Doses are given in standart product form, Ronozyme® WX 2000 (CT), Please use the conversion factors for different product forms to include the same amount of enzyme activity. Conversion factors; Ronozyme® WX (CT)=2, Ronozyme® WX 200 (L): 1, Ronozyme® WX 5000(CT)=0.4

[3] Doses are given in standard product form, Ronozyme® VP (CT), Please use the conversion factor 0.5 for Ronozyme® VP (L) to include same amount of enzyme activity for liquid applications

[4] Ronozyme® HiStarch: Doses are given in standard product form, RRonozyme® HiStarch (CT), Please use the conversion factor 0.67 for Ronozyme® 900 (CT) to include same amount of enzyme activity .

BRIGHT SCIENCE. BRIGHTER LIVING.™

For more information, contact your representative today.

Scan to know more
or visit www.dsm.com/anh

Follow us on:

BRO_Carbohydrase_G_EN_1122_A4

DSM
BRIGHT SCIENCE. BRIGHTER LIVING.