Nutrase® BXP 200 TS

MULTI-ENZYME COMPLEX

Makes
feed formulation
better

nutrex NV
the finishing touch for nutrition

Nutrase BXP

Nutrase BXP is a blend of enzymes special developed for use in animal feed as often those activities are not produced or produced in insufficient quantities by the digestive system to guarantee an optimal digestibility of the feed and supply of nutrients to the intestinal bacterial flora to improve gut health.

Carbohydrates

A major part of common vegetable feed ingredients consists of carbohydrates, making carbohydrates a crucial factor in animal production.

Besides well digestible nutrients, such as starch and sugars, the carbohydrate fraction of vegetable origin includes indigestible components, such as cellulose, hemicellulose, pectins and beta-glucans.

These poorly digestible components are classified in a group referred to as Non Starch Polysaccharides (NSP). The NSP fraction is well known for its anti-nutritional effects.

Table 1 summarises the content on Starch and different NSP fractions in the major raw materials used in animal nutrition. It shows that the arabinoxylan fraction is the most important one.

FIGURE 1: STRUCTURAL GROUPING OF CARBOHYDRATES

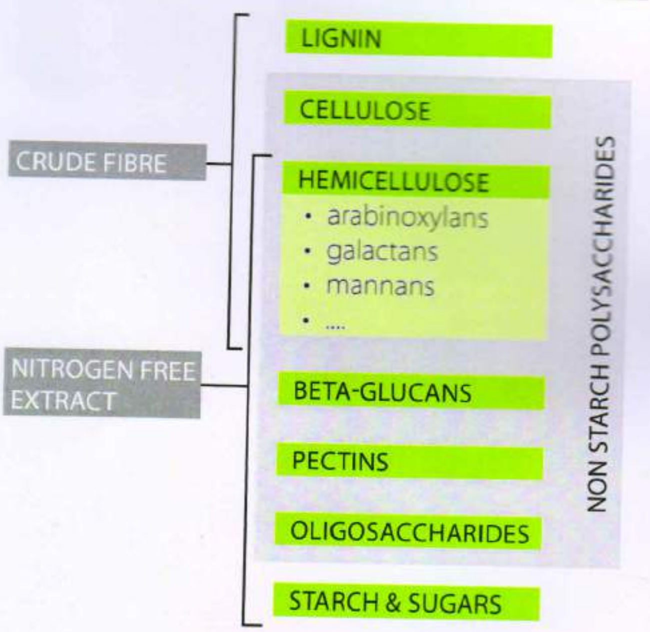


TABLE 1: STARCH AND NSP CONTENT OF FEED INGREDIENTS (AS % OF DRY MATTER)

	STARCH	AX SOL	AX INSOL	β-GLUCANS	CELLULOSE	MANNOSE	GALACTOSE	NSP	AX/NSP
Wheat	58.6	1.8	6.3	0.8	2.0	-	0.3	11.4	71 %
Rye	52.4	3.4	5.5	2.0	1.5	0.3	0.3	13.2	67 %
Corn	62.5	0.1	5.1	-	2.0	0.2	0.6	8.1	64 %
Wheat bran	17.0	1.1	20.8	0.4	10.7	0.4	0.8	35.3	62 %
Sorghum	61.8	0.12	3.8	0.2	2.0	0.1	0.15	6.45	62 %
Wheat DDGS	4.0	4.9	13.4	2.3	5.8	T	0.9	33.2	55 %
Barley	50.9	0.8	7.1	4.3	3.9	0.2	0.2	16.7	47 %
Corn DDGS	2.0	0.4	12.6	-	7.1	0.7	2.1	28.6	45 %
Rice bran	25.3	0.2	8.3	-	1.2	0.4	1.2	21.8	39 %
Rice	70.7	-	0.2	0.1	0.3	-	0.1	0.8	25 %
Sunflower cake	3.4	0.8	5.2	-	12.3	1.2	1.3	31.5	19 %
Soybean meal	5.5	0.75	2.25	-	6.2	1.3	4.1	21.7	14 %

Xylanase & β-glucanase

Whenever using feed ingredients rich in AX and/or β-glucans, the use of AX- and β-glucan degrading enzymes - known as xylanases and β-glucanase reduce the anti-nutritional impact and provide a considerable potential gain in animal production efficiency.

AX and β-glucans | Important anti-nutritional factors

The best known anti-nutritional effect of a high AX and β-glucans content in feed for poultry, is a considerable increase of the viscosity of the intestinal content, caused by the extraordinary water-binding capacity of water-soluble AX and β-glucans.

The increased viscosity affects feed digestion and nutrient use in several direct and indirect ways:

- It prevents proper mixing of feed with digestive enzymes and bile salts
- It slows down nutrient availability and absorption
- It stimulates fermentation in the hind-gut

FIGURE 2: ANTI-NUTRITIONAL EFFECTS OF AX

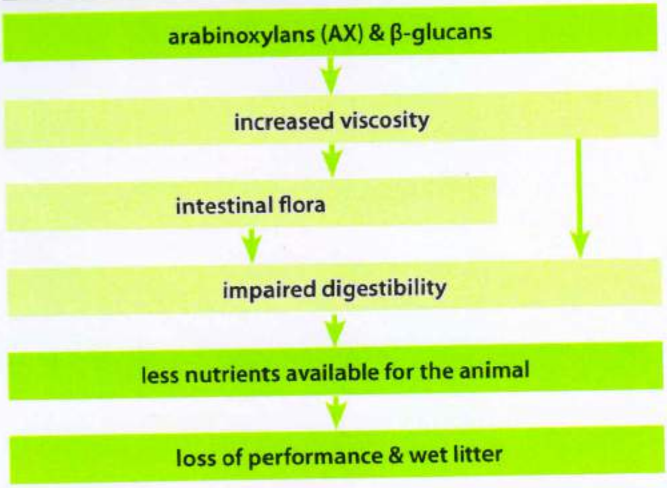


FIGURE 3: XYLAN BACKBONE WITH ARABINOSE SIDE CHAINS

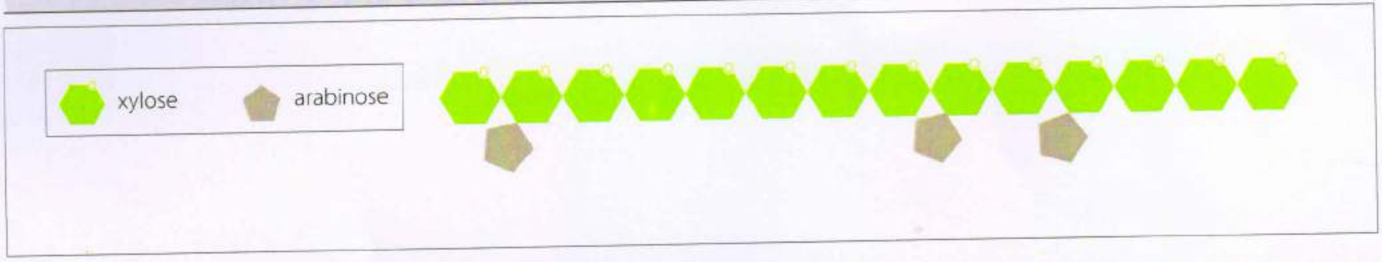
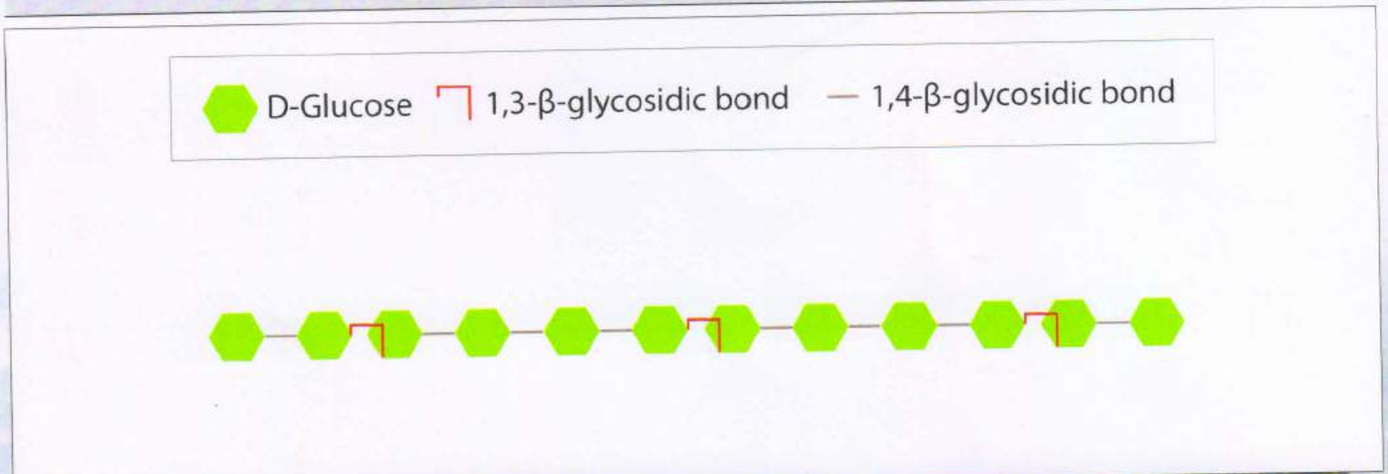


Figure 4: β-GLUCANS MOLECULE



Amylase & Starch

Starch is the main energy source in cereals and is a polymer of D-glucose. Starch is a mixture of amylose and amylopectin and is organised in granules. Generally, starch contains 10-30 % amylose and 70-90 % amylopectin.

Amylase is an enzyme that hydrolyses starch and glycogen. There are 3 different kinds of amylases: α-amylase, β-amylase and glucoamylase (figure 5).

α-amylase

Endoenzyme that cleaves α-(1-4)-glycosidic bonds in amylose and amylopectin, more or less randomly, resulting in the production of maltose (glucose-dimer) as the smallest component.

β-amylase

Exoenzyme that hydrolyses glycosidic bonds starting from the non-reducing end of amylose or amylopectin. This results in a gradual release of maltose. The enzymatic activity stops whenever an α-(1-6)-glycosidic bond is reached.

Glucoamylase

Exoenzyme that cuts of glucose molecules, starting from the non-reducing end of amylose or amylopectin. Whenever an α-(1-6) glycosidic linkage is near, the hydrolytic activity is strongly decreased.

Benefits of supplementing amylolytic enzymes

During the digestion of starch, α-amylase and glucoamylase are produced by the animal and secreted into the small intestines. However, when we take a closer look, we'll see that there are very good reasons to add exogenous amylolytic enzymes to animal feed. Specially young animals and during transition periods the endogenous production might be insufficient.

The shape and sizes of the starch granules differ from source to source, partly explaining the differences in digestibility that are found between different starch sources. Starch has always been considered as highly digestible (98 %). However, it seems that only about 82 % of the starch present in the raw material is digested in the small intestines (figure 6, pigs).

Due to the limited endogenous amylase secretion in young animals, the presence of α-amylase will be of extra help for them to digest starch.

FIGURE 5: FINAL PRODUCTS OF AMYLASE ACTIVITY

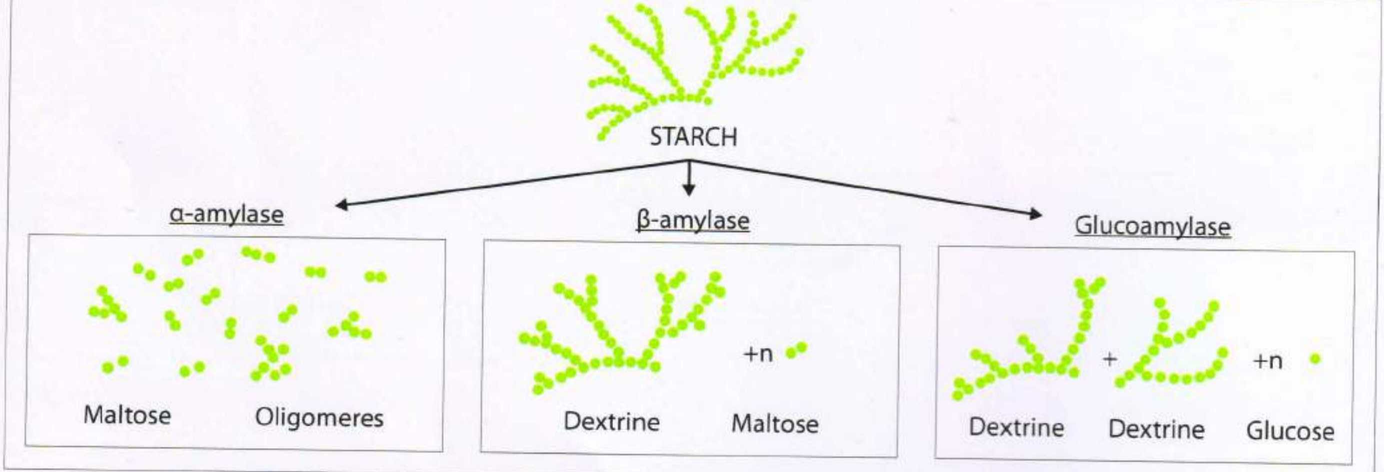
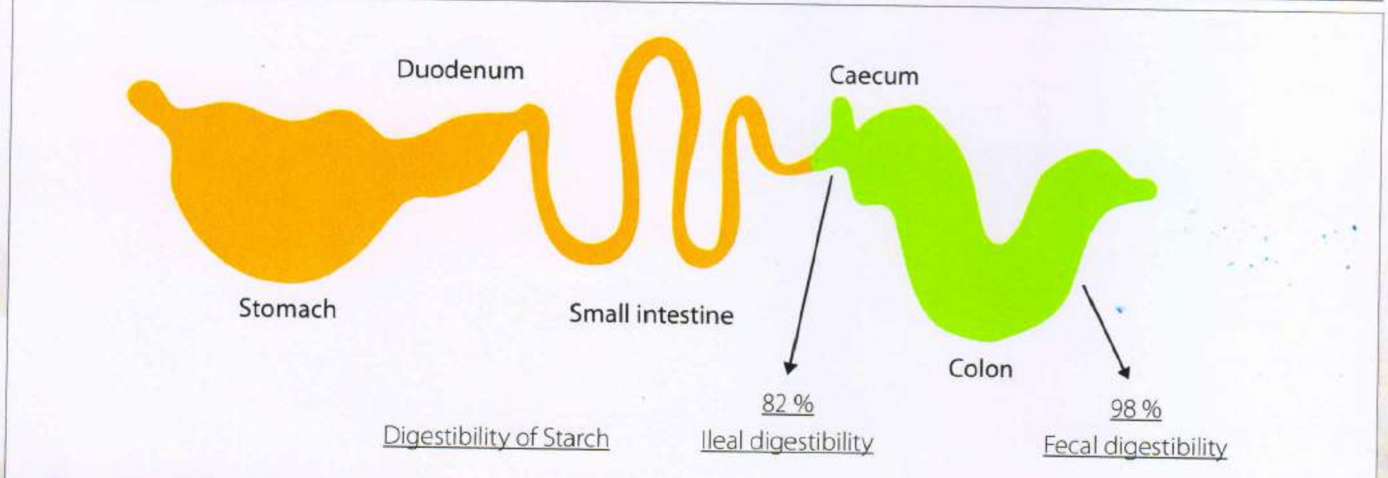


FIGURE 6: UTILISATION OF STARCH THROUGHOUT THE GASTROINTESTINAL TRACT



Phosphorous

Biological

Phosphorous is a key element in all known forms of life. Inorganic phosphorous, as phosphate (PO43-), plays a major role in biological molecules such as DNA and RNA, where it is part of the structural framework of these molecules.

Living cells also use phosphate to transport cellular energy as adenosine triphosphate (ATP). Nearly every cellular process that uses energy obtains it as ATP. ATP is also important for phosphorylation, a key regulatory event in cells.

Phospholipids are the main structural components of all cellular membranes. Calcium phosphate salts assist in stiffening bones.

Phytic acid (known as inositol 6-phosphate (IP6), or phytate when in salt form) is the principal storage form of phosphorous in many plant tissues, especially in bran and seeds.

TABLE 2: P-LEVELS IN RAW MATERIALS

	TOTAL P (%)	PHYTATE-P (%)
	INORGANIC P	
MCP	22.6	-
DCP	18.2	-
	ORGANIC P	
Corn	0.28	0.19
Corn gluten meal	0.47	0.32
Wheat	0.32	0.21
Wheat middlings	1.06	0.90
Barley	0.35	0.24
SBM 46	0.64	0.45
Sorghum	0.28	0.19
Rice Bran	1.45	1.31

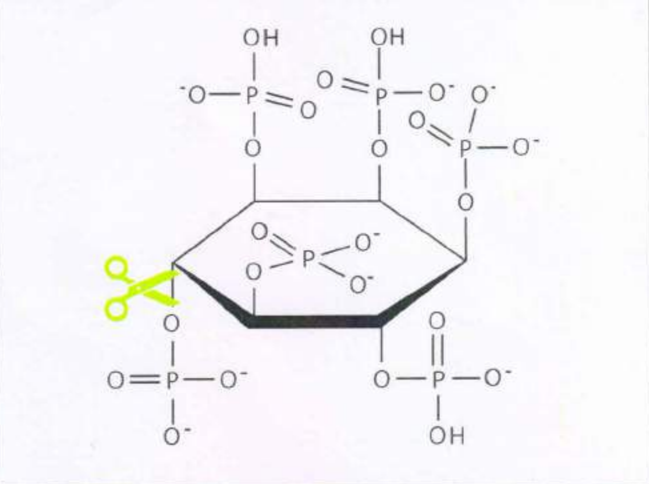
Phytate

Phosphorous in phytate is, in general, not bioavailable to non-ruminant animals, because they lack the digestive enzyme phytase, which is required to separate phosphorous from the phytate molecule.

Because diets of monogastric animals are high in phytate-P, the undigested P can elevate the phosphorous levels in the manure. In areas with intensive livestock production, this can lead to environmental problems.

Furthermore, phytic acid is a strong chelator of important minerals such as calcium, magnesium, iron and zinc and in this way it can be considered as an anti-nutritional factor.

FIGURE 7: PHYTATE



6-phytase

Effects of phytase

Nutrase contains a bacterial 6-phytase preparation that releases phosphate (H2PO4-) bound to phytic acid in order to partly replace inorganic phosphate in animal feed.

Use of Nutrase BXP

Nutrase BXP releases phosphate from phytate and increases the availability of a whole range of nutrients:

Macrominerals

- Phosphorous (P)
  In 1 kg feed, 200 mg Nutrase BXP 200 replaces:
  1,00 g total P from monocalciumphosphate
  1,15 g total P from dicalciumphosphate
  1,25 g total P from bone meal
- Calcium

Trace minerals

- e.g. zinc, iron, magnesium & copper

Amino acids and proteins

Advantages

Feed enzymes encounter a series of different "working" environments during their application. Firstly, feed production processes might result in high temperatures, humidity, ... Secondly, the gastro-intestinal tract puts a strain on enzyme activity: pH, proteolytic enzymes, temperature, ... It is well known that feed enzymes greatly differ in their properties such as stability, optimal pH, optimal T° and release pattern of P (Fig 8,9).

TABLE 3: RESIDUAL PHYTASE ACTIVITY (%) AFTER INCUBATION IN DIGESTA SUPERNATANT (60 MINUTES AT 40°C)

	Crop	Stomach	Duodenum	Jejunum	Ileum
6-phytase (E. coli)	96.9	92.8	96.8	86.7	80.4
3-phytase (Aspergillus)	98.5	90.4	93.6	60.2	54.5

FIGURE 8: RELEASE OF P FROM INOSITOL-6P
6-PHYTASE (E.COLI) VERSUS 3-PHYTASE (ASPERGILLUS)

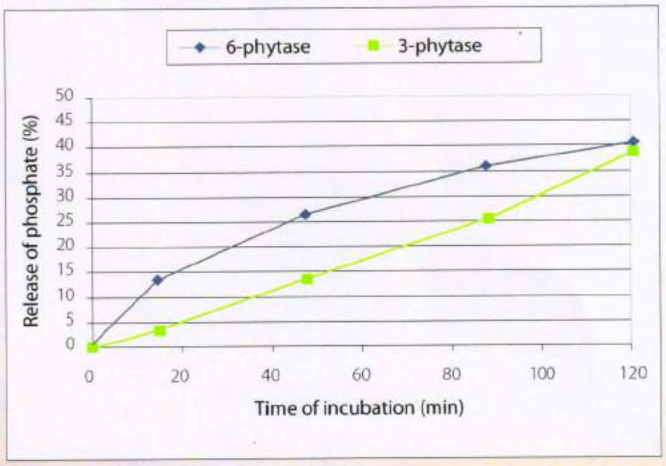
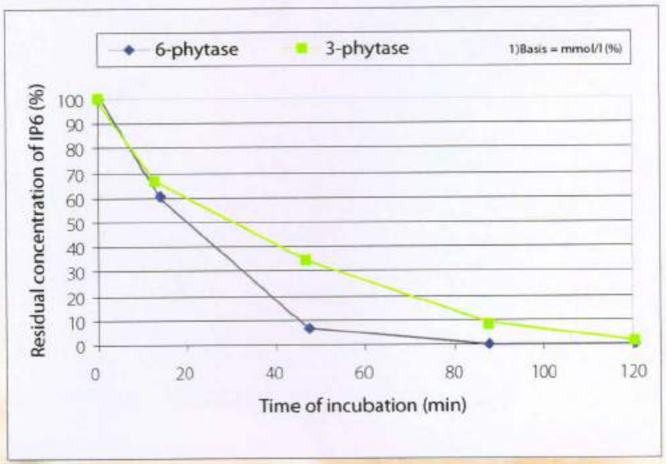


FIGURE 9: DISAPPEARANCE RATE OF INOSITOL-6P
6-PHYTASE (E.COLI) VERSUS 3-PHYTASE (ASPERGILLUS)



Matrix values | Nutrase BXP 200 TS

Description

Enzyme preparation containing endo-xylanase, α-amylase, β-glucanase and 6-phytase.

USE

Nutrase BXP is an enzyme blend containing several enzyme activities, ideal for use in feed for young animals and feed containing several grain or grain by-products. Nutrase BXP allows the feed mill to use only one enzymatic complex and makes feed production easier.

CONTENT	BXP 200 TS
Endo-1,4-β-xylanase (U/g)	112 500
α-amylase (U/g)	22 500
β-glucanase (U/g)	10 000
Phytase (FTU/g)	2 500

DOSAGE	BXP 200 TS g/ton complete feed
Broilers	200
Layers	120
Turkeys	200
Ducks	200

MATRIX VALUES	%
Humidity	2.00
Protein	2.00
Fat	0.20
Starch + sugars	1.50
Ash	92.00
Sodium	0.004
Potassium	0.22
Chlorine	0.07
Magnesium	0.07
Salt	0.11

MATRIX VALUES	%
Pav. Layers	1220
Pav. Broilers	732
Pav. Turkeys	732
Calcium	625
Dig Lysine Poultry	125
Dig Methione Poultry	15
Dig Threonine Poultry	100
Dig Tryptophane Poultry	25

ENERGY LEVELS POULTRY		BXP 200 TS	
		kcal/Kg	MJ/Kg
Broilers	$ME_{poultry}$	500 000	2093
	$ME_{broilers}$	477 000	1997
Layers	$ME_{poultry}$	130 000	544
	ME_{layers}	140 000	586
Turkeys	$ME_{poultry}$	210 000	879
Ducks	$ME_{poultry}$	130 000	544

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The finishing touch for nutrition

Research & Innovation

Our multidisciplinary team of nutrition professionals combines scientific research with hands-on experience to translate their knowledge into workable solutions, adjusted to our customers' needs. All of our products and applications are the result of intensive research and development, in-house as well as in close cooperation with customers, universities and research institutes around the world.

We are constantly alert to emerging trends and receptive to input from our customers and partners. A continuous screening of scientific information unveils new opportunities to create innovative products and solutions.

Quality & Safety

Our internal quality assurance system provides us with a transparent organization, efficient procedures and ensures we're a reliable partner to our customers. Our quality control, based on GMP standards, makes our products fully traceable and safe for animal, man and environment.

Flexibility & Customer Service

We aim to offer flexible solutions in all aspects of our business, touching anything from tailor-made products to providing nutritional advice, aid with product registration procedures and logistical support.

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