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Production of Enzymes

Enzymes are produced by a variety of organisms. In nature you find enzymes produced by plants, fungi, bacteria, animal tissues and yeasts. For the industrial use of enzymes, production methods have been developed,which allow large -scale production, especially for the detergent and food industry.

In the mid 80's attention was put on the use of enzymes in animal feed. Since that time special enzymes have been developed to improve digestibility of carbohydrates and phosphorus in feeds. In 1993, feed enzymes were included in directive 70/524/EEC for additives in animal nutrition as a new group of substances, and legally allowed to be used in the EU in animal feeds.

Production methods

There are two main production methods for enzymes:

Submerged Fermentation process: *this process is used to produce most of the enzymes. The enzyme producing organisms are cultivated in a liquid nutritive medium in big tanks. The nutritive medium composition, pH, temperature and venting need to be strictly controlled to have a high quality enzyme produced. After a certain period of time the enzymes will be harvested via separation methods so they can be marketed as dry or liquid enzymes.*

Surface Fermentation process: *the organism, which produces the enzyme, is grown on the surface of a solid feed material such as wheat bran, rice bran, etc. After fermentation the enzymes are harvested via extraction, precipitation and ultrafiltration processes, so they can be marketed as dry or liquid enzymes.*

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1. Surface fermentation
2. Long-term storability
3. Perfect granulometry
4. Strong heat stability
5. Scientifically proven

Hostazym X50 microGranulate	
Production strain origin	Trichoderma longibrachiatum (IMI SD 135) / not genetically modified
Primary enzyme activity	Endo-1, 4-ß xylanase activity (EC 3.2.1.8.) Minimum activity 30,000 EPU/g
Secondary enzyme activities	Cellulase, hemicellulase, α-amylase, protease
Type of diet	Rich in all types of cereals and cereal by-products
Recommended inclusion (EU/NZ label) Broilers, pigs, piglets	50 g/tonne (= 1500 EPU per kg feed)
Recommended inclusion (EU/NZ label) Turkeys for fattening, & layers	35 g/tonne (=1050 EPU per kg feed)
Packaging	20 kg bags
Shelf Life	24 months

1 EPU is the amount of enzyme which liberates 0.0083 mmol of reducing sugars (xylose equivalents) from oat spelt xylan per min at pH 4.7 and a temperature of 30 °C.

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Let's talk about
Hostazym® X

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Hostazym® X

Hostazym® X is produced by the fungus Trichoderma Longibrachiatum in a Surface Fermentation (SF) Process on wheat bran. It contains all enzyme activities that are necessary to break down the structures in wheat bran to make it possible for the Trichoderma Longibrachiatum to extract nutrients for its growth. This makes Hostazym® X a natural fit to be used in feeds with high grain contents.

Key points Hostazym® X	Why	Benefit
1. Perfect match in feed	Surface Fermentation production on wheat bran	Natural correct mix to break down feed NSP's
2. Perfect particle size	Patented micro granulation process	Perfect mixing, perfect flowability, no dust
3. Robust during storage	Surface Fermentation at high temperatures	Long shelf life and limited loss in storage also under more severe conditions
4. Robust during pelleting	Intrinsic stability	Survives pelleting processes
5. Consistency - proven efficacy over the years	Both action on soluble and insoluble NSP & side activities	Freedom of choice of raw materials, always effective

Table 1: Multiple advantages of using Hostazym® X

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Differentiating Hostazym® X

1. Perfect match in feed: multiple activities due to surface fermentation

Due to the nature of the production process on wheat bran, the Hostazym® X enzyme complex is a natural fit to breakdown NSP fractions like soluble and insoluble arabinoxylans and cellulose, which are major constituents in all cereals including corn, barley, wheat and rye (Fig. 1).

The main activity (standardised) in Hostazym® X is endo -1,4 β-Xylanase but also some 1,3,4 β-glucanase, cellulase and protease activity is present.

Enzymes produced by Trichoderma sp. (like Hostazyme® X) break down both soluble and insoluble NSP's, which makes it different from other endo- 1,4 β-Xylanases produced by other bacterial or fungal organisms (Fig. 2).

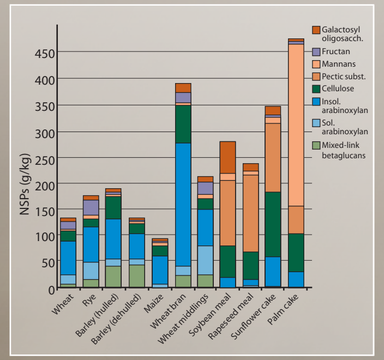

Figure 1: Average NSP fraction content in different raw materials

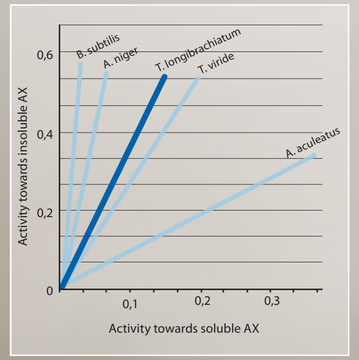

Figure 2: Effect of different xylanases on soluble or insoluble NSP break down (Moers et al., 2003)

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2. Robust during storage: high storage stability

Hostazym® X is a very resilient enzyme, which is reflected in its long shelf life. The reason behind this is the relatively high temperature that is used during the SF process, (55° C). At this temperature the product is most stable, so it withstands more severe storage conditions.

3. Perfect particle size:

Due to a patented microgranulation process, Hostazyme® X has a perfect flowability, has an excellent mixing behaviour and is dust-free.

Hostazym® X has an ideal granulometry

4. Robust during pelletisation: higher thermostability

The relative high temperature during the SF process (55°C) is the reason for the higher intrinsic resistance to higher pelleting temperatures: at 85°C still 89 % of the original activity is recovered (Fig. 3). At higher temperatures recovery is less, then Hostazym® X Liquid is the preferred product to use post-pelleting.

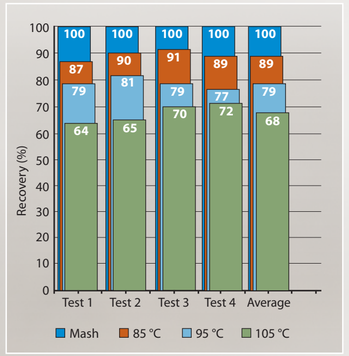

Figure 3: Recovery of the enzyme activity in Hostazym® X (University of Ghent, 2012)

5. Proven efficacy over the years:

By trials at independent research institutes, Hostazym® X has repeatedly proven to be performing on all types of diets, including corn diets. Hostazym® X can be included on top of the feed, or by reformulating the feed using the well-established matrix values.