Xylanase Technical Sheet

High activity enzyme for digesting xylan

BIOFUEL **FRUIT PROCESSING** **BREWING** **GRAIN DIGESTION** **IMPROVED YIELDS** **BULK OPTION**

Scientific & Technical™

Xylanase Technical Datasheet

1. Product Overview

Our high-activity food grade Xylanase has been designed to transform plant-based processing and elevate product quality across the food industry. By efficiently hydrolysing xylan — a major component of hemicellulose in plant cell walls — this powerful enzyme unlocks enhanced extraction, improved texture, and superior yield from cereal grains, fruits, and vegetables. In baking, it promotes lighter loaves, better crumb structure, and increased dough elasticity, while in beverage and juice processing, it delivers clearer, brighter, and smoother products. Its high catalytic efficiency means lower dosage and faster action, translating to cost savings and greater consistency in large-scale production. Produced under stringent food-grade standards, our Xylanase supports clean-label, sustainable manufacturing, reducing dependency on chemical additives while maintaining exceptional performance. Choose our high-activity Xylanase to bring efficiency, quality, and innovation to every stage of your food production process.

2. Product Characteristics

Parameter	Specification
Enzyme Class	endo-β-1,4-xylosidic bonds (EC 3.2.1.8)
Source	*Aspergillus niger* (non-GM strain)
Appearance	Light brown liquid
Activity	50,000 U / g
Units	Enzyme required to release 1 µmol of xylose from beechwood xylan per min
Density	1.10-1.20 g per mL
Total Protein	10-14 % w/v
Temperature Range	15–55 °C
Optimal Temperature	50–55 °C
pH Range	3.4 – 8.0
pH Optima	4.5 – 5.5
Shelf Life	24 months (sealed, stored when kept recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action:

Xylanase (endo-1,4-β-xylanase, EC 3.2.1.8) catalyses the hydrolysis of internal β-1,4-xylosidic linkages in xylan polymer, the major hemicellulose component of plant cell walls. The enzyme binds to accessible regions of the xylan backbone and positions the substrate in a long, open active-site cleft. Most xylanases use a retaining double-displacement mechanism, involving two key catalytic residues—typically two glutamic acids—that act as a proton donor and a nucleophile/base. In the first step, the proton donor protonates the glycosidic oxygen, while the nucleophile forms a transient covalent glycosyl–enzyme intermediate as the bond is cleaved. In the second step, a water molecule—activated by the same nucleophile/base—attacks this intermediate, releasing a shortened xylo-oligosaccharide and regenerating the active site. Because the enzyme acts at random internal positions (non-processively), it rapidly reduces polymer length and increases substrate accessibility for other hemicellulases, resulting in efficient depolymerization of hemicellulose into xylose units, as shown in the formula below:

$$\text{Hemicellulose (polymer)} + H_2O \xrightarrow{\text{Xylanase}} \text{Xylose}$$

3.2 Kinetics:

Xylanase generally follows Michaelis–Menten reaction kinetics, but its behaviour is influenced by the heterogeneous and often insoluble nature of xylan-containing substrates. The enzyme exhibits increasing reaction rates with rising substrate concentration until the active sites become saturated, reaching Vmax, while the Km reflects its affinity for soluble xylan or xylo-oligosaccharides. Because xylan exists in both soluble and insoluble forms and often contains substitutions such as arabinose or acetyl groups, the observed kinetics depend heavily on substrate structure, accessibility, and degree of substitution. Xylanase activity typically shows optimal performance at pH 4.5–6.5 and temperatures between 40–55°C, with deviations causing reduced catalytic efficiency or enzyme denaturation. Product inhibition can occur when accumulating xylo-oligosaccharides bind to the active site and slow further hydrolysis. In multi-enzyme systems, such as those including β-xylosidase or accessory debranching enzymes, overall reaction kinetics may show synergistic effects, as xylanase-generated intermediates are further converted, shifting equilibrium and enhancing overall depolymerisation rates.

- K_m = 1-10 mg per mL
- V_{max} = 650 U / mg
- K_{cat} = 350 s^{-1}

3.3 Inhibitors:

- Heavy metals (Hg^{2+}, Cu^{2+})
- Urea, Guanidine hydrochloride, SDS
- Extreme low or high pH
- High temperatures above 60 deg. C
- High chelator concentrations (EDTA)

4. Applications

4.1 Baking and Bread Improvement:

- Breaks down arabinoxylans in wheat flour to release water and reduce dough viscosity.
- Improves dough handling, gas retention, and loaf volume.
- Enhances crumb softness, uniformity, and overall texture.
- Helps slow staling, extending shelf life.

4.2 Cereal and Grain Processing:

- Enhances extraction from grains such as wheat, barley, and rye by breaking hemicellulose in cell walls.
- Improves filtration, flow properties, and yield in grain mashes.
- Used in the production of whole-grain foods to improve texture and reduce grittiness.

4.3 Juice and Beverage Clarification:

- Breaks down xylan-rich hemicellulose in fruits and vegetables, improving:
  - Juice yield
  - Press efficiency
  - Clarity and reduction of haze
- Often applied in apple, grape, and berry processing as part of multi-enzyme blends.

4.4 Plant-Based Milk and Extract Production:

- Used on oat, barley, and cereal substrates to reduce viscosity and increase extraction of soluble solids, flavors, and nutrients.
- Improves texture and filtration during plant-milk production.

4.5 Brewing and Malting:

- Breaks down arabinoxylans that cause wort viscosity and filtration problems
- Results in better lautering, improved wort flow, higher extract yields
- Enhances clarity and fermentation efficiency.

4.6 Dietary Fiber Modification:

- Converts insoluble hemicellulose into more soluble, fermentable forms useful for functional foods.
- Enhances mouthfeel and nutritional properties of high-fiber products.

4.7 Feed Ingredient Pre-Processing (Food-grade versions in human-use products):

- Helps break down cereal fiber in ingredients used in food supplements, improving digestibility and nutrient availability.

8. Synergistic Action with Other Food Enzymes / Often used with cellulases, β-glucanases, and pectinases to:

- Improve extraction of aromas, colors, and polyphenols
- Increase clarity in juices and beverages
- Enhance breakdown of plant cell wall matrices in general processing

5. Handling & Storage

5.1 Storage Conditions:

- Store at 4–25 °C in sealed containers

- Avoid direct sunlight and freezing
- Keep away from acids, oxidizing agents, and heavy metals

5.2 Stability on Storage:

- Activity loss 1–3% per month at room temperature
- Refrigeration improves stability

5.3 Safety Information:

- Non-toxic and biodegradable
- May cause allergic reactions via inhalation or skin contact
- Use protective clothing, gloves, goggles
- Avoid aerosol formation

Refer to product MSDS for complete safety details.

6. Packaging Options

- 0.1 L, 1 L, 10 L, 25 L (1000 kg totes available upon request)

7. Quality Control Specifications

Test	Specification
Activity assay	≥ labelled activity
Density (liquid)	1.1–1.2 g / mL
Moisture (powder)	≤ 8%
Microbial load	Total plate count ≤ 10,000 CFU / g
Pathogens	*Salmonella* negative, *E. coli* negative

9. Shelf Life

- **Liquid:** 12 months
- **Powder:** 24 months
  Stored in original container, sealed, in cool conditions.

10. Disclaimer

This technical data sheet provides general information. Application testing is recommended to determine optimal use conditions.

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