Cellulase

High activity enzyme blend for digesting cellulosic feedstocks

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1. Product Overview

Our food-grade cellulase is an enzyme preparation derived from safe microbial sources, designed specifically for use in the food and beverage industry. It possesses hydrolytic activity against cellulose and other β-1,4-glucans, breaking down plant cell walls into simpler sugars without producing harmful by-products. Key properties include high specificity, stability under moderate temperatures and pH ranges suitable for food processing, and absence of toxic contaminants. Its primary use cases include enhancing juice extraction and clarity by breaking down fruit and vegetable cell walls, improving the texture and digestibility of plant-based foods, facilitating fermentation processes in brewing and wine production, and increasing nutritional bioavailability. Food-grade cellulase is valued for its ability to improve yield, consistency, and quality in plant-derived food products while maintaining safety for human consumption.

2. Product Characteristics

Parameter	Specification
Enzyme Class	EC 9012-54-8
Source	*Aspergillus niger* (non-GM strain)
Appearance	Brown liquid
Activity	>15,000 U / g
Density	1.1-1.20 g per mL
Temperature Range	15–60 °C (operational)
Optimal Temperature	50–55 °C
pH Range	3.5 – 8.0
Optimal pH	4.5 – 5.5
Shelf Life	12 months (sealed, recommended storage conditions)

3. Enzymatic Properties

3.1 Mechanism of Action:

Cellulase is a group of hydrolytic enzymes that catalyse the breakdown of cellulose, the primary structural polysaccharide found in plant cell walls. The enzyme complex acts synergistically through the combined activities of endoglucanases, exoglucanases (cellobiohydrolases), and β-glucosidases. Endoglucanases randomly cleave internal β-1,4-glycosidic bonds within the cellulose chains, creating new chain ends and reducing the degree of polymerisation. Exoglucanases then act on these newly exposed chain ends to progressively release cellobiose units, while β-glucosidases hydrolyse cellobiose into glucose. This sequential hydrolysis converts insoluble cellulose into soluble sugars that can be utilised by microorganisms or further processed in industrial applications. The coordinated action of these enzymes enables efficient degradation of crystalline and amorphous

cellulose and is widely exploited in biofuel production, animal feed, textile processing, paper manufacture, detergent formulations, and food processing.

3.2 Kinetics:

The hydrolysis of cellulose by cellulase generally follows Michaelis–Menten kinetics under conditions where the substrate is readily accessible. The reaction rate increases with substrate concentration until the enzyme becomes saturated, at which point the maximum reaction velocity (Vmax) is reached. The apparent affinity of the enzyme for cellulose is described by the Michaelis constant (Km), although this value can vary considerably depending on the physical properties of the cellulose, including crystallinity, particle size, and surface area. Because cellulose is an insoluble polymer, overall reaction kinetics are also influenced by enzyme adsorption to the substrate, substrate accessibility, product inhibition (primarily by cellobiose and glucose), temperature, pH, and mixing efficiency. Commercial cellulase preparations contain multiple synergistic enzyme activities, including endoglucanases, exoglucanases, and β-glucosidases, whose combined action enhances cellulose hydrolysis beyond that predicted for the individual enzymes alone. Under optimal conditions, the reaction rate is initially rapid but gradually decreases as the concentration of accessible cellulose declines and inhibitory hydrolysis products accumulate.

3.3 Inhibitors:

- Heavy metals (Hg^{2+}, Cu^{2+})
- Urea, Guanidine hydrochloride, SDS
- Extreme low or high pH
- High temperatures above 65 deg. C
- High chelator concentrations (EDTA)

4. Key Applications

- Fruit juice extraction and clarification
- Vegetable juice extraction and clarification
- Wine production and clarification
- Cider production
- Brewing (improved mash filtration and extract yield)
- Coffee bean processing
- Tea processing
- Olive oil extraction
- Vegetable oil extraction
- Citrus fruit processing
- Tomato processing
- Puree and pulp production
- Fruit mash maceration
- Plant-based beverage production (e.g. oat, soy, almond)
- Starch processing (in combination with other enzymes)
- Baking and dough conditioning
- Wholegrain and high-fibre bakery products
- Extraction of natural colours and flavours from fruits and vegetables
- Dietary fibre modification

- Production of fruit and vegetable concentrates
- Biomass hydrolysis for food ingredient manufacture
- Animal feed ingredient processing
- Production of fermentable sugars for food fermentations
- Cocoa bean processing
- Production of vegetable purees and baby foods
- Recovery of valuable compounds from fruit and vegetable processing by-products
- Improvement of yield during fruit and vegetable processing
- Production of soluble dietary fibre ingredients

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 ~1–5% 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 ≤ 50,000 CFU / g

Test	Specification
Pathogens	*Salmonella* negative, *E. coli* negative

9. Shelf Life

- **Liquid:** 12 months, store 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.