

Phytase Technical Sheet

High activity enzyme for digesting phytate



ANIMAL FEED



AGRICULTURE



BIOFUELS



IMPROVED YIELDS



FOOD GRADE



BULK OPTION

 Scientific & Technical™

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1. Product Overview

Our food grade phytase enzyme helps you cut feed costs and improve efficiency by releasing the phosphorus locked inside plant ingredients, reducing your dependence on expensive inorganic phosphate while maintaining and even improving animal performance. By breaking down phytate, it also frees up calcium, amino acids, and energy that would otherwise be wasted, giving you greater formulation flexibility, better feed conversion, and more consistent results across varying raw materials. The outcome is simple: lower cost per ton, stronger performance, and reduced phosphorus excretion to support sustainability goals and regulatory compliance — all from one high-impact addition to your feed program.

2. Product Characteristics

Parameter	Specification
Enzyme Class	Phytase (EC 3.1.1.8)
Source	<i>Aspergillus niger</i> (non-GM strain)
Appearance	Light brown powder
Activity	200,000 U / g
Units	Where 1 U is the amount of enzyme required to release 1 μ mol of inorganic phosphate per min
Temperature Range	30–65 °C (operational)
Optimal Temperature	35–38 °C
pH Range	4.0–7.0
Optimal pH	6.0–7.2
Shelf Life	12 months (sealed and kept under recommended storage conditions)

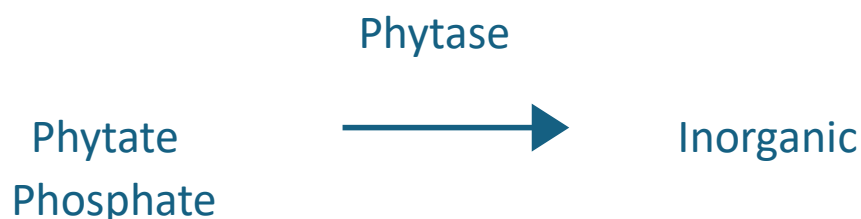
3. Enzymatic Properties

3.1 Mechanism of Action:

Phytase enzymes catalyse the stepwise hydrolysis of phytic acid (myo-inositol hexakisphosphate, IP6) by cleaving its phosphate ester (P–O) bonds, releasing inorganic phosphate and progressively lower inositol phosphate intermediates (IP5, IP4, IP3, etc.). The enzyme binds phytate in its active site and uses a catalytic residue (commonly a histidine in histidine-acid phytases or a metal-assisted mechanism in β -propeller phytases) to attack the phosphorus atom, forming a transient phosphorylenzyme intermediate or a metal-stabilized transition state. Water then hydrolyses this intermediate, freeing phosphate and regenerating the active site so the reaction can repeat. By

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breaking down phytate, phytase reduces its ability to chelate minerals and bind proteins, thereby improving phosphorus availability and increasing the bioaccessibility of nutrients such as calcium, zinc, and iron.



3.2 Kinetics:

Phytase-catalysed phytate hydrolysis typically follows Michaelis–Menten kinetics, where the initial reaction rate increases with phytate concentration until the enzyme becomes saturated and reaches a maximum rate (V_{max}); the substrate concentration at which the rate is half of V_{max} is the K_m , which reflects the enzyme's apparent affinity for phytate (lower K_m = higher affinity). Because phytate is a highly charged molecule and binds strongly in the active site, phytases often show strong dependence on pH and ionic strength, with activity peaking near their optimum pH (commonly acidic for histidine acid phytases and near neutral for β -propeller phytases). Reaction rate also increases with temperature up to an optimum (often ~ 45 – 60 °C for industrial enzymes), after which activity drops due to thermal denaturation, so the overall temperature dependence reflects a balance of faster catalysis versus enzyme instability. Many phytases display product inhibition by released inorganic phosphate and may show substrate inhibition at very high phytate concentrations, as excess phytate can occupy secondary binding sites or alter enzyme conformation; in practical applications, these factors influence effective activity in feed or process conditions and determine how efficiently phytate is converted over time.

3.3 Inhibitors:

- Heavy metals (Hg^{2+} , Cu^{2+})
- Urea, Guanidine hydrochloride, SDS
- Extreme low or high pH
- High temperatures above 70 deg. C
- High chelator concentrations (EDTA)

4. Key Applications

- **Biofertilizers and agricultural soil treatment** – Phytase can release inorganic phosphate from phytate present in soils, compost, manure, and plant residues, potentially improving phosphorus availability to crops and reducing dependence on mineral phosphate fertilizers.
- **Phosphate recovery from agricultural waste** – Treatment of manure, crop residues, oilseed meals, and other phytate-rich biomass can convert organically bound phosphorus into recoverable inorganic phosphate.

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- **Wastewater treatment** – Phytase can hydrolyse phytate-derived organic phosphorus in agricultural or industrial wastewater, making phosphorus easier to remove, recover, or biologically utilise.
- **Environmental phosphorus management** – Enzymatic degradation of phytate in manure and organic wastes can help control the form and fate of phosphorus before land application, potentially reducing phosphorus accumulation and runoff.
- **Composting and organic-waste treatment** – Addition of phytase can accelerate phytate mineralisation during processing of plant-derived wastes and improve phosphorus availability in the resulting compost/fertiliser.
- **Plant biotechnology** – Phytase genes can be expressed in plants or microorganisms associated with plant roots to improve utilisation of phytate-bound soil phosphorus.
- **Microbial biofertiliser formulations** – Phytase-producing *Bacillus*, *Pseudomonas*, fungi, and other microorganisms can be developed as phosphate-mobilising inoculants for agriculture.
- **Pulp and paper processing** – A more niche application where phytase has been investigated for degradation/removal of phytate and associated metal-ion complexes in plant-derived processing streams.
- **Industrial biomass processing / biorefineries** – Phytase can be used during processing of phytate-rich plant biomass to liberate phosphate and reduce phytate's metal-chelating effects before downstream fermentation or chemical processing.
- **Production of lower inositol phosphates** – Controlled phytase hydrolysis can produce IP5, IP4, IP3 and other inositol phosphate intermediates for research, biochemical reagents, biotechnology and potentially pharmaceutical/cosmetic applications.
- **Phytic-acid analytical methods** – Phytase can serve as a reagent for enzymatic determination of phytate/phytic acid in agricultural, environmental and biological samples.
- **Laboratory and molecular-biology research** – Used to study phytate metabolism, phosphorus cycling, inositol phosphate pathways, enzyme kinetics and phytase structure/function.

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

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- Use protective clothing, gloves, goggles
- Avoid aerosol formation

Refer to product MSDS for complete safety details.

6. Packaging Options

- 100 g, 1 kg, 10 kg or 25 kg drums.

7. Quality Control Specifications

Test	Specification
Activity assay	≥ labelled activity
Moisture (powder)	≤ 8%
Microbial load	Total plate count ≤ 50,000 CFU / g
Pathogens	<i>Salmonella</i> negative, <i>E. coli</i> negative

9. Shelf Life

- **Powder:** 24 months when 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.

NOTE: THIS DOCUMENT CANCELS AND SUPERSEEDS ALL OTHER EDITIONS