Benefit from the root-to-stem trend with plant-based flavors

Safe and predictable processing and natural savory ingredients

Rethink Tomorrow

novozymes®

Traditionally hydrolyzed plant proteins can be hard to control

It can be challenging to make a high-quality hydrolyzed protein using acids

- Acid hydrolysis, if not well controlled, can produce harmful chlorinated products
- It is difficult to tailor-make desired flavors
- Acid hydrolysis is not sustainable, nor does it produce the desirable umami and savory flavors

Meeting customer demands

High usage of flavor enhancers in e.g. fast foods and need for salt reduction is supporting the growth of flavor enhancer market in general

5.5%

CAGR for flavor enhancers overall between 2019 and 2024

– Mordor Intelligence

6.3% CAGR

In natural flavors (2019 – 2027)
reaching USD 20.04 billion by 2027

– REPORTS AND DATA

Create plant-based flavors with enzymes

Enzymes can help secure desired product characteristics

Safe and predictable processing

Enzymes help you deliver label-friendly ingredients in a safe, sustainable and controlled manner.

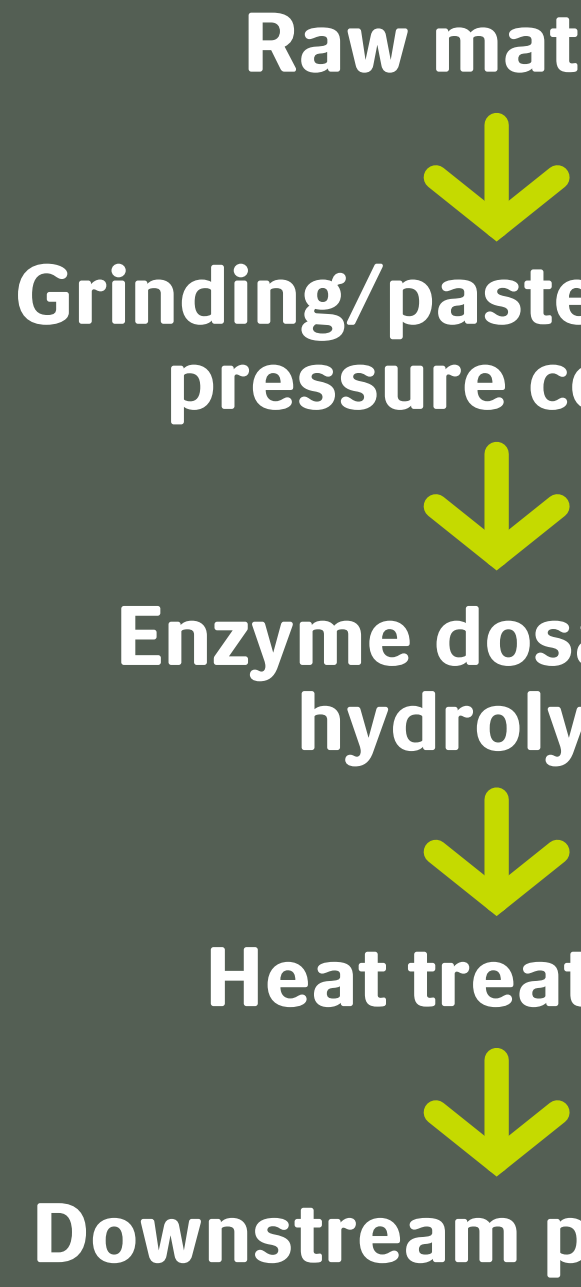
Natural savory ingredients

Gentle hydrolysis with enzymes is very flexible, as the base taste is mild and pure. It also allows tailor-made Maillard reactions, umami and savory flavors to develop.

Products

The following enzymes are suitable for solubilization of plant proteins:

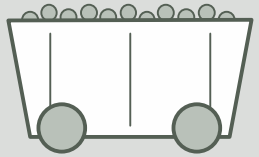
Novozymes product	Description
Alcalase® 2.4 L FG	Broad-spectrum endoprotease, liquid
Flavourzyme® 500 MG	Flavor-enhancing exoprotease, granulate
Flavourzyme® 1000 L	Flavor-enhancing exoprotease, liquid
Protamex®	Very broad-spectrum endoprotease, granulate
Viscozyme® L	Broad-spectrum enzyme that can hydrolyze plant tissue, liquid



Usage

- Substrate: most commonly soy, wheat, oat and corn
- Proteins must be accessible to the enzymes
  - Refined and processed plant proteins such as soy isolates, concentrates, flakes, wheat and corn gluten are already in such a form
  - Raw agricultural material may need breakdown of plant tissue and/or particle size
- 2 recommended hydrolysis procedures, though customization is possible:
  - Near neutral substrate or higher: Alcalase® or Protamex®
  - Mildly acidic (pH 5-7): Flavourzyme®
- Flavourzyme® can also be added as a second stage of hydrolysis after Alcalase®/Protamex® for enhanced savory or debittering
- Heat treatment inactivates enzymes and preserves product

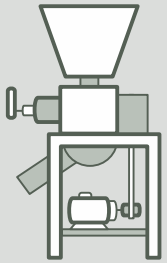
Usage
Plant protein flavor enhancement



Step 1

Raw material

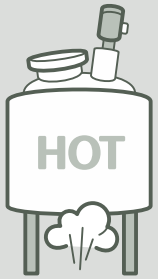
- Soy, wheat, oat or corn protein



Step 2

Grinder

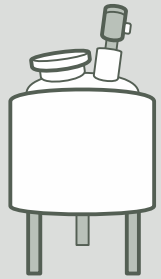
- Reduce particle size of plant material to enhance the enzymatic action



Step 3

Cooking

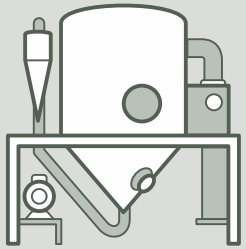
- Heat to make proteins more available for enzymes



Step 4

Enzyme dosage and hydrolysis

- Add enzyme
- Monitor pH, time and temperature
- Inactivate using heat



Step 5 **Optional**

Downstream processing

- Separation
- Drying

Optimum pH and temperature

	Optimum pH	Optimum temperature (°C)	Optimum temperature (°F)	Max. % DH
Alcalase®	8.0	50–60	122–140	15–25
Flavourzyme®	5.5–7.7	50–55	122–131	Approx. 60
Protamex®	7–8	50	122	10–20
Viscozyme®	4.5–5.5	45–55	113–131	N/A

Partner to expand your plant protein capabilities

Differentiate

Understanding market demands

Plant proteins are often co-products whose nutritional and functional properties are underutilized given the market demand for protein. Plant protein flavors are sustainable ways to derive value from plants and plant co-products, and umami and savory flavor from plants make these more sustainable sources more desirable.

By working with Novozymes' experts, you can unlock the value within these process streams and win in the marketplace.

Optimize

Optimizing your product with enzymes

Protease technology has unique and versatile functional benefits. Through experimentation, we can select the optimal balance and dosage of enzymes to develop your new hydrolysate.

The enzymes that can boost the performance of your hydrolyzed plant proteins are Alcalase®, Flavourzyme®, Protamex® and Viscozyme®.

Expand

Winning customers and sales

Novozymes helps you meet your production and launch goals with a partnership mentality.

You have access to a wealth of expertise, from labeling and regulatory to technical services, supply chain and commercial account management. Together we ensure that your hydrolyzed plant protein is a commercial success.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