

The sustainable way to make your beer shine

A clear beer throughout shelf life

The formation of molecular structures composed of proline-rich proteins and polyphenols is regarded as one of the major contributors of the haze formation in beer. With time, the size and stability of these protein-polyphenol complexes grow, resulting in increased beer turbidity. In a worst-case scenario, these particles become visible to the naked eye, diminishing the consumer appeal of the final product.

Lumista® Gold comprises a proline-specific endopeptidase that targets haze-active proteins rich in proline residues. By preventing the formation of sizable haze-active structures, it notably reduces the visible haze in beer. This highly specific enzyme activity enables the brewers to produce a clear and stable product throughout shelf life.

Benefits

- **Maintain colloidal stability throughout shelf life**
- **Increased production capacity and flexibility:** Optimized tank utilization
- **Decreased energy consumption:** Beer stabilization achieved rapidly without deep cooling
- **Easy and safe handling:** Minimal volume per application and no powder handling
- **Reliable and sustainable solution:** Ensuring a stable supply
- **Gluten reduction in beers¹:** Utilizing barley and/or wheat malts
- **Cost-effective:** Comparatively lower cost-in-use than current enzymatic and adsorbent-based solutions

¹ Depends on the country regulation, please consult Novozymes' Lumista® Gold experts for advice

Performance

What is haze in beer?

In beer, a variety of insoluble particles can be suspended in the liquid phase, which will scatter the light and make the beer appear turbid. Turbidity in beer can be directly measured with a turbidimeter equipped with detectors placed at a 25° and/or 90° light scattering angles, allowing the detection of very small particles (under 1 µm) with high sensitivity.

Chill and tannic acid-induced haze measurements are commonly used in breweries to assess the potential haze formation during shelf life. Chill haze analysis is a robust method which gives an indication of the maximum potential haze formation caused by the complexes that precipitate under cold conditions and/or by ethanol addition. Tannic acid-induced haze correlates with the level of haze-sensitive proteins present in the matrix.

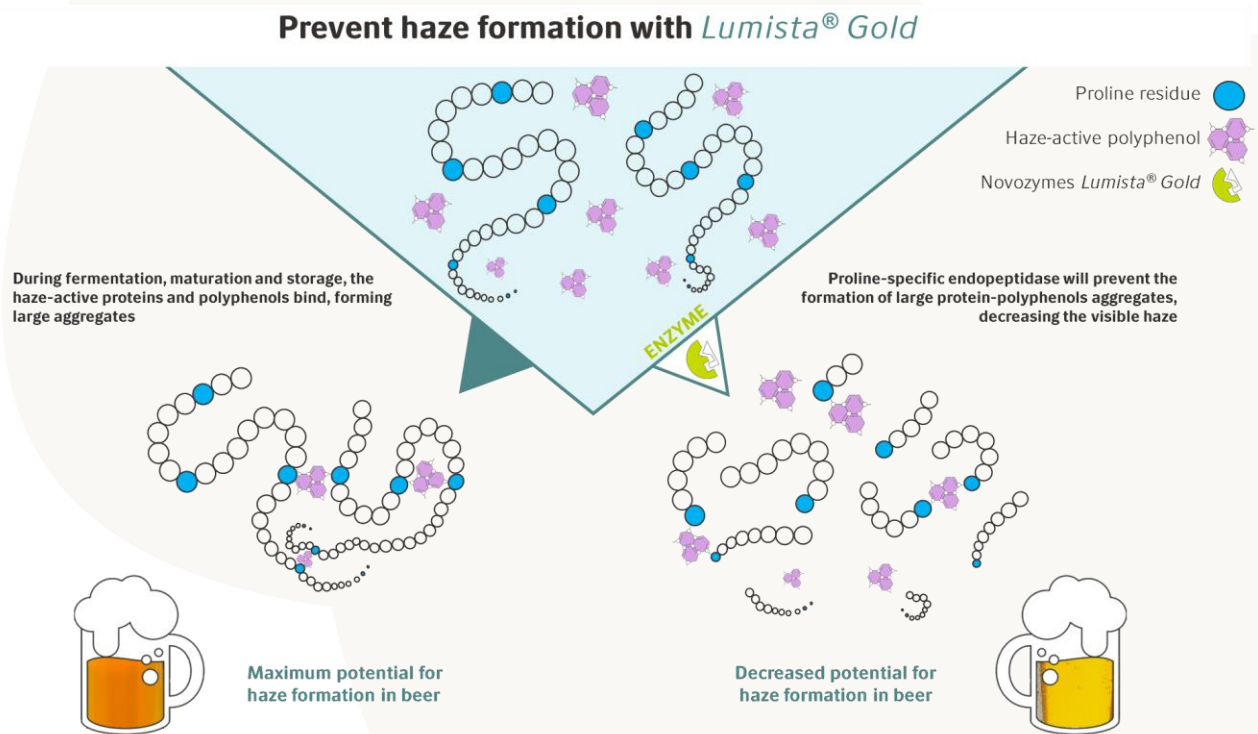


Fig. 1 – Schematic representation of the mode of action of Lumista® Gold

How to decrease the haze formation in your beer?

Lumista® Gold is the solution for haze prevention in your beer. This highly specific endopeptidase neither affects the fermentation performance nor the sensory profile or foam stability of your beer, keeping it clear (Fig. 1). The addition of Lumista® Gold during fermentation decreases both chill and tannic acid-induced haze values considerably, as shown in Fig. 2.

Traditionally, beer stabilization requires a deep cooling step and is based on the binding and/or precipitation of proteins or polyphenols to avoid the formation of large protein-polyphenols in the finished beer. Applying synthetic adsorbents during maturation and/or filtration may bear the risk of carrying over traces to the finished beer. With an enzymatic solution, breweries can abandon or limit the usage of adsorbents. In addition, the maturation time can be shortened since the enzyme is active throughout the fermentation process.

The impact of Lumista® Gold on beer stability is also evident when following real-time shelf life (Fig. 3). After storing beer samples for 12 months at room temperature, the turbidity and chill haze levels were significantly lower when Lumista® Gold was added (green line, Fig. 3A and 3B). In addition, the foam stability remained unchanged and within standard values (≥ 220 seconds), demonstrating the high specificity of this endopeptidase.

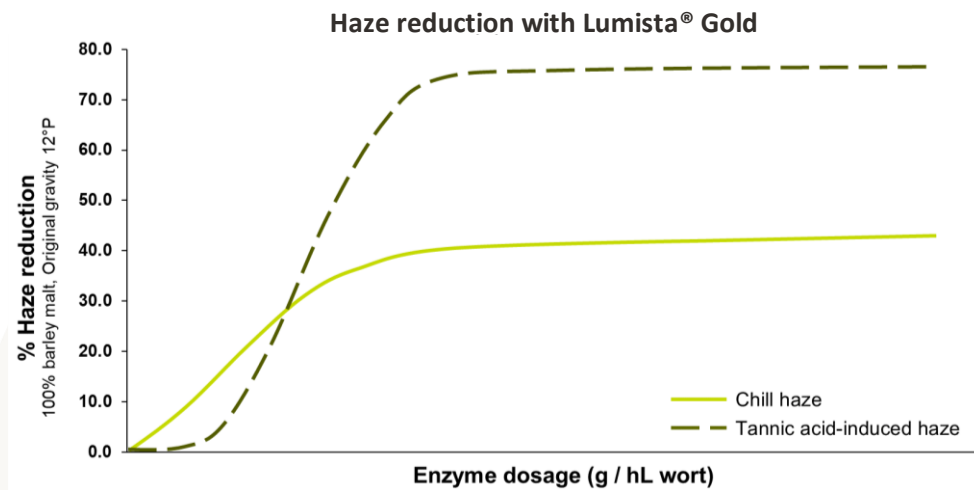


Fig. 2 – Impact of increasing enzyme dosage of Lumista® Gold on the chill (green line) and tannic acid-induced (grey line) haze formation.

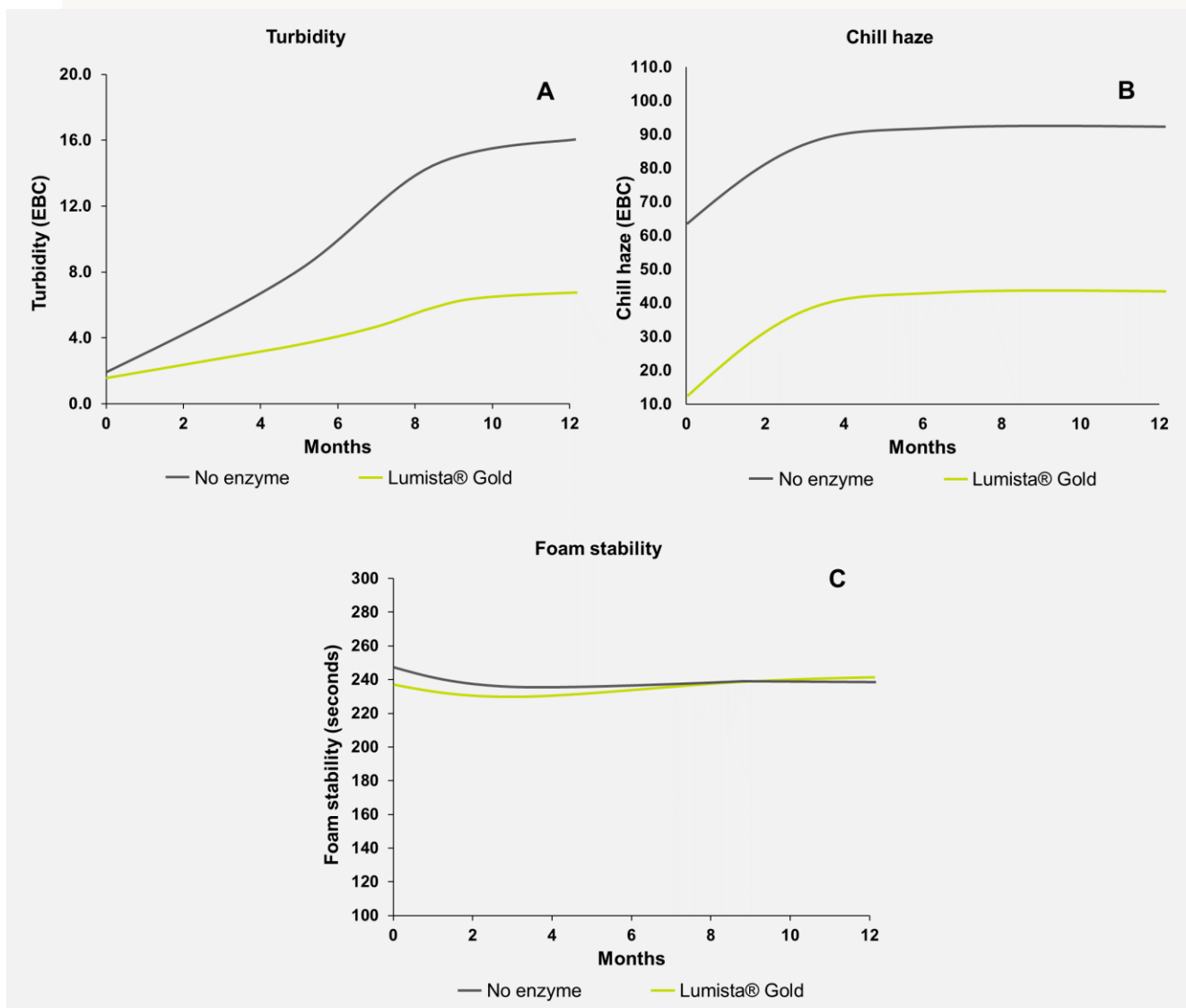


Fig. 3 – The long-term impact of Lumista® Gold in beer was assessed during 12 months by following turbidity (A), chill haze (B) and foam stability (C) of a traditional lager beer based on 100% barley malt

Gluten reduction

In barley and/or wheat-based beers and beverages

Most commercial beers and malt-based beverages are based on gluten-containing grains such as barley or wheat, preventing their consumption by people on a low or free gluten diet. Upon ingestion of foods or beverages based on barley or wheat, gluten degradation is minimal through the digestive system since the gluten matrix is very resistant to human gastrointestinal peptidases. A major reason for this resistance is the high level of proline in the composition of the gluten proteins. Applying the proline-specific endopeptidase Lumista® Gold leads to a reduction of the gluten content in beer, by cleaving the proteins and peptides rich in proline which constitute a major part of the gluten matrix. When considering a standard pilsner beer based on 100% malt, Lumista® Gold can reduce the gluten content up to 90%, reaching a level below 20 ppm (Fig. 4).

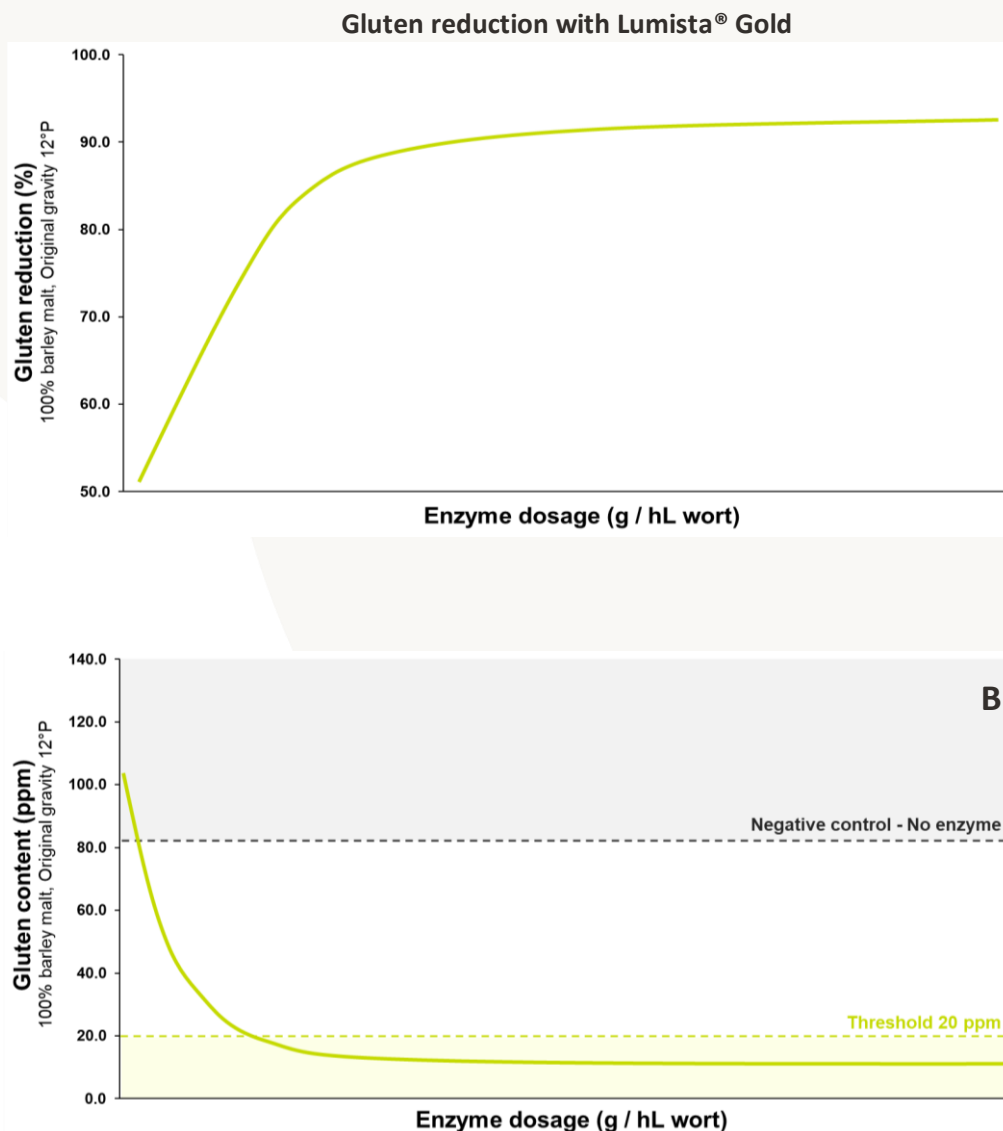


Fig. 4 – In beers based on gluten-rich cereals, Lumista® Gold can decrease the gluten content by 90% (A). Breaking down the proline-rich gluten matrix enzymatically can lead to gluten levels below the 20 ppm threshold (B).

Applying the proline-specific endopeptidase Lumista® Gold leads to a reduction of the gluten content in beer, by cleaving the proteins and peptides rich in proline which constitute a major part of the gluten matrix. When considering a standard pilsner beer based on 100% malt, Lumista® Gold can reduce the gluten content up to 90%, reaching a level below 20 ppm (Fig. 4).

The gluten content in the finished product and remaining allergen potential depends on the raw materials and production process used and therefore, the finished product must be carefully assessed by the producer. The legislation on gluten reduction is highly specific per country or region. Please consult a Lumista® Gold expert for advice before testing this solution for gluten reduction

Usage

Lumista® Gold is dosed into the cold wort at the beginning of the fermentation process. The dosage may vary depending on the wort composition, original gravity and intended shelf life.

- The recommended dosage for **preventing haze formation** in a 100% barley malt beer with 12° Plato is 1.7 g/hL cold wort. In the cases where the main application is **gluten reduction**, higher dosages may be required: 2.0 – 4.0 g/hL cold wort
- The optimal dosage is reached when the finished beer remains clear during the intended shelf life

Lumista® Gold interacts with its environment, so the results are not only pH- and temperature-dependent, but also linked to yeast strain, wort composition and original gravity. Thus, each application needs to be assessed and optimized individually.

Product data

Lumista® Gold	
Declared enzyme	Prolyl oligopeptidase
Catalyzes the following reaction:	Prolyl oligopeptidase hydrolyzes peptide bonds at the carboxyl site of mainly proline- and to a lesser extent alanine-residues
Declared activity	375 AU(P)/g
E.C/I.U.B. no.:	3.4.21.26
Physical form	Liquid
Production method	The enzyme product is manufactured via fermentation of a microorganism not present in the final product. The production organism is improved using modern biotechnology
Density	1.1 – 1.3 g/mL

Stability

Find more information at [Novozymes Market](#).

Safety, handling, and storage

Safety, handling, and storage guidelines are provided with all products.

Get ahead

Staying ahead of the dynamic food and beverage market requires the best technology and expertise to become even more flexible, efficient and profitable. With our solutions and expertise, Novozymes can support you on that journey. Let's transform the quality and sustainability of your business together.

About Novozymes

Novozymes is the world leader in biological solutions. Together with customers, partners and the global community, we improve industrial performance while preserving the planet's resources and helping build better lives. As the world's largest provider of enzyme and microbial technologies, our bioinnovation enables higher agricultural yields, low-temperature washing, energy-efficient production, renewable fuel and many other benefits that we rely on today and in the future.

We call it Rethink Tomorrow.

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