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Application Data Sheet

# Beer from barley malt made Gluten-free with Brewers Clarex®

*Same great taste without the gluten!*

## BENEFITS

Consumers are increasingly looking for gluten-free foods & beverages. Gluten free beer with great taste can now also be made from barley malt, thanks to Brewers Clarex®, the innovative solution by DSM.
There is no need to switch to alternative gluten free grains for your beers. Beer can be produced according to your choice of recipe and malt and can be served to the customer as gluten free, in alignment with local regulatory guidelines.

Brewers Clarex® is in use in the brewing industry for a decade to efficiently prevent colloidal chill haze in beer, without negatively affecting foam, beer flavour and other beer quality aspects.
Recently, all proof has been collected that it is also enabling to brew gluten free beer!

## PRODUCT DESCRIPTION

BREWERS CLAREX® is a patented product containing a highly specific fungal endopeptidase enzyme, obtained from the fungus *Aspergillus niger* in a fully controlled fermentation process. The product is offered as an easy-to-use and robust liquid formulation.

## FUNCTION

Gluten-free labelling often requires gluten levels to be below 20 ppm in the final beer. Levels of gluten in beers made from malted barley vary but typically exceed 20 ppm. Gluten are also proteins and Brewers Clarex® is a protease enzyme that degrades the gluten into harmless peptides. Brewers Clarex® is highly specific to degrade gluten proteins and haze sensitive proteins due to its action that specifically targets the carboxyl end of the amino acid proline, omnipresent in haze sensitive proteins as well as gluten.
In beer, gluten have no specific function and no impact on taste, flavor, body or mouthfeel. Thus, the absence of gluten does not impact the beer quality

## APPLICATION & RECOMMENDED DOSE RATES

BREWERS CLAREX® can be used with all kinds of malted barley and other raw materials used in brewing. The liquid product is simply added to cooled wort at the beginning of fermentation, see figure 1.

The required dose rate is determined by factors also listed in Table 1.

Most important parameters are the percentage of barley malt, raw barley and/or wheat of the total grist composition, and the fermentation conditions.
Higher gluten levels due to material or process choices of course should be countered with adjusted dose levels of the Brewers Clarex® product.
One should correct the addition rate to the fermentation vessel taking into account the specific gravity (Plato) of the wort at the beginning of fermentation. Very short fermentation time or very low temperature of the process may be optimized for. Table 2 provides recommended dose levels and optimizations.

Table 1: Factors influencing gluten levels during the brewing process

| Brewing Parameters | Gluten Levels : |
|---|---|
| Percentage of malt in recipe | Decrease when more malt is replaced by gluten free adjuncts (sugars, syrups, starch from maize, rice) |
| Type of malt | Variable |
| Original gravity of the beer | Increase with higher gravity |
| Use of wheat | Increased gluten levels |
| Use of specific process equipment (centrifuge, whirlpool, filters) | Most added steps would decrease gluten levels |

Table 2. Recommended dose levels for a selection of recipe/process conditions

| Materials / Conditions | Recommended Dose level based on gravity of the final beer *12' Plato wort* | Corrected Addition rate to fermentation vessel example High Gravity @ 16'Plato ) |
|---|---|---|
| 100% barley malt | 2 – 3 g/hL | 2.6 – 3.9 g/hL or 2.4 – 3.5 mL/hL (@ density of 1.1g/ml) |
| 60% barley malt + adjuncts, like syrups, maize, rice, starch (not containing gluten) | 1.5 – 2 g/hL | *Adjust accordingly* |
| Short fermentation or lower temperature (eg. For low/non-alcohol beers) | Optimize dose levels | *Adjust accordingly* |
| Wheat in the mash bill | Optimize dose levels | *Adjust accordingly* |

Please note that when using Brewers Clarex® also for beer stabilisation (chill haze), we kindly refer you to the related Application sheet and adjust the dose levels according to the desired shelf life of your beer.

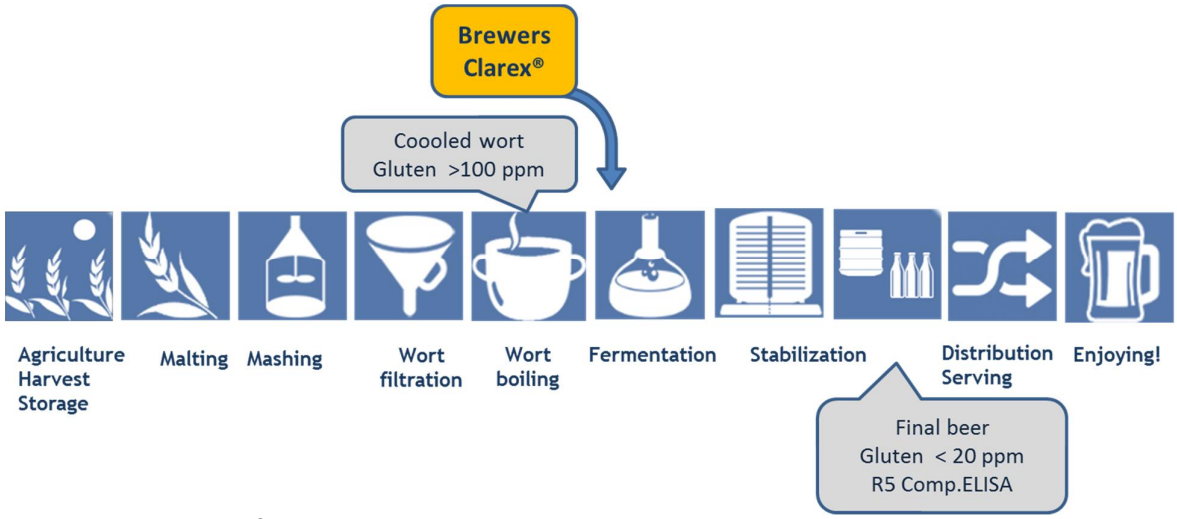


Figure 1. Brewers Clarex® is simply added at the start of fermentation and enables to decrease levels of gluten consistently.

LABELLING GLUTEN-FREE BEER

The labelling of gluten free beer or beers crafted to remove gluten, is subject to local regulations and legislation. Please check with your local advisors, and/or inquire with DSM representatives for the situation applicable to your market.

We advise brewers to go to an accredited lab to test the level of gluten in the beer to claim it as gluten free. DSM representatives will be able to guide you to local accredited test laboratories.

- European Union - Beers that contain less than 20 ppm of gluten can be labelled gluten-free.

  Following the Codex Alimentarius guidelines www.codexalimentarius.com
  "Gluten-free foods are dietary foods consisting of one or more ingredients from wheat, rye, barley or oats, which have been specially processed to remove gluten, and the gluten level does not exceed 20 mg/kg (ppm) in total, based on the food as sold or distributed to the consumer."

- USA –'Crafted to remove gluten"

  The TTB allows use of the statement "[Processed or Treated or Crafted] to remove gluten" together with a qualifying statement. TTB also requires the submission of results of the R5 (Mendez) Competitive ELISA assay

- Canada- Beers which measure under 20pmm gluten can be labelled gluten free

  We recommend to check the current position of Health Canada regarding GF beers made with barley

MEASURING GLUTEN IN BEER

*Advised to use the R5 (Mendez) Competitive ELISA assay*

Several tests exist to determine gluten levels in food and beverages. The Codex Alimentarius refers to the R5 Sandwich ELISA (Enzyme-Linked Immunoassay) to measure gluten in food. In this (quick) test, the monoclonal R5 antibody recognizes the QQPFP (glutamine-glutamine-proline-phenylalanine-proline) motif, among others. QQPFP is a common repetitive sequence present in all prolamins and immunoreactive epitopes. However, the Sandwich R5 test is not suitable for every type of food, especially food containing hydrolyzed gluten such as beer, malt extract, sourdough, and starch.

The R5 Competitive ELISA test has been further developed to accurately measure gluten in beer also if it is partially hydrolyzed. This competitive ELISA test recommended for beer can recognize as little as 1 epitope. It is standard practice to multiply the level of prolamin by a factor of 2 to obtain the gluten concentration when measuring gliadin from wheat; however for barley products such as beer it is estimated that 97 percent of the immunoreactive epitopes are present in the hordein fraction of the malt. Therefore, doubling it is largely overestimating the content of gluten, thus giving the test an extra margin of safety for barley based products.

The R5 Competitive ELISA has been tested in two successful collaborative studies organized by the AACC International and the American Society of Brewing Chemists (ASBC).

## REFERENCES


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## TECHNICAL SERVICE

This product was developed by our dedicated team of experts. They can help you to maximize the yield and efficiency of your mash and beer filtration processes, building on extensive biochemical knowledge and many years of brewing experience.
Please contact your local DSM Food Specialties technical sales representative to receive additional information on meeting your needs.