



DISTILLASE® CS WB

Saccharifying Enzyme For Ethanol Production

DESCRIPTION

DISTILLASE® CS WB enzyme is an optimized blend of enzymes that produces glucose from liquefied starch. DISTILLASE® CS WB enzyme contains fungal 1,4- α -D—glucan glucohydrolase (E.C. 3.2.1.3) commonly referred to as glucoamylase or amyloglucosidase and fungal alpha-amylase (E.C.3.2.1.1). The glucoamylase in DISTILLASE® CS WB catalyzes the release of successive glucose units from the non-reducing ends of soluble dextrans and oligosaccharides, while the alpha-amylase at the same time can generate those oligosaccharides and dextrans. The enzymes contained in the DISTILLASE® CS WB system are produced by genetically modified strains of *Trichoderma reesei*.

TYPICAL CHARACTERISTICS

Activity: 400 GAU/g (minimum)

Appearance: Opaque brown liquid

pH: 4.0 - 4.5

Specific gravity: 1.05 - 1.15 g/ml

Formulation: Food-grade

UNIT DEFINITION

One Glucoamylase Unit (GAU) is the amount of enzyme that will liberate one gram of reducing sugars calculated as glucose per hour from soluble starch substrate under the conditions of the assay. A detailed assay method is available upon request.

PERFORMANCE BENEFITS

DISTILLASE® CS WB enzyme provides the following benefits to ethanol producers:

- Increased ethanol yield by complete saccharification of liquefied starch
- Less unfermented starch in stillage and DDGS
- Improved performance in pre-saccharification processes.
- Increased fermentation rates and shorter fermentation times

APPLICATION RECOMMENDATIONS

DISTILLASE® CS WB enzyme is used to saccharify liquefied starch from various sources including wheat, corn, sorghum, barley, rye, rice and cassava. The resultant glucose product is fermented by yeast to yield ethanol.

RECOMMENDED OPERATIONAL CONDITIONS

Optimum pH range	4.0 - 5.0
Effective pH range	3.2 - 5.8
Effective temperature	28 to 65°C (86 to 149°F)
Pre-saccharification	1 to 16 hours at 60 to 65°C (140 to 149°F)
DISTILLASE® CS WB Dosage	Please contact your DuPont representative for recommendations specific to your fermentation process

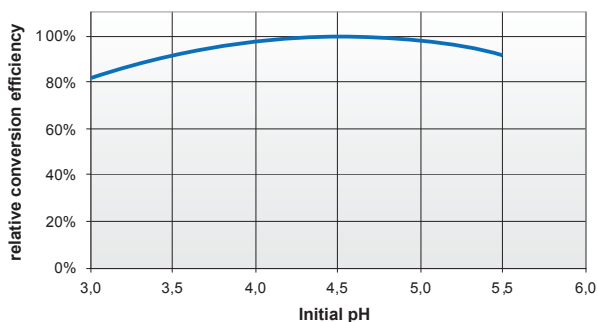
DOSAGE RECOMMENDATIONS

DISTILLASE® CS WB enzyme is generally added at a level of 0.080 to 0.11 % w/w (starch, dry solid basis). This corresponds to a level of 0.54 to 0.725 kg DISTILLASE® CS WB / MT grain 'as is'. The actual enzyme requirement is dependant on the temperature, reaction time and pH of the individual plant saccharification/fermentation process, and its desired results. Fermentation performance may be enhanced by the addition of acid fungal protease like FERMGENTM.

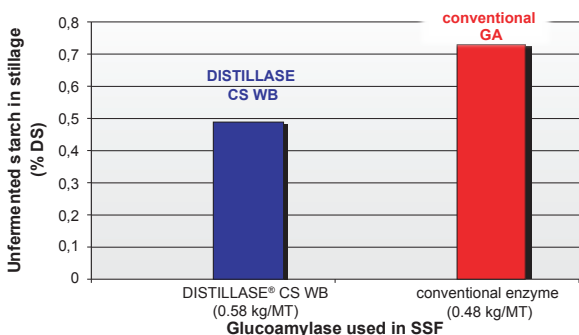
COMPLETE SACCHARIFICATION OF STARCH

DISTILLASE® CS WB enzyme converts more starch to fermentable sugars compared to other comparable products

Effect of initial fermentation pH on conversion efficiency with DISTILLASE® CS WB (whole ground wheat, 30% DS, 32°C



Effect of DISTILLASE® CS WB and conventional glucoamylase on residual starch of fermented wheat mash



REGULATORY STATUS

The enzymes and ingredients in DISTILLASE® CS WB are in compliance with TSCA and meet the standards for fuel ethanol production in the United States. In addition, the enzymes in the product have been determined to be GRAS for distillers dried grains produced as a by-product in alcohol production. For other countries, please contact customer service.

PACKAGING

DISTILLASE® CS WB is available in various package sizes and bulk tankers. Please consult your DuPont representative for detailed information.

STORAGE

To ensure maximum retention of activity, store DISTILLASE® CS WB enzyme under refrigerated conditions with the container closed. Prolonged storage at elevated temperature should be avoided.

SAFETY & ENZYME HANDLING

Inhalation of enzyme dust and mists should be avoided. In case of contact with the skin or eyes, promptly rinse with water for at least 15 minutes.

For detailed handling information, please refer to the appropriate Material Safety Data Sheet, the Enzyme Technical Association (ETA) handbook *Working Safely With Enzymes*, and the Association of Manufacturers and Formulators of Enzyme Products (AMFEP) handbook *Guide to the Safe Handling of Microbial Enzyme Preparations*. All are available from DuPont.

TECHNICAL SERVICE

Information covering specific applications of this product is available. DuPont will work with customers to enhance processes and solve problems. Let us know what you need and we will assist you.

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