Fermentation Enzymes

Made with technology from DSM
About Enzymes

What are they?
Enzymes are proteins – complex amino acid structures – made by live cells, although not all proteins are enzymes.

Where do they come from?
Enzymes have many natural sources including:

- Microbial (yeast or bacteria)
- Plant (papaya, pineapple)
- Animal (pancreatic, for example)

How do they work?
Enzymes bring molecules together in optimal orientations to make and break chemical bonds.

- They are CATALYSTS of biological systems
- All chemical reactions need and use energy
- Enzymes LOWER the energy needed for activation of reactions
- Determine pathway of chemical reactions
- Mediate transformation of energy from one form to another (releasing free energy)
- They are SPECIFIC in their reactions
- Each enzyme is responsible for a single chemical reaction or a set of closely related reactions
- But they can act on a wide range of molecules
**Why are they important in fermentation?**

Many aspects of fermentation require enzymatic reactions in order to proceed. Extracting fermentable sugars from grains are critical to the success of yeast fermentation, and production of alcohol could not occur without the work of amylase enzymes to break down starch into simple sugars that are usable by yeast. Also, many steps of the metabolic pathways used by yeast are enzyme-dependent. Without enzymes, fermentation would not be possible.

**Fermentation Enzymes**

White Labs Fermentation Enzymes are packages with products made by technology from DSM Unlimited, and come in home-brew 1L, and 10L sizes that are ready to use. All of our enzyme products are sources from non-genetically modified organisms. They are also Kosher approved and comply with current Food & Drug Administration standards for Good Manufacturing Practice.

Enzymes should be stored at 4-8º, which will minimize activity loss to less than 5% over 36 months. See individual product descriptions for specific dosage rates.
AMINO-QUIK - WLN4200

*Liquid papain for chill proofing beer*

**PRODUCT DESCRIPTION**

AMINO-QUIK is a liquid vegetal papain extracted from Carica papaya.

**FUNCTION**

Brewers must ensure that the finished beer they produce is as clear and bright as possible for answering consumer demand. However, sometimes chill haze appears progressively when beer is stored at low temperature. Haze is composed of proteins, polyphenols, carbohydrates and inorganic compounds such as iron or copper.

Polyphenols and proteins associate in hydrogen, then covalent bonds in time, making haze irreversible. Papain is a cystein protease that degrades protein fraction of beer, preventing further association with polyphenols. AMINO-QUIK acts specifically on the haze forming protein components by hydrolyzing bonds with leucine or glycine.

Chill proofing with AMINO-QUIK effectively prevents chill haze without physically removing other important beer components. AMINO-QUIK does not impart any odor or taste to the beer.

**APPLICATION**

AMINO-QUIK is easy to use. It must be added to the beer at maturation stage at 1 to 3 ml/BBL into the lagering tank or when the beer is transferred prior to final filtration. Optimal temperature is 55-65°C. Just before use, to ensure adequate mixing, it should be diluted at a dosage of 1 Liter in 4 Liters of beer or water.

CLARITY-FERM - WLN4000

*A highly specific endo-protease to prevent chill haze in beer and reduce levels of gluten*
PRODUCT DESCRIPTION

CLARITY-FERM is a product containing a highly specific endo-protease which only cleaves polypeptides at the carboxyl end of the amino acid proline. Protease is derived from Aspergillus niger.

FUNCTION

Chill haze in beer results from the precipitation of complexed polyphenols and proteins during cold storage. The nature of this precipitation has been shown to be the result of hydrogen bonding between the polyphenols and the proline-rich fraction of particular polypeptides. This haze develops over time and, initially, is reversible (haze disappears when the temperature of the beer increases). As the hydrogen bonding becomes stronger this chill haze can become permanent.

CLARITY-FERM will prevent the precipitation of complexed polyphenols and proteins by hydrolyzing the sensitive (haze-active) polypeptides in the region where such hydrogen bonding occurs, specifically the amino acid Proline. The specificity of the enzyme ensures that no other beer parameters, such as foam/head retention or flavor are affected.

This easy to use enzyme can be used on all types of brewing ingredients and is a cost effective product to replace silica gel or PVPP. Simply add when pitching yeast, and CLARITY-FERM will do its work during fermentation. When fermentation is complete, chill haze has already been addressed.

In addition to eliminating chill haze, CLARITY-FERM significantly reduces the gluten content in beers made with barley and wheat by specifically breaking down the Proline fraction, making up the gluten protein. A CLARITY-FERM treated beer made from barley or wheat usually tests below 20 ppm of gluten, the current international standard for gluten free.

*THE TTB ISSUED INTERIM LABELING GUIDELINES IN 2012 FOR BEERS MADE WITH GLUTEN CONTAINING GRAINS, AND IT STATES:
TTB will allow use of the statement “Processed or Treated or Crafted to remove gluten,” together with a qualifying statement to inform consumers that: (1) the product was made from a grain that contains gluten; (2) there is currently no valid test to verify the gluten content of fermented products; and (3) the finished product may contain gluten.

TTB will only approve label applications with the above claims if it contains a detailed description of the method used to remove gluten and R5 Mendez Competitive ELISA assay for the finished product showing a response of less than 20ppm gluten (and the manufacturer of the assay)

APPLICATION

CLARITY-FERM can be used with all kinds of malts and other raw materials.
CLARITY-FERM is added to cooled wort at the beginning of fermentation.

The required dose rate is determined by:
- The percentage of barley malt, raw barley and/or wheat of the total grist composition;
- The specific gravity (Plato) of the wort at the beginning of fermentation;
- The shelf-life required (months).
Note: There is no requirement to treat any adjuncts derived from maize grits or rice with CLARITY-FERM.

RECOMMENDED DOSE RATES OF CLARITY-FERM FOR CHILL HAZE REDUCTION*

<table>
<thead>
<tr>
<th>Raw Material (by extract)</th>
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<th>Product Shelf-Life Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% malted barley</td>
<td>6 ml/BBL</td>
<td>&gt;12 months</td>
</tr>
<tr>
<td>60% malted barley</td>
<td>3 ml/BBL</td>
<td>6 ml/BBL</td>
</tr>
</tbody>
</table>

*Recommended dose rates based on a 12°P wort. Increase dosage proportionally with increasing wort gravity.
**RECOMMENDED DOSE RATES OF CLARITY-FERM FOR GLUTEN REDUCTION**

<table>
<thead>
<tr>
<th>Raw Material (by extract)</th>
<th>Dosage Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% malted barley</td>
<td>12 ml/BBL</td>
</tr>
<tr>
<td>60% malted barley</td>
<td>6 ml/BBL</td>
</tr>
</tbody>
</table>

*Reduced to <20ppm gluten. Recommended dose rates based on a 12ºP wort.

**CRYSTALZYME PLMX - WLN4600**

*Enzyme system for processing fruit and vegetable mash*

**PRODUCT DESCRIPTION**

Crystalzyme PMLX is a proprietary enzyme system produced by the controlled fermentations of non-genetically modified strains of Aspergillus niger. and Trichoderma reesei. The enzyme system includes pectinases, cellulases, hemicellulases, and arabinase. Crystalzyme PMLX hydrolyzes and depolymerizes (breaks down) fruit and vegetable pectin and other selected complex polysaccharides. The food grade liquid contains no chemical preservatives.

**FUNCTION**

Crystalzyme PMLX is designed for the processing of milled fruit and vegetable mash. It contains standardized levels of pectinase, cellulase, and hemicellulase activities, and takes advantage of enzyme synergies to efficiently break down soluble and colloidal pectin, araban, and other selected complex polysaccharides.

Crystalzyme PMLS rapidly reduces the viscosity of fruit and vegetable mash in maceration applications, enhancing solids separation employing centrifugal separation (decanter) equipment, increasing decanter and press efficiency and productivity, and increasing the release and recovery of soluble solids, and total juice yields.
APPLICATION

Crystalzyme PMLX is applicable for the maceration of fruit and vegetable mashes. Enzyme requirements and performance are generally dictated by the fruit or vegetable type and maturity, the quality and polysaccharide content of the fruit or vegetable, and the process and processing conditions (pH, temperature, reaction time, etc.). In consideration of your process and processing conditions, conduct laboratory tests to establish and optimize use.

Initially evaluate Crystalzyme PMLX at:

- 0.25mls/pound of mash in press operations
- 0.5mls/pound of mash in decanter/centrifuge operations (23-113 mL/2,000 U.S. pounds).

These recommendations are based on a 120 minute maceration time at 10-20°C (50-68°F). To ensure homogeneous enzyme distribution in the mash, add the enzyme directly to the maceration tank during filling. Continuous mash agitation is recommended.

In general, a higher dose will be required for more acidic fruit mashes and juices (< pH 3.5) and a lower dose will be required for less acidic fruit mashes and juices (> pH 3.5). Also, a higher enzyme dose will be required when mash or juice temperatures are lower or when the maceration or depectinization time is decreased.

Effect of pH
Optimum Range: pH 3.5-4.5
Effective Range: pH 2.5-5.5

Effect of Temperature
Optimum Range: 45-55°C (113-131°F)
Effective Range: 10-60°C (50-140°F)

Crystalzyme PMLX performance is flexible as a function of temperature. The enzyme system is effective at ambient temperatures [10-25°C (50-
HAZYME C - WLN4700

Amylases for starch breakdown in apple juice in cold process

PRODUCT DESCRIPTION

HAZYME C is a complex of fungal amylases from different Aspergillus species.

FUNCTION

Apples contain starch at the beginning of season. The starch content decreases as the season progresses and apples ripen. Starch is present as granules in apple juice: it must be gelatinized during pasteurization at a temperature above 85°C before being hydrolyzed. If starch is not broken down, it may retrograde and give a haze in the juice that could precipitate in concentrate.

HAZYME C has been developed especially for starchy apple juice clarification. It contains the right balance of specific amylases and glucoamylase stable in apple juice. Its application after starch gelatinization and juice cooling down, results in the total breakdown of soluble starch in glucose, avoiding haze formation.

APPLICATION

HAZYME C is used in apple juice during depectinisation, after heat treatment needed for gelification of starch. It must be added directly during the filling of the tank. Just before use, to ensure adequate mixing, it should be diluted in 10 to 20 times its volume of water.

Active from: 20 to 60°C - PH 3.0 to 5.0
RECOMMENDED DOSE RATES OF HAZYME C

<table>
<thead>
<tr>
<th>Application</th>
<th>Dosage</th>
<th>Recommended Contact Time &amp; Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple juice depectinization</td>
<td>12ml/bbl OR 400mls/1000 gal</td>
<td>3 - 6 hours at 15-20°C (59-68°F) OR 12 - 24 hours at 10-15°C (50-59°F)</td>
</tr>
</tbody>
</table>

Note: higher dosage is sometimes necessary at the beginning of the season depending on apple starch content.

OPTI-MASH - WLN4300

Classical thermostable alpha-amylase for starch liquefaction of brewing adjuncts

PRODUCT DESCRIPTION

OPTI-MASH is a liquid thermostable alpha-amylase from a classical strain of Bacillus licheniformis.

FUNCTION

Different adjuncts such as maize, rice, wheat, and sorghum are used in brewing. The starch of these grains can have gelatinization temperature greater than 76-78°C, the temperature at which different amylases from barley are inactivated. In addition, the milling of adjuncts and malt results in different sizes of flour and grist particles, the largest of which may not be completely solubilized below this temperature. OPTI-MASH alpha-amylase ensures starch liquefaction when using adjuncts in the mash bill. Extract yield is improved and the risk of starch retrogradation is prevented.

OPTI-MASH alpha-amylase can be used for starch break-down with all types of adjuncts that are used in the Brewhouse. No pH adjustment or stabilization of enzyme with calcium ions is required, although the addition of Ca(OH)2 to obtain a pH of 6.5 will ensure maximum efficiency.
APPLICATION

If malt is used to liquefy the starch in the mash, then also add OPTI-MASH at 220-280mls per ton of adjunct. If no malt is used, with adjuncts such as maize, rice, wheat, or sorghum, OPTI-MASH should be used at 300-400mls per ton of adjunct.

It is recommended to dilute OPTI-MASH in brewing water prior to use to facilitate mixing in the adjunct cooker. OPTI-MASH must be added at the beginning of adjunct cooking. It will be inactivated during the kettle boil.

PRO-MAX - WLN4500

Bacterial neutral protease

PRODUCT DESCRIPTION

PRO-MAX is liquid neutral protease from self-cloned strain of Bacillus amyloliquefaciens standardized at minimum 180 000 PCU per gram (double strength).

FUNCTION

Starch is embedded in a protein matrix in most cereals, and can only be totally released when the matrix is sufficiently hydrolysed. PRO-MAX allows a good extraction of soluble proteins from raw material when only raw grains are used. It increases the free amino nitrogen of the wort to get a good fermentation when malt proteases cannot be used, or when adjuncts represent a large proportion of the mash bill. PRO-MAX enables getting enough protein to obtain good foam. It increases the yield when raw or highly unmodified cereals are used.
APPLICATION

PRO-MAX is added in the mash tun at a dosage of 200mls to 1Liter per ton of grain or 500mls per ton of barley.
The product should not be used together with other enzymes. Activity of PRO-MAX will be maximal at 45-50°C with hydrolysis time of 30 minutes. It is completely denaturated after 10 minutes at 85°C.

ROUGE-EX - WLN4900

Pectinase for color extraction of acidic red berries

PRODUCT DESCRIPTION

ROUGE-EX is a liquid pectinase from Aspergillus niger.

FUNCTION

The extraction of juice from red berries is a delicate process for juice natural color and aroma preservation. It is therefore very important to choose the right enzyme to achieve the levels of depectinisation and color stability required along with maximum yields.

ROUGE-EX has been developed especially for improving color extraction from acidic red berries such as Grape, Blackcurrant, Aronia, Cherry or Cranberry. It contains specific pectinases required for red berry processing, active and stable in acidic pulp or juice with high phenolic content. Whether used for maceration or depectinisation, ROUGE-EX allows total pectin breakdown with release of red color stable in the final concentrate, because it has no anthocyanase activity.

APPLICATION

ROUGE-EX is easy to use. It must be added with a metering pump to the fruit pulp into the maceration tank before juice extraction or into the depectinisation tank. Just before use, to ensure adequate mixing, it should be diluted in 10 to 20 times its volume of water.

Active from: 10 to 60°C - PH 2.0 to 6.0
RECOMMENDED DOSE RATE OF ROUGE-EX

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Process</th>
<th>Dosage</th>
<th>Contact Time &amp; Temp</th>
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<tr>
<td>Blackcurrant</td>
<td>1 stage</td>
<td>Mash 1ml/pound</td>
<td>1-2 hours at 50°C</td>
</tr>
<tr>
<td>or Grape</td>
<td></td>
<td></td>
<td>(122°F)</td>
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<tr>
<td>Blackcurrant</td>
<td>2 stages</td>
<td>Mash 1ml/pound</td>
<td>1-2 hours at 50°C</td>
</tr>
<tr>
<td>or Grape</td>
<td></td>
<td></td>
<td>(122°F)</td>
</tr>
<tr>
<td>Cherry</td>
<td>1 stage</td>
<td>Mash 0.5mls/pound</td>
<td>1-2 hours at 50°C</td>
</tr>
<tr>
<td>Cranberry</td>
<td>1 stage</td>
<td>Mash 1ml/pound</td>
<td>1-2 hours at 50°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(122°F)</td>
</tr>
</tbody>
</table>

ULTRA-FERM - WLN4100
Amyloglucosidase for ethanol or dry beer production

PRODUCT DESCRIPTION

ULTRA-FERM is a liquid amyloglucosidase (highly concentrated) from selected classical strain of Aspergillus niger.

ETHANOL PRODUCTION

After starch liquefaction by alpha-amylase, dextrins are hydrolysed in glucose by amyloglucosidase, before alcoholic fermentation. Ethanol production is faster and yield is higher. The recommended saccharification temperature is 60°C.

A suitable substrate for saccharification is a liquefied starch with a dextrose equivalent (DE) between 10 and 20. A higher DE than 20 might reduce the saccharification efficiency. The concentration of the substrate will also influence the saccharification efficiency. A concentration of 20-25% is a general practice. ULTRA-FERM dosage, for given reaction time, depends on the amount of glucose requested. It is usually recommended to add 400 ml per ton of starch for a fast hydrolysis. Possible pH range of use is from 3.5 to 5.5 with optimal between 4.0 and 5.3.
Optimal temperature is 60°C. Amyloglucosidase activity is completely destroyed when the saccharified liquor is held at 85°C for 10 minutes. As an example: a yield of 94% glucose can be obtained after 40 hours with 36000 AGI per kg dry matter; after 72 hours with 17000 AGI/kg and after 85 hours with 13000 AGI/kg, at pH 4.5 with temperature 60°C.

**BEER PRODUCTION**

Brewers often want to produce light beers or dietetic beers. In these cases the brewer wants a controlled or complete hydrolysis of starch and dextrins to fermentable glucose. Traditional brewing methods permit only 75 to 80% hydrolysis of starch present in the grain raw material. ULTRA-FERM amyloglucosidase permits total hydrolysis of dextrins to fermentable glucose, from all types of starch.

In the brewhouse, the recommended application dosage of ULTRA-FERM is 0.8 to 3.2L per ton of starch. It can be added at the beginning of the mash-in. In the fermenter, the recommended application dosage is 1.5 to 2.5 milliliters per barrel of beer, applied as the fermenter is being filled.

ULTRA-FERM optimal pH is between 3.5 and 5.5. Temperature should not exceed 60°C. Amyloglucosidase activity is completely destroyed when the wort is held at 85°C for 10 minutes.

**VISCO-BUSTER - WLN4400**

*Glucanases and hemicellulases improving filterability of wort and beer, and increasing the brewhouse yield*

**PRODUCT DESCRIPTION**

VISCO-BUSTER is a liquid product obtained from Trichoderma reesei. This is an enzyme complex containing predominantly _1,3-1,4-glucanase_ activity, but also endo-xylanase and other hemicellulases.
**FUNCTION**

The use of raw grain adjuncts and less-modified malts often leads to wort filtration problems after mashing and consequently to capacity and extract losses. It is well known that β-glucans found in the endosperm wall of grains can cause filtration problems after mashing and haze problem in finished beer. Similarly, hemicelluloses (mainly xylans and arabinoxylans) can retain wort and cause extract loss due to its very high liquid retention ability in the grain bed. Hemicellulose can also lead to haze problems in the finished beer, especially during high gravity brewing.

VISCO-BUSTER enzymes decrease quickly the mash’s viscosity and improve filterability of the wort. This latter is less retained in spent grains, yield and extract are improved. More efficient filtration results in an increased efficiency of brewhouse throughput, particularly when poorly modified malts or adjuncts are used, but standard malts can also benefit. Filtration of the finished beer is its colloidal stability are consequently improved.

**APPLICATION**

VISCO-BUSTER can be used will all types of malts and adjuncts and is particularly recommended when poorly modified malt makes up a large proportion of the mash bill.

VISCO-BUSTER dosage usually required is 100mls per ton of malt or raw material making up the mash bill. VISCO-BUSTER has high activity between 40°C and 70°C. It should be added at the beginning of mashing-in so that enzymes can work along the mashing process.
Quick Reference Guide to White Labs Fermentation Enzymes
## Commercial Brewing Applications

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<td>Aspergillus niger</td>
<td>Disrupts specific haze-active proteins, increasing beer shelf-life</td>
<td>Hydrolyzes Proline which is a component of gluten, implicated as a cause of Celiac’s disease. Beer could be suitable for such patients*</td>
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<td>Bacillus licheniformis</td>
<td>Promotes starch break-down of unmalted cereal brews</td>
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<td>β-glucanase</td>
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<td>Pro-Max</td>
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<td>Proprietary enzyme system Aspergillus niger and Trichoderma reesei</td>
<td>Breaks down selected complex polysaccharides. Reduces the viscosity of fibrous fruit and vegetable mashes, such as pumpkin.</td>
<td></td>
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</tr>
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<td>Hazyme C WLP4700</td>
<td>Complex of amylases different Aspergillus species</td>
<td>Breaks down starches in apple juice during cold process. Reduce haze formation from soluble starch break down in apple juice.</td>
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*Beers test below 20ppm gluten when used correct dosages
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<td>Rapidase 80 WLN4800</td>
<td>Pectinase</td>
<td>Aspergillus niger</td>
<td>Breaks down pectin from apple &amp; pear</td>
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- Visco-Buster
- Pro-Max
- Rouqe-Ex
- Rapidase C80
- Crystalzyme
- Clarity-Ferm
- Amino-Quik
- Opti-Mash
- HazyMe C
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- Amino-Quik
- Beer Filter
- MASH TUN
- Kettle
- Whirlpool
- Fermentation
- Maturation
- Cooling
- MASH Filter
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<tr>
<td>Ultra-Ferm WLN4100</td>
<td>Amylo-glucosidase</td>
<td>Aspergillus niger</td>
<td>To reduce saccharification times</td>
<td>To increase attenuation. To saccharify unmalted cereal brews</td>
</tr>
<tr>
<td>Opti-Mash WLN4300</td>
<td>α-amylase</td>
<td>Bacillus licheniformis</td>
<td>To saccharify unmalted cereal mashes</td>
<td></td>
</tr>
<tr>
<td>Visco-Buster WLN4400</td>
<td>β-glucanase</td>
<td>Trichoderma reesec</td>
<td>Reduces mash filtration time with all types of malt</td>
<td></td>
</tr>
</tbody>
</table>
# Commercial Distilling Applications Cont.

<table>
<thead>
<tr>
<th>PRODUCTS</th>
<th>ACTIVITIES</th>
<th>SOURCES</th>
<th>APPLICATION (1)</th>
<th>APPLICATION (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-Max</td>
<td>Neutral protease</td>
<td>Bacillus amyloliquefaciens</td>
<td>Increase FAN</td>
<td>Required when brewing with all unmalted cereals including barley &amp; sorghum.</td>
</tr>
<tr>
<td>WLN4500</td>
<td></td>
<td></td>
<td>Hydrolyses protein matrix surrounding starch granule so higher yields etc</td>
<td></td>
</tr>
<tr>
<td>Crystalzyme</td>
<td>Proprietary enzyme</td>
<td>Aspergillus niger and Trichoderma</td>
<td>To break down selected complex polysaccharides</td>
<td>Reduces the viscosity of fibrous fruit and vegetable mashes, such as pumpkin</td>
</tr>
<tr>
<td>WLN4600</td>
<td>system</td>
<td>reesei</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazyme C</td>
<td>Complex of amylases</td>
<td>different Aspergillus species</td>
<td>To break down starches in apple juice during cold process</td>
<td>To reduce haze formation from soluble starch break down in apple juice</td>
</tr>
<tr>
<td>WLP4700</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>RapidaseC80</td>
<td>Pectinase</td>
<td>Pectinase</td>
<td>To break down pectin from apple &amp; pear</td>
<td></td>
</tr>
<tr>
<td>WLN4800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Products, Activities, Sources, Application**

**Pro-Max**
- WLN4500
- Neutral protease
  - Bacillus amyloliquefaciens
  - Increase FAN
  - Hydrolyses protein matrix surrounding starch granule so higher yields etc.
  - Required when brewing with all unmalted cereals including barley & sorghum.

**Crystalzyme**
- WLN4600
- Proprietary enzyme system
  - Aspergillus niger and Trichoderma reesei
  - To break down selected complex polysaccharides
  - Reduces the viscosity of fibrous fruit and vegetable mashes, such as pumpkin

**Hazyme C**
- WLP4700
- Complex of amylases different Aspergillus species
  - To break down starches in apple juice during cold process
  - To reduce haze formation from soluble starch breakdown in apple juice

**Rapidase C80**
- WLN4800
- Pectinase
  - To break down pectin from apple & pear

**Distilling Applications**

- ULTRA-FERM
- PRO-MAX
- RAPIDASE C80
- OPTI-MASH
- VISCO-BUSTER
- CRYSTALZYME

- ULTRA-FERM
- PRO-MAX
- RAPIDASE C80
- MASH COOKER
- CEREAL COOKER

- ULTRA-FERM
- PRO-MAX
- MASH COOKER
- CEREAL COOKER

- ULTRA-FERM
- MASH COOKER
- CEREAL COOKER

- ULTRA-FERM
- CEREAL COOKER

- ULTRA-FERM

- PRO-MAX

- MASH COOKER

- CEREAL COOKER
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