ASBC Method Highlight: Malt-7. Alpha Amylase Malt

Breweries rely on malt to produce beer. This malt is most often made from barley. When barley is soaked in water, germination begins. This is similar to what you would find in nature when barley is planted in the soil. During germination, enzymes develop that begin the degradation of starch into short-chained sugars such a glucose and fructose. Alpha-amylase is one of the key enzymes in the starch degradation process. The malting process is with kilning. Kilning is the process in which the malt is heated and dried to remove water. The kilning step is often performed at rather low temperatures to maintain the enzymes in the malt. After this treatment, the malt is stable and can be stored for a long time.

It is critical to control the alpha-amylase activity during malting as this determines the outcome of the mashing at breweries and distilleries. Malthouses often provide malt with different enzyme activities that enable different brewing results. Malt-7C is the standard procedure used by malthouses to obtain a precise determination of the alpha-amylase activity.

Malt-7 provides several ways to measure alpha-amylase from manual methods to automated flow methods. A laboratory will need to select the method that fits their capabilities the best.

Conversion of starch to reducing sugars by diastatic enzymes results, in major part, from the complementary actions of two enzymes: β-amylase, considered as primarily saccharifying in action, and α-amylase, primarily dextrinizing. Dextrinizing activity of α-amylase can be measured quantitatively by using a special “starch” substrate, limit-saccharified by purified β-amylase, combined with insurance of an excess of β-amylase during action of malt infusion liquid on special limit-dextrin substrate.

Method Highlights

For all Malt-7 methods please follow all safety data sheets for all reagents and ensure your laboratory can accommodate those reagents accordingly

The Malt-7A method is a fixed color and variable time method. This method evaluates the activity of α-amylase by the reaction time required for β-amylase limit-dextrin substrate to reach a specific substrate-iodine endpoint.

It has been recommended that efficiency of measurement and reduction of operator dependence could be achieved by instrumental color measurement in the specified dextrin-iodine color range and factoring the value to the Malt-7A reading.

Malt-7B is a fixed time and variable color method. This alternate procedure is the same as Malt-7A except for the end-point evaluation; Malt-7A is used to calibrate the modified procedure.

Malt-7C is the standard method used in the malting industry. This is an automated flow analysis using iodine reagent. This automated procedure for the determination of α-amylase is based on the following reaction. The malt extract is diluted with a buffer solution, and the diluted sample is mixed with a beta-limit dextrin substrate and incubated for 10 min at 35 °C. The sample is then mixed with an iodine solution, and the rate of breakdown of the dextrin is measured colorimetrically. The absorbance decrease is measured at 610 nm.

As an alternative and a less expensive method, some laboratories utilize Malt-7D. Malt-7D is an automated flow analysis using potassium ferricyanide reagent. This method is an automated procedure for the determination of alpha-amylase in malt using potassium ferricyanide. Malt extract is mixed with a sodium chloride–calcium acetate solution and heated at 73 °C. The starch solution is added, and then a potassium ferricyanide solution is added, which, at 95 °C, oxidizes the reducing sugars resulting from the enzyme action on the starch. The remaining unreduced ferricyanide is determined at 420 nm.

Both automated flow methods utilize Malt-7A for the preparation of samples.

For a more in-depth understanding of alpha-amylase, please visit the *Journal of the ASBC* and search alpha-amylase