Grind Profiles for Optimum Distilling Yields

Introduction

All grain distillers may be missing an opportunity to optimize their yields by not utilizing the correct grind for their raw ingredients. In 2012, Briess partnered with Michigan State University (MSU) and Dr. Kris Berglund in a study to evaluate and quantify the difference in yields between preground malt and floured malt. This paper compares the Brix of slurries produced from two different grind profiles using the same methods of mashing and fermenting.

Selecting a Mill and Grind

There are several mills to select from when grinding malt. Commonly used in the brewing industry is a *4-roller Mill*. This produces a very coarse, non-uniform grind that consists of slightly cracked and crushed kernels. This grind profile is ideal for a distiller using a lautering process to separate the solids from the liquid prior to going to the still. Adjustments to this milling process can be made through changing the size of the gaps between the rollers.

Another common mill used in the industry is the *Hammer Mill*. This mill is capable of a finer, more uniform grind. Adjustments can be made to hammer configuration by adjusting the screen size and revolutions per minute (RPM). This mill produces a grind between 2800 – 250 microns and is commonly used at large distilleries in North America.

Lastly, there are *Fine Grind Mills*, which can produce extremely uniform grinds between 100 – 10 microns. These mills can be adjusted through changes in the screen size, blade configurations, and RPM. They are also safer than Hammer Mills due to their single-stage grinding process, which produces less heat.

During our research with MSU, we evaluated the difference between slurries produced from malt ground through a *4-roller Mill* and flour milled through a *Fine Grind Mill*.

Methodology

In this comparative study, we created identical mashes using the same recipe for both grind profiles.

Each mash started with 375 gallons of 122°F water and 1,000 lbs of coarsely ground malt or malt flour. We then raised the temperature to 149°F for optimal beta amylase activity. Finally, we increased the temperature to 160°F to optimize alpha amylase activity. Together, these enzymes work together to convert malt starch into fermentable sugars that are later utilized by yeast cells to produce alcohol.

After a brief hold at 160°F, 125 gallons of water was added to each batch and cooled down to 90° F before pitching the yeast. Each mash was pitched with 2 lbs of *Red Star Whiskey Yeast* and fermented for 5.5 days in a 60 bbl glycoljacketed (temperature controlled), enclosed fermenter.

Figure 1. Grind profile from a *4-roller Mill* consisting of very coarse, non-uniform crumbs of slightly cracked and crushed kernels.

Figure 2. Grind profile from a *Fine Grind Mill* consisting of extremely uniform particles, ranging in size from 100 – 10 microns.

Results

After 5.5 days, the malt flour fermenter had 515 gallons of a 15.8 brix slurry and the coarsely ground malt fermenter had 565 gallons of a 14.6 brix slurry.

The malt flour slurry yielded an 8% increase in fermentable sugars, a 9% reduction in mash volume, and a 10% increase in ethanol when compared to the coarsely ground malt slurry. For every 1,000 lbs of malt used under these conditions, over 50 gallons of fermenter space would be gained, resulting in room for as much as 60 additional bottles of whiskey. Thus, if you are an all-grain distiller, you will be able to optimize fermenter space, produce more alcohol per batch, and increase throughput by utilizing a fine malt flour rather than a coarsely ground malt.

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