

Mashing Basics

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Mashing is the process of using hot water to hydrate your grains, activate the malt enzymes, and convert the grain starches into fermentable sugars. Therefore, it's possibly the **most important** step in the brewing process (after sanitising, of course!).

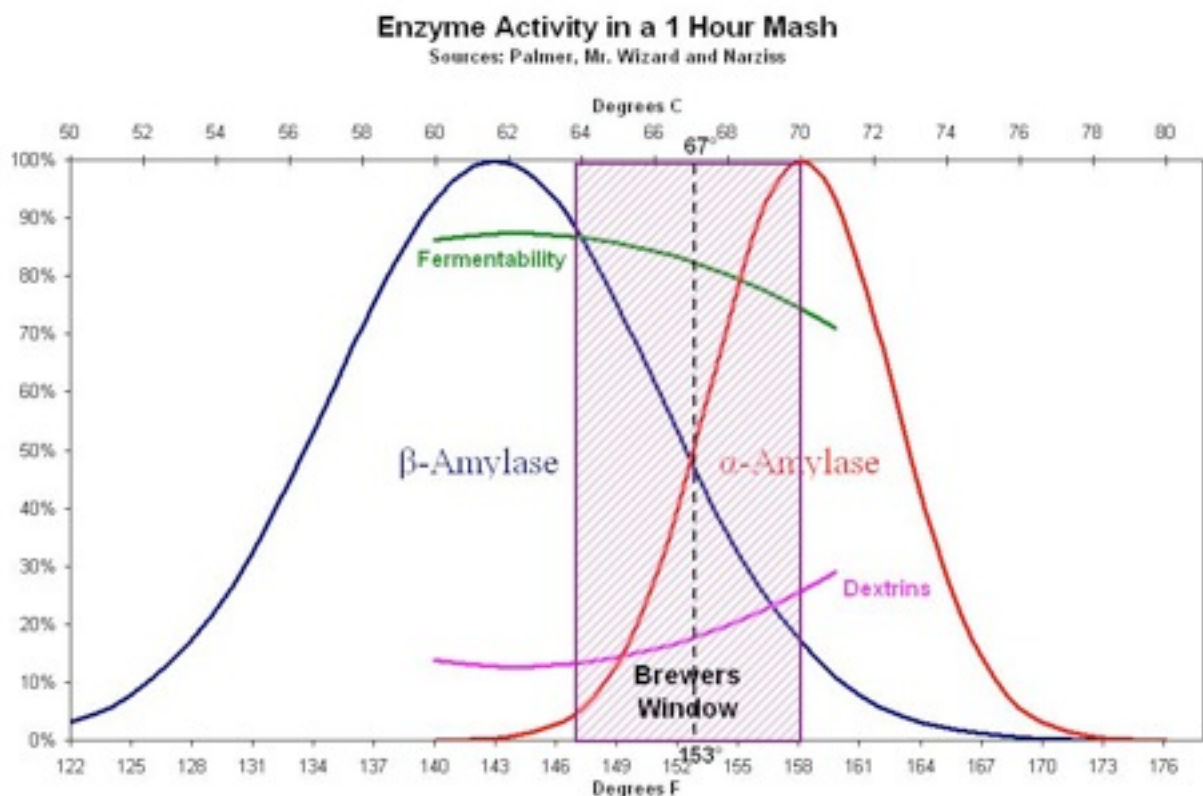
Malted Grains are cereal seeds that have been soaked in water until they germinate and then stopped from germinating further by drying them in hot air. It's the malting process that creates the enzymes used for converting the starches to sugars.

Milled grain --> **Mash** --> Sparge --> Boil --> Ferment --> Drink!

First we mill the grains, breaking the seeds into granules with larger surface areas so that it's easier to extract the sugars.

Enzymes are biological catalysts, proteins that accelerate the rate and specificity of chemical reactions. Some types of enzymes occur naturally in malted grains - the relevant ones are called **alpha amylase** and **beta amylase** and they are active at different temperature and pH ranges:

Alpha amylase is active between around 64 to 74 degrees and produces maltose and other sugars. Beta amylase is active between around 50 and 70 degrees and produces maltose.



Maltose is your primary fermentable sugar. That means that if you mash at a lower temperature, for the beta amylase, you may get more fermentable sugar and therefore a stronger, dryer, crisper beer after fermentation. Mashing at a higher temperature for the alpha amylase you will get more complex sugars that add flavour, sweetness, body, mouthfeel and malt character. Most homebrewers like to try and mash at a temperature halfway, around 66-68 degrees to get the best of both enzymes.

If you mash at too low a temperature you will not get a very flavourful beer, and if you mash at too high a temperature, you will get a weak, tea-like beer full of unwanted tanins extracted from the grain husks.

Note also that mashing pH is important. The enzymes are active between a pH of 5.1 to 5.5. Adding grains to your water will lower the pH - the darker the grain the more they will lower the pH. That's why Dublin is famous for making stouts and Plzen for making lagers - the pH of the water in Dublin is high and so adding dark grains lowers it to the appropriate range, while the pH of the water in Plzen is low, so adding light grains keeps the mash pH in the correct range.

You should measure the temperature of your mash at various stages using an accurate digital thermometer. You can measure the pH of your mash (after you've put the grains in and steeped for 10 minutes) by using pH test paper or a digital pH meter. The water in Kunming is pH 7.0, which is suitable for making a good range of styles.

Mashing techniques

Single Temperature Infusion

This is where you heat the water to strike temperature, about 5 degrees above your mash temperature, so around 73 degrees, add the grains, and then keep the mash at that temperature for about an hour. This can be achieved by placing your mash tun in a warm oven, an insulated box, or by adding gentle heat from a stove. The goal is to maintain a steady temperature. Most people use an insulated cooler, like an ice chest or a picnic cooler. This is the most common mashing technique.

Multi-Rest

You keep the mash at different temperature ranges for half hour intervals (e.g. 40-60 degrees then 60-70 degrees). This type of mashing has been shown to improve the liquefaction of the mash and improve enzyme activity, improving the yield of sugars. You add heat either directly or by infusing hot water. You need to be aware of exactly what enzymes are active when and what kind of beer you're going for as this type of mash can be difficult to control and repeat, therefore it's not often used by homebrewers.

Decoction

Like multi-rest mashing but without having to add heat or add hot water. Essentially, the mash is split into different pots which are steeped at different temperatures before finally being added back together into the main mash. Again, this can be too complicated and require too much equipment for home brewers but can allow for very fine precision.

What's next?

We mash for at least 1 hour to ensure that we can fully extract all the sugars from the grains. After mashing is complete, we need to wash the sugary wort from the spent grain in a process called **lautering**.