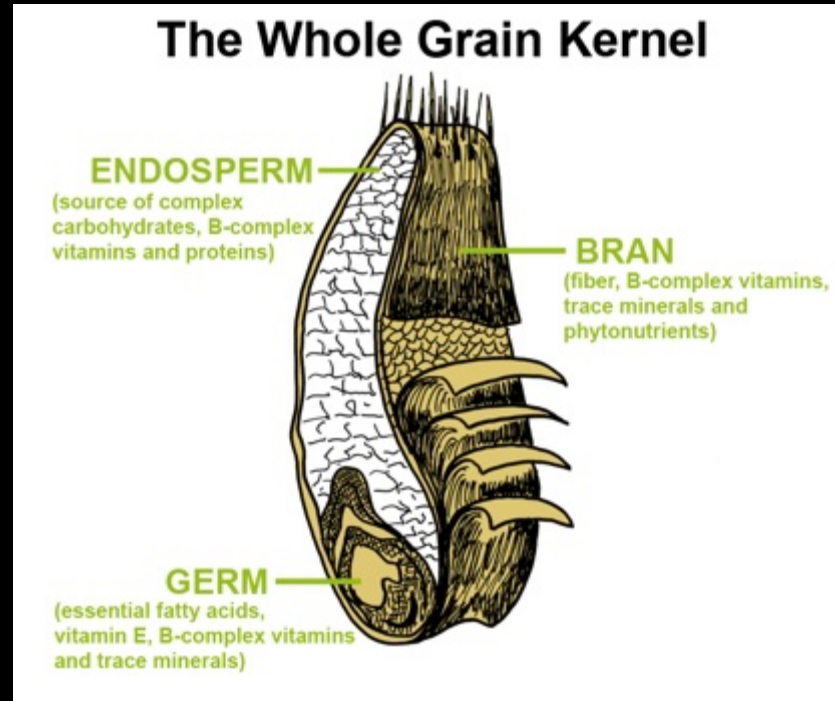


Making Sense of Mash Temps

05/02/14

Justin Vincent

So, What's in a kernel of grain?



Protein
Starch
Vitamins
Trace Minerals
Other Compounds

What do we want from the mash?



Sugars

Small Peptides (for head retention)

Free Amino Acids

Trace Minerals

Other Compounds

(for yeast health)

So, What's in a kernel of grain then?

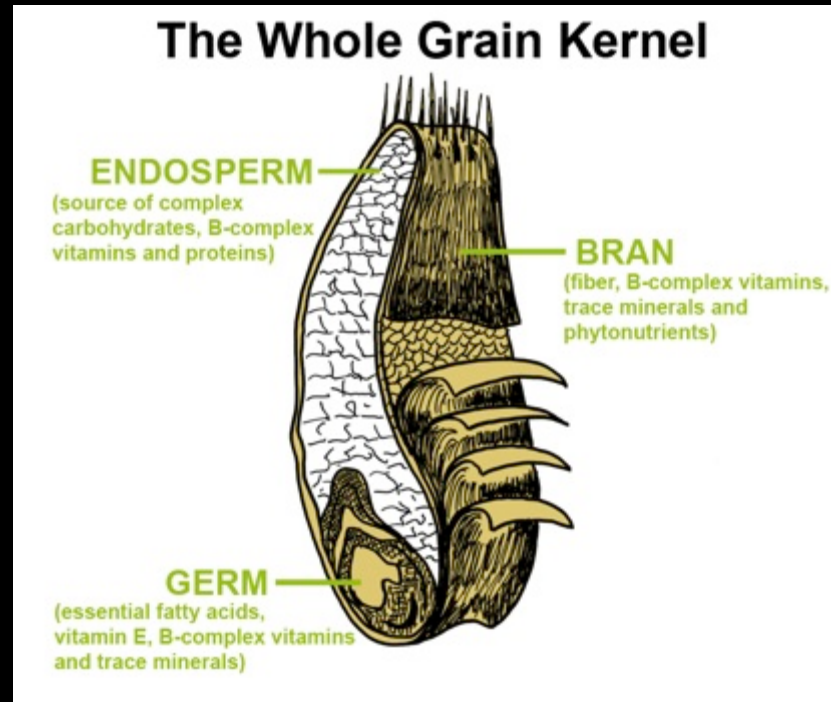


Table 11 - Major Enzyme Groups and Functions

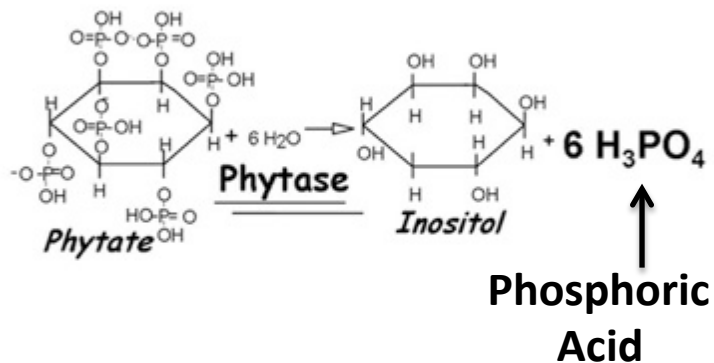
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 Lowers pH to optimum range
 No longer used, Why?

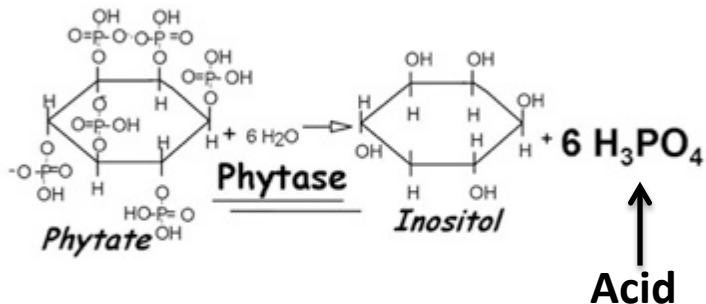


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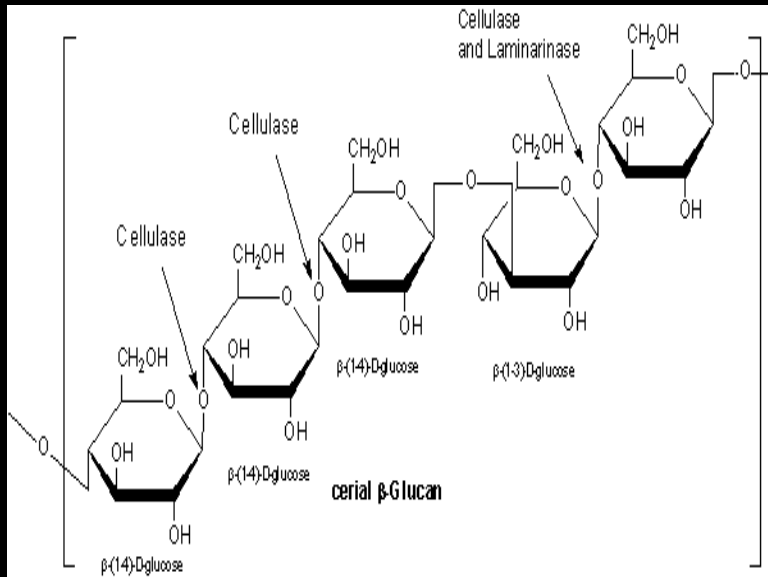
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Have you ever used lots of rye or flaked grains in your mash?

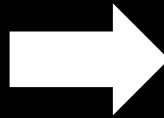
Great first rest for decoction mashes!
110°F NO DOUGHBALLS!!

Very little protein degradation and no appreciable starch conversion.

The B-Glucan Rest

Table 11 - Major Enzyme Groups and Functions

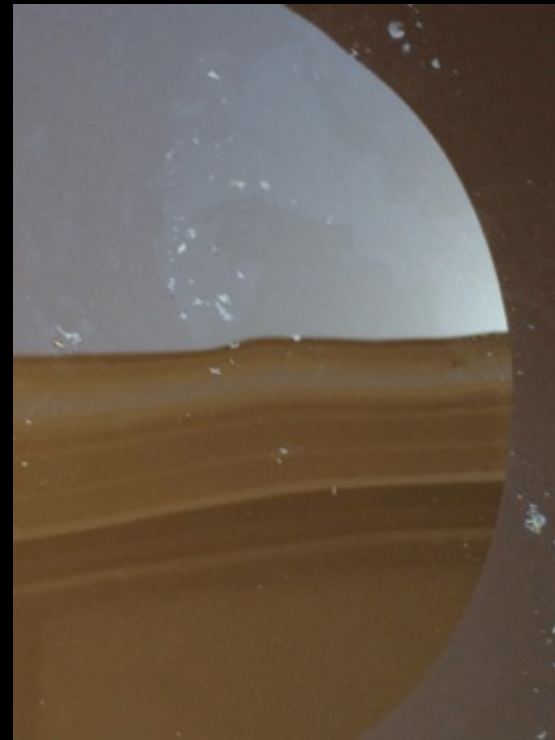
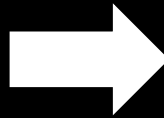
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The Protein Rest(s)

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Not as crucial with today's highly modified grains
Still an important part of decoction mashing for certain
German styles

I favor a single brief (10 Minute) protein rest at 131°F

What Does Highly Modified Mean?



Modification is a result of the malting process
(Nothing to do with GMO)

A simple measure is the length of the
developing acrospire before kilning

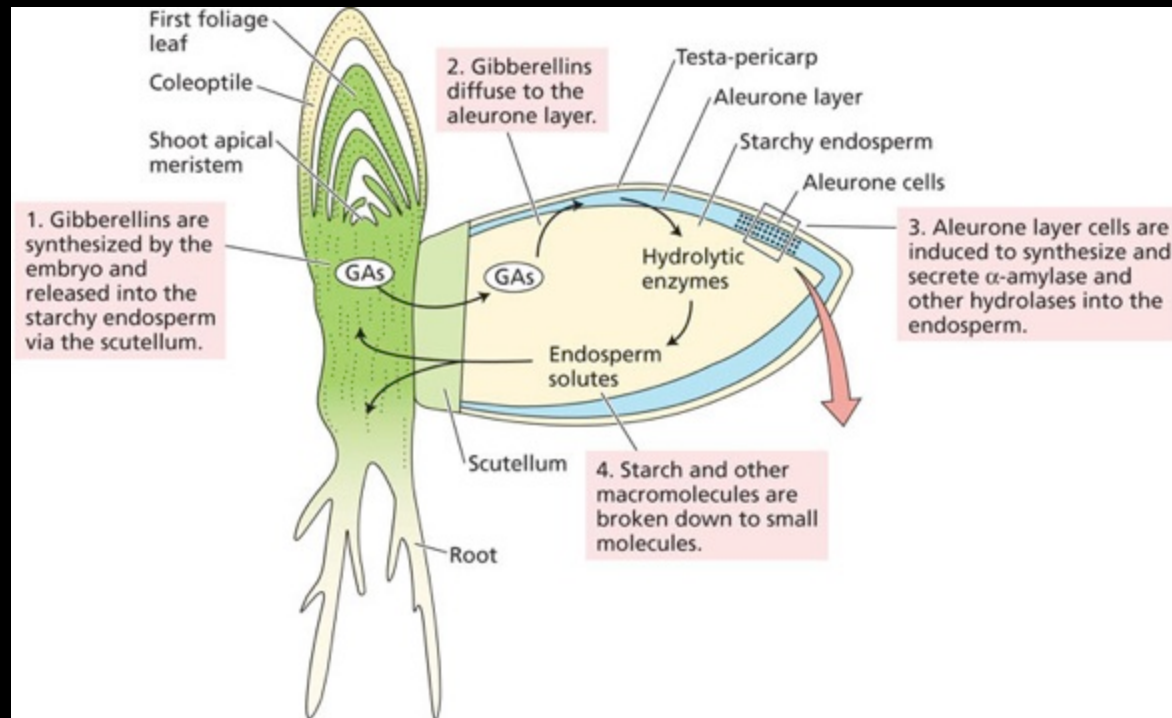
What Does Highly Modified Mean?



“The germinated grains, which show a well-developed root and have a shoot (termed an “acrospire”), which is approximately 75% of the length of the grain, are then kilned.”

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What Does Highly Modified Mean?

Specifications PILSEN MD TM

Variety	:	2- row summerbarley
Moisture	:	max 4.5 %
Colour	:	max 3.5 EBC
Boiled wort colour	:	max 6.5 EBC
Extract fine D.M.	:	min 80 %
Fine/coarse grind extract difference	:	1.0 - 2.5 %
Soluble protein	:	3.8 – 4.7 %
Total protein	:	max 11.5 %
Kolbach	:	35 – 45
Friability	:	min 80 %
Whole Unmodified Grains	:	max 3 %
Wort Viscosity	:	max 1.60 cp
pH	:	max 6.1
NDMA content	:	max 2.5 ppb (**)
Final attenuation	:	min 80.0 % (*)
B –Glucans	:	max 250 ppm (*)
Diastatic power	:	min 230 WK (*)

“One indicator of the degree of modification of a grain is that grain's Nitrogen ratio; that is, the amount of soluble Nitrogen (or protein) in a grain vs. the total amount of Nitrogen(or protein).

This number is also referred to as the "Kolbach Index" and a malt with a Kolbach index between 36% and 42% is considered a malt that is highly modified and suitable for single infusion mashing.

Maltsters use the length of the acrospire vs. the length of the grain to determine when the appropriate degree of modification has been reached before drying or kilning.”

The Big Show!!!!

Starch Conversion

Table 11 - Major Enzyme Groups and Functions

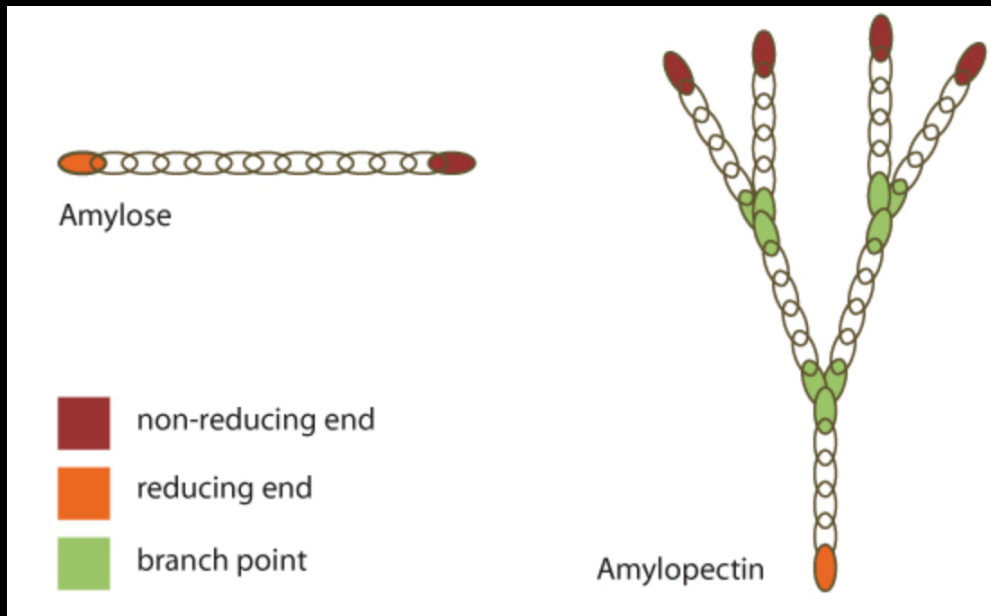
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The major starch components of malted barley are Amylose and Amylopectin

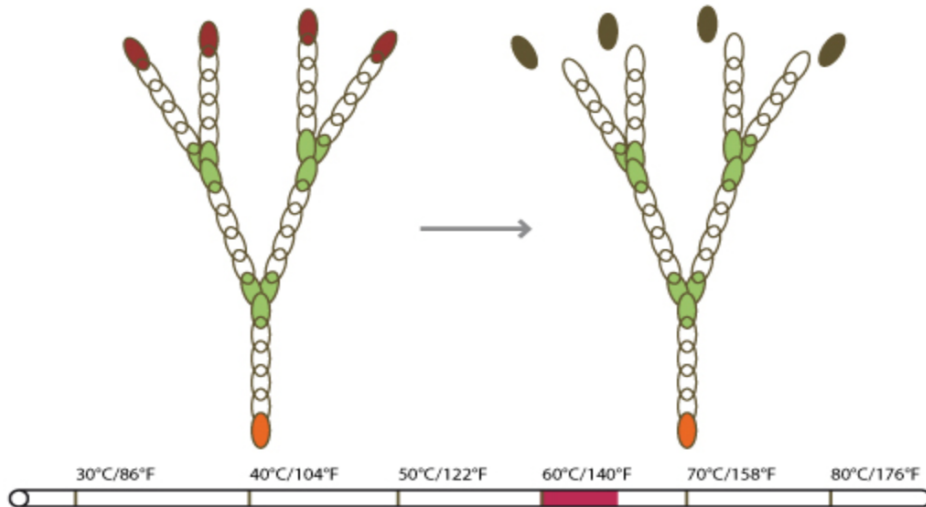
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Beta-amylase



B-Amylase works at the lower end of the saccharification range (usually favored in single infusion mashes from 145-150°F).

It produces maltose, a simple 2-glucose chain, that is highly fermentable.

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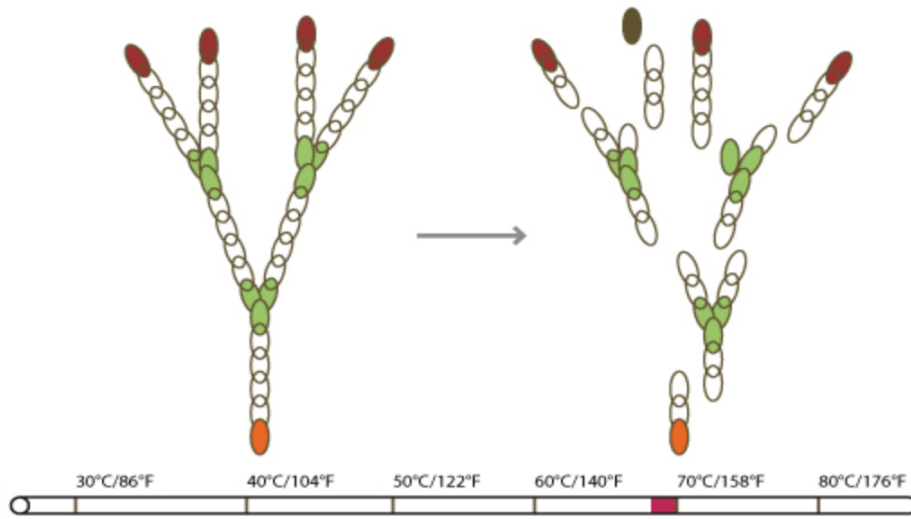
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It produces many sugars of varying composition, including maltose.

The Big Show!!!!

Starch Conversion

Alpha-amylase

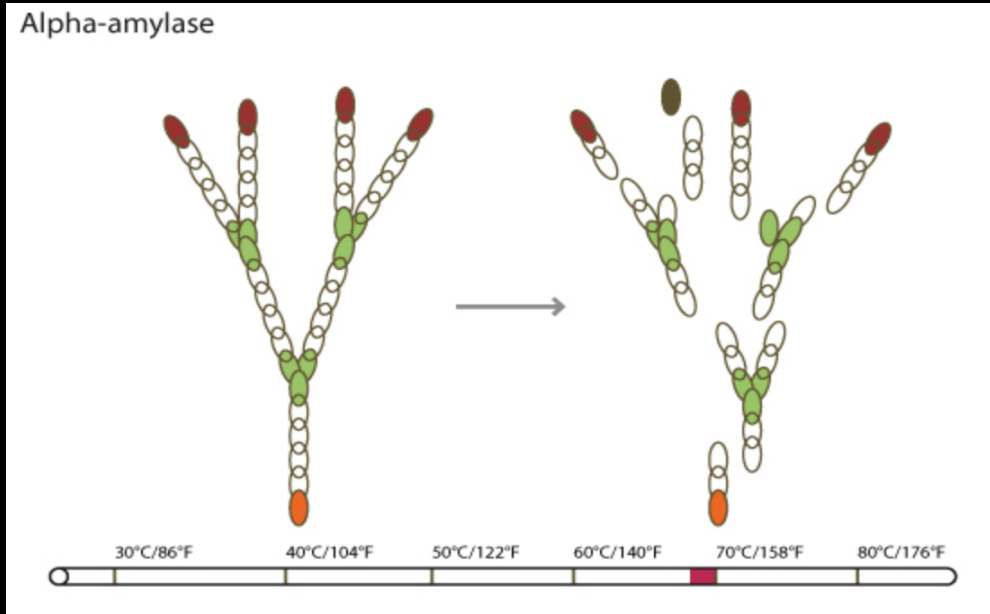


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Starch Conversion



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Normal *Saccharomyces* can only ferment 2 and 3 chained sugar molecules. Anything more complex is what lends body and residual sweetness to your beer.



My Favorite Decoction Set -Up

The Modified Hochkurz

1.



Dough in at 110°F. Get everything all mixed up and rest for 20 minutes. This is great because at this temp you can just dump everything in and mix with no fear of doughballs. Also, while preparing the decoction the main mash can sit with no worries about protein degradation or starch conversion. Notice the milky color. That is all the starch and protein in solution.

My Favorite Decoction Set -Up

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2.



Pull a thick decoction, that means all the grain and about $\frac{1}{4}$ of the water. This goes into the kettle and is heated very slowly, 2-4°F/minute.

My Favorite Decoction Set -Up

The Modified Hochkurz

3.



Rest at 131°F for 10 minutes. You should be stirring very often to keep heat evenly distributed and prevent sticking to bottom of pot.

My Favorite Decoction Set -Up

The Modified Hochkurz

4.



Continue heating slowly to your saccharification temp. This will be style dependent.

(A trick here for a super dry beer is to rest at 158°F. This will create more chain ends for B-Amylase to work on in the main mash)

Once reached rest for 20-30 minutes. You're done when you've lost the milky color entirely.

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5.

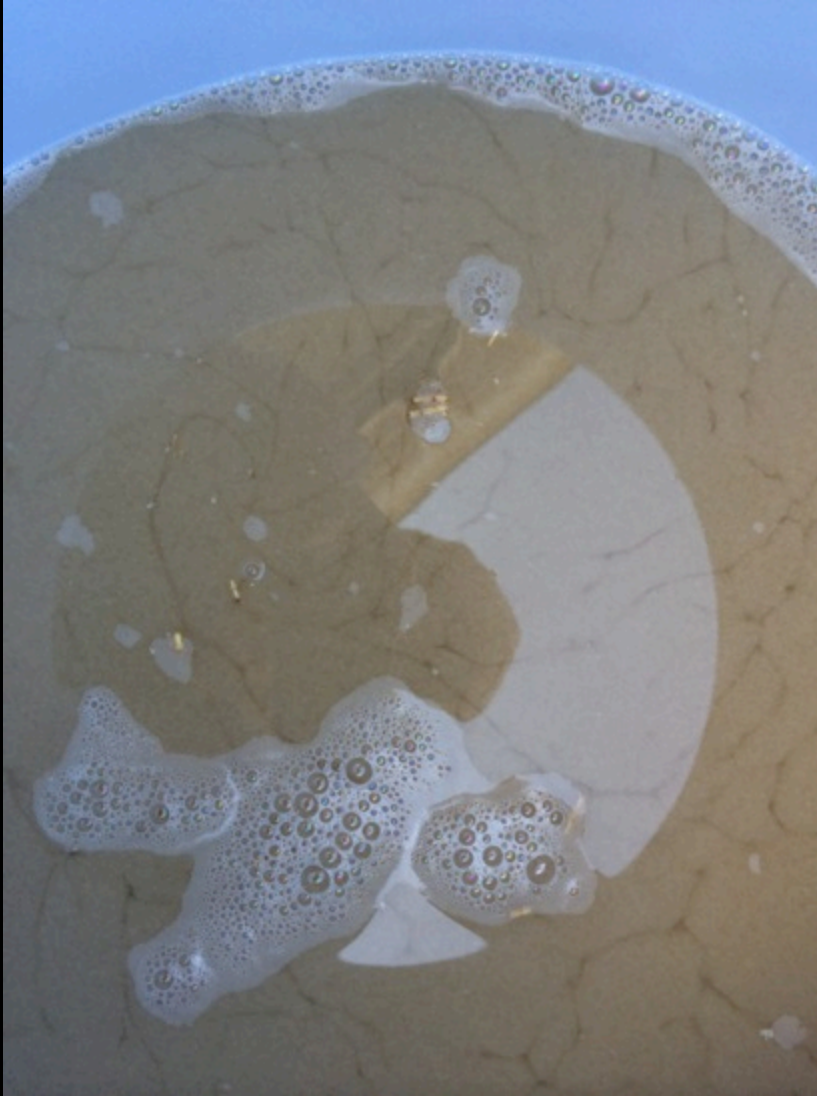


Slowly bring to a boil while stirring often. Length of boil time is style dependent. Lighter beers 10 minutes is plenty so there isn't too much color development. Darker beers can go up to 30 minutes for nice melaniodin development and malty flavor. This can be overdone. Too long and you will start getting too much umami flavor.

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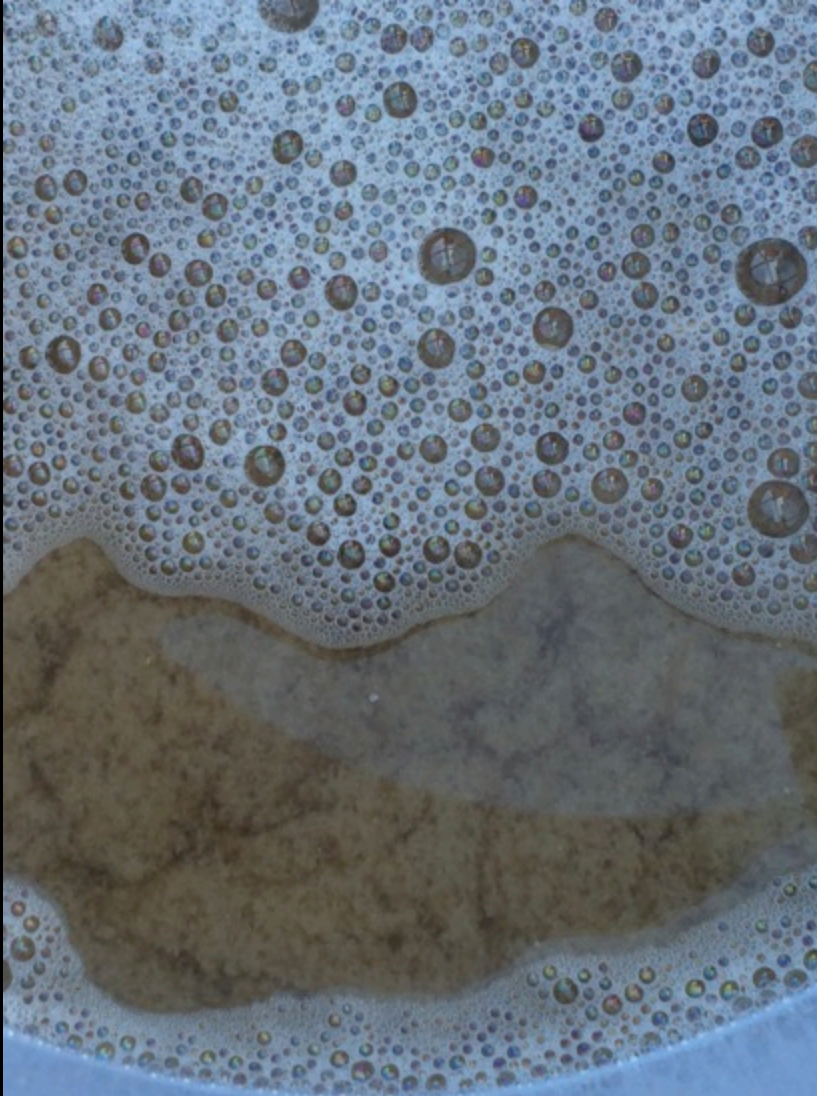


Add enough of the decoction back to the main mash to hit 131°F for a 10 minute protein rest. Continue boiling the decoction throughout. Stare in wonder at the activity in the mash.

My Favorite Decoction Set -Up

The Modified Hochkurz

7.



Add enough of the decoction back to the main mash to hit your saccharification temp, again style dependent. Rest for 40 minutes. If there is remaining decoction, add it back to the mash tun once it cools to the desired mash temp.

My Favorite Decoction Set -Up

The Modified Hochkurz

8.

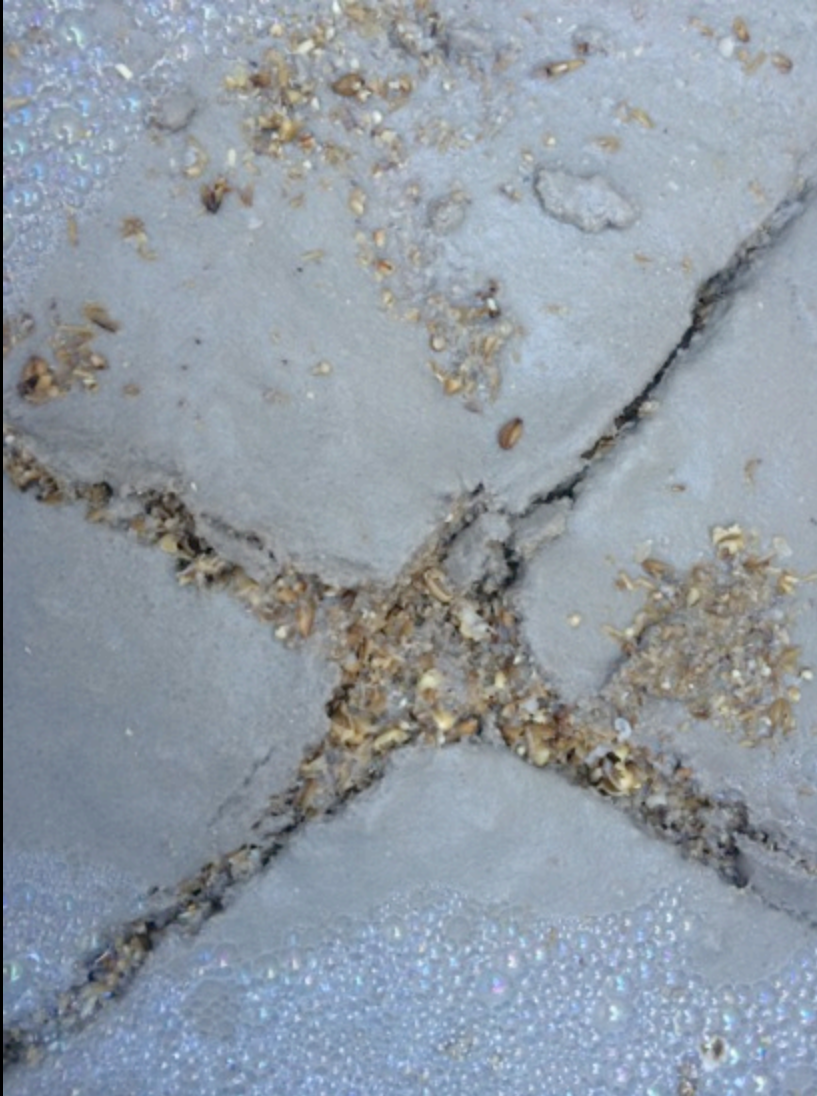


Pull a thin decoction, that means just the liquid portion, and bring to a boil. Add back to the main mash to reach mash out temp.

My Favorite Decoction Set -Up

The Modified Hochkurz

9.



Sparge as usual. All that gunk on top
is from your protein rests.

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A brief rest at the high end of the range is useful in decoction mashing.
- Saccharification occurs between 145-160°F. The lower end favors B-Amylase and a highly fermentable wort. The higher end favors A-Amylase and a less fermentable wort.

References

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