

Brewing High Gravity Beers

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Why brew high gravity beers?

- It's a fun challenge.
- You can achieve complexity not available in lower alcohol beers.
- Often these beers will improve with age.
- Properly cellared strong ales are not only delicious, they are a conversation starter.
- But... they're expensive to make, have a high risk of failure, and they're a pain in the ass.

Key Factors

- Carbohydrate profile
- Yeast choice
- Ideal environment for fermentation
- Time

Carbohydrate Profile

- Simple sugars are most easily fermented due to yeast only being able to metabolize monosaccharides (yeast utilize enzymes to reduce disaccharides to monosaccharides).

Types of Sugars

- Monosaccharides: Glucose, Fructose, Galactose
- Disaccharides: Maltose, Sucrose, Lactose (not generally fermentable by most yeast)
- Trisaccharide: Maltotriose
- Polysaccharides: Dextrin, starches, cellulose

Sugar Profile of Wort (150F Mash Temp.)

- 50% Maltose (high fermentability)
- 18% Maltotriose (low fermentability)
- 10% Glucose (highest fermentability)
- 8% Sucrose (high fermentability)
- 2% Fructose (highest fermentability)
- 12% Dextrins (no fermentability)

Skewing towards Simple Sugars

- Keep the recipe simple and avoid dextrinous malts (crystalized malts)
- Low mash temp (143F – 146F), ensure enzymatic conversion
- Use simple sugar adjuncts (but not on the hot side)

Other Mash Notes

- Expect very low extraction (50% or so)
- Likely need to double mash to get the same brew volume as a lower gravity beer, or brew half as much.

Yeast Choice

- Healthy, high viability yeast (98%+)
 - Best bet is to get a yeast pitch from a brewery, have a super vigorous starter, or brew a lower gravity beer and re-use yeast (without much time between end of fermentation and reusing yeast)
- Low flocculating
- High attenuation
- High alcohol tolerance
- Much better to overpitch than to underpitch on these sorts of beers.

High Performance Yeast Examples

- WLP001 - California Ale Yeast – Good up to 15%. Flocculation a bit too high for higher than 15%.
- WLP570 – Belgian Golden Ale Yeast – Very similar to our house yeast. Performs better than White Labs suggests.

Fermentation Environment

- Low pressure on yeast cell walls (osmotic pressure)
 - Fermenter geometry
 - Reasonable wort density (target 1.10 OG without adjuncts added)
 - Addition of fermentables during fermentation
 - Agitation or recirculation
 - Oxygenation
 - Nutrients
 - Temperature

Feeding During Fermentation

- Agitate during fermentation (stir plate, shaker table, etc.)
- In addition to dextrose, add oxygen and yeast nutrient during each feeding
- After first 24 hours, rapid attenuation should have occurred. We typically experience 40% attenuation (40% attenuation would be from 1.10 to 1.066).

Feeding During Fermentation

- 1st addition: Increase fermentables by 30% (1.066 to 1.083)
- 2nd addition: If fermentation has achieved at least 30% attenuation within 24 hours after last addition, increase fermentables another 30% (1.062 to 1.08)
- 3rd addition: If fermentation has achieved at least 20% attenuation within 24 hours after last addition, increase fermentables another 10% (1.064 to 1.07)

Feeding During Fermentation

- The resulting beer has a OG of 1.151 (considering all the dextrose additions) and should have a FG of around 1.014.
- ABV = 17.98%
- Our range for Black Tuesday is highly variable, anywhere from 16% to 20% post-fermentation. Average is 17.5%.
- Racking the beer into spirit barrels will result in a ABV gain (anywhere from +1.5% to +4%). We dump excess spirit to avoid huge ABV pickup.

Listen to your beer

- You can predict whether the addition of fermentables during fermentation is going to result in more fermentation, or a stuck fermentation.
- During fermentation, measure specific gravity before additions of fermentables.
- If specific gravity has not dropped at least 1.020 in 24 hours, do not feed additional sugar.

Time

- Once fermentation has completed (expect apparent attenuation of 80-95%), need to age
- Don't expect your beer to taste good fresh
- Micro-oxidation is beneficial
- Further flavor development sometimes beneficial (i.e. oak, vanilla)

Hops?

- As these beers are best with some age, avoid using hops for flavor / aroma.
- If you're set on using hops, dry hop prior to packaging to ensure fresh flavor.
- We aim for very low bitterness with our strong beers. We want a sweeter perception and these beers tend to be fairly dry.

The Bruery – A Range of High Gravity Beers and Methods at Certain ABV's

- Share This! – 11.9% ABV, California Ale strain, no dextrose added. Ferm. Temp 68F
- Anniversary – 13.8% ABV prior to barrel aging, house yeast strain, approx. 15.5% ABV post-barrel aging. Approx. 15% of fermentables from sugar in kettle. No feedings, no recirculation. Ferm temp 68F
- Black Tuesday – 17.5% ABV prior to barrel aging, approx. 20% ABV post-barrel aging. Approx. 37% of fermentables from sugar introduced fermentation. Ferm temp. starts at 72F, increased to 74F at last feeding (typically day 3).