

In Pursuit of Perfection:

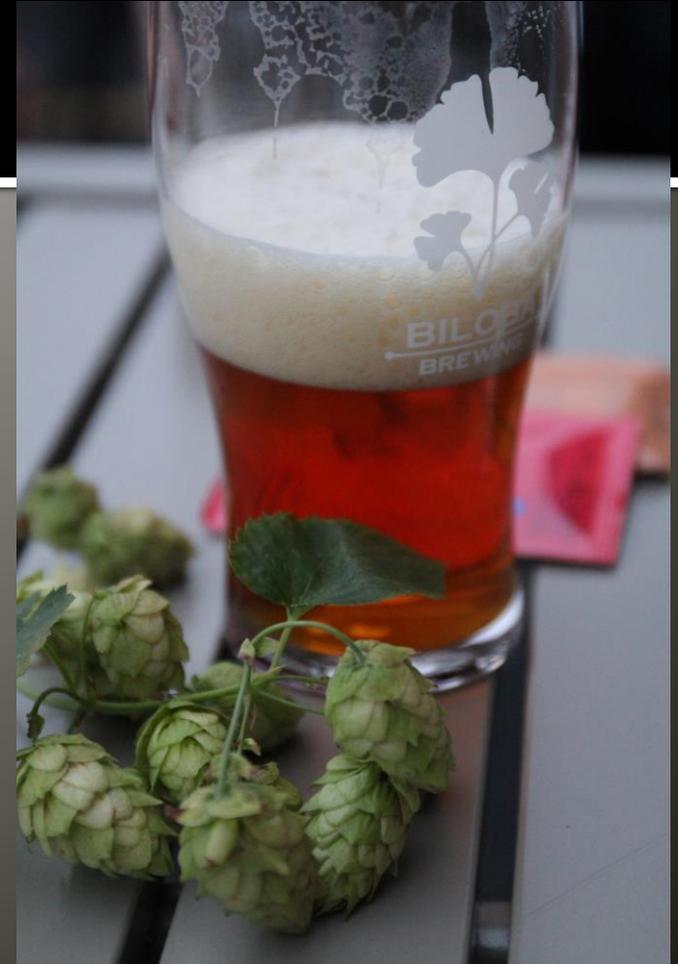
Hefeweizen Project

AHA Conference - San Diego
2015

June 11-13,

A little about our story

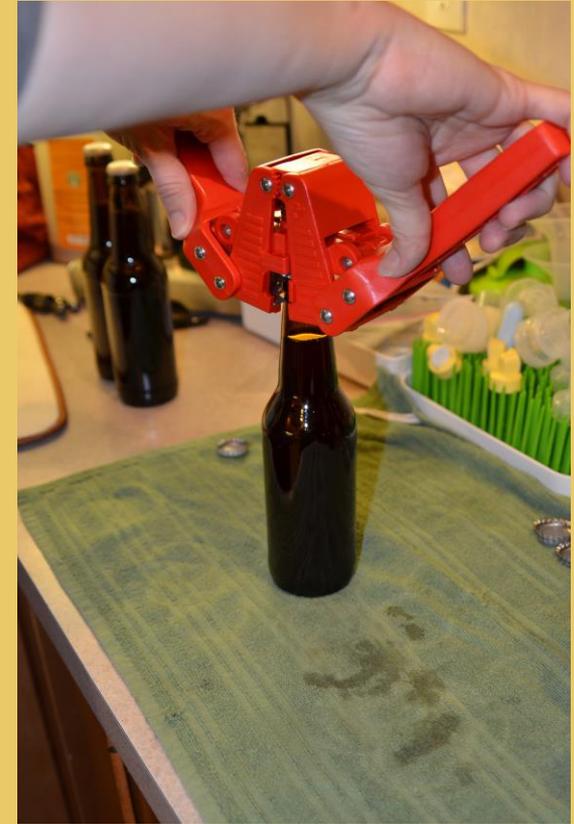
Home Brewing Start



First Batch



First Beer



And it was NOT the best beer I've ever tasted... But
We fell in love with the process!

The Brewing Process – Science!

Every step and ingredient of the brewing process is a control point.

At any point we can alter our final results with one small change.



Example: Process Change

- Whipped Cream vs. Butter
 - Same ingredient and process.
 - Variable is time whipped.
 - 30 seconds.



Multiple Variables

HandletheHeat.com



more flour



All granulated sugar



All brown sugar



Melted Butter



Baking Soda



Baking Powder



Both



Dough Chilled 24hr

Brewing Process Variables

- **Ingredients** – Recipe, Malts (maltster), Hops, Yeast, Water, Nutrient Additions
- **Mash** – Rests used - Rest Times/Length, Mash pH, Extraction, Gravity
- **Boil** – Hop Schedule, Length of Boil, Concentrated or Full Boil
- **Chilling** – Time and Method

Brewing Process Variables

- **Pitching** – Pitch Rate, Temperature, type of yeast, Starter/Yeast Health, Oxygenation
- **Fermentation** – Temperature, Length, Vessel Shape, Secondary, post-fermentation processes
- **Bottling or Kegging** – Forced vs. Natural carbonation
- **Serving** – Glass Choice, Temperature, age of beer

What do you change?

- **Ingredients** – Recipe, Malts (maltster), Hops, Yeast, Water, Nutrient Additions
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Becoming a better
Brewer

Mashing



Becoming a better
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Full Boil



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The Quick Chill



Becoming a better
Brewer

Yeast Starters

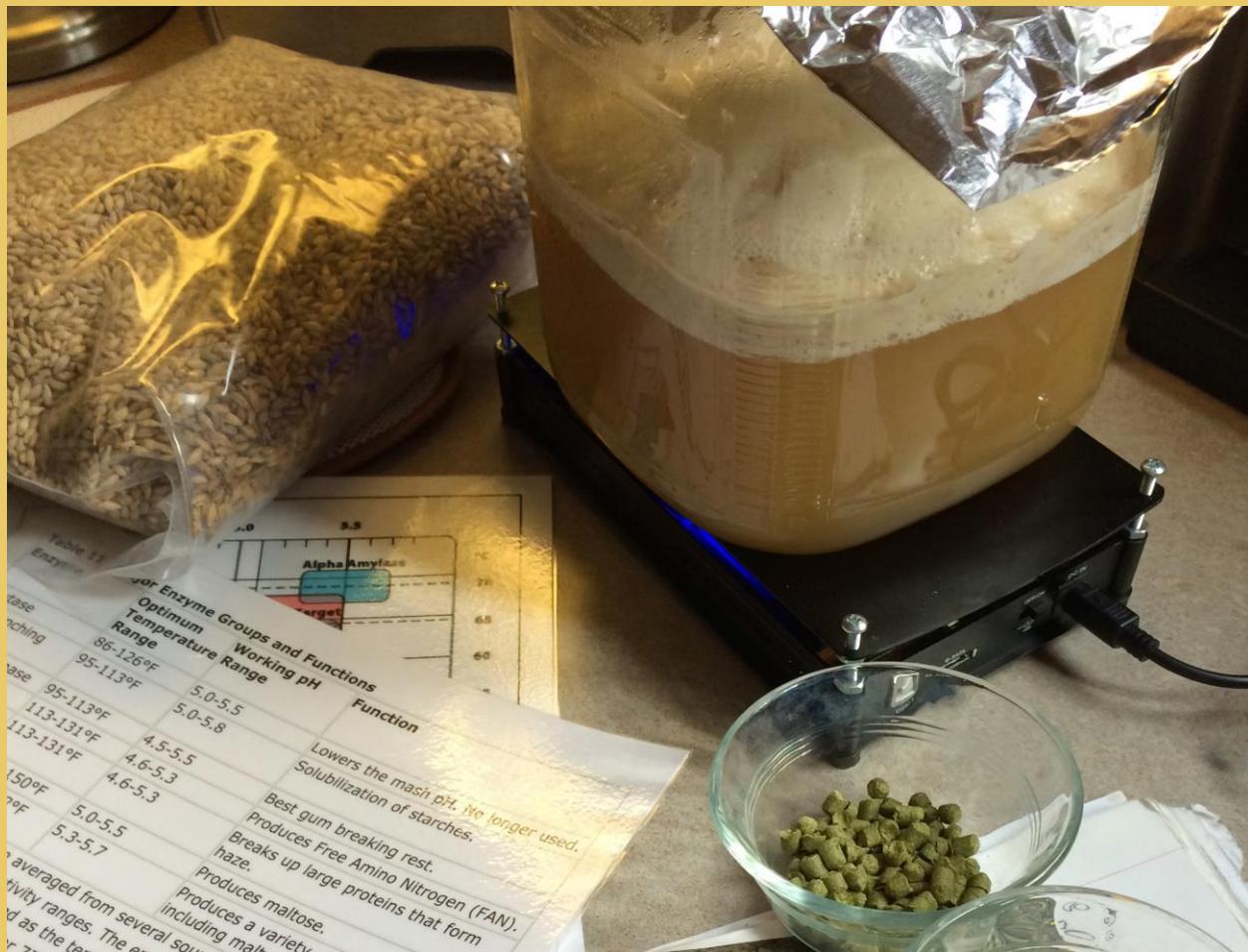
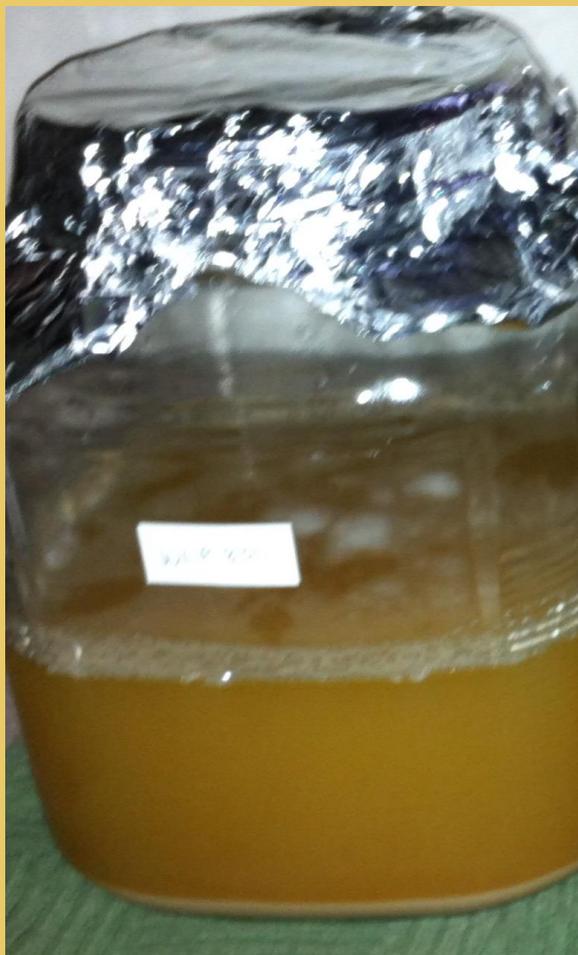


Table 1.1
Enzymes

Graph: Alpha Amylase activity vs. pH. The activity is highest between pH 4.5 and 5.5.

Enzyme	Optimum Temperature Range	Working pH	Function
Alpha Amylase	86-126°F	5.0-5.5	Lowers the mash pH. No longer used.
Beta Amylase	95-113°F	5.0-5.8	Solubilization of starches.
Protease	95-113°F	4.5-5.5	Best gum breaking rest.
Cellulase	113-131°F	4.6-5.3	Produces Free Amino Nitrogen (FAN).
Xylanase	113-131°F	4.6-5.3	Breaks up large proteins that form haze.
Glucanase	150°F	5.0-5.5	Produces maltose.
Galactanase	170°F	5.3-5.7	Produces a variety of sugars including maltotriose.

averaged from several sources. The activity ranges. The enzyme activity is measured as the rate of release of reducing sugars.

Becoming a better
Brewer

Lagering & temperature control



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Open Fermentation



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Brewer

Kegging?



Becoming a better
Brewer

Filtering



Experiments

Yeast Trial



Yeast Trial

- 3-gallon batch split into 4 glass cookie jars as fermenters
- 4 Yeast strains (WL300, WL380, WL351, Kellerweiss – cultured from bottle)
- Controlled pitch rate calculated on yeast age (using MrMalty for viability)



Yeast Trial

- Controlled environment - 62°F Pitch, 61°F Fermentation
- Pseudo-Open Fermentation
- Swamp Cooler to equalize temperature



Yeast Trial

- Bottle conditioned
 - Coopers Carbonation tabs
- Side by Side taste test with 12 fellow home brewers at our larger club meeting



Yeast Trial – RESULTS

- Rankings: #1 WL380, #2 Kellerweiss, #3 WL300, #4 WL351
- Comments:
 - WLP 300: All banana odor, Taste slightly sour, tart, low banana taste, almost American wheat-ish
 - WLP 351: Lower odor, touch of cloves with banana, almost funky, 2 reviewers noted the flavors of sour apples and pears
 - WLP 380: Great smell, great blend of clove/banana, almost banana bread, Balanced, Really F*ing good, Weiss flavor right on, a reviewer that placed it as 4th thought it was overly fruity
 - Kellerweiss: Low odor but balanced, flavors right on but phenolics at a low level, nice tart flavor, fruity, stone fruit.

Experiments

Grain Side by Side



Grain Side by Side

- Mashed 6 base malts
- 3 Pilsners
 - German Pilsner from NB
 - Weyermann bohemian pilsner
 - Best maltz pilsner
- 3 Wheats
 - Weyermann German pale wheat malt
 - Weyermann floor malted bohemian wheat malt
 - Rahr red wheat malt



Grain Side by Side

- Dry taste test observations:
 - German Pilsner: light, slightly sweet, starchy, plain, relatively flavorless, smells grainy
 - Best Maltz Pilsner: drier than german, powdery, starchy, basically the same as the german if a little less flavorful, but better aroma
 - Bohemian pilsner: nutty flavor and smell, sweeter than the other two, most complexity
- Bohemian floor malted wheat: crunchy hard kernel, grape nuts like flavor, complex, full flavor
- German pale wheat: softer kernel, doughy, like dry pizza crust
- Rahr Red Wheat: much harder kernel, starchy, a little nutty, more complex than pale, but not as complex as bohemian

Grain Side by Side

- Mashed in Mason Jars
 - 50 min @ 154°F
- Stovetop water bath



Grain Side by Side

- Strained and sparged each jar
- Collected wort
- “Boiled” – Brought all up to pasteurization temps, but did not perform a full boil
 - No Hops



Grain Side by Side

- Chilled by ice bath
- Filtered into sanitized jars with coffee filters



Grain Side by Side

- Tasting notes pre-fermentation:
 - German Pilsner: Very sweet, pleasant, grainy/husky/almost dirt like flavor
 - Best Maltz Pilsner: Super sweet, corny (is it possible to taste DMS before fermentation?)
 - Bohemian Pilsner: Sweet (least sweet of the pilsners), lightest color of the 3, pleasant, slight hint nuttiness, nicest of the 3.
- Floor Malted Bohemian Wheat: sweet, nutty, best smell of the wheats, definitely more complex in flavor
- Rahr Red Wheat: lighter sweet (OG is likely lower...I may have oversparged this one), creamy, pleasant aroma, darkest color
- German Wheat: sweetish, husky, grainy, minerally

Grain Side by Side

- Inoculated with 6 mL of WL380
- Set in Brew Room to ferment @ 70°F ambient temp

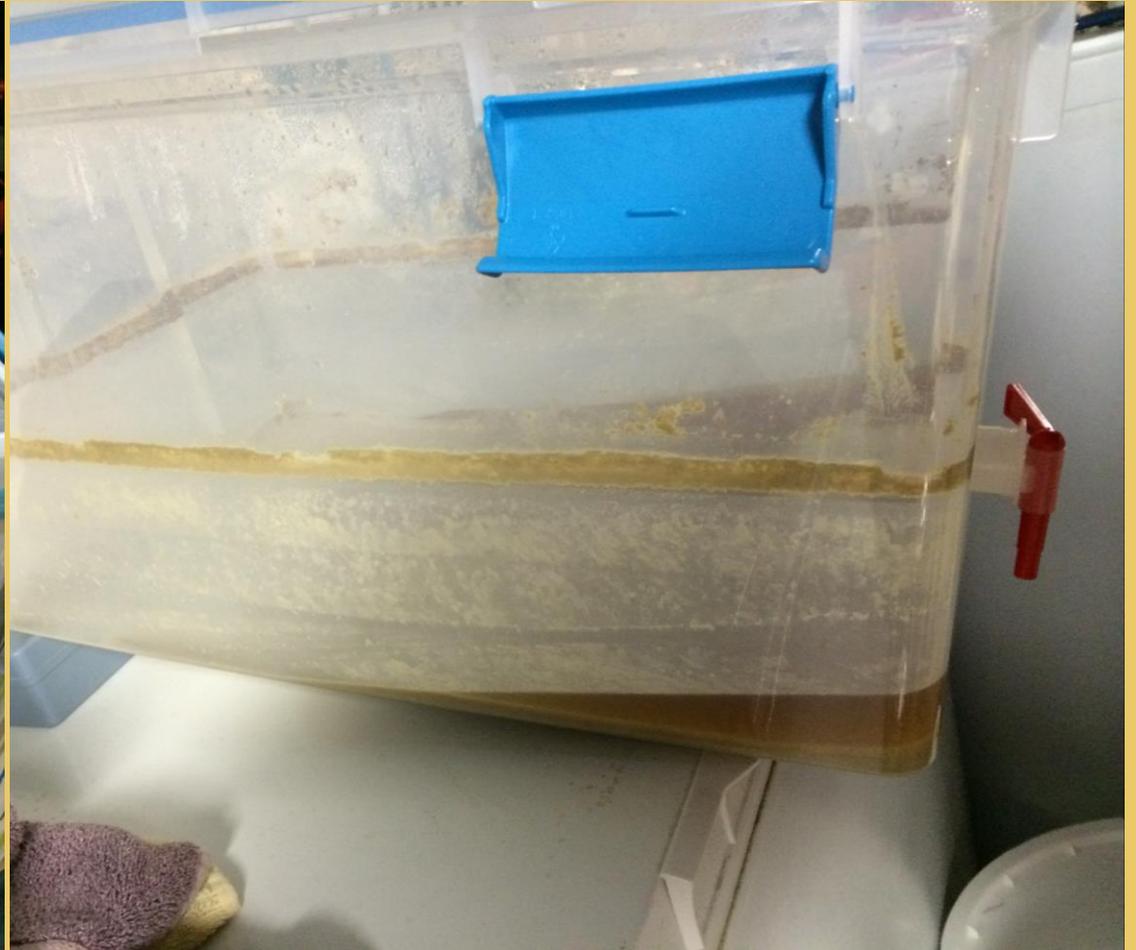


Grain Side by Side

- Post-Fermentation Tasting notes: (6 fellow homebrewers)
- Pilsners:
 - German: bread/cracker, dirt (to me)
 - Best malz: stale bread, nothing exceptional
 - Bohemian: rich, sweet, bread crust, nutty, ranked #1 by the majority of tasters
- Wheats:
 - German pale wheat: husky, bland, mild. Very little hefe expression.
 - Floor malted bohemian wheat: pleasant, bready, tart, "wheat character that you look for in a wheat beer", most balanced hefe expression, ranked #1 for the wheats
 - Rahr red wheat: creamy, thick, strong, caramely, almost like rye without the spice, hefe expression towards the esters.

Experiments

Fermenter Shape



Fermenter Shape

- Modeled fermenter after Traditional German hefe tanks
 - Supported by research to get most ester & phenol production by yeast
 - Allows for easy skimming
 - Would it work on a homebrew scale?



Fermenter Shape

- Food-grade plastic with seal (\$12 @ Target)
 - Actually created vacuum when transferring
- Added bottling spigot with 90° PVC elbow to help pick up wort without splashing or loss.

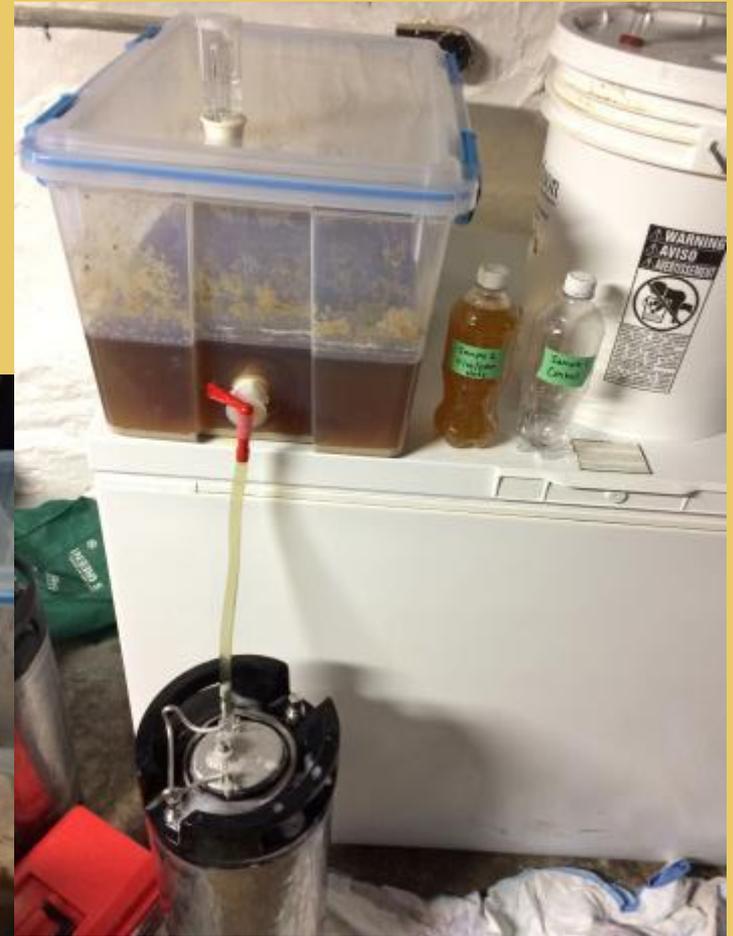


Fermenter Shape Side by Side

- Blended 2 – 5 gallon batches then split into traditional bucket and flat shallow fermenter
- Same pitch and beginning aeration



Fermenter Shape Side by Side



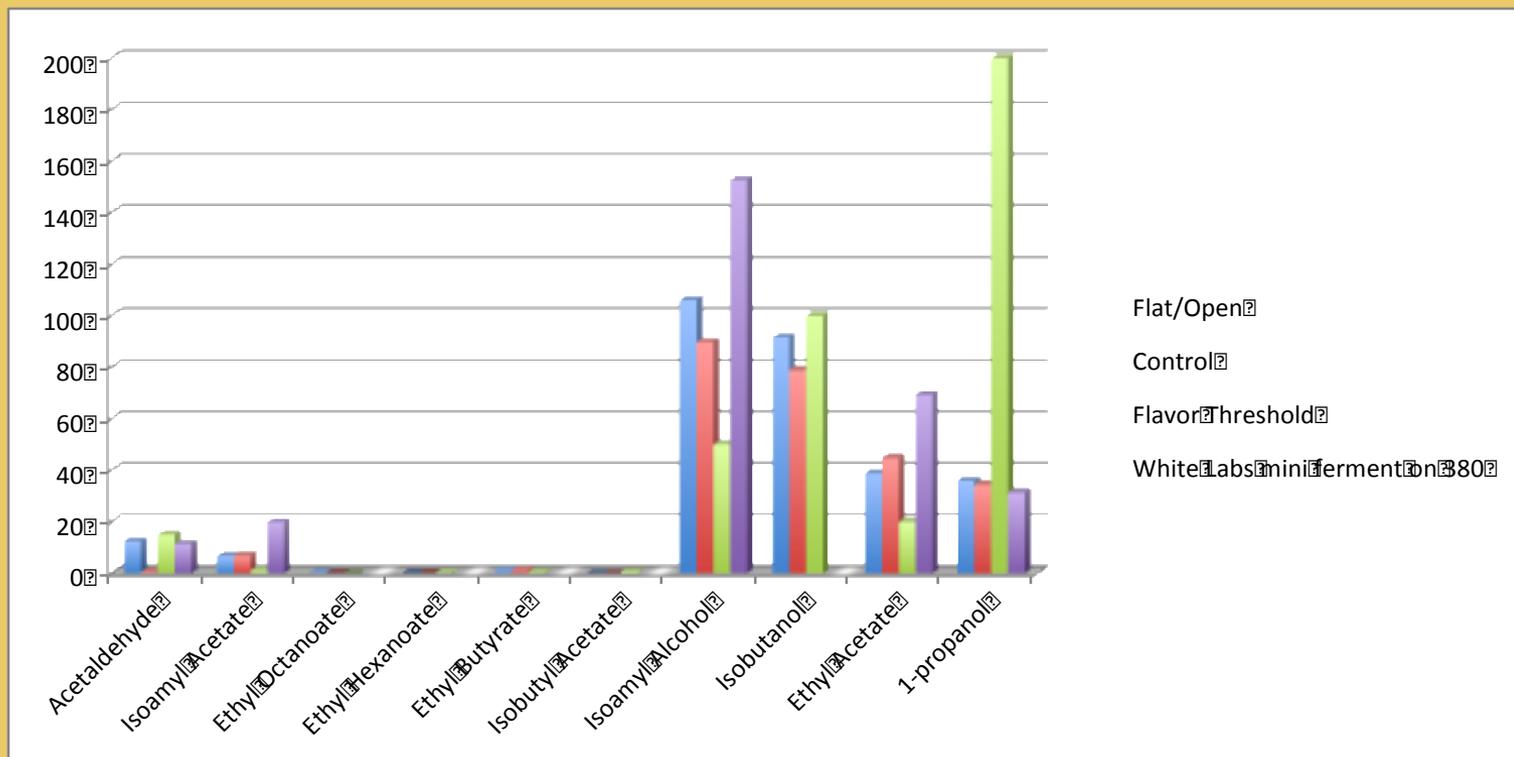
Fermenter Shape Side by Side



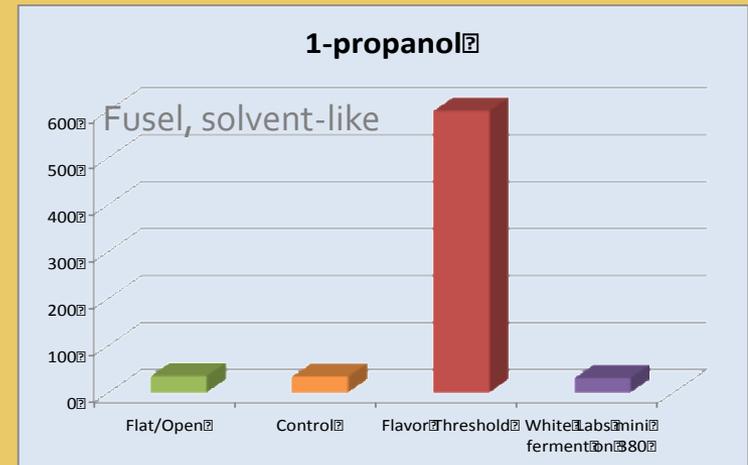
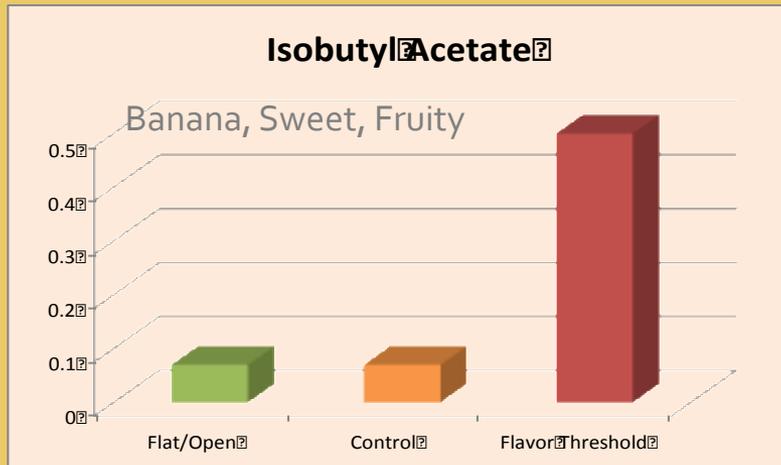
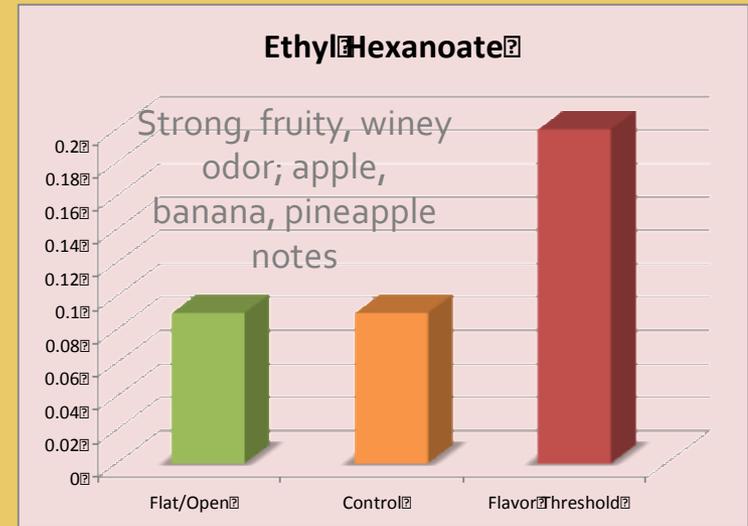
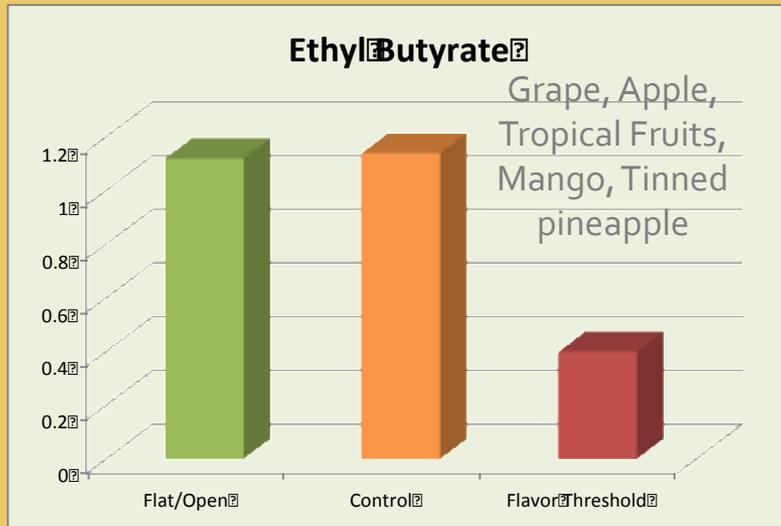
- Kegged for Festival
 - Used DME in both kegs and let naturally carb
- Sent these samples for Ester Analysis
- Huge THANK YOU to Kara Taylor at White Labs!

Fermenter Shape Side by Side

- Results: While some question the difference that this fermenter change can make on a small scale the difference is tangible to the general public.

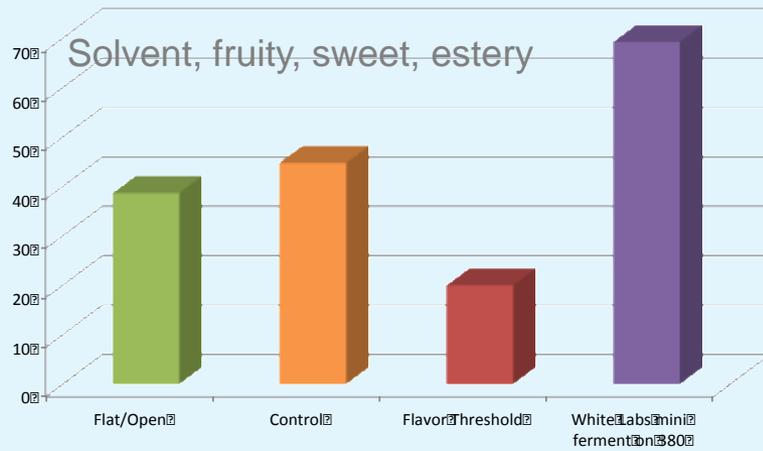


Fermenter Shape Side by Side

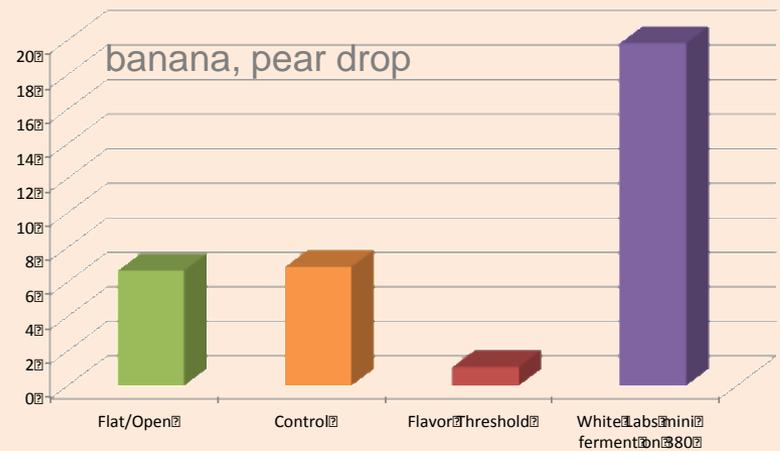


Fermenter Shape Side by Side

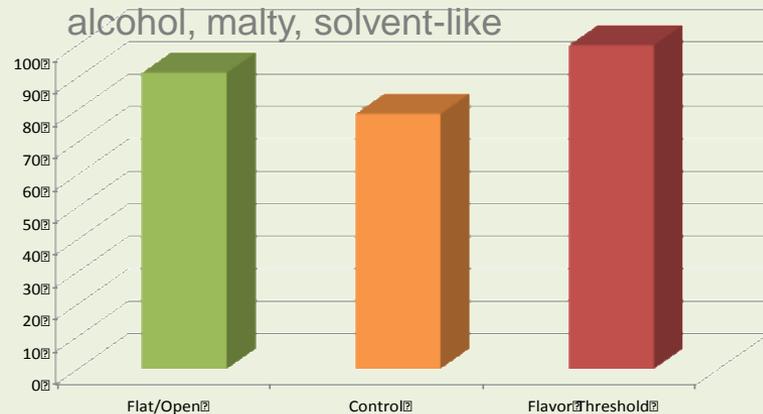
Ethyl Acetate



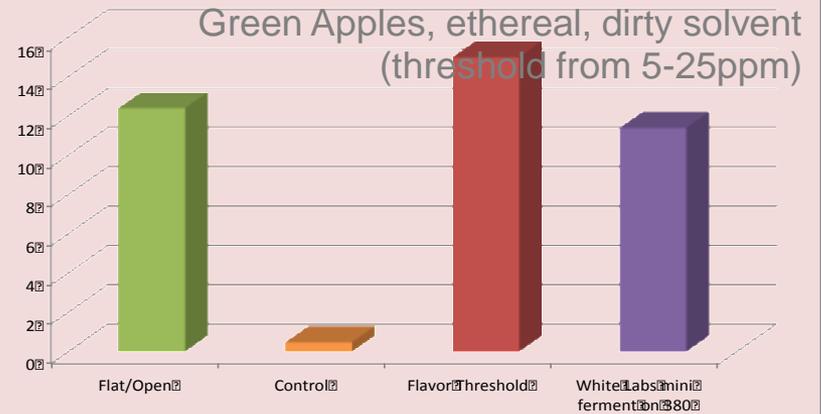
Isoamyl Acetate



Isobutanol

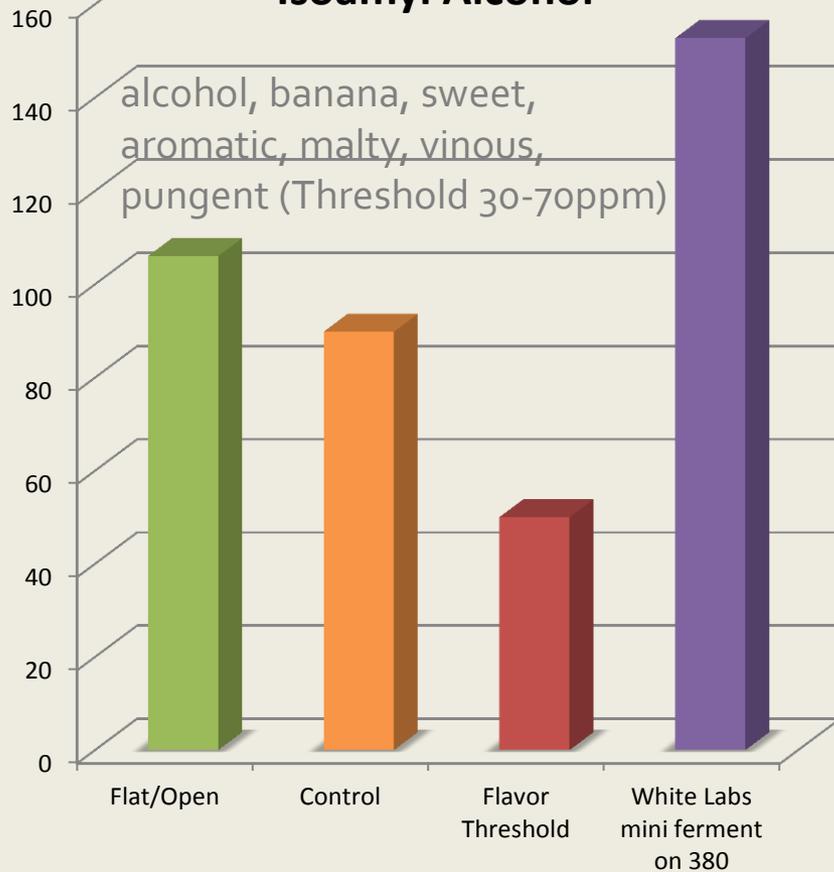


Acetaldehyde

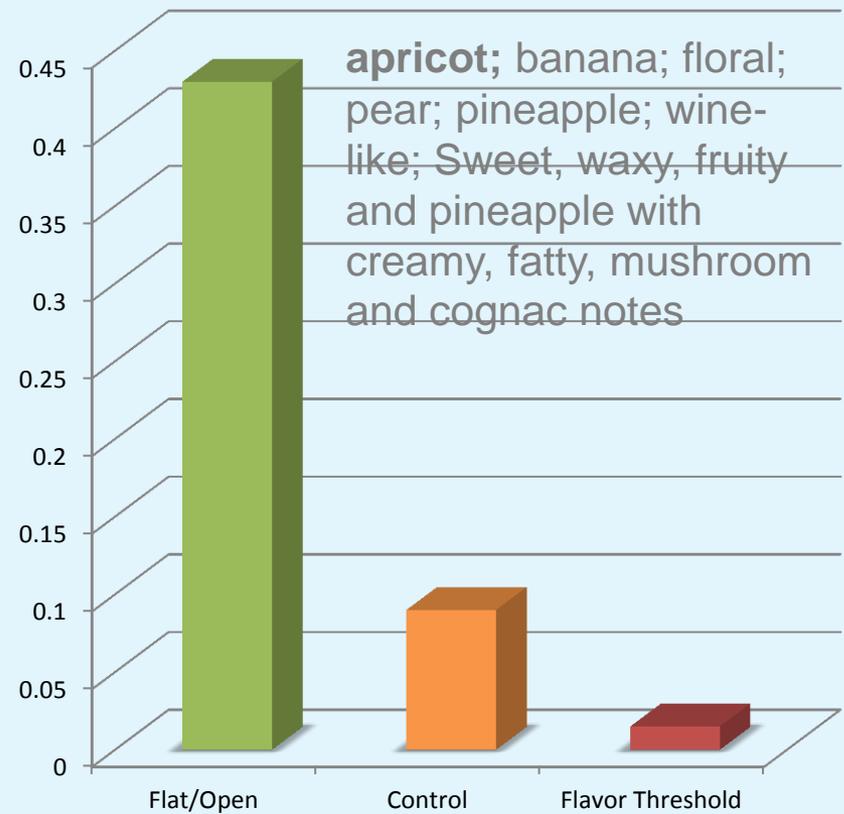


Fermenter Shape Side by Side

Isoamyl Alcohol



Ethyl Octanoate



Fermenter Shape Side by Side

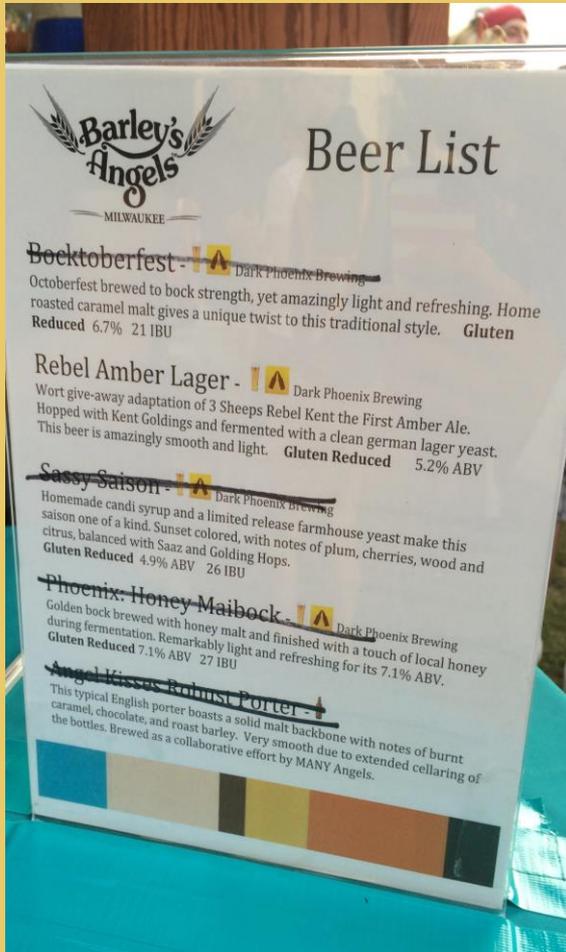
Taste Test:

- 5 people tried both side by side at 5 weeks post pitch. All testers considered both examples to be exceptional. 4 people felt the traditional/control was a better representation of a hefe. 1 person (me) favored the flat open fermenter.
- Conclusion: Would like to try again with WL300. Given how the dominant esters were amplified, I want to try this with the “go-to” traditional hefe strain. Also given that the room heater “malfunctioned” I would like to try this again when I can guarantee a more consistent temperature. (Temp dipped to 59°F on day 3 of fermentation, perhaps suppressing ester production.)

Home Brew Club



Barley's Angels



Barley's Angels
MILWAUKEE

Beer List

~~Bocktoberfest - 1 A Dark Phoenix Brewing~~
Octoberfest brewed to bock strength, yet amazingly light and refreshing. Home roasted caramel malt gives a unique twist to this traditional style. **Gluten Reduced** 6.7% 21 IBU

~~Rebel Amber Lager - 1 A Dark Phoenix Brewing~~
Wort give-away adaptation of 3 Sheeps Rebel Kent the First Amber Ale. Hopped with Kent Goldings and fermented with a clean german lager yeast. This beer is amazingly smooth and light. **Gluten Reduced** 5.2% ABV

~~Sassy Saison - 1 A Dark Phoenix Brewing~~
Homemade candi syrup and a limited release farmhouse yeast make this saison one of a kind. Sunset colored, with notes of plum, cherries, wood and citrus, balanced with Saaz and Golding Hops. **Gluten Reduced** 4.9% ABV 26 IBU

~~Phoenix: Honey Maibock - 1 A Dark Phoenix Brewing~~
Golden bock brewed with honey malt and finished with a touch of local honey during fermentation. Remarkably light and refreshing for its 7.1% ABV. **Gluten Reduced** 7.1% ABV 27 IBU

~~Angel Kisses - ROBERT MOORE~~
This typical English porter boasts a solid malt backbone with notes of burnt caramel, chocolate, and roast barley. Very smooth due to extended cellaring of the bottles. Brewed as a collaborative effort by MANY Angels.



Barley's Angels



Thank You

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