Brewing with New Hop Varieties

http://destroy.net/brewing/hops-2015.pdf



Nathan Smith
June 5th 2015
Porto Alegre



Introduction

- Wide range of new hops: Mosaic, El Dorado, Belma,
 Azacca.. (And that's just a few that we know of that have names.)
- In the past, new hops were often variations of classic American or noble varieties. (different than the "Amarillos, Simcoes and Citras" of the past.)
- How should we approach these new varieties?
- Are all of these new hops intended to be IPA hops?

Introduction

Question:

Why bother? The classic hops should be enough.

(Cascade, Goldings, Hallertau, Styrian, Saaz)

Answer:

- Maybe you want something different.
- Intangible complexity. A unique signature hop.
- Hops are still one of the most powerful ingredients in brewing to create complexity.

Hop Breeding

Something changed over the last 10 years.

(and has accelerated over the last 2)

- First, let's take a step back... (Not quite back to Cascade.)
 - "A decade ago we may have been 100% concerned with alpha breeding or trying to mimic noble aroma types. We have now made a shift. That shift started with YCR-014"
 - Jason Perrault, Perrault Farms/HBC/Select Botanicals, Hopunion Hops & Brew School 2011.
- Why mimic noble type hops? 3 letters, 1 beer style..

Hop Breeding – story of YCR014

- YCR-014 breeding and selection done mid 1990s, expanded acreage late 90s.
 - "YCR-014 was our first unique, strong, distinct, craft aroma type hop. It is a high alpha hop, but we consider it an aroma hop and we selected based upon that. YCR-014 paved the way for similar unique varieties."
 - Jason Perrault
- YCR-014 in 2011 huge success; 2001 almost a failure.
- An American commercial craft brewer started buying YCR-014 in quantity 2002-2003.

Who started using YCR-014/Simcoe in 2002? This guy knows:



Photo by Jon Weber

Hop Breeding

- Things have come a long way since Simcoe.
- Contrast: Citra absolute success by 2009. Rel. '08. (By late 2000s, craft had changed the market.)
- Citra = HBC 394, Selection & crosses 1990-1992. (5)
 - "There's a lot of good already out there, it needs to be rediscovered"
 - Peter Darby, Wye Hops LTD. (5)
- Citra, almost lost to the archives, has become the absolute rock star hop of the craft brewing world.

Rock star? Like this..?



More like this.. An early adopter of Citra who made the most out of it



Kelsey McNair, NHC Final Round, Category 14 1st place 2014, 2nd place 2013, 1st place 2012, 1st place 2010

Hop Breeding

- In the past characterful, expressive hops: discarded.
 "stinky", "catty", "american", they were considered inferior
- Breeding programs now have an opportunity to sell unique hops for the specialty/craft market.
- Good yield? Agronomically stable? Get it to market.
 - "There are 2,000 (American) craft brewers out there with 2,000 opinions. If it fits agronomically, let the baby out." - Eric Desmaris, El Dorado (5)
- Breeding takes ~10 years, only ~1 in 40k makes it.
- Typical attributes of these new, characterful hops:
 - 9-12% AA
 - 24-32% cohumulone
 - High total oil. 2-3%+ (5)



Breeding Programs



- HBC/Select Botanicals (USA): Simcoe, Mosaic, Equinox
- Hopsteiner (USA/Germany): Apollo, 05256/Eureka!, 01217, 06300
- ADHA (USA): Summit, Azacca, Jarrylo

- Hopsteiner
- USDA (USA): Newport, Santiam, Glacier, Cashmere
- Huell (Germany): Mandarina Bavaria, Huell Melon, Huell Blanc
- Individual farms, such as Puterbaugh Farm: Belma, Legacy



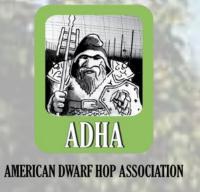




Bav. State Research Center for Agriculture

Institute for Crop Science and Plant Breeding Hop Research Center Huell





Hop Breeding – Summary

- Breeders exploring the broadest expression of hop genetics to satisfy demand for characterful hops.
- Increased single-hop complexity & higher oil. "One stop hops"
- Growers & breeders want a Citra in their portfolio. (Why? Price per LB, patents, royalties.)
- U.S. Craft Brewing ~1.2-1.3+ LB/BBL.
- A record 2,500+ U.S. Craft breweries plus expansion of the bigger craft players adds up to a huge consumption of new hops (Sierra Nevada, New Belgium, Lagunitas, Bell's, Stone, etc.)

Drinking break





New School hops Sensory Descriptors

Citrus (limão, laranja, tangerina)

Resin (querosene, o petróleo)

Tropical Porry (mintle manage)

Dank (cannabis)

(maracujá, mamão, abacaxi) **Berry** (mirtilo, morango)

Spicy (pimenta preta)

Melon (melão, melancia)

Woody/Cedar (madeira, cedro)

Onion/Garlic (cebola, alho)

Apple (maçã)

Stone Fruit (cereja, pêssego)

Bubblegum (chiclete)

Pear (pera)

Peppermint (hortela-pimenta)

Vanilla (baunilha)

"Fruity"

Coconut (coco)

Tea

Licorice (alcaçuz)

Tobacco

Cocoa

- Look for tropical, berry, melon in category 10, 14 of new BJCP guidelines
- Where does this complexity originate? In the alpha acids? Nope.. Not quite.

Essential oils - hundreds or thousands?

- ~.5-3.5+% volume by weight. Extremely volatile.
- 80% hydrocarbons. Primarily: (1,4)
 - Humulene: Woody, balsamic.
 - Carophyllene: Black-pepper spicy.
 - Myrcene: Geranium-like floral.
 - Farnesene: Gardenia-like floral. (less frequent)

Sometimes:

- Linalool: Citrus-like bergamot. (least frequent, but high impact)
- Beta-Pinene: Spicy, piney
- Geraniol: Floral, rose
- Limonene: Citrus, fruity
- 4MMP (4-mercapto-4-methylpentan-2-one) Muscat grape/black currant.
 Occurs naturally in grapes, wine, green tea grapefruit juice.
 Signature character of New World Hops. Highest levels in Summit,
 Simcoe, Topaz. (5)
- Monoterpenoids, Sesquiterpenoids.. We know less about hop oils than we think we do.

How do we get these hops?





Photos by Chip Walton

Evaluation & Recipe Development

- Short cuts? Statistics? Rub Test? Hop Tea? (10 years to coddle these hops to mkt, least we can do is give them a try in the brewhouse..)
- "You actually have to brew with hops to figure them out." -Vinnie Cilurzo
- Actually brew with them, but first make some guesses before using them in a beer.
- Use our time wisely. (As homebrewers we're not producing 30bbl of wort daily)
- Start simple emphasize the strongest character in the hop.
- Increase recipe complexity as you understand the hop better.

Brew Day / Process Approach

- Idea: Try more than one new hop in a single brew day, but keep the components of the experiment separate.
- Any time hops can be used create new options & split.
- Hop Back: Split wort into different fermenters with 2-3 different hop back charges.
 - Requires pump + counterflow/plate chiller.
 - Use quick disconnects (or equivalent).
 - Be careful! Use gloves & safety goggles. Don't burn yourself.
 - Don't be afraid of the extended rest. Think whirlpool.
 - Or use hop bags 2 or more at flame out staged at different times.
- Fermentation: 2 or more carboys/fermenters/yeast strains.
- Dry hop: 2 or more different dry hop approaches.
- Post fermentation & extended aging: Oak, brett.

Multi Hop Back

Collect first hop back, prepare for 2nd hop back. Safety first! Hot liquid under pressure.





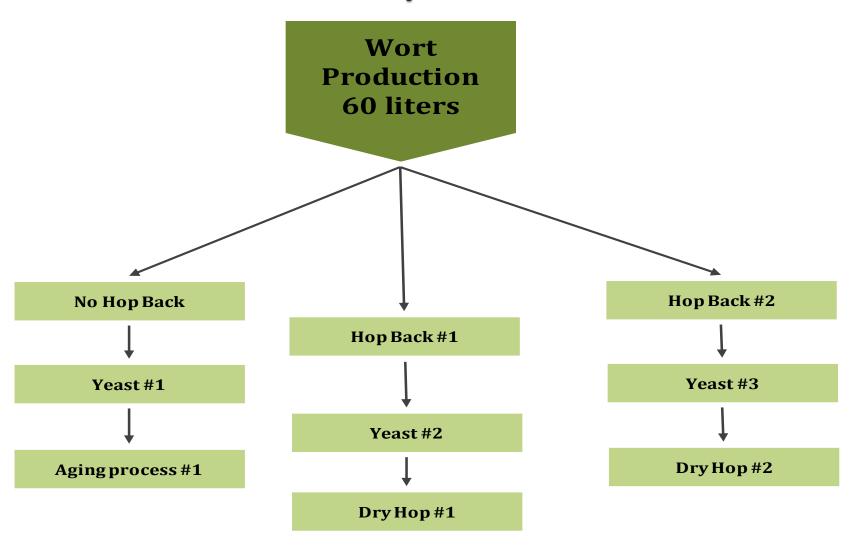


Don't forget to turn off the pump, and close all valves. Quick disconnects in sanitizer.

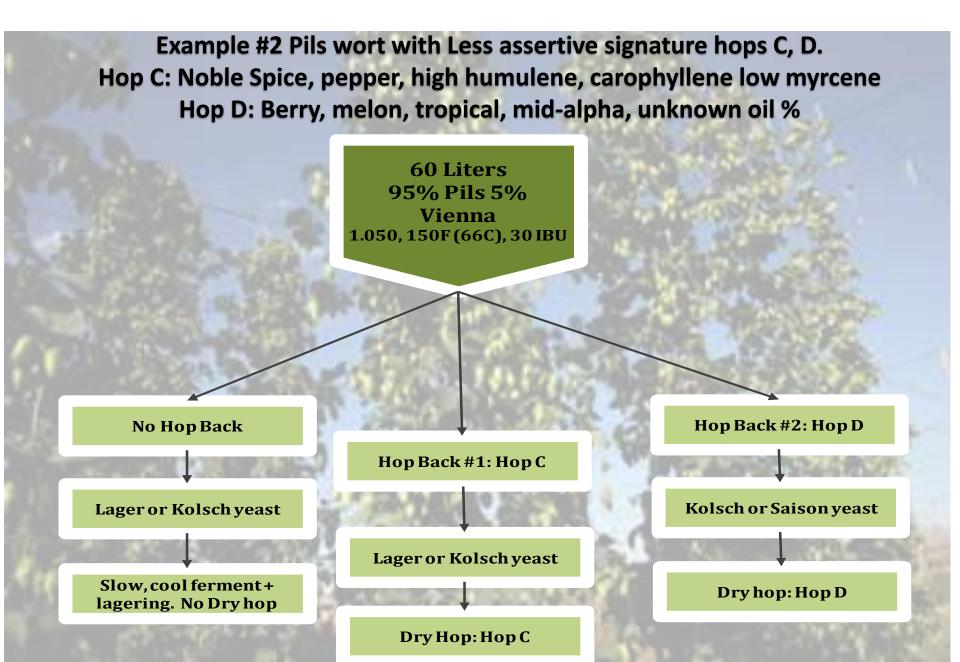




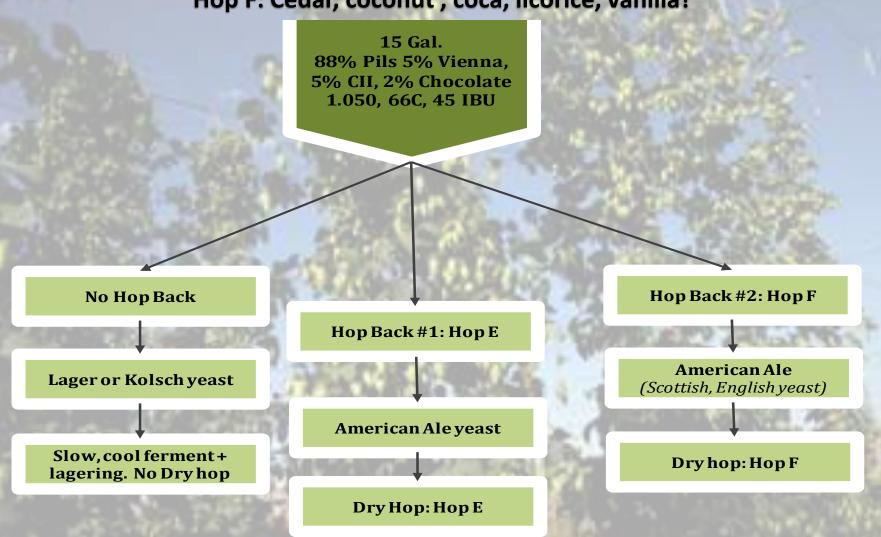
Brew Day Process



Style Selection & Process Example #1 – IPA wort Assertive hops A, B: Citrus, Pine, Dank, high oil %myrcene, linalool, farnesene **60 Liters IPA wort** showcase for hops A, B. Hop Back #1 - Simcoe Hop Back #3 -New Hop B Hop Back #2 - New hop A WLP001 (WLP004/S-04) WLP001 / US-05 WLP001 / US-05 **Dry Hop New Hop B** Simcoe Dry Hop **Dry Hop New Hop A**



Example #3 Dark, moderate roast wort – Less assertive signature hops E, F. Hop E: Berry, melon, tropical, mid-alpha, unknown oil % Hop F: Cedar, coconut, coca, licorice, vanilla?



Drinking break



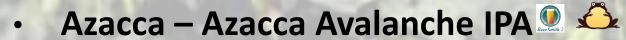


New Varieties

- Belma Belma Kölsch 🧕 🕰
- Belma Petite Bourgeoisie Saison



- HBC 369/Mosaic Mosaic Monster IPA
- El Dorado / ADHA 871 Jagoff Justin Schwarzbier



- Legacy Legacy Blonde Ale
- HBC 366/Equinox & HBC 344 Equinox IPA 🚇 🕰

All recipes on **Beersmith** and **Brewtoad**

Apollo

O151 Bred by Hopsteiner in early 2000s, released 2006. Zeus (98001 x USDA 19058m)

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
15-19%	5.5- 8.0%	24-28%	1.5-2.5%	30-55%	14-20%	20-35%	<1.0%

- Patent filed 1/31/2006
- Commercial: Aroma Specification: Lime, Pine, Vanilla, Garlic.
- Style ideas: IPA, DIPA, APA

Apollo

- Summary: The definition of dank and aggressive.
- Homebrew recipe:
 - Dankness IPA: 1.068-1.011, 7.5% ABV, 80 IBU.
- Fruit Low fruit Generic citrus
- Spice Intense spice, allspice, cooking spice.
- Aged Character Good shelf life.
- Risk Overpowers. Too much = onion/garlic (similar to Summit)

Careful when collaborating with Apollo...





Photo by Jon Weber







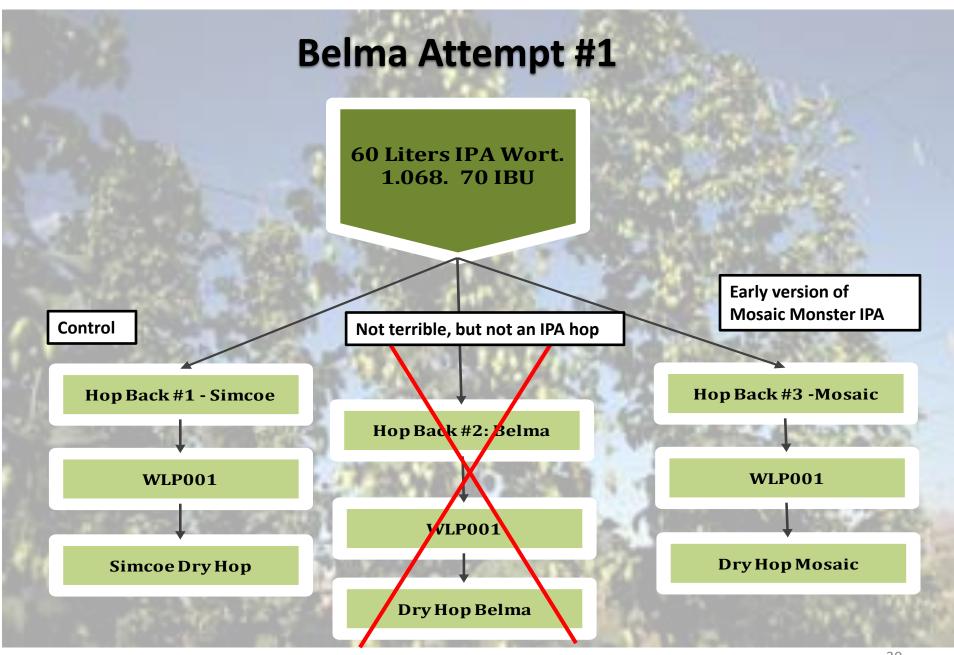
Photo by Liz Zainasheff

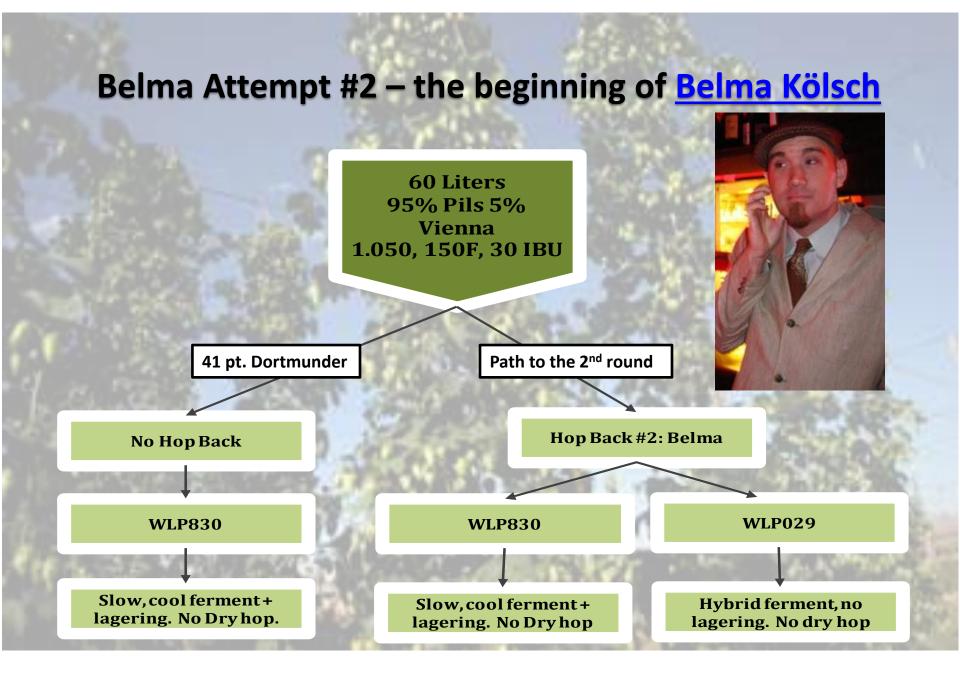
Belma

Hopsdirect & Puterbaugh Farms, Crosses: unknown

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
11-12%	4.3%	?	?	66.21%	1.64%	13.77%	

- β-pinene 1.69%, limonene .23%, linalool .11%, geraniol .04%
- Trademark filed 11/10/2011 by "Puterbaugh Farms Partnership"
- Commercial description: "A very clean hop, with a very orange, slight grapefruit, tropical pineapple, strawberry, and melon aroma."
- Style ideas: Kölsch, Saison, Wheat.
- Homebrew recipes:
 - Belma Kölsch 1.051-1.010, 5.3%, 20 IBU, WLP029
 - Petite Bourgeoisie Saison 1.035-1.010 3.2%, 32 IBU, 3711/565







Belma

Summary

- Subtle slightly green strawberry and ripe melon
 - Strawberry starburst with lime skittles.
- This hop shines with Pilsner malt.
- New-school interesting hop that is not an IPA hop.
- No citrus, pine, dank.
- Spice Very low neutral noble spice.
- Aged Character Aromatics have low shelf life.
- Strength Interesting, subtle blending component.
- Risk Easily overpowered by other hops.

06300

Hopsteiner cross between Galena, Eastern Gold, 98005

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
14-15%	5-6%	49%	1.40%	?	?	?	?

- Commercial description: Cocoa, Coconut, Dill, Lemon candy, Passion Fruit, Peach, Stone Fruit and Vanilla.
- Complex, but subtle and easily lost. Worth repeating some experiments if this one re-surfaces.
- Style ideas: Cocoa & Coconut qualities w/ Roasted malt?
 IPA/APA ok as blending hop

05256, now Eureka!

Hopsteiner cross between Apollo and Merkur.

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	<mark>Farnese</mark> ne
18-19%	5-6%	27%	~3.0%	43%	~14%	~29%	.20%

- Hopsteiner hop originally cultivated 2005
- Commercial description: "Light Grapefruit, Citrus, Pine, and Mint notes. Also has dark fruit and Strong herbal notes."
- Aggressive and in-your-face. Familiar complexity. Think Simcoe, Summit
- Will dominate over tropical or more delicate citrus hops, goes towards diesel/onion/garlic in excess.
- Style ideas: IPA, APA.
- Try it where you would normally use Simcoe

01210 / Lemon Drop

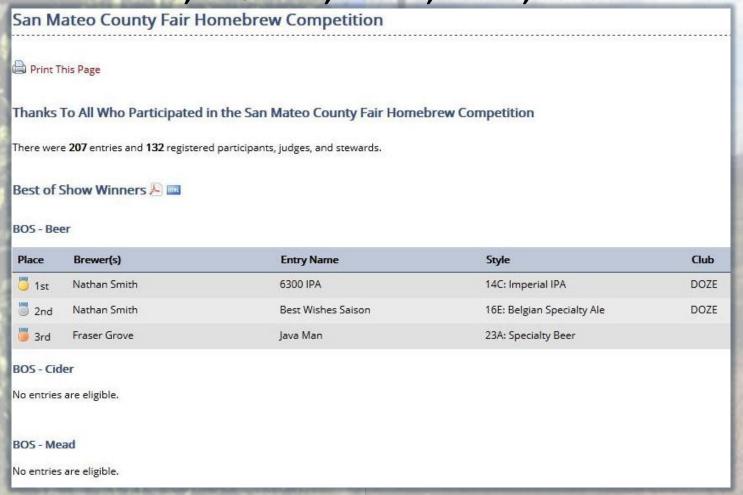
Cascade and USDA 19058 Male cross.

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
5-7%	4-6%	28-34%	1.5- 2.0%	??%	??%	??%	?

- Hopsteiner hop originally cultivated 2001
- Commercial description: "Pleasant Lemon aroma with citrus, herbal (tea) and fruity/floral (fruit blossom)."
- Alpha and oil content on the lower end, can get lost up against aggressive hops such as Apollo, Simcoe, Amarillo
- Recipe ideas: APA, IPA, Saison. Blending component in Big IPAs.

06300, 05256/Eureka! and 01210/Lemon Drop

- Homebrew recipe: 6300 Double IPA
- 1.074-1.013, 8.1% ABV, 80 IBU, 06300, 05256. WLP007



"06300 IPA" becomes "Dragon Semen" IPA



Photo by Push Eject

...And then becomes Cryptographic IPA

Drake's Brewing, San Leandro California - September, 2014











Drake's Cryptographic Double IPA

I can't resist being a homebrewer a little bit...

- 75% Rahr 2-Row
- 11% Crisp Maris Otter
- 11% Castle Pils
- 3% Simpsons Caramalt 10-15L
- 70 IBU Simcoe @ 75min.
- Whirlpool & DH: Mosaic, 05256, 01210 (Lemondrop)
- 1.074-1.010 8.5% ABV 85 IBU
- Future no crystal, inrease DH quantity

Nelson Sauvign

RJH Roborgh, New Zealand, Cross between NZ
 Smoothcone (Cluster, myrcene) & unknown NZ male.

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
12-13%	6-8%	22-26%	1.1%	21-23%	10-12%	35-37%	<1%

- Commercial description: Distinct cool climate and white wine
 "fruitiness" with fresh crushed gooseberry and grape infused flavors
- Style ideas: Rye Pale Ale, IPA
- Production commercial beers:
 - Alpine Nelson

Nelson Sauvign

- Summary: The signature Southern Hemisphere hop.
- Grape, Blueberry and 4MMP
- Isobutyric esters 2-methylbutyl isobutyrate. "greenapple/apricot fruity flavor" 2 novel thiols. (1)
- Interesting w/ contrasting hops, Amarillo & Chinook (highly contrasting hops)
- Homebrew recipe: Molotov Pale
 - 1.055-1.015, 7% Rye, WLP002.
- Fruit Grape, black currant, "tropical"
- Spice Low spice
- Risks Diesel/kerosene/boxwood/ribes?
- Brewing with Nelson...



Brewing w/ Nelson Sauvign, Motueka, Southern Cross - Simcoe, Chinook & Amarillo

Blood and Thunder IPA

Cellarmaker Brewing, San Francisco CA - October 2014



cellarmakerbrewing

8 months ago

@brewingnetwork's Nathan Smith @Nahthan collaborated with us today on our 100th brew. It's

called Blood and Thunder and is an IPA that uses three New Zealand varieties of hops (Nelson Sauvin, Motueka and Southern Cross) and three varieties of American hops (Simcoe, Chinook and Amarillo).

nahthan, altbrau, awaggytail and 164 others like this.











Mosaic / HBC 369

• HBC 369 - Mosaic HBC 369 daughter of Simcoe and Nugget.

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
11.5- 13.5%	3.2- 3.9%	24-26%	1.0-1.5%	47-53%	5.2-7.8%	13-16%	0.06%

- American hop with a Southern Hemisphere profile?
- β-pinene 0.95%, linalool: .68%, Geraniol 1.16%
- Patent filed 2/15/2012
- Commercial Description: unique and complex floral, tropical, fruity
- Style ideas: IPA/APA
- Homebrew recipe: Mosaic Monster IPA 1.066-1.010 7.4%

ABV 80 IBU

Azacca

 ADHA 483 named Azacca for 2013 harvest. Haitian god of agriculture.

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
14.86%	5.39%	?	1.8%	48.88%	8.76	?	?

- Trademark filed 5/14/2013 by ADHA.
- Commercial description: Aroma & Flavor Characteristics:
 Intense and tropical. Sustained impressions of citrus and very ripe mango, with notes of orchard fruit (pears, apples) and pine needles throughout.
- Homebrew recipe: Azacca Avalanche IPA (I haven't learned my Belma lesson!)

Mosaic and Azacca

15gal IPA Mosaic & Azacca wort, 80IBU, 1.068-1.012, 7.4% ABV.

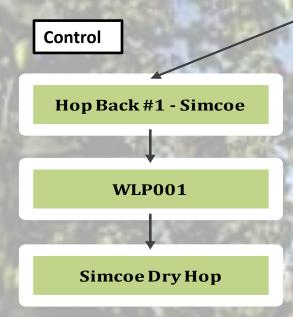


Nicole says passion fruit

Hop Back #3 - Mosaic

WLP001

Dry Hop Mosaic



Not so intense. Not learning my Belma lesson

Hop Back #2 - Azacca

WLP001

Dry Hop Azacca

Azacca

Summary

- Fruit & spice Candied mango, with slight vanilla.
- Slightly aged Pink grapefruit, stone-fruit (peach), cantaloupe, slightly bitter over-ripe fruit skin. Slight mint. Aroma drops off quick, flavor still in-tact.
- Unique quality: brings malt flavors forward.
 - Style ideas: APA/American Amber/Brown/Barleywine?
- In Drake's Drakkeller Double IPA as it aged Generic "fruity", Vanilla, cupcake/confection/frosting.
- Risks Fruitiness may highlight esters & acetaldehyde.

Mosaic / HBC 369

- Summary: North American Southern Hemisphere.
- New school hop with lots of complexity = one stop hop.
- Fruit Yes! Lots. Blueberries, Tropical, Grape, Mango
- Spice Yes! Some. But not quite noble.
- Aged Character Canned stone fruit.
- Risks Easily overdone, becomes muddled if blended with too many others. Some diesel/kerosene risks (re: Nelson). So fruity can elevates esters. Nasty with elevated diacetyl. Not familiar to many judges yet – weird scoresheets! Some people perceive the Mosaic profile as "sour".

Mosaic Monster for the Masses

11	CREAM ALE	BROWN	5.0
12	SPRING TRAINING BLACK & ORANGE STOUT	ADAM WYSS	6.3
13	BAXTER BITTER	RYAN MARSHALL	3.5
14	AZACCA NO MASI AVALANCHE IPA	NATHAN SMITH	7.5
15	MOSAIC MONSTER	NATHAN KAMISMITH	7.1
16	TION	NATHAN SMITH	6.2
1	#BLACKFRIDAY FOREIGN EXTRA STOUT	TANINDA JANINDA	7.0
1	B PRETTY SMPLE PALE	JEFF PATTERSON, DAVID ZABARTE	4.2
1	DOZE BOURBON BARRE	POZE	0.0



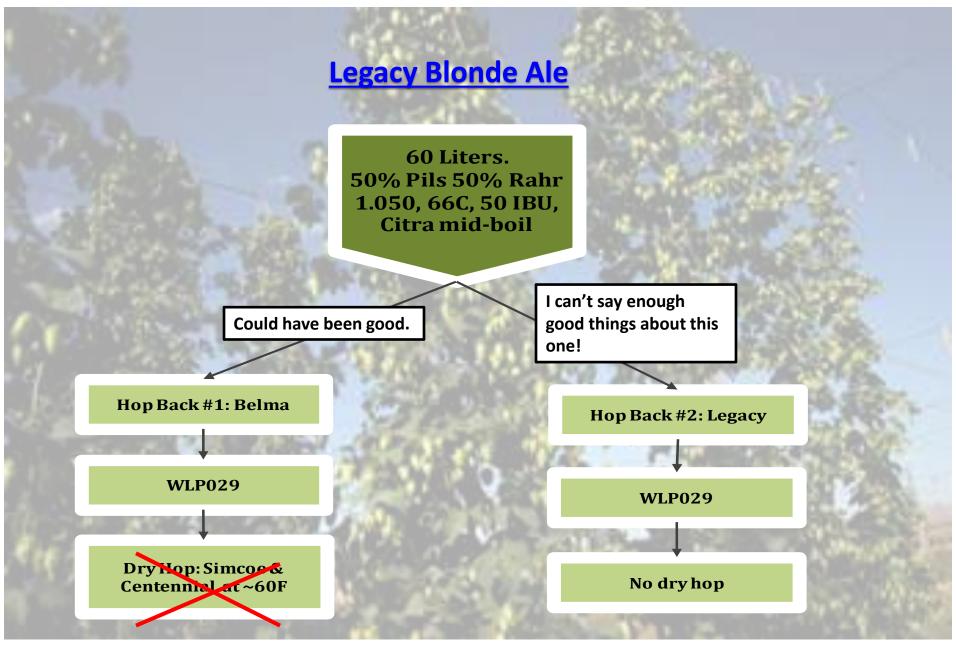


Legacy

 "Legacy has been grown in Washington State for 50 years, but was only registered as Legacy in 2013 by Hops Direct." (since 1963?)

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
7.3- 10.2%	5.9%	?	?	?	?	?	?

- Style ideas: Blonde Ale w/ WLP029.
- Homebrew recipe: <u>Legacy Blonde Ale</u>
 - 1.050-1.010, 50% Pils, 50% 2-Row, 150F, 50 IBU, Citra mid-boil, Legacy late, flame-out and hop-back. WLP029
- No Citrus, Pine, Dank Use a little Citra to elevate Legacy?



Legacy

Summary:

- 4MMP without diesel, kerosene, dank. Moderate/low classic citrus (orange & grapefruit).
- Mosaic-like fruit when you want to avoid the NZ-like diesel, oily, resin qualities that Mosaic can have.
- Fruit Black currant, berry.
- Spice Medium/low.
- Aged character In Legacy Blonde at medium age, the 4MMP-forward flavor transformed into a key-lime pie like flavor. Even more age: berry & raspberry ice tea.
- Risk Catty/Boxwood/Ribes character.

El Dorado

• Crosses: Unknown. CLS Farms, Released 2010.

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
14-16%	7-8%	28-33%	2.5-2.8%	55-60%	6-8%	10-15%	.1%

- No patent app., trademark filed 9/29/2010. CLS Farms, LLC.
- Commercial description: "El Dorado® consistently elicits responses of fruity notes, specifically tropical fruit flavors.
 Other fruit notes offered have been pear, watermelon and stone fruit." Ref: a,b

El Dorado

- Summary: Complex hop with high oil content.
- Citrus zest & berry plus slight wood/mint. Light tropical, not as tropical as Citra. No dank/diesel/kerosene. Strawberry & lemon.
- Somewhat familiar/neutral.. in a good way.
- Style ideas: Single hop APA/IPA, Dark Lager, Stout.
- Fruit Lemon, Strawberry, Pear, Cherry
- Spice Slight wood/mint.
- Risk IPA/APA too muddled if combined with other hops. El Dorado's unique qualities fade quickly in the finished beer.

Saphir

• Hüll, Released 2000 Bred for classic noble aroma.

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
2.0- 4.5%	4.0- 7.0%	12-17%	0.8-1.4%	25-40%	9-14%	20-30%	<1%

- Commercial description: Distinct spicy, fruit and citrus (tangerine) tones, Good aroma variety with a distinct hoppy tang.
- Style ideas: Pils, Kolsch, Belgian styles
- Production Commercial beers: Pivo Pils

"Pivo was formulated with Saphir from the beginning. It was built as a canvas to show off that hop. I fell in love with Saphir the very first time I tried it in a beer. To me it is distinctively different from the old school classic German Nobel hops, yet it fits in with the bunch as a new classic hop that works best in Lager beer."

- Matt Brynildson.

Saphir

- Summary: Old-school noble roots, slight newschool twist.
- Homebrew recipe: Sacrilege Pils
- Fruit Low, but slight berry and citrus.
- Spice Distinct noble spice, w/ juniper, lemongrass complexity.
- Risks Low oil (tough dry hopping?), higher myrcene than other noble type hops.

Equinox / HBC 366

Crosses: Daughter of YCR-5 (Warrior).

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
14.5- 15.5%	4.5- 5.5%	32-38%	2.5-4.5%	31-34%	11-14%	18-20%	?

- Patent application 12/15/2011
- Commercial description: "marked peaks of citrus, tropical fruit and pine with nearly zero negative attributes... Exceptionally high oil content of 2.3 4.3%. Good argonomics and a relatively high alpha acid level."
- Component of Ales for ALS 2013, Revealed as Equinox at CBC 2014.
- Tom Nielsen at Sierra Nevada strong advocate for this hop during elite trials & commercialization.
- Excited to see that Fernando and André have this hop at Tupiniquim for our Citrus Bomb brew day on Sunday.

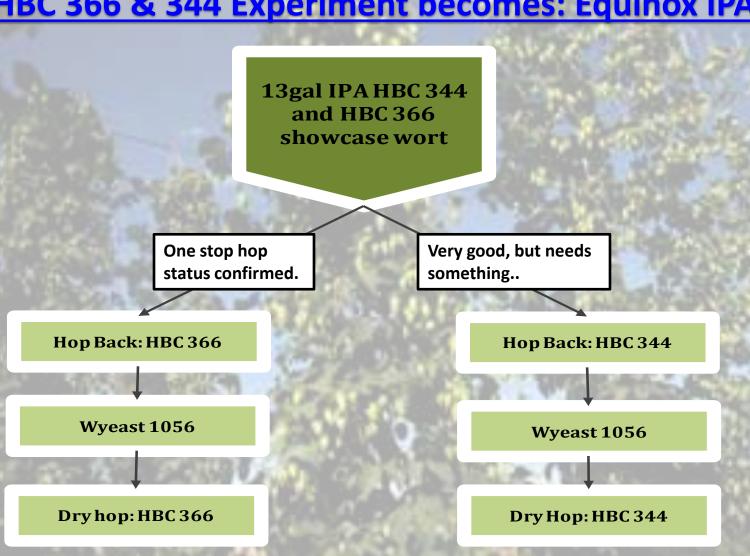
HBC 344

Crosses: Daughter of YCR-5 (Warrior).

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
14.5-	2		6	200	THE REAL PROPERTY.		THE PERSON NAMED IN
15.5%	4.5-5%	25-29%	?	?	?	?	?

- Commercial description: "Exceptionally unique green apple / tropical aroma. Its relatively high alpha acid content and unique aroma make it a great choice for hop forward beers."
- Component of Ales for ALS 2013

HBC 366 & 344 Experiment becomes: Equinox IPA



Equinox / HBC 366

Summary

- Fresh orange juice, grapefruit zest
- Medium Blackberry, strawberry.
- Low melon/ripe cantaloupe.
- Stone fruit in low amounts especially sweet bing cherry.
- No pine, no dank, no spice.
- Big complexity. Fits well into HBC portfolio.
- Aged Character Straight passion fruit into Grapefruit.
- Risks Public may not distinguish between other classic C hops as the beer ages, but brewers will get it immediately.
- Production Commercial beer: Russian River Aud Blonde,
 Dribble Belt. Crooked Stave Extra Brett Pale Ale.

HBC 344

Summary:

- Medium fruity, Apple candy.
- Low berry/strawberry.
- Aged into a more generic "fruit/citrus" over time, still pleasant
- Not a "one stop hop" like Simcoe, Citra or what Equinox may become, but would be very useful in a blend.
- Aged Character Oils seem to fade faster than other HBC
- Risks Acetaldehyde

Hops: Compare & Contrast

	4		(200)	THIRDS.	32	1200	15-525		
Нор	Alpha	Beta	Coh.	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene	Linalool
Amarillo	8-11%	6-7%	21-24%	1.5-1.9%	68-70%	2-4%	9-11%	2-4%	?
Simcoe	12-14%	4-5%	15-20%	2.0-2.5%	60-65%	5-8%	10-15%	0.0%	0.4%
Citra	11-13%	3.5-4.5%	22-24%	2.2-2.8%	60-65%	6-8%	11-13%	<1.0%	0.7%
Apollo	15-19%	5.5-8.0%	24-28%	1.5-2.5%	30-55%	14-20%	20-35%	<1.0%	?
Eureka!	18-19%	5-6%	27.0%	~3.0%	43.0%	~14%	~29%	0.2%	?
Mosaic	11.5-13.5%	3.2-3.9%	24-26%	1.0-1.5%	47-53%	5.2-7.8%	13-16%	0.1%	0.7%
Equinox	14.5-15.5%	4.5-5.5%	32-38%	2.5-4.5%	31-34%	11-14%	18-20%	?	?
Lemon									
Drop	5-7%	4-6%	28-34%	1.5-2.0%	??%	??%	??%	?	?
Nelson									
Sauvign	12-13%	6-8%	22-26%	1.1%	21-23%	10-12%	35-37%	<1%	?
Azacca	14.86%	5.39%	?	1.8%	48.88%	8.76			
El Dorado	14-16%	7-8%	28-33%	2.5-2.8%	55-60%	6-8%	10-15%	.1%	
Saphir	2.0-4.5%	4.0-7.0%	12-17%	0.8-1.4%	25-40%	9-14%	20-30%	<1%	

• Myrcene: Petroleum, spicy, geranium-like floral. (most common oil)

• Carophyllene: Black-pepper spicy.

Humulene: Woody, earthy balsamic.

• Fasnesene: Gardenia-like floral. (less frequent)

Linalool: Citrus-like bergamot. (least frequent, high impact)

Closing comments

- There are more new, unique hops than ever before.
- Look beyond what everyone else is doing with the latest hype hops and create your own story.
- Develop your own recipes based on your perceptions of these new hops (but don't forget to involve others' whose palates you trust!).
- Brew into the hops' own strength. If the hop isn't working with the style you're focusing on, try another.

What's next?

- Steiner More hops like Lemon Drop and Eureka! ??
- ADHA Jarrylo specifically marketed as "not an IPA hop" banana/orange/pear.
- Huell program more German hops with a new world American accent?
 - Mandarina Bavaria, Huell Melon
- USDA program:
 - Tahoma Grapefruit/cedar/pine?
 - Cashmere from Brulotte Farms Cascade lineage, melon/citrus/coconut?
 - Yakima Gold Lemon zest & grapefruit?
 - Triple Perle Orange zest and noble leanings?
 - Perle 074
 - Multihead / Medusa Guava, Citrus, Melon.
- CLS Farms/Eric Demereh 8 neo-mexicanus variations
- Azacca next iteration of experiments with dark wort?
- Soverign English hop with interesting dried fruit character.
- Select Botanicals / HBC progam hops such as 291 exceptionally low cohumulone.

Questions?

- Contact
 - nathan@thebrewingnetwork.com
 - Twitter: @nathanhomebrew
- Links
 - http://destroy.net/brewing
- Special thanks to:

















References

- 1. Oxford Companion to Beer. Edited by Garrett Oliver. Oxford University Press, 2012.
- 2. The New Brewer Volume 23, Number 6. "The Eternal Quest for the Ultimate Hop Impact" by Matthew R. Brynildson (p. 22-29)
- 3. "Humulus Lupulus: Hopping for Flavor and Aroma" Matthew R.
 Brynildson, Michigan Brewers Guild and MBAA District Michigan Winter
 Conference
- 4. The Brewers' Handbook. Ted Goldammer, KVP Publishers, 1999
- 5. For The Love of Hops. Stan Hieronymus, Brewers Publications, 2013



Citra

- HBC 394 the early 90s, not released until 2008.
- Crosses: 50% Hallertau, 25% U.S. Tett**, 19% Brewer's Gold, 3% EKG, 3% unknown. (5) "US Tett" = what?

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
11-13%	3.5- 4.5%	22-24%	2.2-2.8%	60-65%	6-8 <mark>%</mark>	11-13%	<1.0%

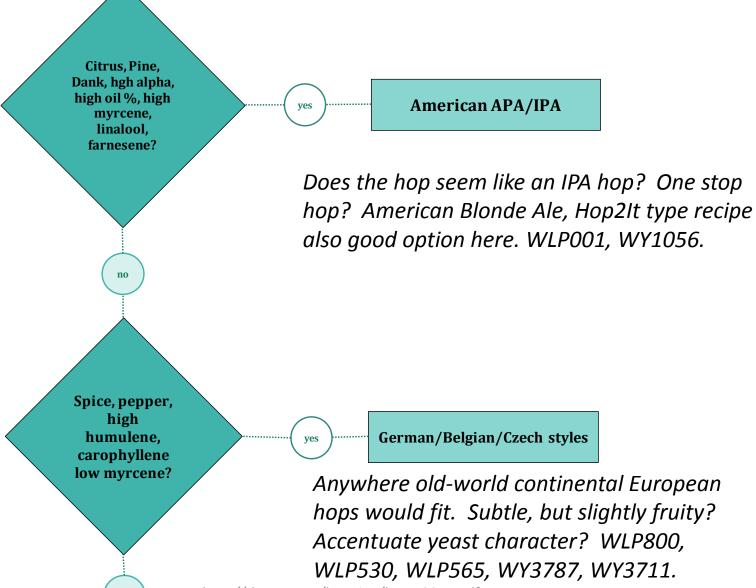
- β-pinene .93%, Linalool .70%, Geraniol .48%,
- Patent filed 1/23/2009
- Citra is the absolute rock-star darling hop of the craft beer world right now.

Citra

- Starting point for American "Tropical" high-oil hops.
- So complex everyone gets something different. Tomato plant Sensory panel perceptions at SN? To me..
 - Aged Character = Irish spring soap flakes?
- Style ideas: You don't need my help here.
- Homebrew recipes: APA my first attempt in 2009. Lemon pledge?
 - Morebeer Citrus Bomb IPA Citra on the hot side only.
 - 1.068-1.012, 7.4%, 80 IBU.
 - Kelsey McNair and North Park Beer Co. Hop Fu (see Zymurgy!)
- Production commercial beers: Too many to list!
 - Kern River Double Citra.
 - Heretic Evil Twin
- Fruit Tropical fruit and citrus complexity. Lychee, Gooseberry.
- Spice Moderate spice.
- Risks Too over used/too overdone/hard to find/expensive!

Style selection

When we can't do all options, trust our instincts...



no

Style selection (continued)

Berry, melon, tropical, midalpha, unknown oil?

Blonde Ale, Kolsch, Pils, Wheat

Low/no ester yeast, simple malt bill, low toast, pilsner malt, no stewed malts. Subtle, no aggressive citrus or pine? English styles also may be interesting here.

WLP029/028/001/800/833/320

Cedar, coconut, coca, licorice, vanilla?

yes .

Schwarzbier, Stout, Porter, Mild

Low/no ester yeast, simple malt bill, medium toast, medium/low roast, no stewed malts.

Scottish styles also may be interesting here..

WLP800, 833, 028, 001, 007, WY1098

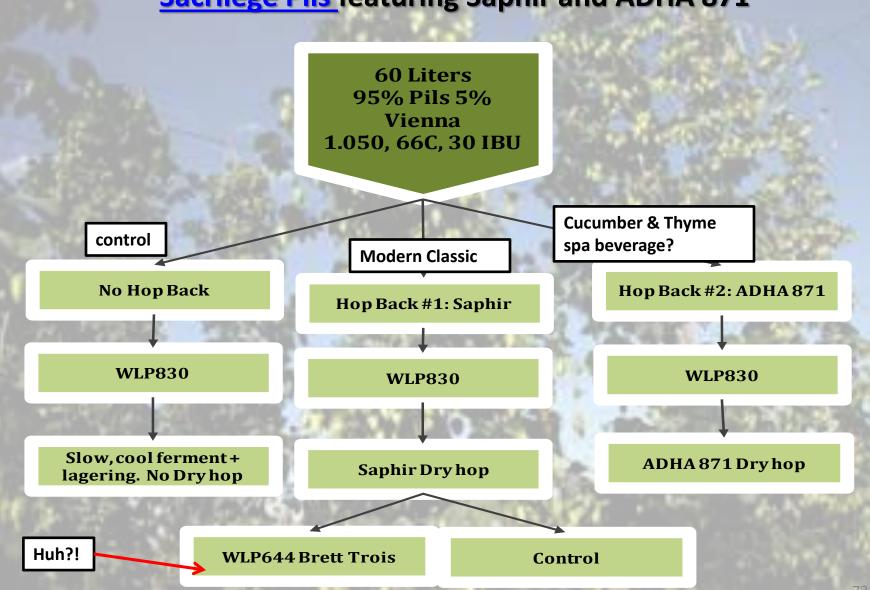
ADHA 871

• Crosses: Unknown

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
13.42%	3.96%	27.43%	?	?	?	?	?

- Commercial description: "clean, pleasant, floral, citrus, huge mint, herbal, mellow spice, thyme, saaz like, cucumber, sage, touch of lemon."
- 3:1 Alpha:Beta, unlike Saaz, similar cohumulone.
- Style Ideas: Pils
- Homebrew recipe: Sacrilege Pils

Sacrilege Pils featuring Saphir and ADHA 871

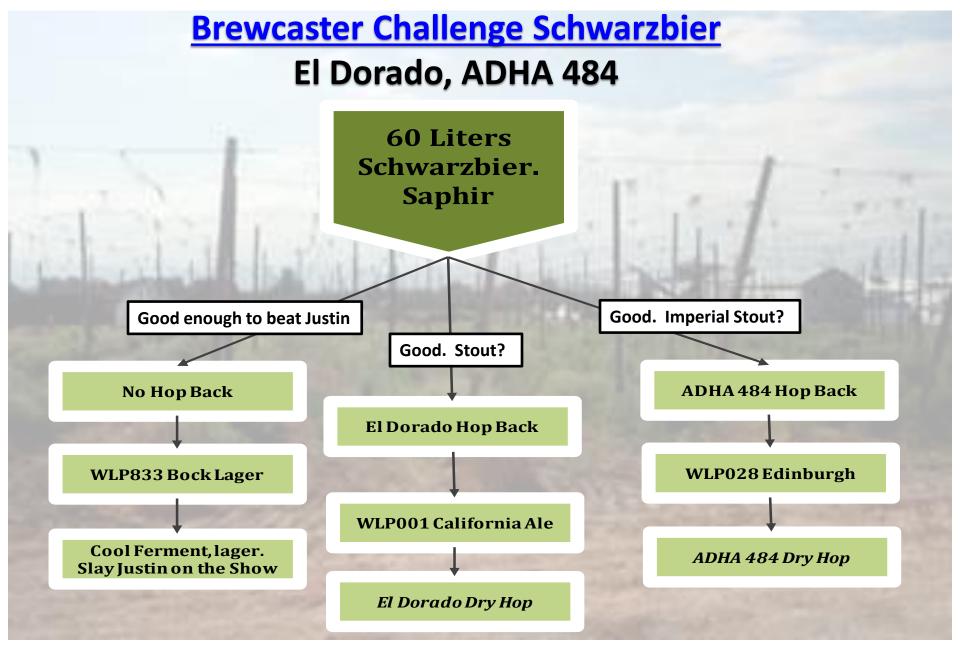


ADHA 484

Crosses: Unknown

Alpha	Beta	Cohumulone	Total Oils	Myrcene	Caryophyllene	Humulene	Farnesene
11.65%	3.53%	46.78%	?	?	?		?

- Commercial description: Cedar, wood, bubblegum, spice.
- Summary: cedar, French oak, spice (imperial stout?)
- Production commercial beers: None known.
- Fruit Low
- Spice Moderate, complex spice.
- Risks Accentuates alcohol?
- Style ideas: Dark lager, stout, porter.



Mosaic / HBC 369 - Yeast variations

- Repeatedly proven the recipe? Try changing a variable:
- Uncharted Territory IPA Mosaic Monster wort w/ Yeast Bay:
 - Vermont Ale I'll let you guess which brewery this might be from.
 - Funk Town Pale Vermont Ale & Brett blend.
 - Wallonian Farmhouse complex phenols, muted esters, tart, highly attenuative.
- 77% Rahr 2-row, 10% Belgian Pils, 5% Turbinado Sugar, 4%
 Carafoam, 3% C15, 2% Acidulated. 148F (64C). 1.066, 80 IBU
- Low/no pine & dank. No classic C hops. Focus on tropical & fruity.

Uncharted Territory IPAMosaic Monster variant w/ Yeast Bay strains



60 Liters Mosaic Monster Wort, Mosaic late & flameout



VermontAle Yeast

Hop Back #1 - Mosaic

Dry Hop: Mosaic

Mosaic / HBC 369 Yeast variations Uncharted Territory IPA

- Vermont: Peach ester, white wine grape, lychee fruit. Light kerosene, diesel. Very good, but dry hop faded fast. Wild swings in sensory peaks as the beer aged. Increase DH and IBU?
- <u>Funk Town</u>: Brett +aromatic character: Sandalwood, peach, pineapple. Very aromatic and unique with the hop character.
- Wallonian Farmhouse: Surprisingly awesome! Very dry, IBU and water minerals pulled forward. Hops popped through well despite esters & phenols. Lower esters than other Saison strains but focused phenols (mild smoke, no offensive band-aid or medicinal) worked surprisingly well with grape & tropical yeast character.
- Conclusions:
 - Mosaic + tropical hops + phenols may be an interesting path.
 - Ester & phenol forward yeast with low/no pine & dank re-confirmed.