



STONE[®]
BREWING CO.

TECHNIQUES AND INGREDIENTS
FOR BREWING AMAZING HOPPY
BEERS

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Brewmaster

Stone Brewing Co.

Objectives

- Review some new developments with hop varieties and hop research
- Hopping schedules in the brewhouse
- Dry-hopping techniques and schedules
- Other brewing procedures-what can be done to maximize hop flavors?

IPA new developments-HOPS

- New trends in hop research
- New Hop Varieties
 - New Southern Hemisphere varieties
 - New European varieties
 - New American varieties

Hop research

- Studies being done to analyze hop flavor through the brewing process
 - Bio-transformation of hop oil by yeast:
 - Examples: Geraniol to B-Citronellol
 - Influence of yeast ester production on hop aromas
 - Fermentation temperature and pitching rate-lower can increase hop flavors
 - Really in-depth studies of oils in hops and how they translate in beer.
- Hop Processing impact on flavor
 - Early vs late harvest
 - Low or high temperature kilning
 - How to minimize garlic/onion?

Hop research

- Hop pre-isomerization to increase utilization-up to 65%
- Non-iso-humulone bittering compounds
- Impact of oxidation on hop bitterness and hop flavor
 - What role does yeast strain play?
 - Hop Bursting = greater retention of hop flavors?
- Direct pelletizing-no baling: is there a flavor difference?
- Loose pack pellets vs. hard pack pellets

Hop Research

- The “real” impact of mash hopping, first wort hopping???
- Hop breeding programs taking on a new life
 - Public: WSU, USDA
 - Private: Hop Breeding Companies, Farmers, and Hop Brokers
 - Occurring in all major hop growing regions

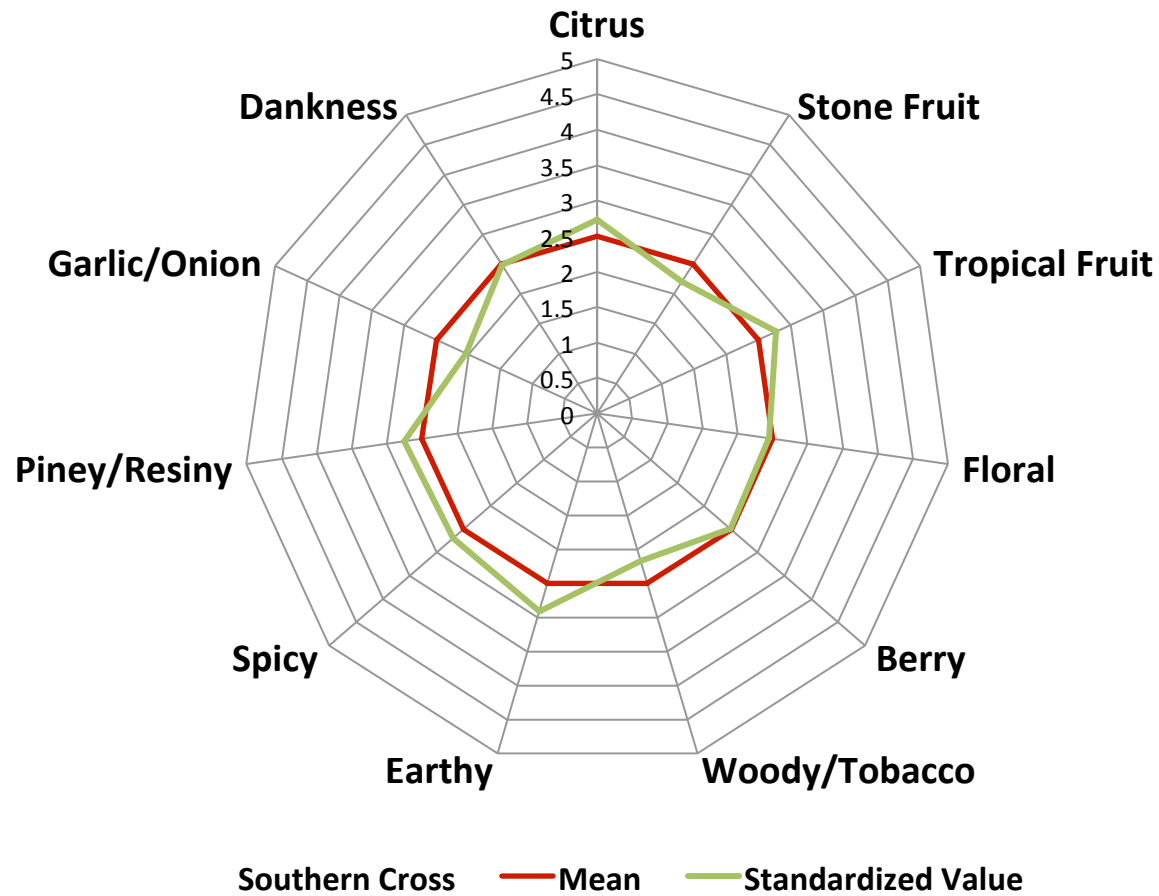
Some new hop varieties

Test Protocol

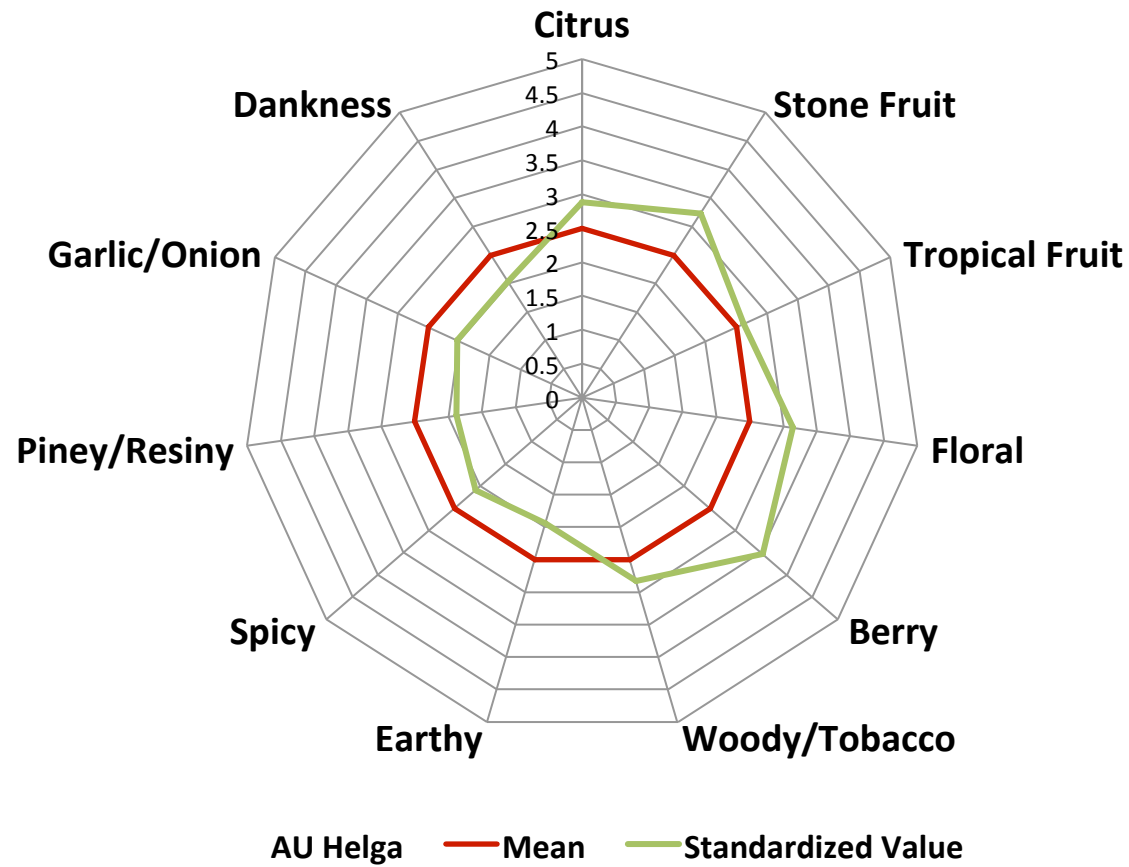
- Stone IPA, pulled from fv, just prior to dry-hop
- 5 gallons into a 6 gallon carboy
- Add the hops at rate of 1 lb/bbl
- Agitate 3 X over 36 hours, then chill for 1 week.
- Keg into corny kegs, carb up and taste:
 - Participants rank the flavor attributes on 1-7 scale
 - Also provide descriptor comments
 - Also provide a preference rating

Southern Hemisphere Hops

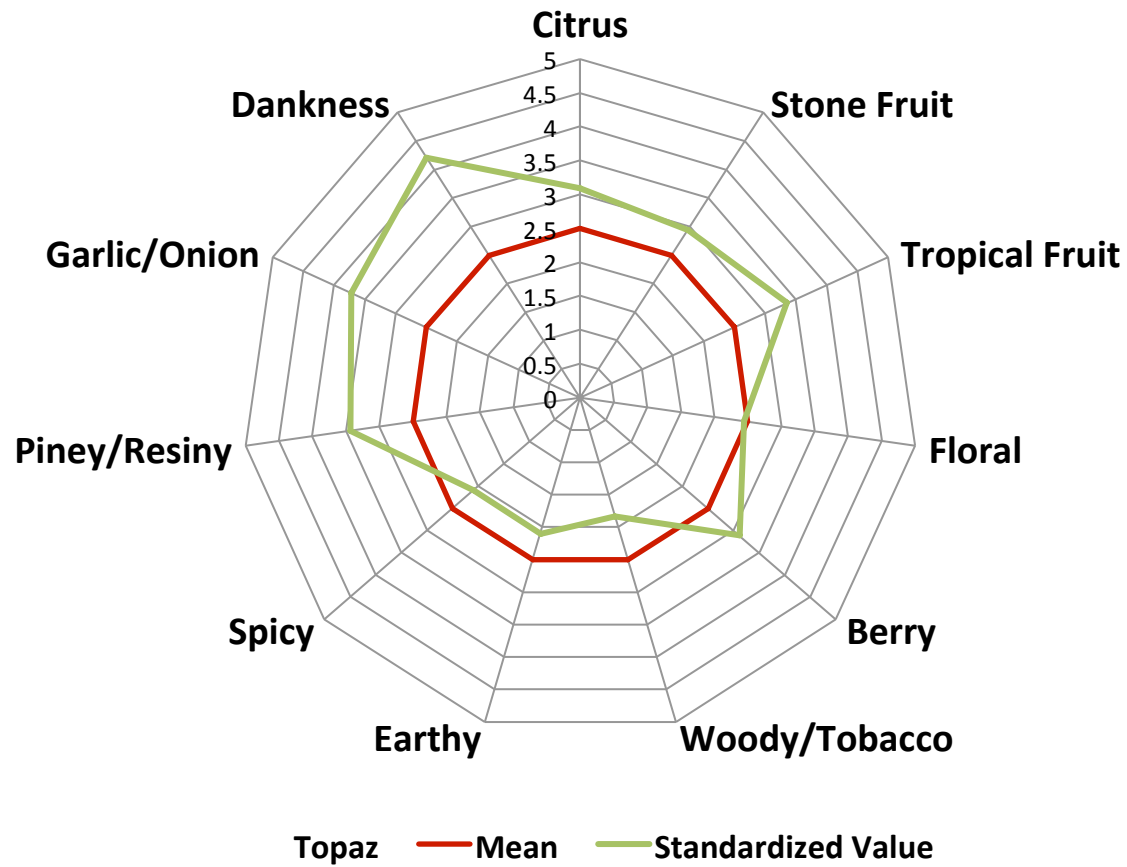
- Nelson Sauvín:
 - Positives: Dank, dank, dank. Wine-like, citrus and resin
 - Negatives: very bitter on the finish. (??, ok, how is this a negative?)
 - Overall: huge hop, very favorable.
- Motueka:
 - Positives: Intense herbal, lemon, peach, spicy/coriander, citrus and pineapple
 - negatives: a bit mild overall, drying/astringent finish.
 - Overall: Interesting hop flavors!



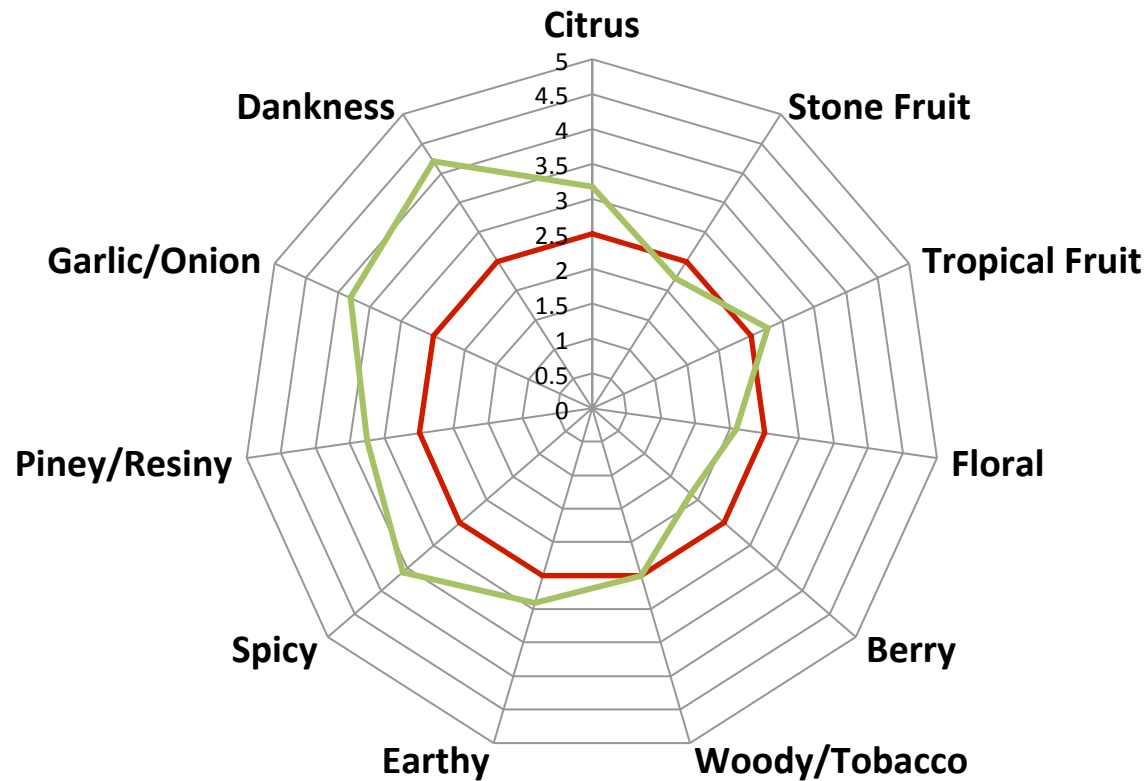
SOUTHERN CROSS: A lot of fruitiness. Pine resin with a touch of grass. Tobacco, strong fruit finish. Depth almost chocolaty, herbaceous mouthfeel. Perfume, pineapple. Very nice. Dark citrus, spicy. Tropical Mango. Some stone fruit and resin. Weak aroma. Waxy, pineapple, mango. Excellent. Pretty well liked overall.



HELGA (formerly Southern Hallertau): Berry with peaches. Blueberry, woody. Honeydew melon, peach, lemon, complex. Peppery. Woody, garlicky, stone fruit, peaches, astringent and sage. Herbal, fruity, sage. Different and well liked.

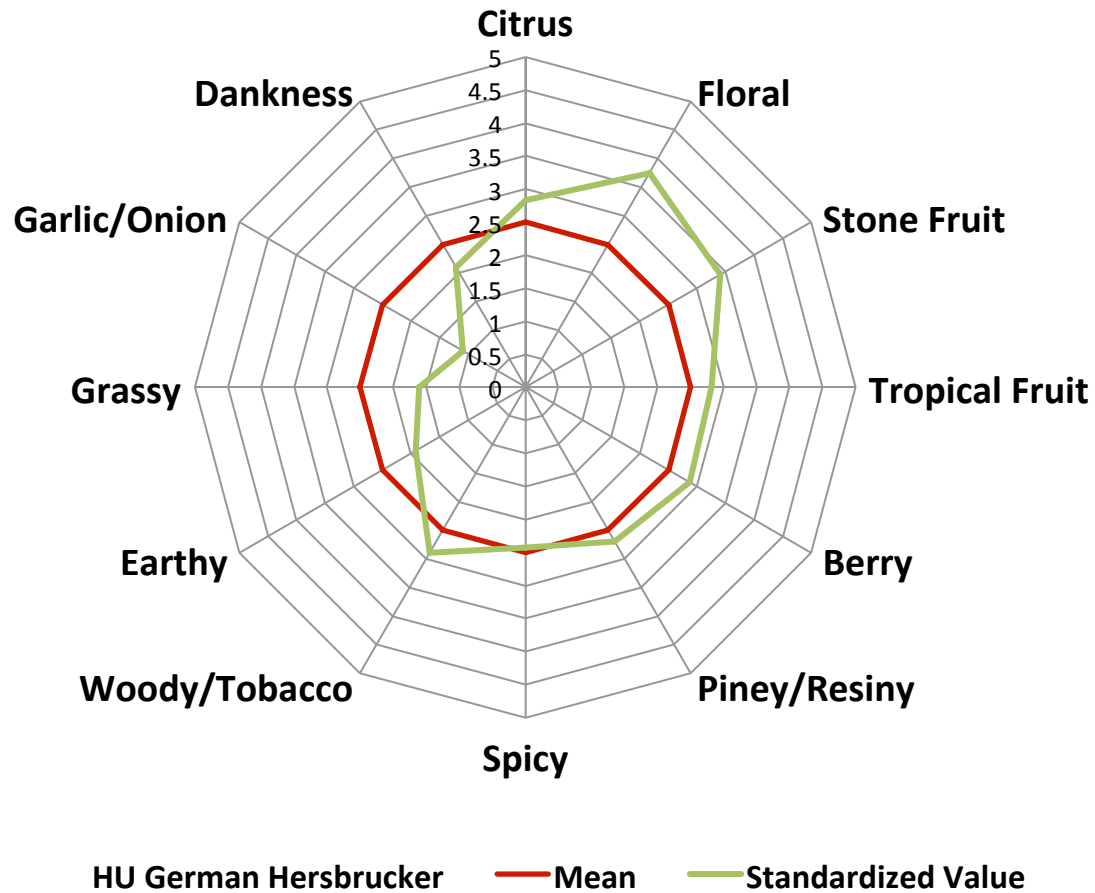


TOPAZ: Citra-like, with a little Nelson on the nose. Pineapple, uzu, resinous. Dank, resin, onion. Nectarine and peach, fruity tone. Dank. Peaches, stone fruit, intense. Grapefruit, tropical, stone fruit. A hit for some, a miss for others.



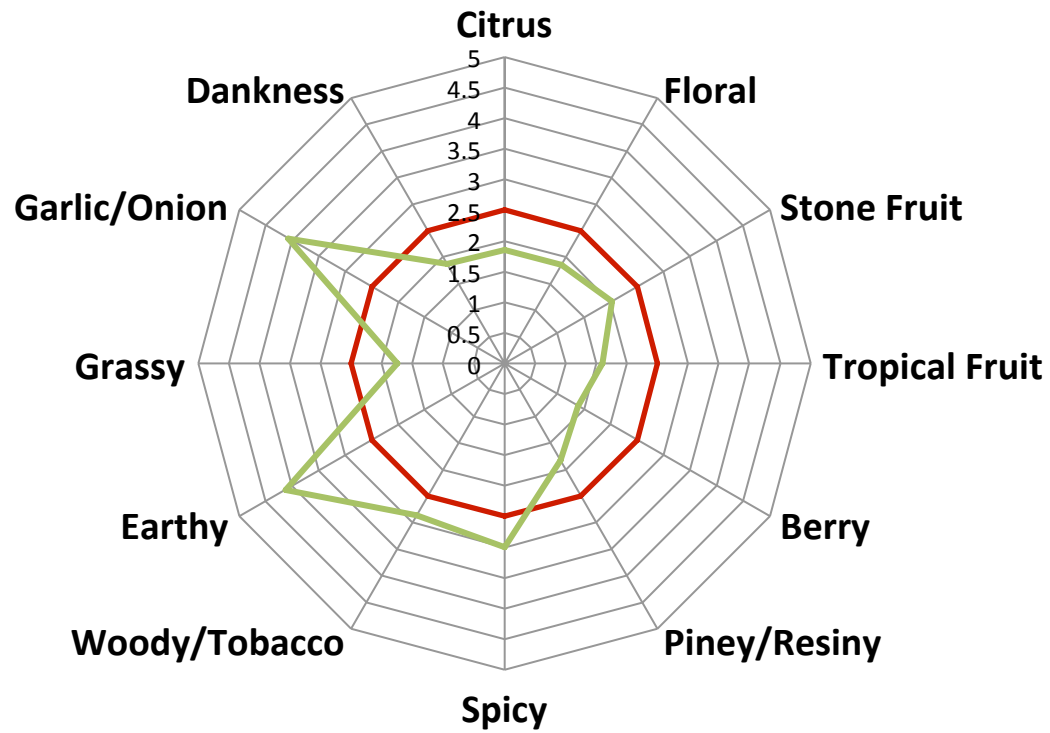
GREEN BULLET: Like a milder Citra or Nelson citrus, dank, mango. Almost cooling on the palate. Onion nose, berry, persimmon, spicy. Dank, resin, onion, some fruit. Spicy, herbal. Garlic, spicy, dank. A bit harsh. Nice fruit underneath. Peaches, resinous, sage. Nice combo of fruit and wood. Green, sage, citrus. Looks like we picked up a lot of dank and garlic, but it didn't seem too objectionable to rule this one out.

European Hops

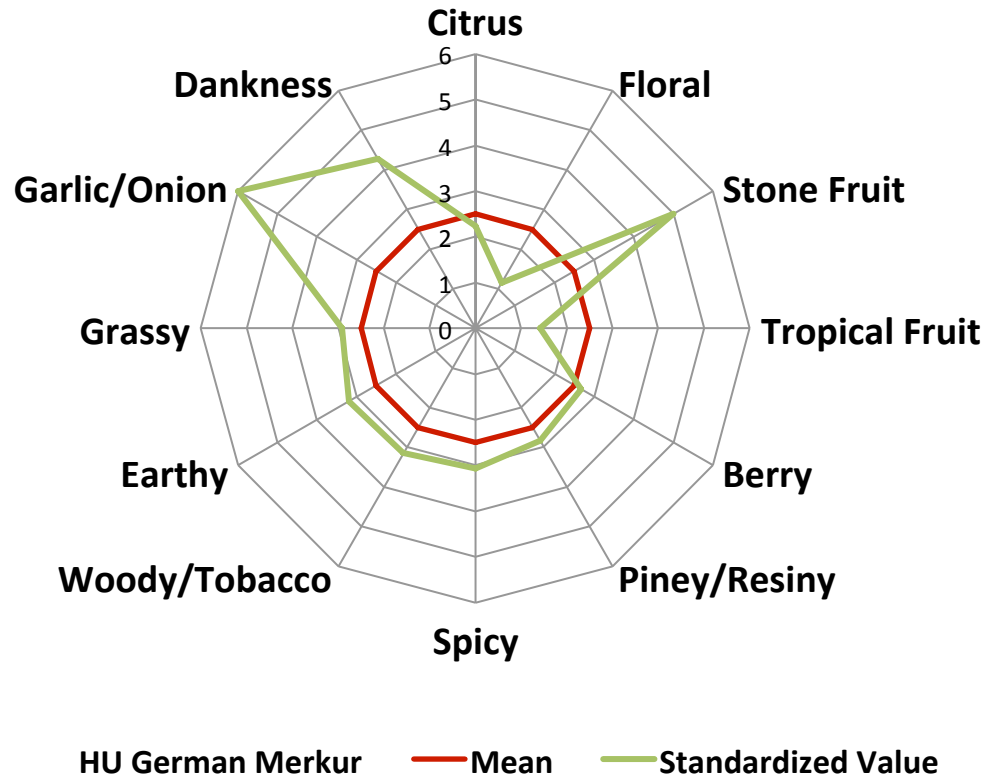


HERSBRUCKER

Big Grapefruit, Lemon, Rosey, Peach, Apricot X2, Mango, Melon, Blueberry, Resin, Black Pepper, Tobacco, Mushroom, Grassy, Nectarine X2, Rose Petal, Plum, Geraniums, Herbal, Citrus Zest, Woody, Lots of Stone Fruit, Stone Fruit X2, Spicy Aroma X2, Minty, Tobacco, Classic Hop

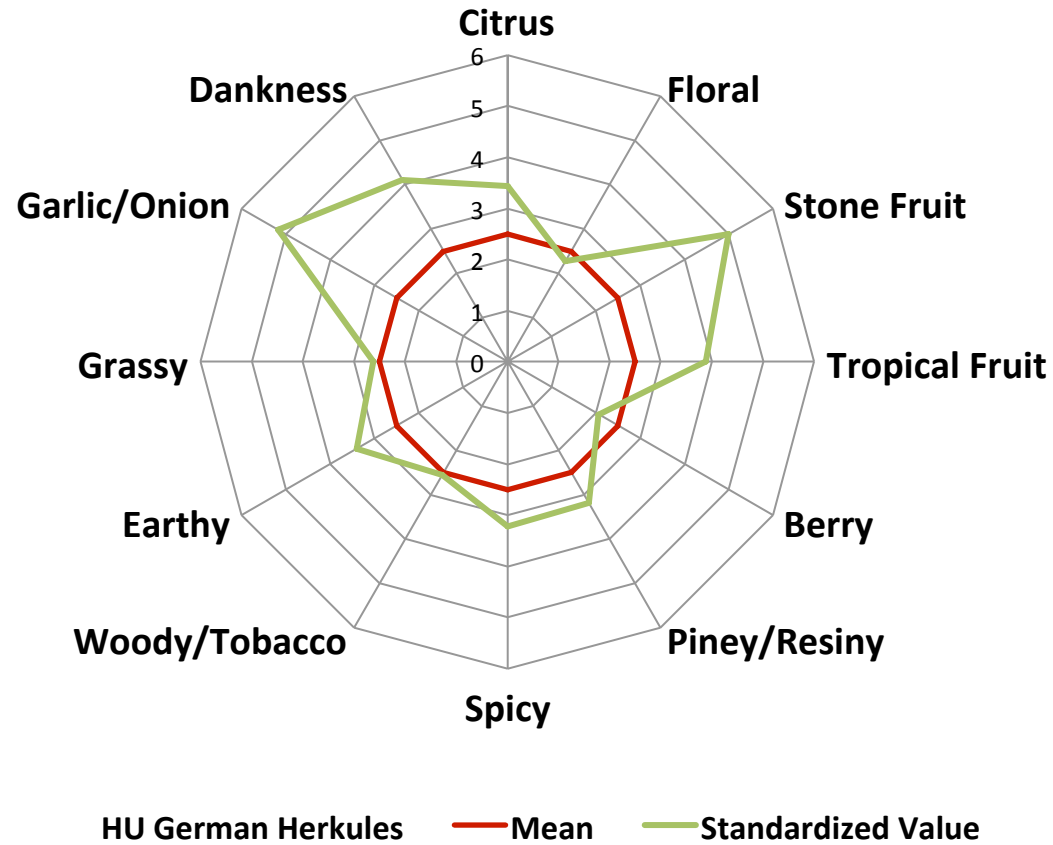


Comptoir Agricole Organic Premiant — Mean — Standardized Value



MERKUR:

Orange, Rosey, Nectarine, Melon, Garlic, Dank, Onion, Orange, Skunk Weed, Dank, Tobacco, Ashy, Citrus, Garlic X2, Onion, Woody, Peppery, Sharp Finish



HERKULES

Over the Top Citrus, Orange Juice, Skunky, Orange X2, Earthy X2, Peppermint, Lemon, Rose, Fruity, Berry, Piney, Pepper, Woody, Grassy X2, Nelson Like, Garlic X2, Mango, Tropical Fruit, Dank, Intense, Resin, Onion, Woody, Mint



HOPUNION
CRAFT BREWING SPECIALISTS

HALLERTAU BLANC

Alpha: 10.5%

Aroma – Flowery-fruity aroma.
Passion fruit, grapefruit, gooseberry
and pineapple

2 1/2 oz Raw Hop (71 grams)

SAMPLE: NOT FOR RESALE

HOPUNION
CRAFT BREWING SPECIALISTS

HUELL MELON

Alpha: 7.2%

Aroma – Fruity aroma. Strawberry
and honeydew melon nuances

2 1/2 oz Raw Hop (71 grams)

SAMPLE: NOT FOR RESALE

HOPUNION
CRAFT BREWING SPECIALISTS

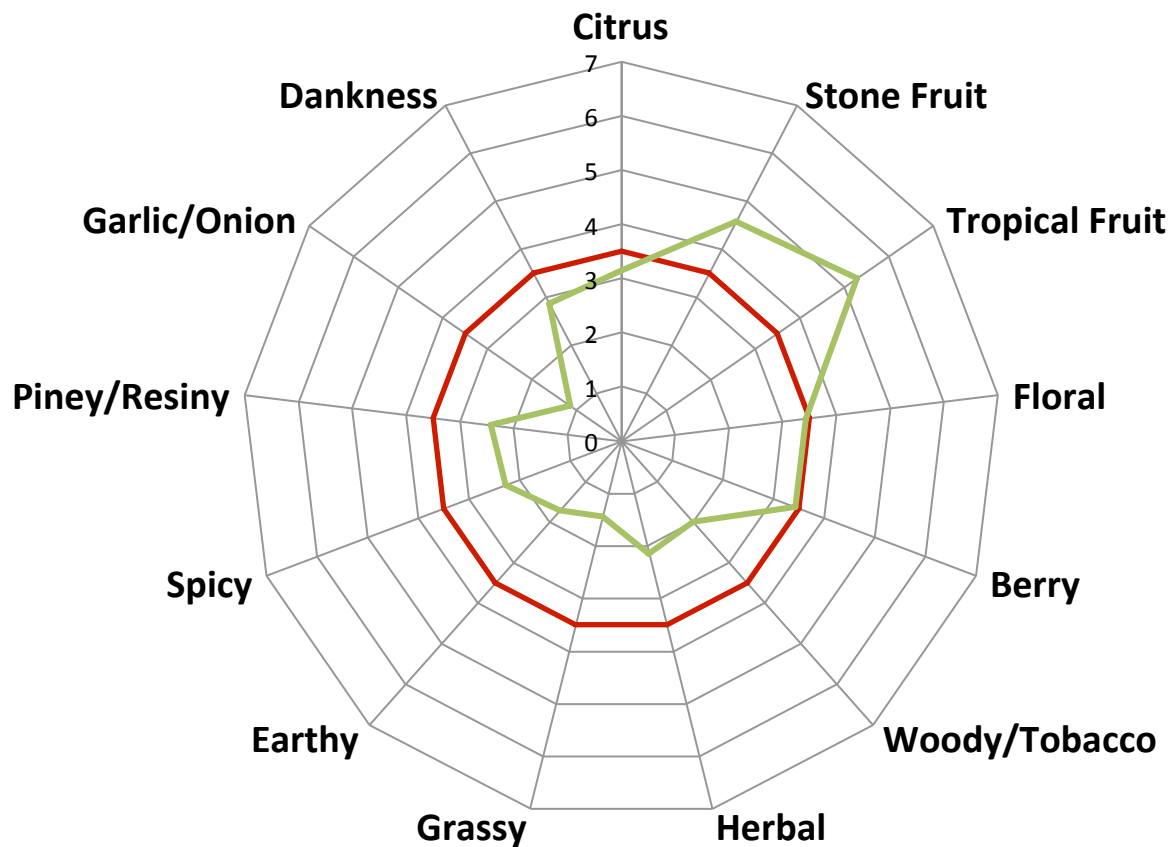
MANDARINA BAVARIA

Alpha: 8.5%

Aroma – Fruity aroma, intense
mandarin and citrus note

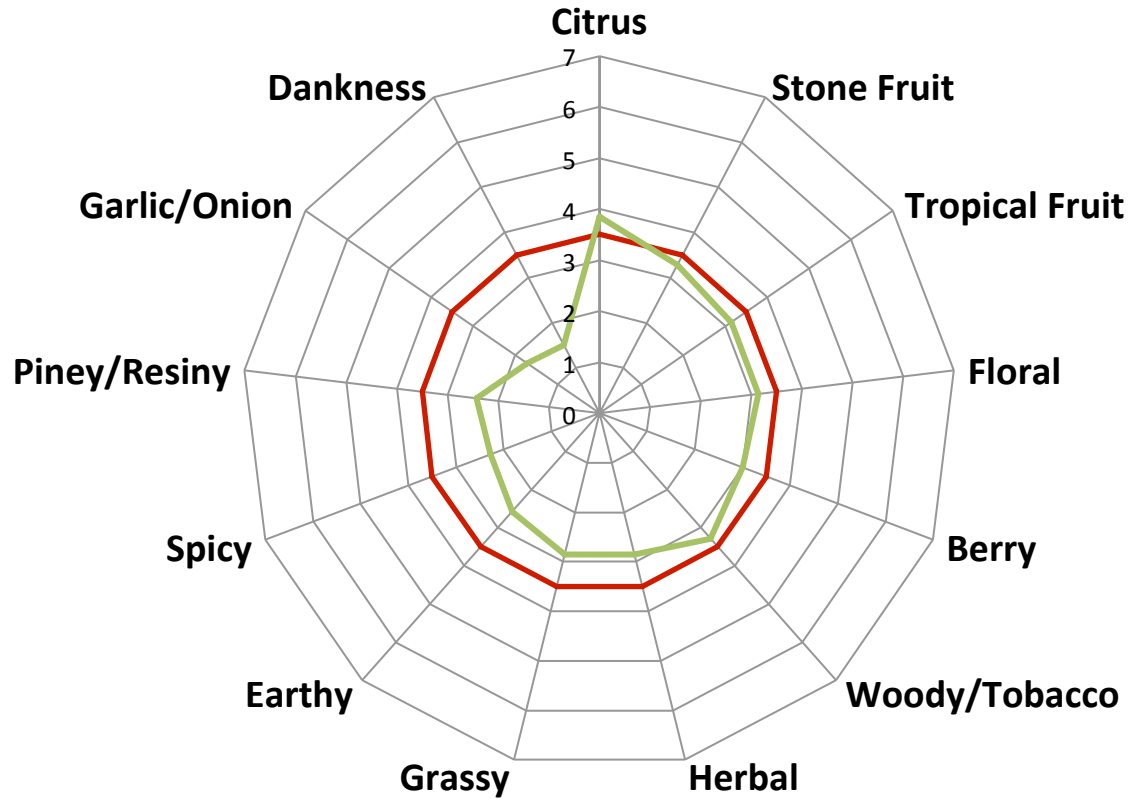
2 1/2 oz Raw Hop (71 grams)

SAMPLE: NOT FOR RESALE



Hallertau Blanc

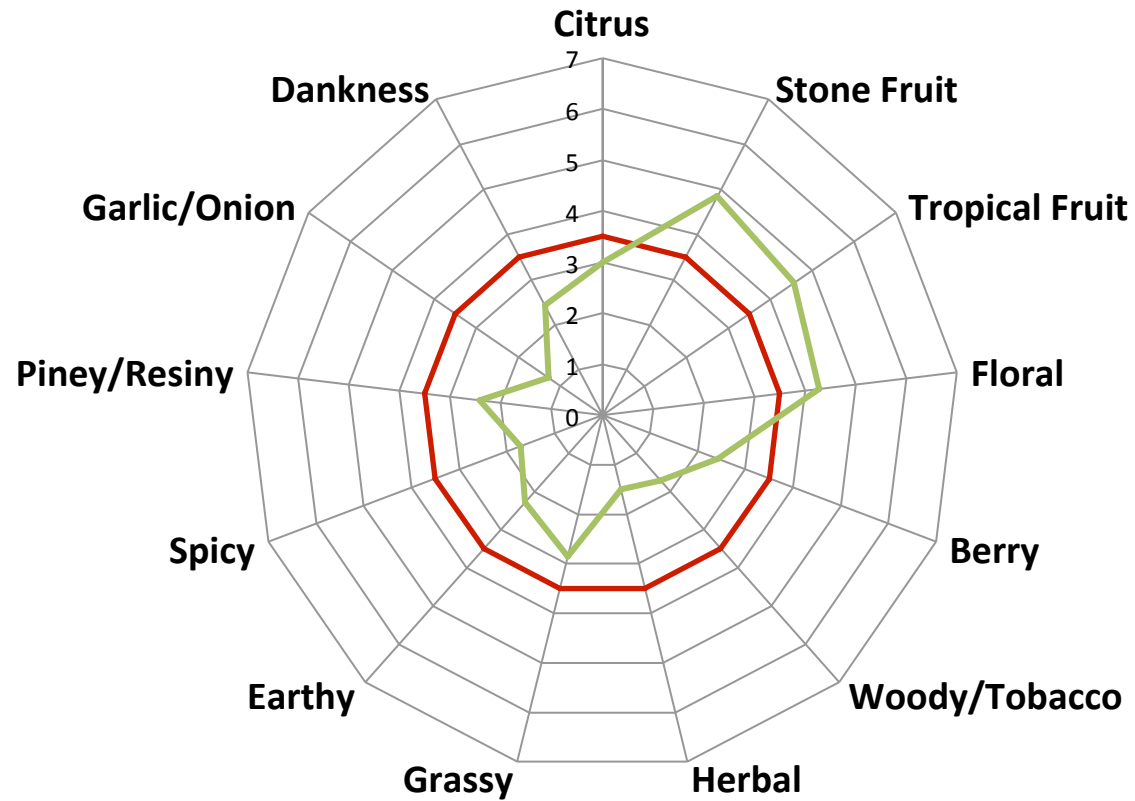
Comments: Peppermint (X2), tobacco, fruit (X4), stone fruit, mango, grapefruit, peach, melon, vanilla ice cream, mango, coconut (X2), delicious, peppers, dank (X2), mild, elegant, citrus, floral, flowers, herbs, pine, spice, refreshing, lychee, grapefruit.



Mandarina Bavaria

Comments:

Peach, berries, stone fruit (X2), woody (X3), skunk, cigar, earth (X2), dusty, peach, melon, citrus (X2), white wine, lipton tea w/lemon, kiwi, peppery, interesting, pleasant, mango, tangerine, honey, raspberry, bay leaf.

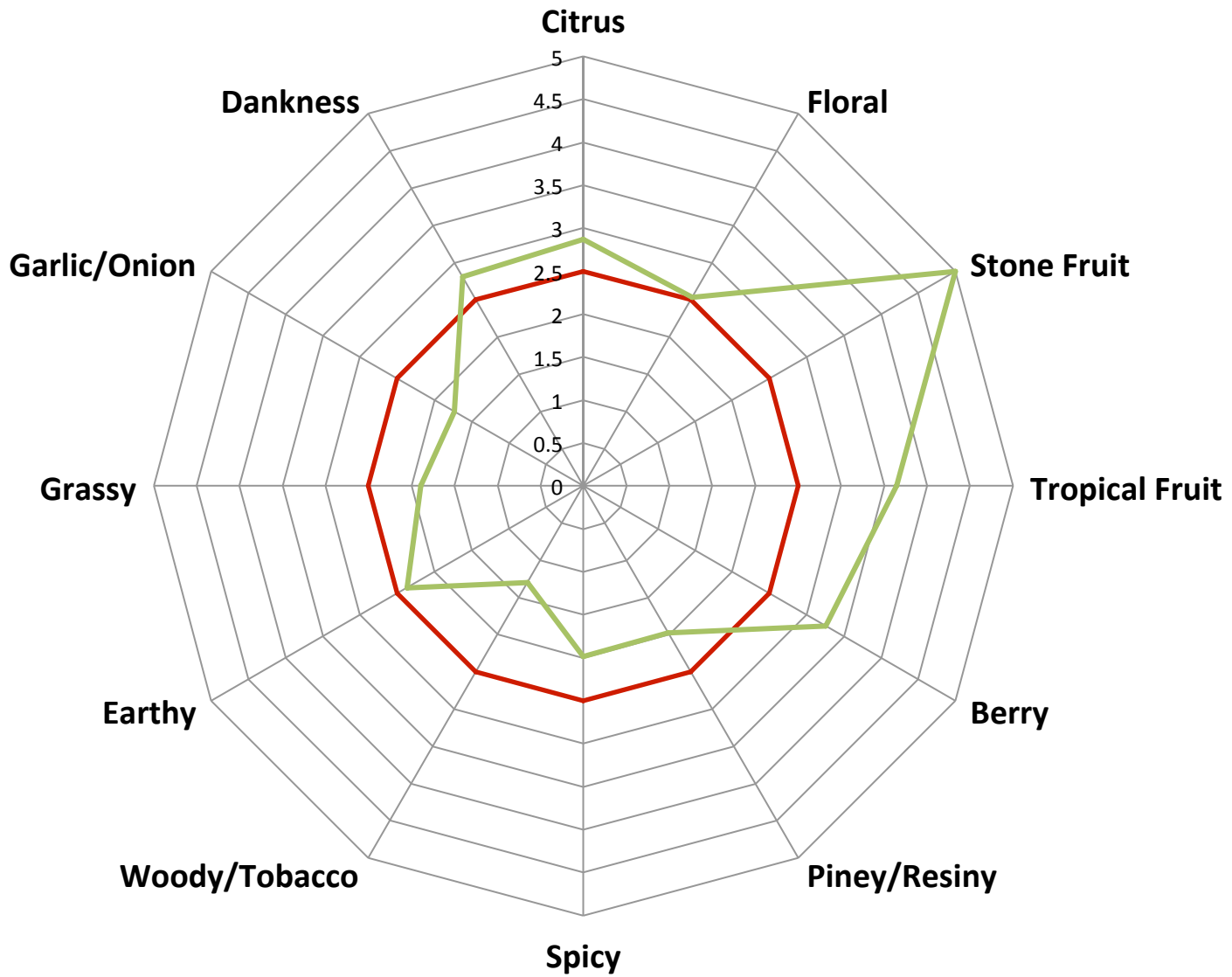


Huell Melon

Comments:

Melon (X2), passion fruit, pine sap, peach, cantalope, honey dew, pleasant fruit, fruit mid-palate, hay, resinous, not a lot of fruit, pungent melon, surprisingly intense, woodiness, tropical punch, earthy tones (X2), flowery, apricot.

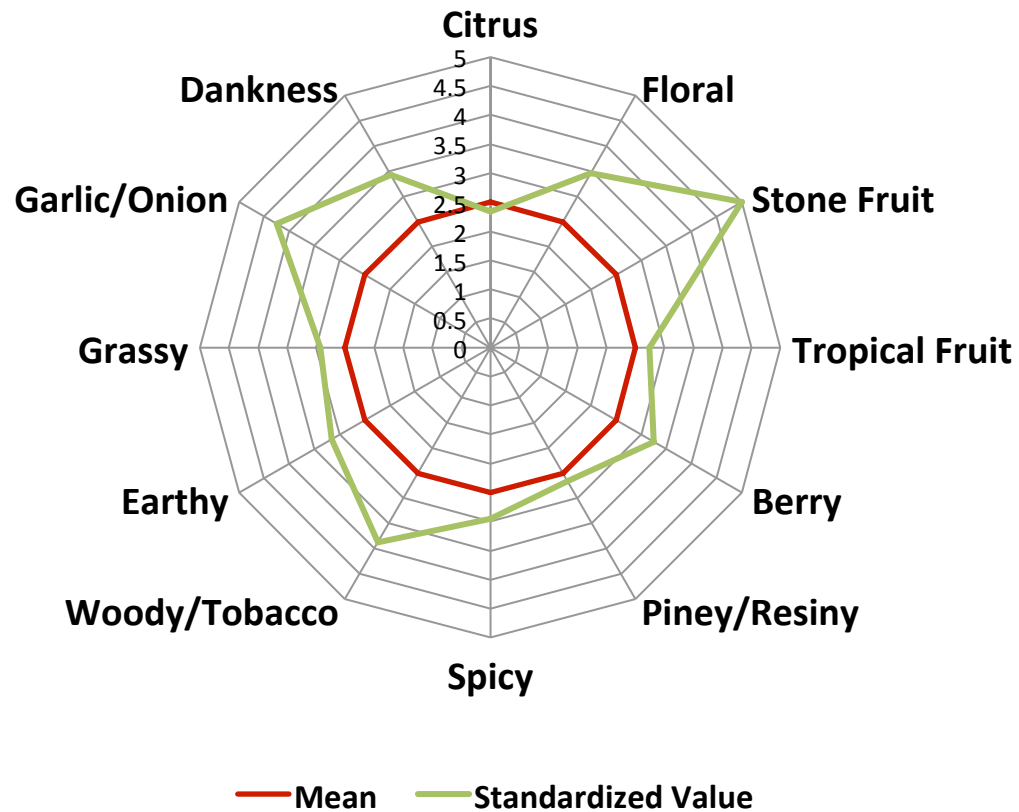
New American hop varieties



AMARILLO

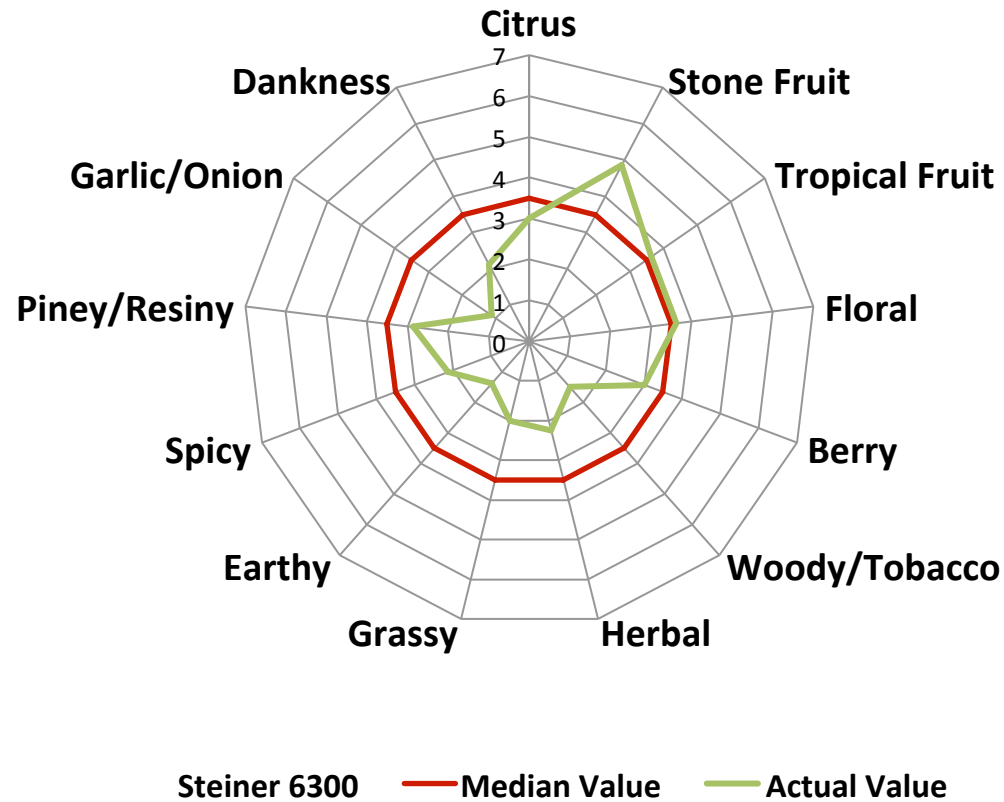
— Mean

— Standardized Value

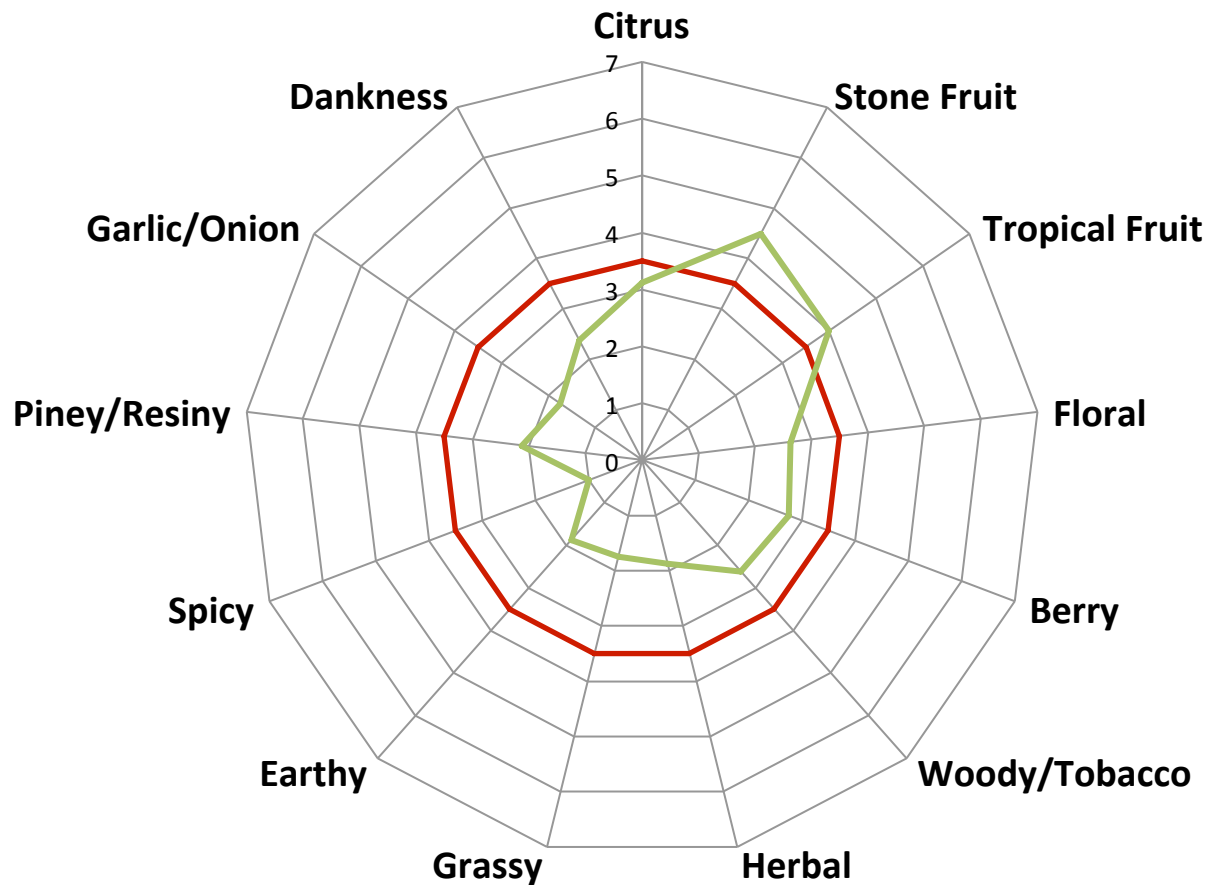


MOSAIC

Citrus/Dank/Resin/Some Garlic. Big Perfume. Almost Artificial Fruit Flavor. Tropical, Fruity. Like Amarillo. Lot going on. Too Garlicky? Unlike Nelson, not enough Tropical Fruit to back up the Onion. Lots of Pine, Bitter, Spicy, Forest Like, Dank. A Favorite.



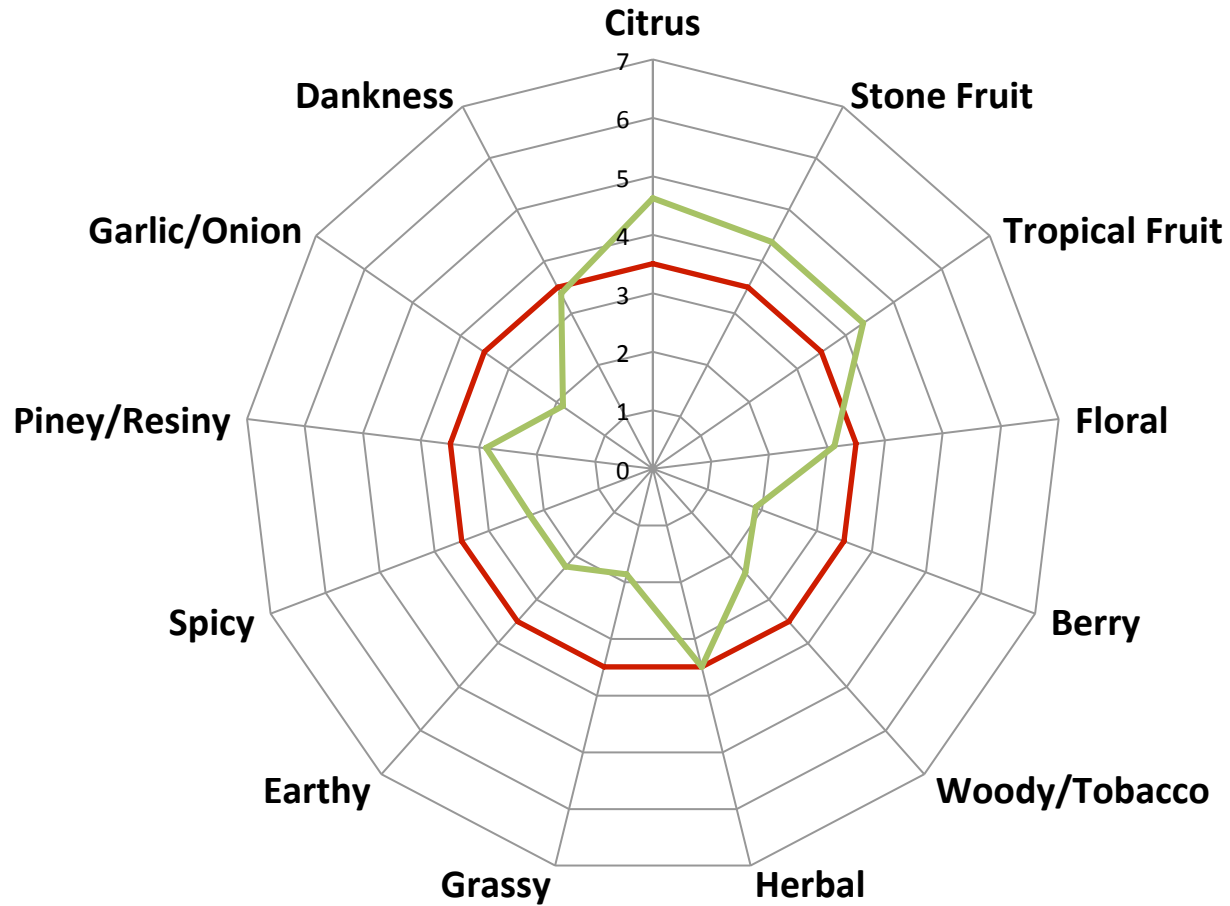
6300: Earthy, European, fruity, roses, carnation, apricots, plums, coconut (X3), dankness, noble, tropical (X2), melon (X3), berry (X2), pear, fruit aroma, orange peel/rind, herbal, nutty, melon.



LEGACY

— Median Value — Actual Value

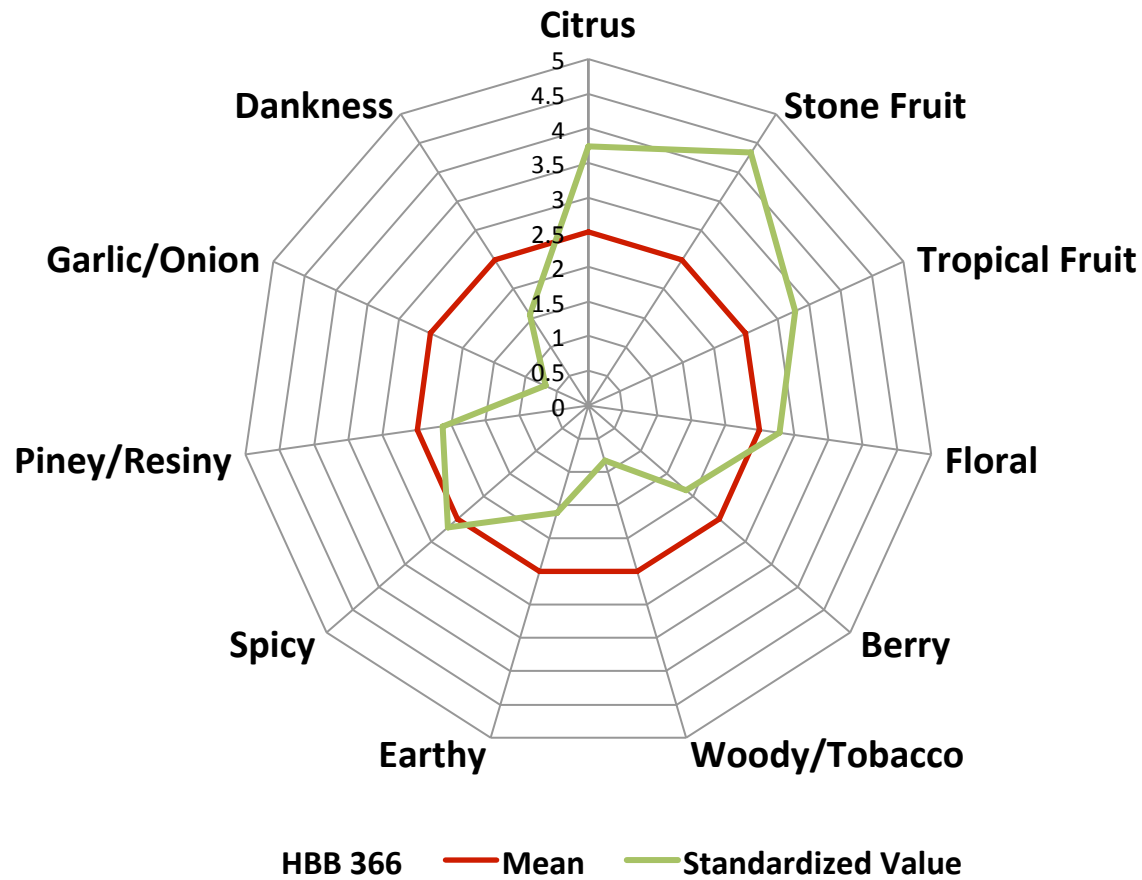
LEGACY: Berries, fruit (X2), tropical, melon, orange, tangerine, apricot (X2), citrus (X2), floral (X2), woody (X2), chocolate, mango, target-like, vanilla, herbal, peach, leaves, sage, coconut, mint.



COMET

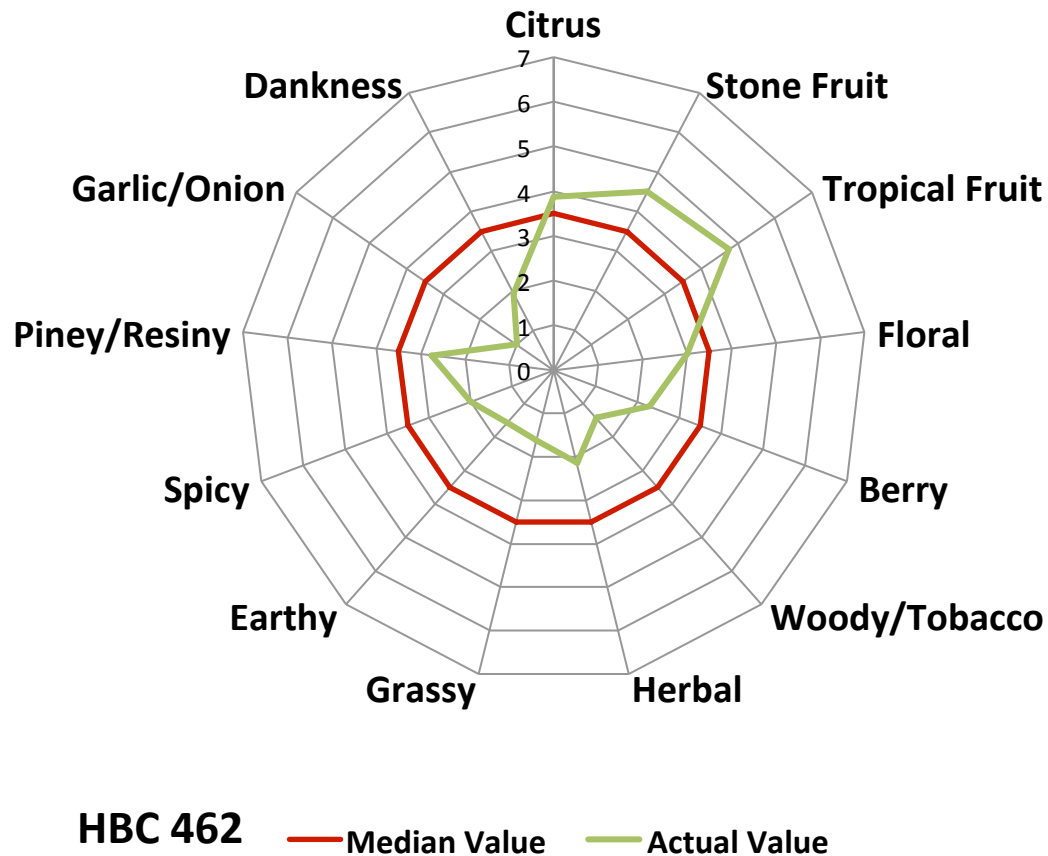
— Median Value — Actual Value

COMET: Citrus (X3), fruit (X2), berry, dank (X3), garlic (X2), parsley, tropical, stone fruit, passion fruit, melon, green onion, sage, lemon zest, peach, fruit, floral, lemon.

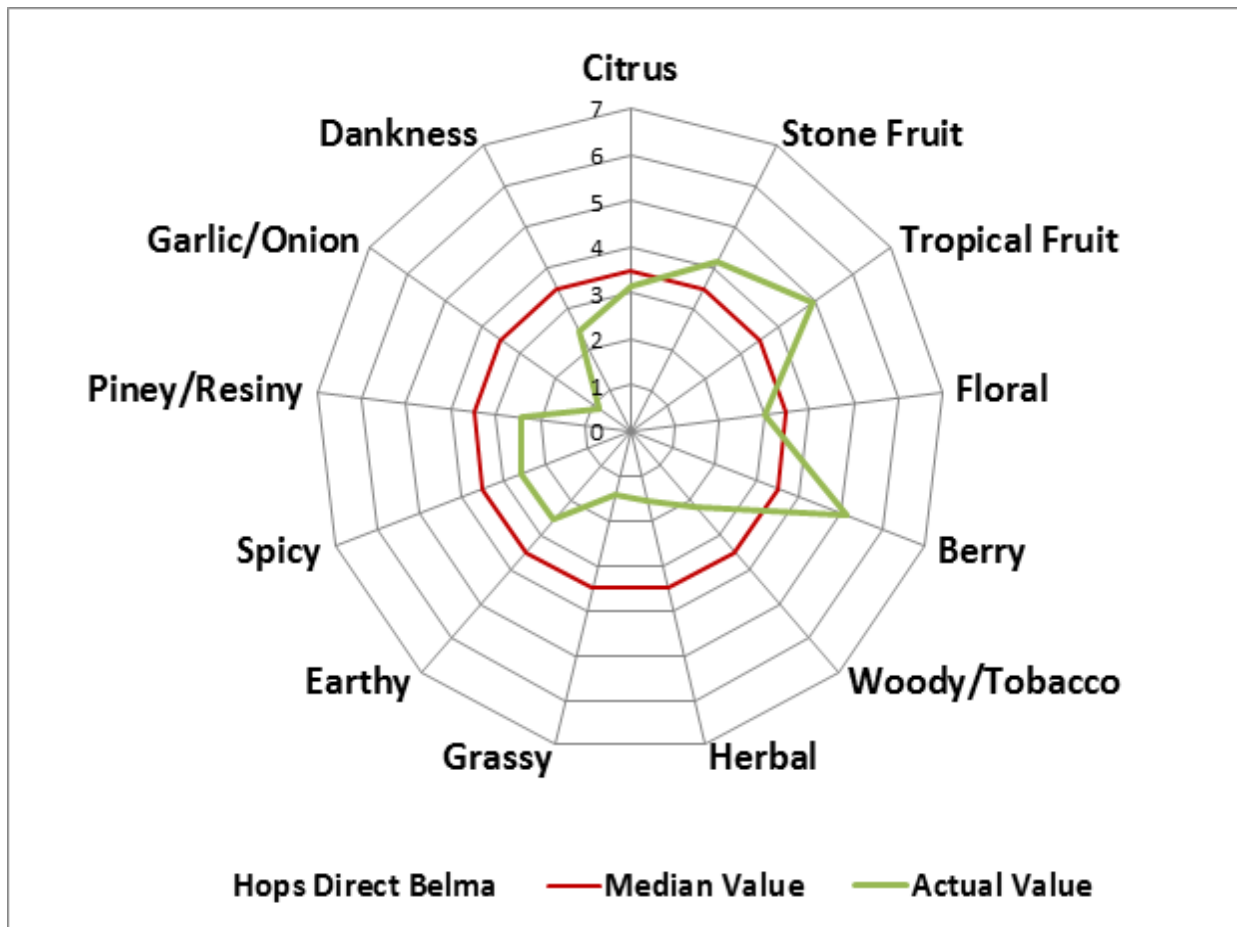


HBC 366

Well-Liked! Very fruity, mangos and peaches. Peachy, nice spice, ripe citrus flowers. Peach. Nice! Tropical fruit, soft, peaches, very strong. 😊. Interesting and unique, low resin, strong fruit. One of the favorites of the set.

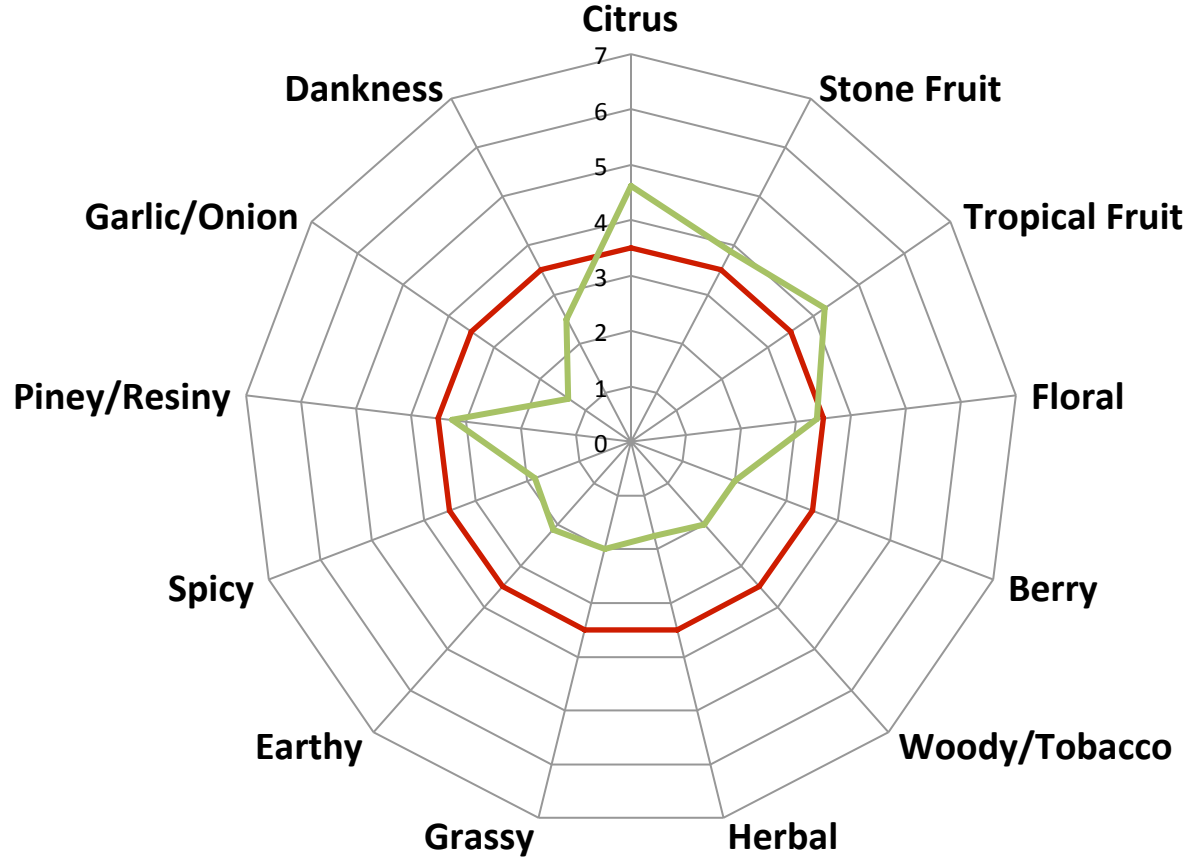


HBC 462: Melon, violets, peach, peach cobbler, peach pie, butter, apricot, old grass (hay?), tropical fruit (X3), stone fruit (X2), floral, peppery, orange marmalade, orange (X3), mango, pineapple (X2), mandarine orange, spicy, honey, grapefruit



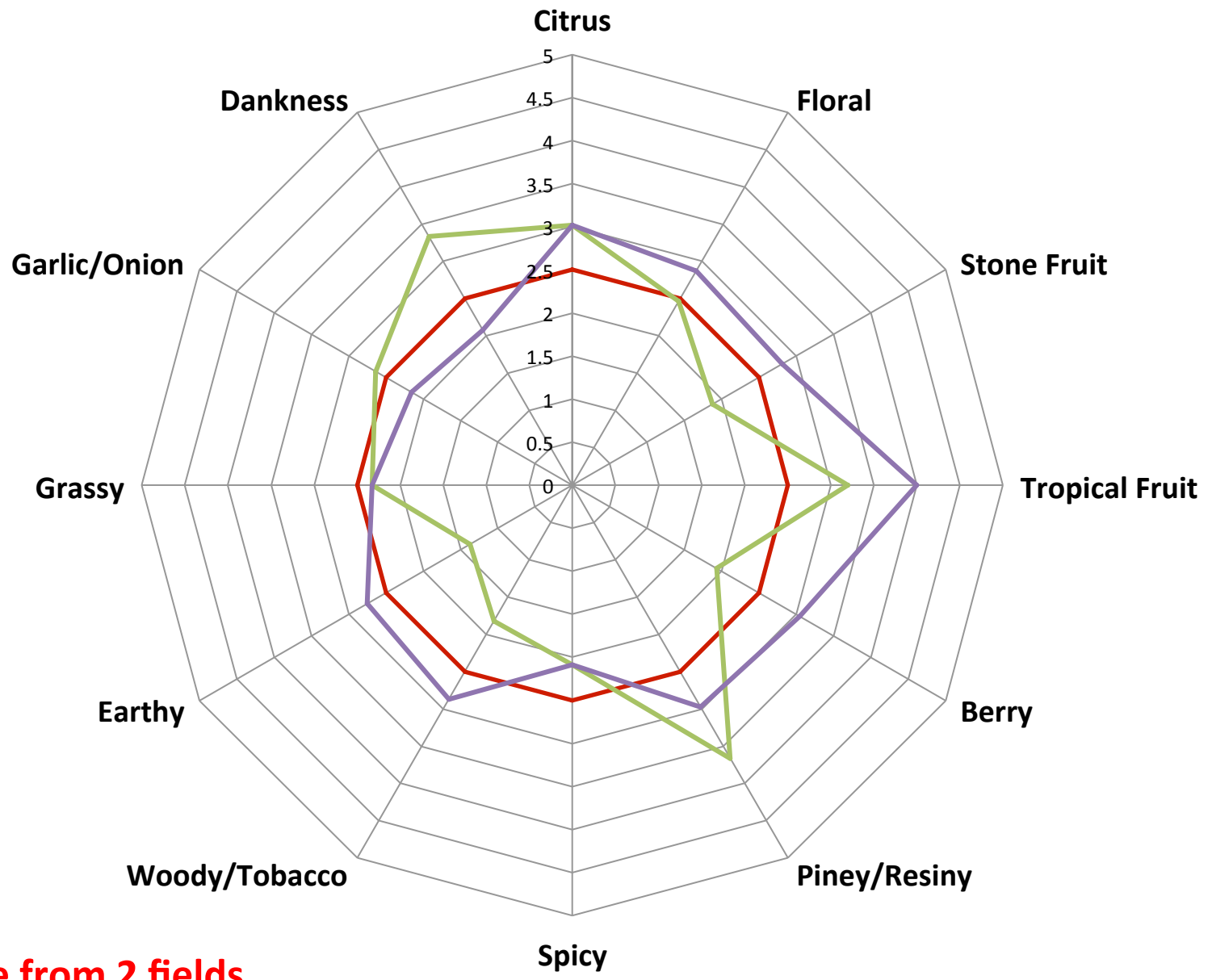
BELMA

Floral, fruit, lemon cleaner, grapefruit (X2), nectarine, earth, dust, mint, wintergreen, grape, Welch's grape juice, mango, peaches, Fruit Stripe gum, nutty, over-ripe stone fruit, wine-like, strong berry-raspberry, blueberry, grape juice, less citrus, melon, berry, tropical, orange, soil, peppery, strawberry.



Steiner 01210 — Median Value — Actual Value

01210: Dank (X3), earth, wood, peach, orange, fruit, citrus (X2), floral (X2), resiny (X2), lemon, melon, coconut (X2), grapefruit, pine, stone fruit, tropical, melon, passion fruit, grassy, earthiness.



Cascade from 2 fields

Hopping Schedules in the brewhouse

Traditional

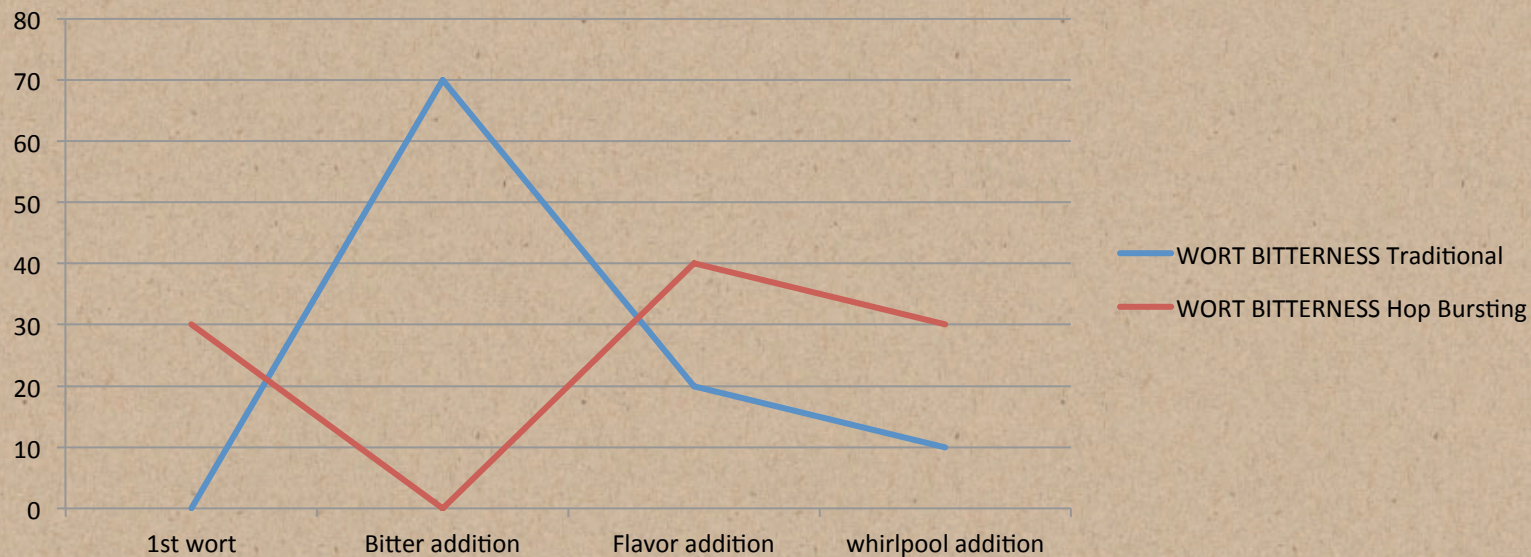
- Bitter:
 - Largest addition
 - Usually 1-2 varieties
 - Often not highly aromatic
- Flavor :
 - Late boil addition
 - Typically 1-2 varieties
 - More aromatic varieties
- Aroma
 - Whirlpool rest addition
 - 1-2 varieties
 - Highly aromatic

New/Old way

- Bitter:
 - Very little to none, except 1st wort hopping
 - Extract instead of pellets or whole hops
- Flavor
 - Very large addition
 - Many varieties
 - End of boil
- Aroma:
 - Very large addition
 - Many varieties
 - Highly aromatic!

Hop Bursting vs. “Traditional” hopping

- Majority of wort bitterness comes from late stage additions
- Results in a more refined bitterness (?)
- Longer lasting, more complex hop aromatic





Dry-Hopping Techniques

Traditional

- One or two varieties
- Total 0.25-1 pound/bbl
- 5-14 days residence

New School

- Many varieties
- Multiple short stages
 - All flavor extracted within 24-36 hours?
 - 5-7 days
- Total addition-2-3 lbs/bbl

Dry-Hop considerations

- Temperature of beer-warmer = more flavor extraction
- Absence of yeast
- Use of hop oils to augment dry-hop aroma and flavor
- Beer loss when using massive hop additions, multiple dry-hops

Brewing techniques to emphasize hops

- Malt:
 - Pale Ale malt with small % of crystal or Munich
 - English Pale Ale Malt- Extra Pale (aka White) malt.
- Brewhouse:
 - Low mash temperatures-accentuate fermentability and dryness
- Yeast: WLP001 or WY1056, reasonably clean ale yeast
- Water: Varies, usually with added salts

Final thoughts

- Don't be timid with late hopping and dry-hopping!
 - 1-2 lbs/bbl (0.5-1 oz/gallon), or more!
- Remember the classic American hops (Cascade, Centennial, Sterling, Cluster) these are excellent hops for IPA
- Blending lots of hops can make for amazing beers
- Don't be afraid to try botanicals or unusual hops in your IPA