

# NEW DEVELOPMENTS IN HOPPING TECHNIQUES AND HOP FLAVORS

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# Objectives

- Review some new developments with hop varieties and hop research
- Dry-hopping techniques
- Hopping schedules in the brewhouse
- Other brewing procedures

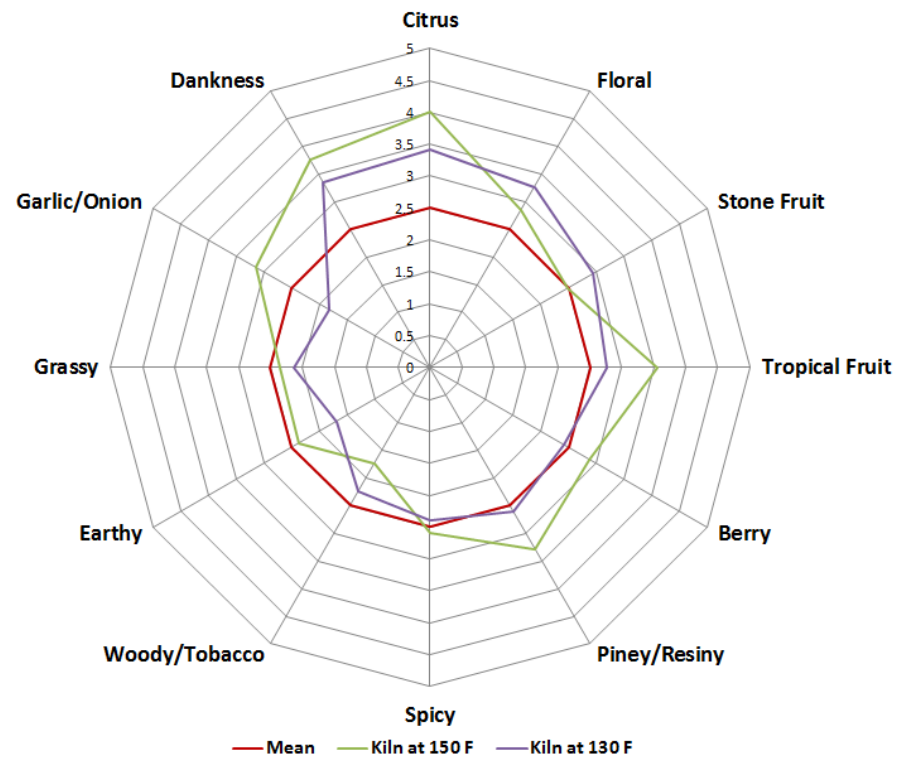
# IPA new developments-HOPS

- 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
  - Influence of yeast ester production on hop aromas
  - Fermentation temperature and pitching rate-lower can increase hop flavors
- Hop Processing impact on flavor
  - Early vs late harvest-impact on fruit vs. garlic/onion
  - Low or high temperature kilning
  - How to minimize garlic/onion?
  - Direct pelletizing-no baling: is there a flavor difference?
  - Loose pack pellets vs. hard pack pellets

# Cascade 150 °F vs 130°F Kiln



# Hop research

- Best way to measure IBU in highly hopped beer?
- Hop Pre-isomerization to increase utilization-up to 65%
- Impact of oxidation on hop bitterness and hop flavor
- The “real” impact of mash hopping, first wort hopping???
- Hop breeding programs taking on a new life
  - Occurring in all major hop growing regions

# 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 improves hop flavor retention
  - These first two items conflict with each other
- Use of hop oils to augment dry-hop aroma and flavor
- Beer loss when using massive hop additions, multiple dry-hops



# Hopping Schedules in the brewhouse

## Traditional

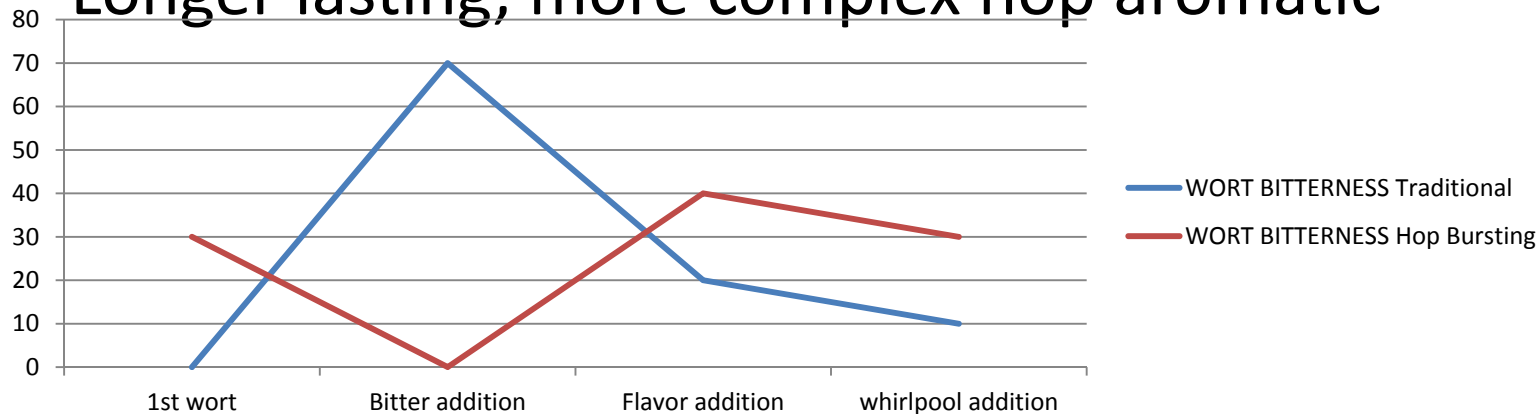
- Bitter:
  - Largest addition
  - Usually 1-2 varieties
  - Often not highly aromatic
- Flavor :
  - Late boil addition
  - Typically 1-2 varieties
  - More aromatic varieties
- Aroma
  - Whirlpool rest addition
  - 1-2 varieties
  - Highly aromatic

## New/Old way

- Bitter:
  - Very little to none, except 1<sup>st</sup> 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



# 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, or any other reasonably clean ale yeast
- Water: Varies, usually with added salts. Ca<sup>+</sup> enhances bitterness perception

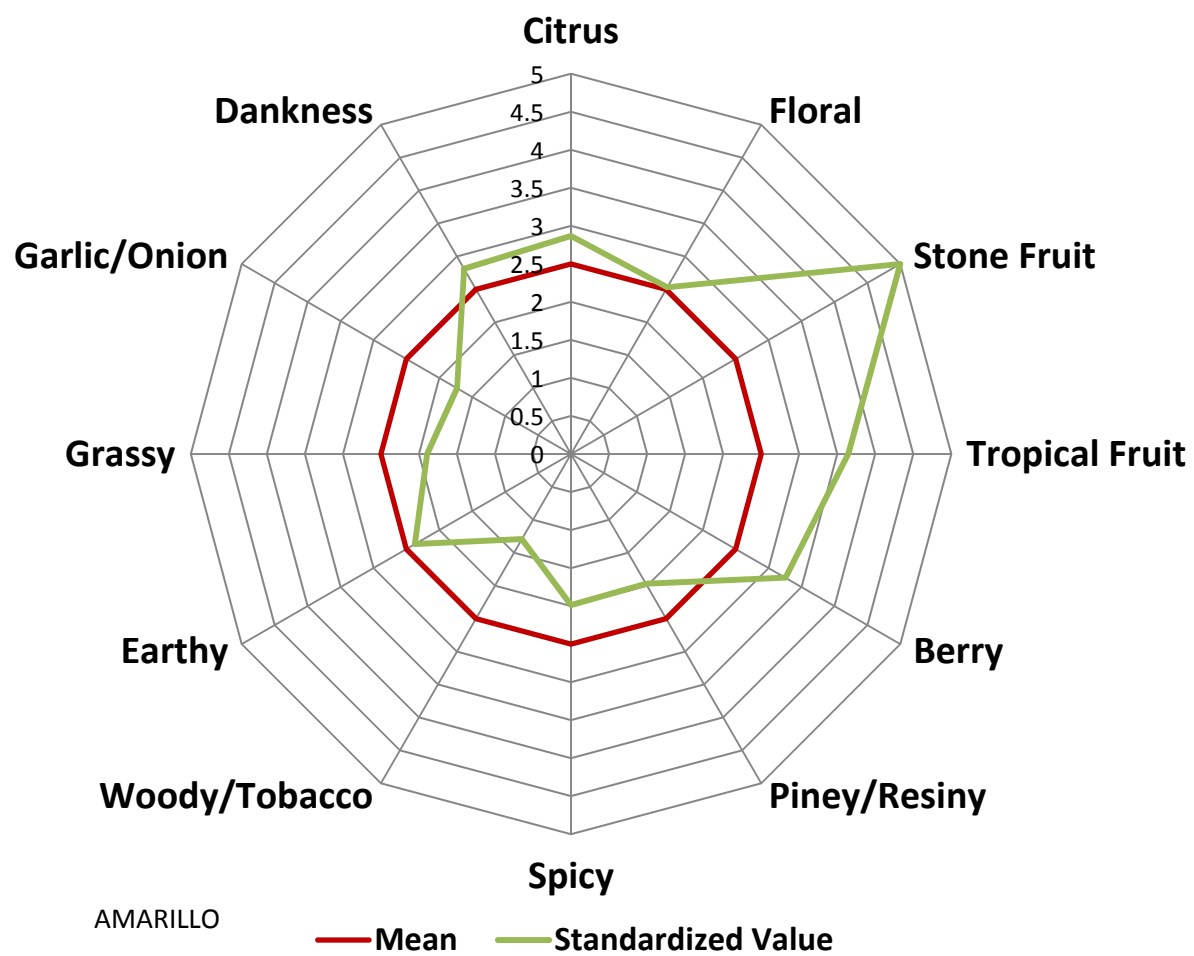
Testing some new hop varieties

# Why do these tests?

- Identify varieties of interest before brewing full scale batches
- Keep up with new trends
- Generate ideas for new beers
- Hop Substitution options

# The Dry-Hop Test:

- Dry Hop Test: Using Stone IPA just prior to normal dry-hop
- Divert 5 gallons to sealed container (carboy or stainless)
- Dry-hop at rate of 1 lb/bbl= 88 grams in 5 gallons
- Hold 36 hours then chill to 35 °F
- Rack into Cornelius Keg and force carbonate









**HOP UNION**  
WINE 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

**HOP UNION**  
CRAFT BREWING SPECIALISTS

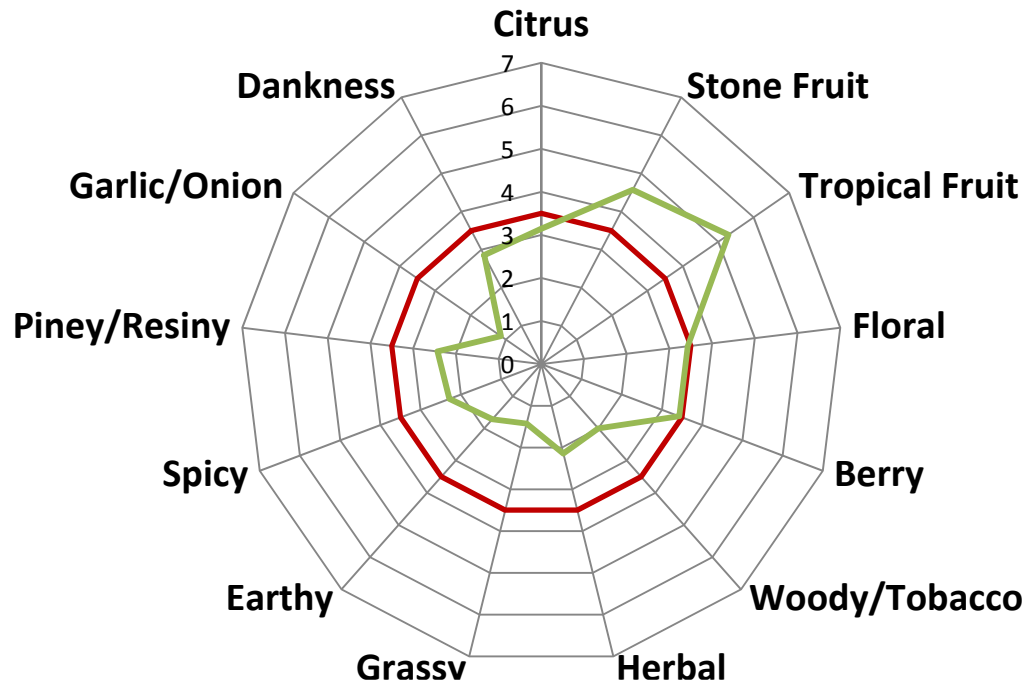
**HUELL MELON**  
Alpha: 7.2%  
Aroma – Fruity aroma. Strawberry  
and honeydew melon nuances  
2 1/2 oz Raw Hop (71 grams)

SAMPLE: NOT FOR RESALE

**HOP UNION**  
CRAFT BREWING SPECIALISTS

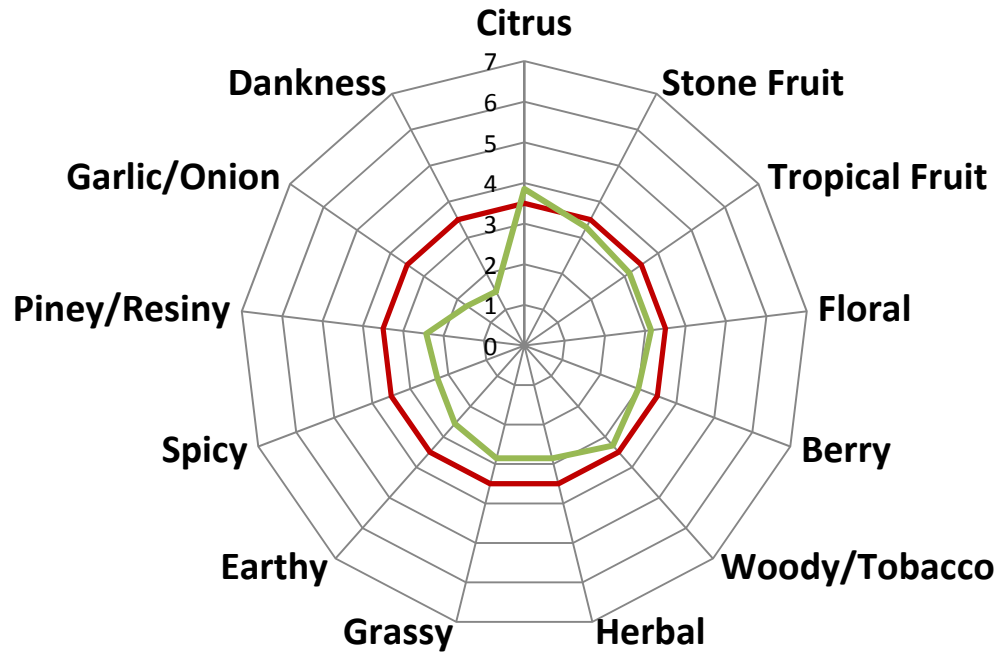
**MANDARINA BAVARIA**  
Alpha: 8.5%  
Aroma – Fruity aroma, intense  
mandarin and citrus note  
2 1/2 oz Raw Hop (71 grams)

SAMPLE: NOT FOR RESALE



### Hallertau Blanc

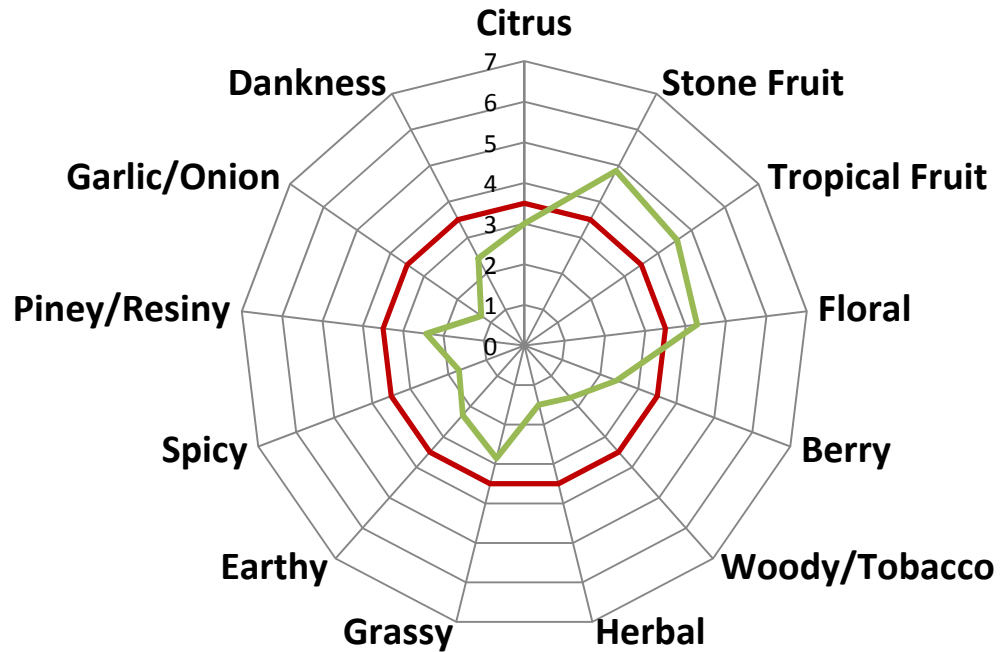
Comments: Peppermint (X2), tobacco, fruit (X4), stone fruit, mango, grapefruit, peach, melon, vanilla ice cream, mango, coconut (X2), delicious, peppers, dank (X2), mild, elegant, citrus, floral, flowers, herbs, pine, spice, refreshing, lychee, grapefruit.



Mandarina Bavaria

Comments:

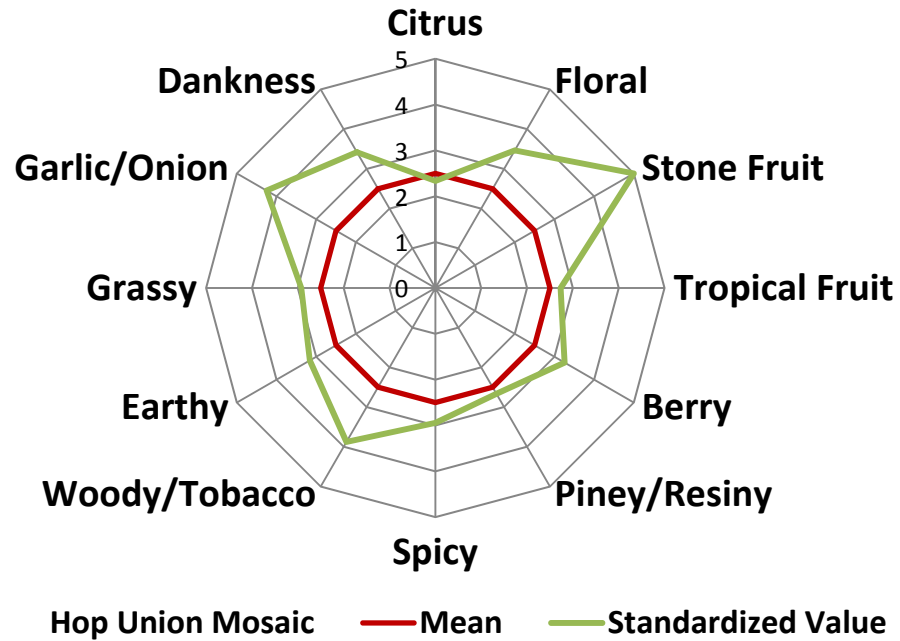
Peach, berries, stone fruit (X2), woody (X3), skunk, cigar, earth (X2), dusty, peach, melon, citrus (X2), white wine, lipton tea w/lemon, kiwi, peppery, interesting, pleasant, mango, tangerine, honey, raspberry, bay leaf.



Huell Melon

Comments:

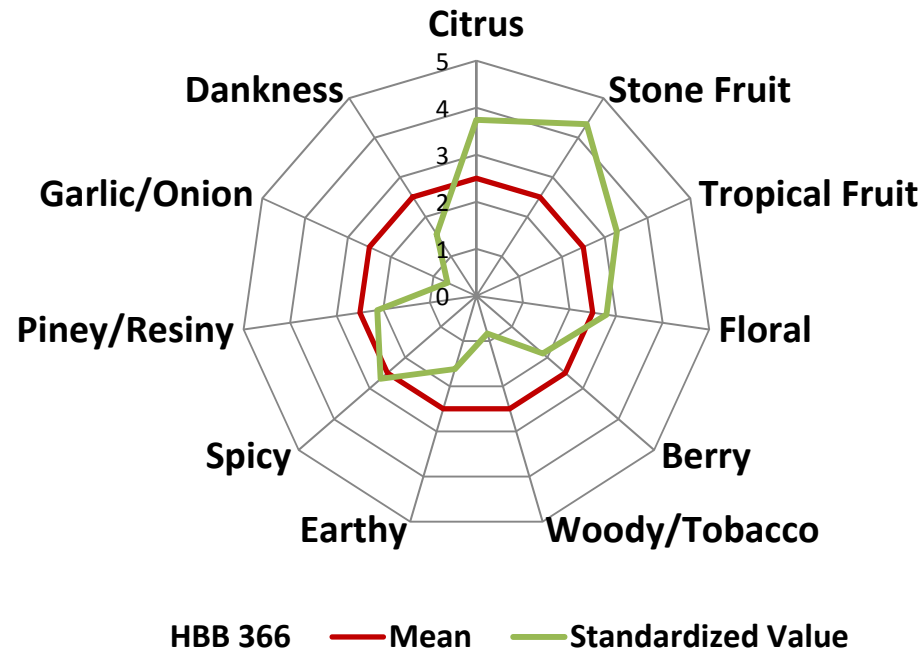
Melon (X2), passion fruit, pine sap, peach, cantalope, honey dew, pleasant fruit, fruit mid-palate, hay, resinous, not a lot of fruit, pungent melon, surprisingly intense, woodiness, tropical punch, earthy tones (X2), flowery, apricot.



## MOSAIC

Well liked. 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.

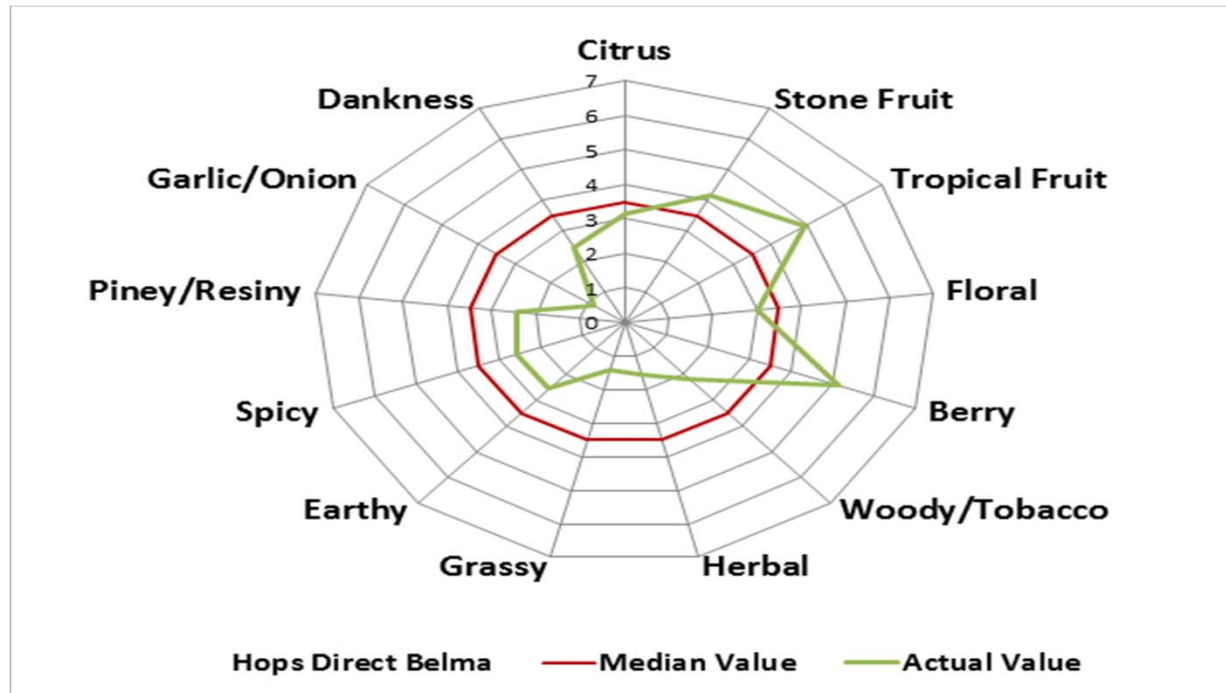
HBC 366



HBC 366

Like! 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.

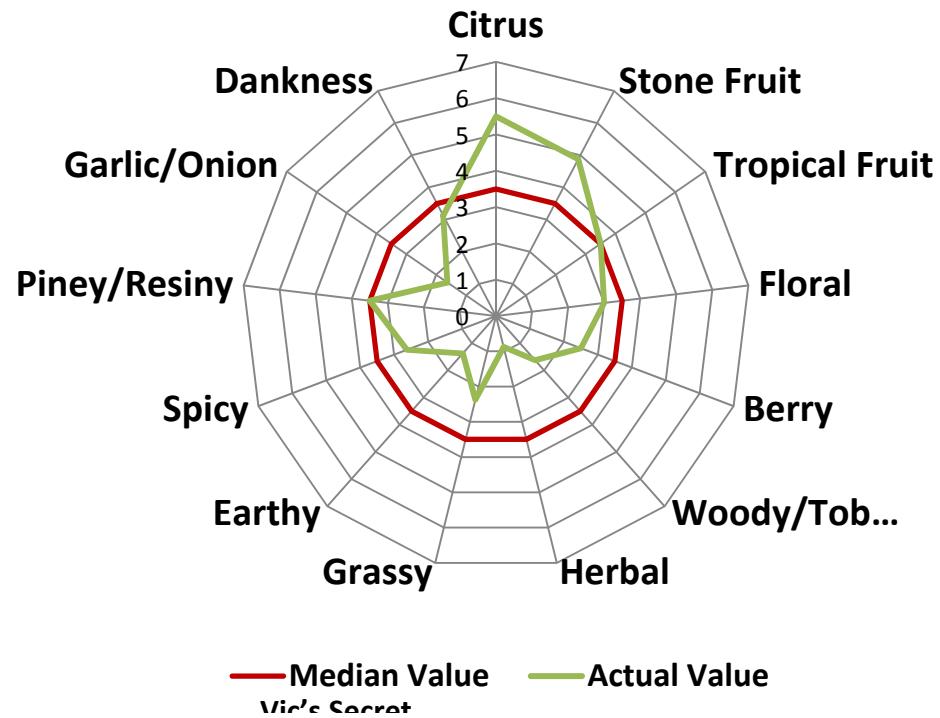




## BELMA

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.

Vic's Secret (AU)

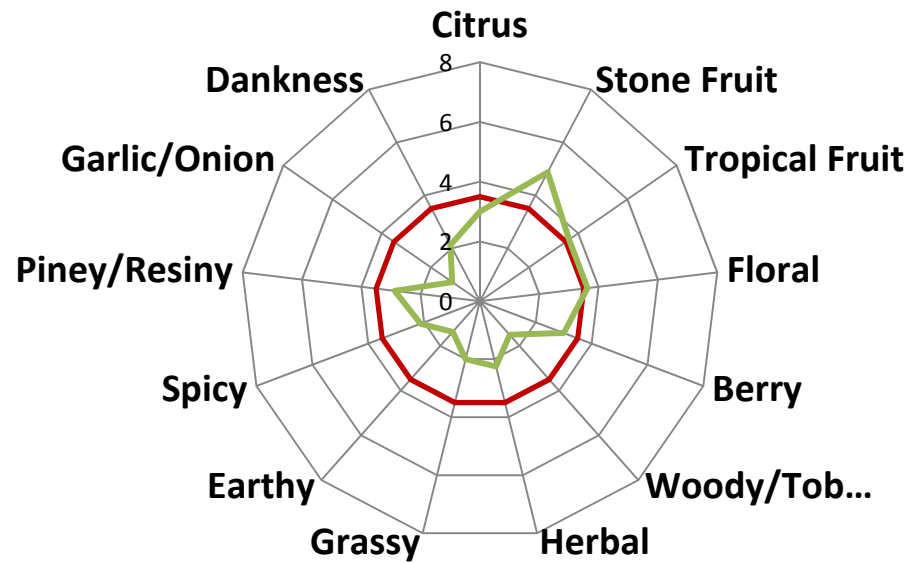


Comments:

Big citrus fruit, citrus (X5), melon, peach (X5), apricot, tropical, berry, pear, floral, tangerine, lemon, lemon grass, stone fruit, dank, grass, earth, bitter, dank, orange



06300

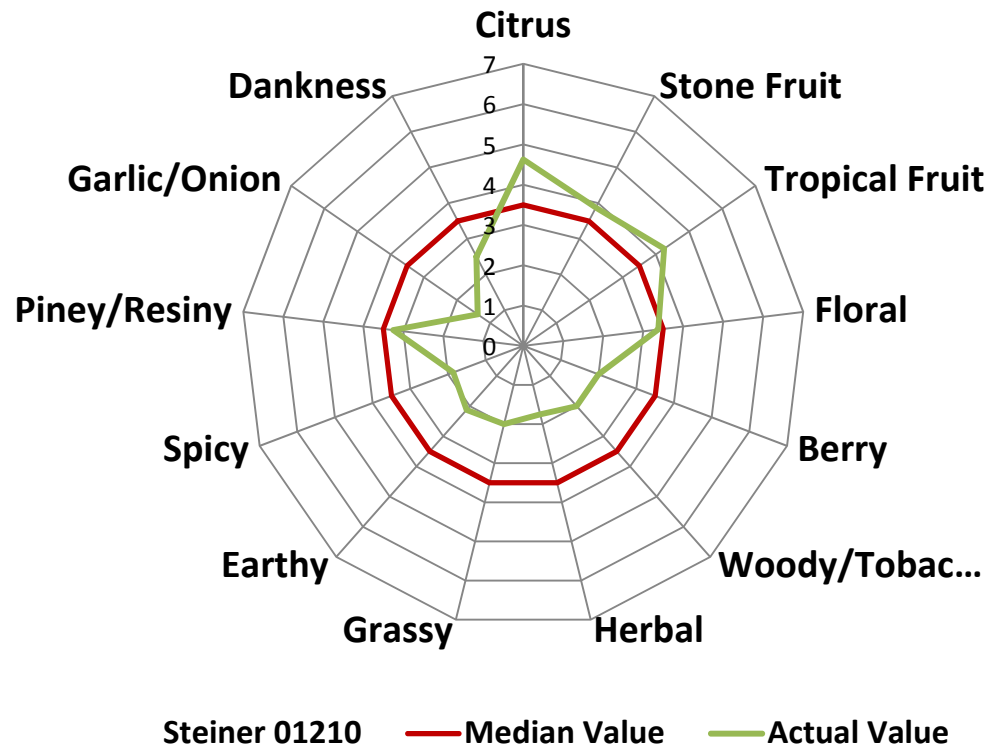


Steiner 6300 — Median Value — Actual Value

Comments:

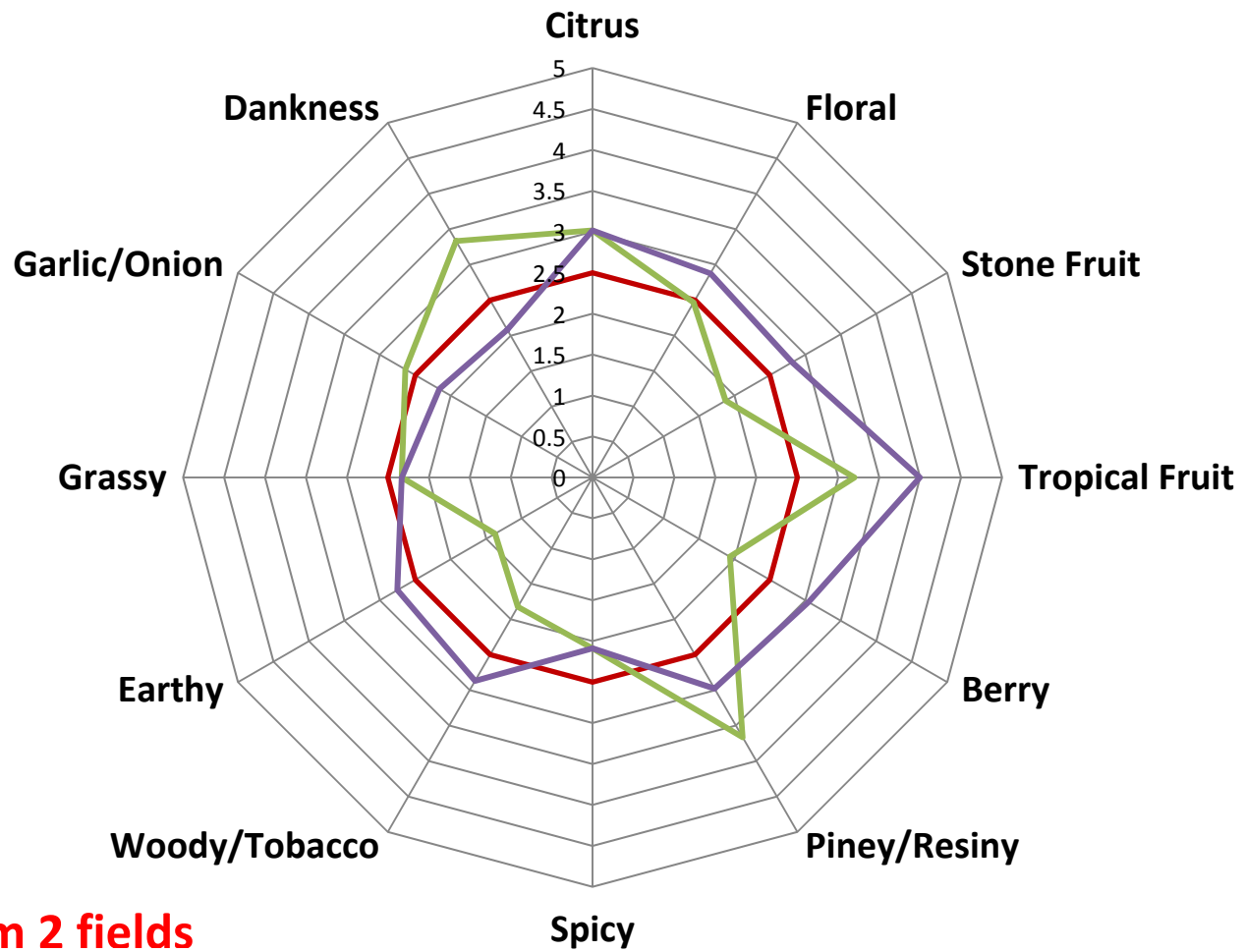
Earthy, European, fruity, roses, carnation, apricots, plums, coconut (X3), dankness, noble, tropical (X2), melon (X3), berry (X2), pear, fruit aroma, orange peel/rind, herbal, nutty, melon.

# 01210 (Lemon Drop)



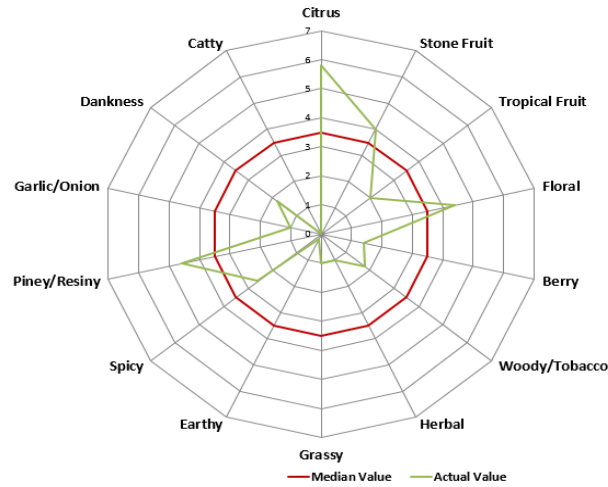
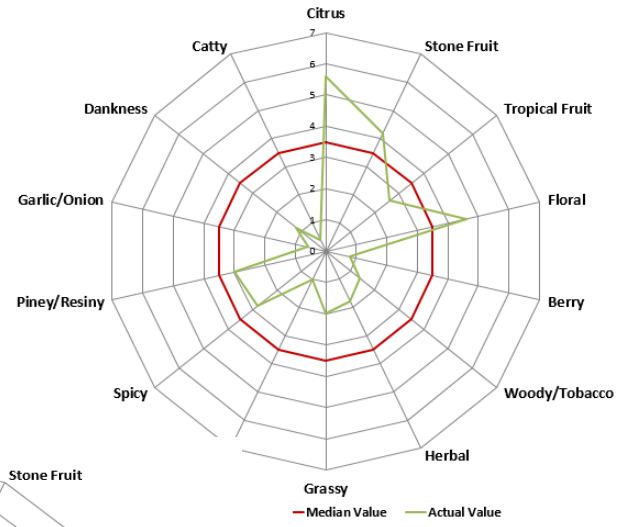
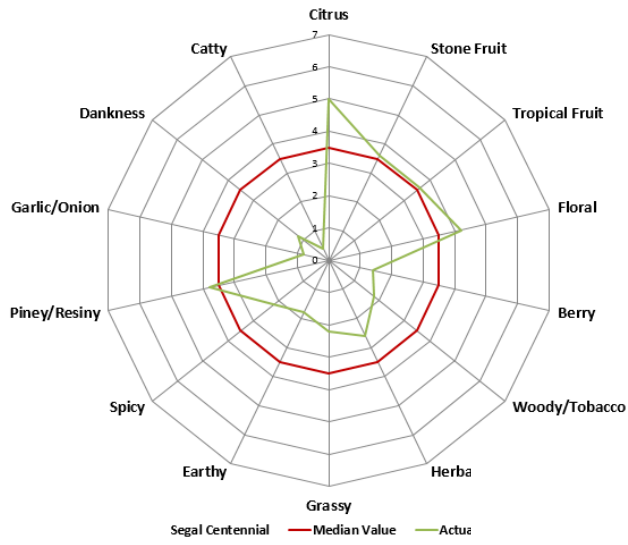
## Comments:

Dank (X3), lemon, 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**

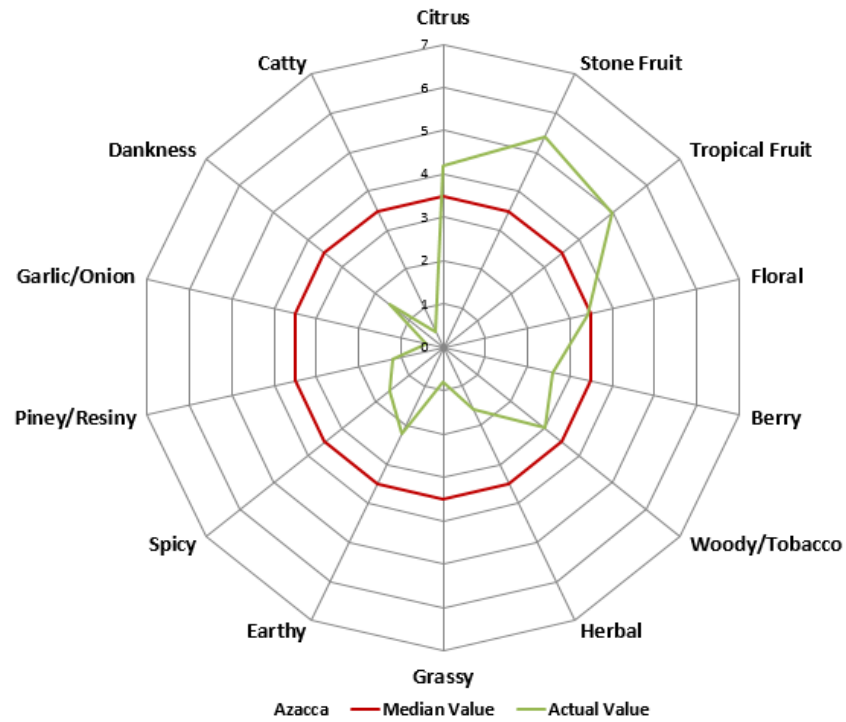
# 3 Different Centennials



# The Pilot Brew test

- Stone IPA base recipe:
  - 93.3% Pale malt, 6.7% C15
  - Magnum and Chinook for bittering target 70 IBU in finished beer
  - Whirlpool hop using test hop 0.5 lbs/bbl
  - Dry-hop with test hop at 1 lb/bbl

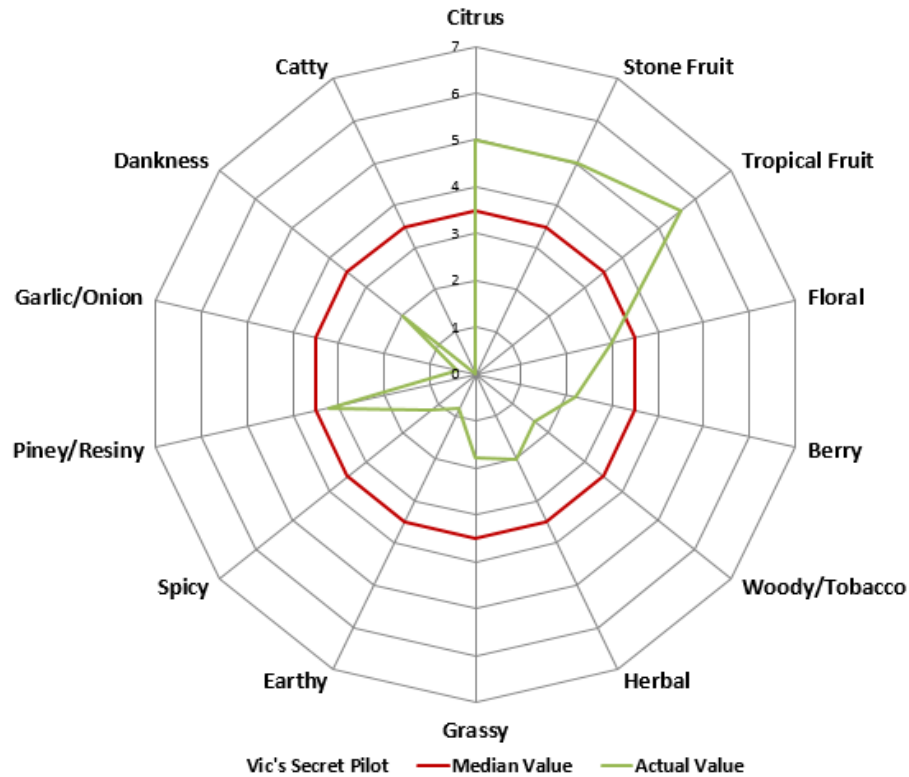
# AZACCA



## Comments:

Orange peel, peach (X3), apricot, tropical fruit, pineapple, yuzu, grapefruit, papayas, earthy flavor, slight mint, fruit candy, nectarine, kiwi.

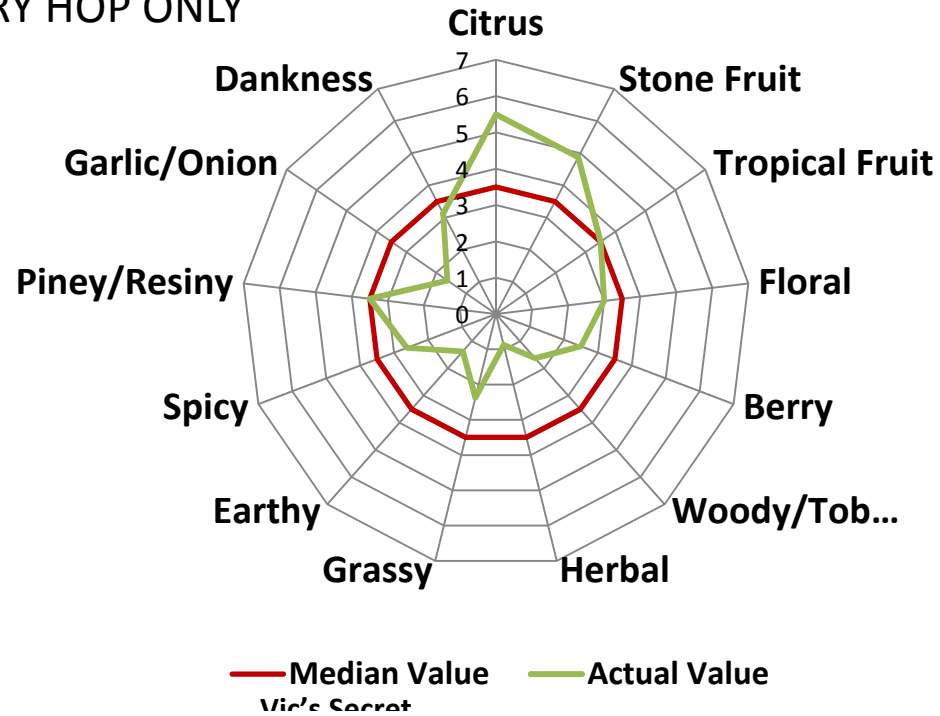
## Vic's Secret (Au)



### Comments:

Over-ripe fruit, peach, fruit cocktail, mango, dank, earthy, creamy mouthfeel, slight mint, lemon juice, tangerine, juice, zest, lemon oil, Hall's lemon cough drop, Lemon Lift Herbal Tea, intense fruit, watermelon, green apple candy, lots of citrus, nice resiny end, hints of vanilla.

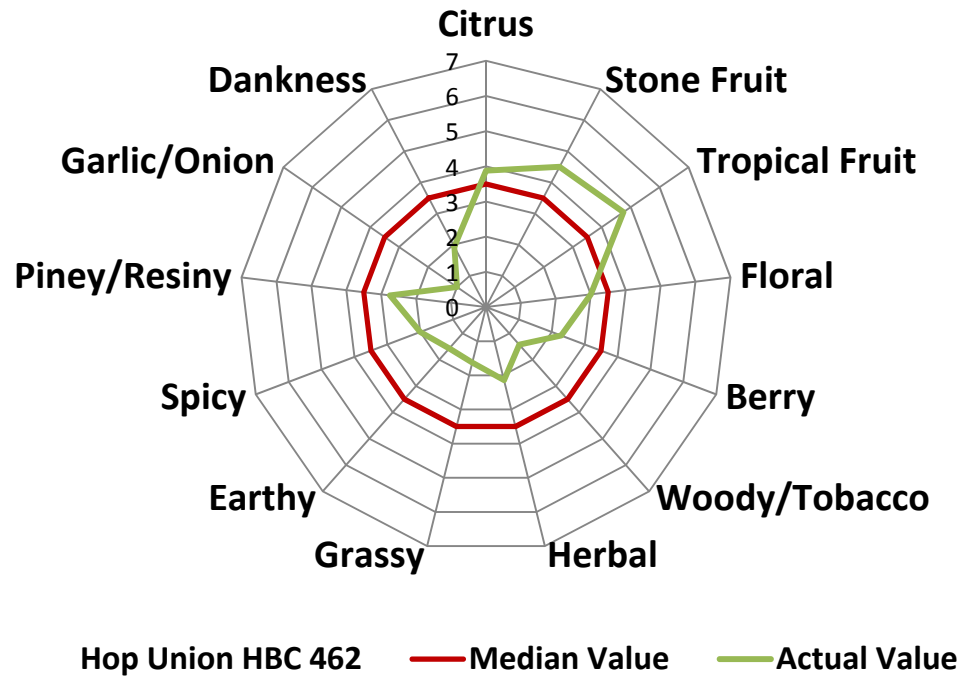
## Vic's Secret (AU) DRY HOP ONLY



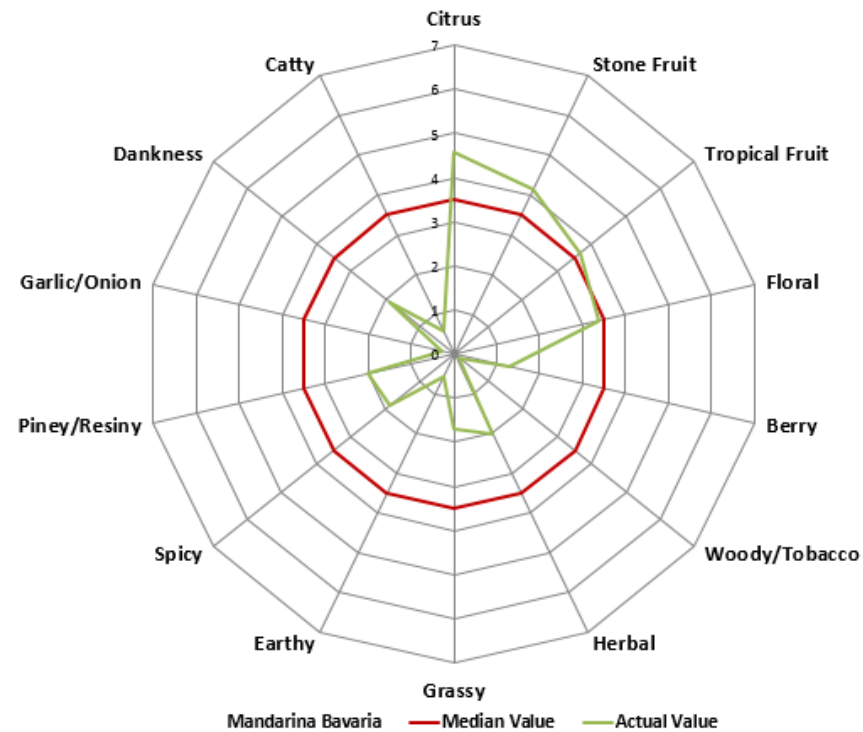
### Comments:

Big citrus fruit, citrus (X5), melon, peach (X5), apricot, tropical, berry, pear, floral, tangerine, lemon, lemon grass, stone fruit, dank, grass, earth, bitter, dank, orange





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), mandarin orange, spicy, honey, grapefruit



## Mandarina Bavaria

Tangerine (X3), mild all around, fruit over grass, melon, tropical fruit, stone fruit, citrus (X3), floral, elegant, resin, dank, orange, peach, vegetal, earthy.

# 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.
- Beware of the Single Hop Beer:
  - Blending lots of hops can make for amazing beers
  - Can also make adjustments based on availability easier to manage