



TM

**YAKIMA
CHIEF
- HOPS -**



EXPLORING THE WORLD OF “SURVIVABLE” COMPOUNDS

SPENCER TIELKEMEIER

NORTH AMERICA EAST DIVISION, BREWING INNOVATIONS LEAD

OUR MISSION

To connect family hop farms to the world's finest brewers

OUR VISION

We are the global supplier of choice, focused on sustainably produced, innovative hop products. We are a responsible neighbor and asset to our communities, enriching the products, businesses and lives of everyone we encounter.

OUR VALUES

- **Passion:** For people, product, planet and process
- **Respect:** Teamwork and collective responsibility
- **Integrity:** Transparency and accountability in all we do
- **Dedication:** Quality and sustainability
- **Excellence:** An emphasis on innovation and continuous improvement

GROWERS

We are the only 100% grower owned hop company. Our grower families have been harvesting hops in the Northwest since the 1800s and have acquired a wealth of knowledge and expertise throughout the decades to create the highest quality hops.

These grower-owners include:

- 3D Farm/BC Hop Farm
- Brulotte Farms
- B.T. Loftus Ranches
- C&C Hop Farms
- Carpenter Ranches
- Gasseling Ranches
- Perrault Farms
- Sauve & Son Farms
- Sodbuster Farms
- Van Horn Farms
- Double R Hop Ranches
- Black Star Ranches
- Oasis Farms
- Coleman Agriculture



In addition to our grower owners, we receive hops from an additional 43 families throughout the Pacific Northwest.

YAKIMA CHIEF RANCHES

Yakima Chief Ranches, formerly Select Botanicals Group (SBG), is Yakima Chief Hops partner from propagation to pint.

Works with Hop Breeding Company to develop new hop varieties.

YCR is an integrated crop management company that specializes in breeding new hop varieties for the global brewing industry.

Footprints® - Comprehensive brand management program that ensures the highest level of attention is given to the growing and harvesting of hops.

YAKIMA CHIEF
— *Ranches* —

HOP BRANDS, VARIETIES & BLENDS

Portfolio of over 80 varieties:

- American Hops from the Pacific Northwest - A full portfolio of hops that can be used to create the world's best beers – hops for delivering aroma, flavor and bitterness
- Select Imported hops from Germany, New Zealand, the Czech Republic, & the UK

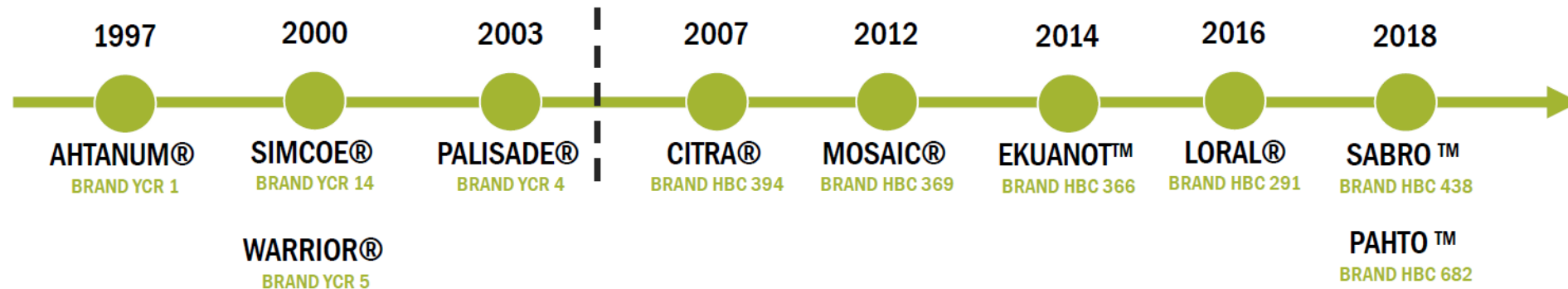
YCH also offers proprietary blends.

Community Blends

- Pink Boots Blend
- Falconer's Flight® Blend
- Veterans Blend

Expression Blends

- Zythos® Blend
- Pacific Crest Blend



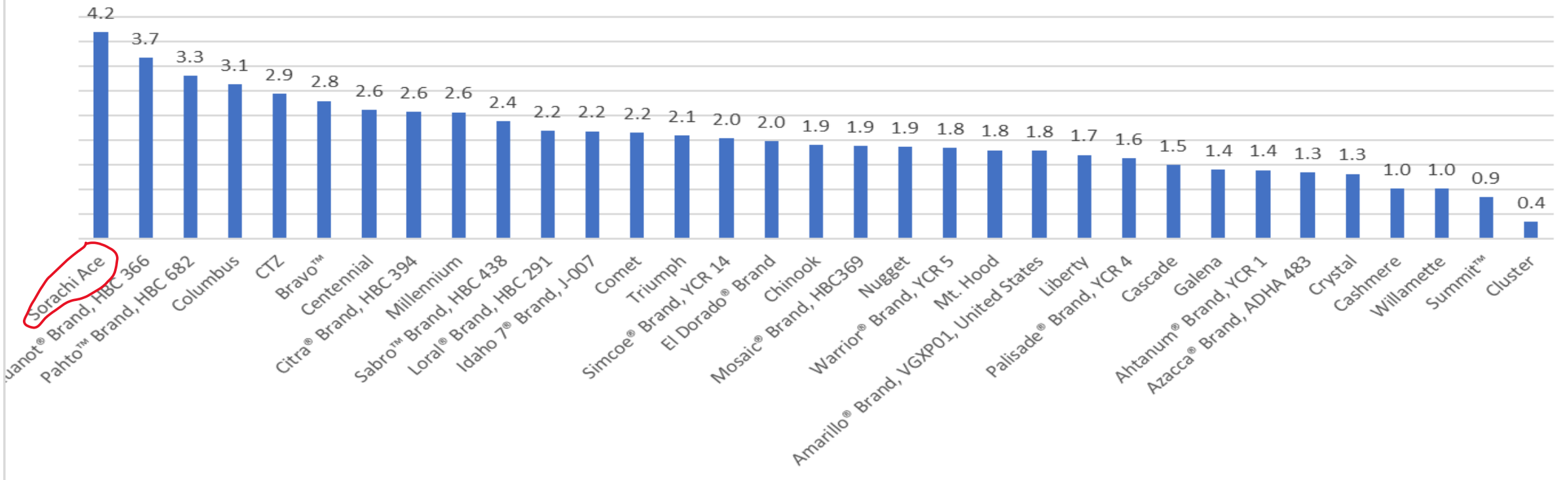


TRACKING AROMATIC HOP COMPOUNDS

2019 HARVEST HOP VARIETAL AROMATIC ANALYSIS

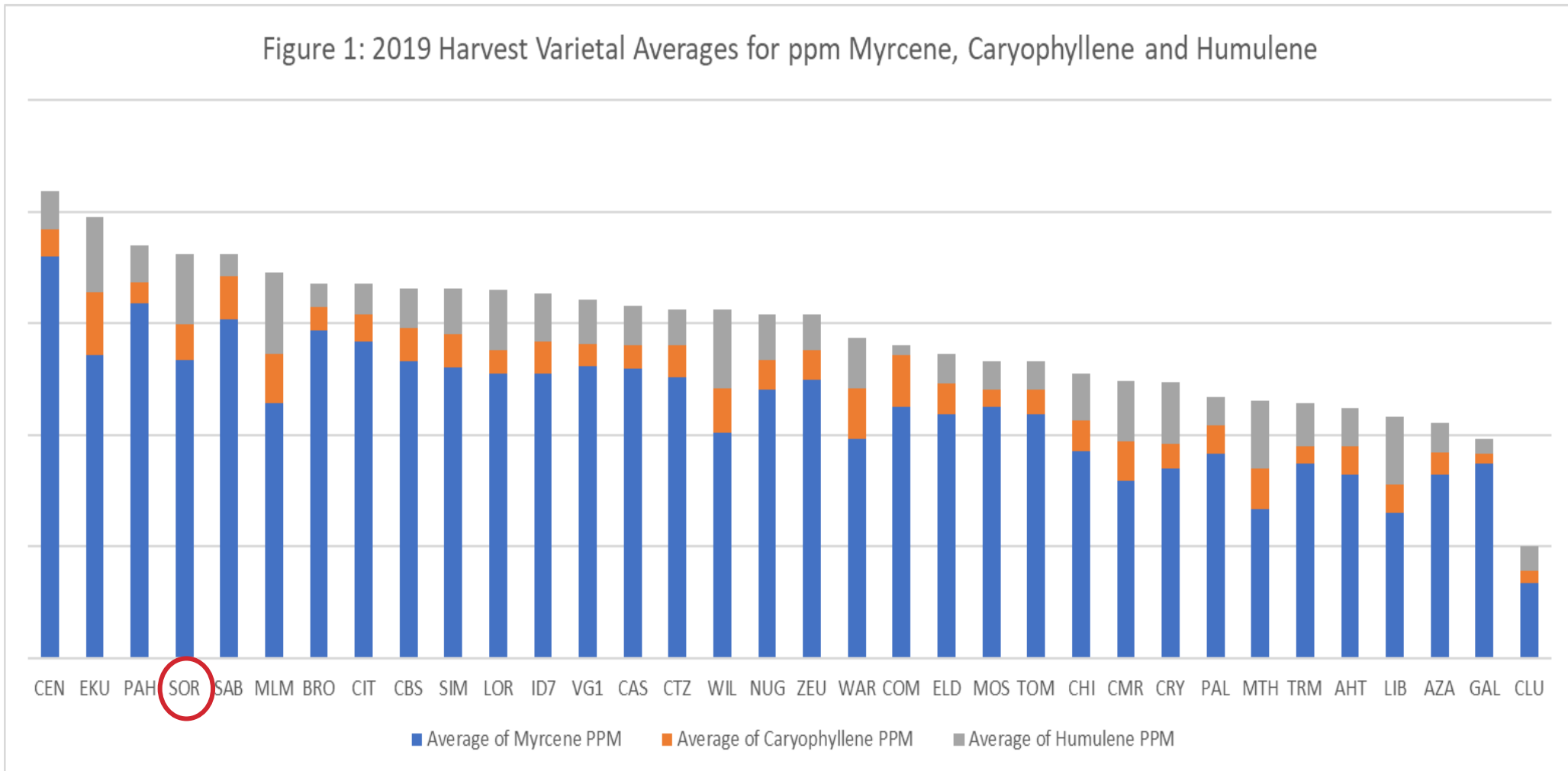
- 34 hop varieties
- 1328 hop lots

Figure 1: 2019 Harvest Varietal Averages for Total Oil Content mL/100g



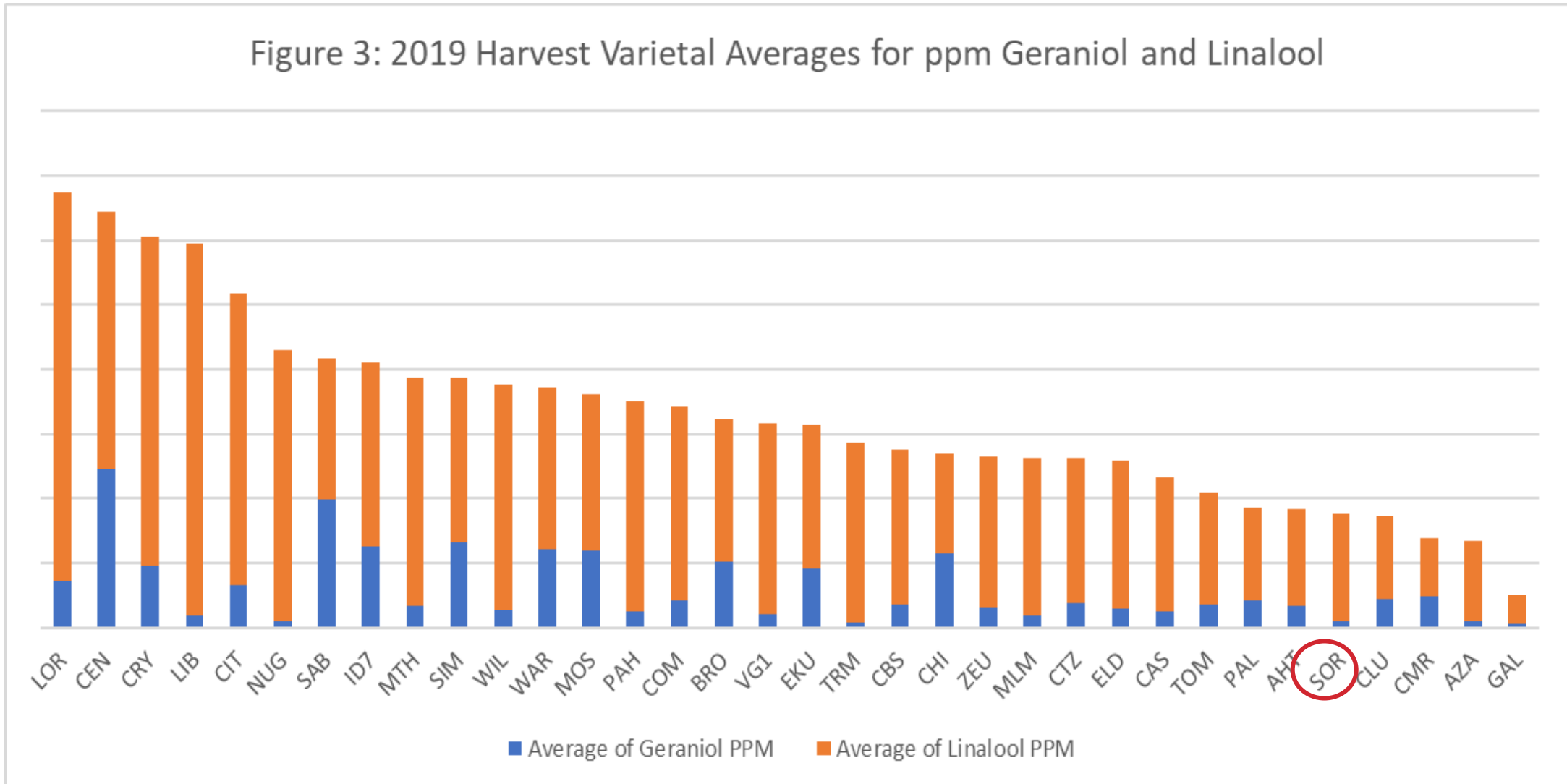
2019 HARVEST HOP VARIETAL AROMATIC ANALYSIS

Figure 1: 2019 Harvest Varietal Averages for ppm Myrcene, Caryophyllene and Humulene



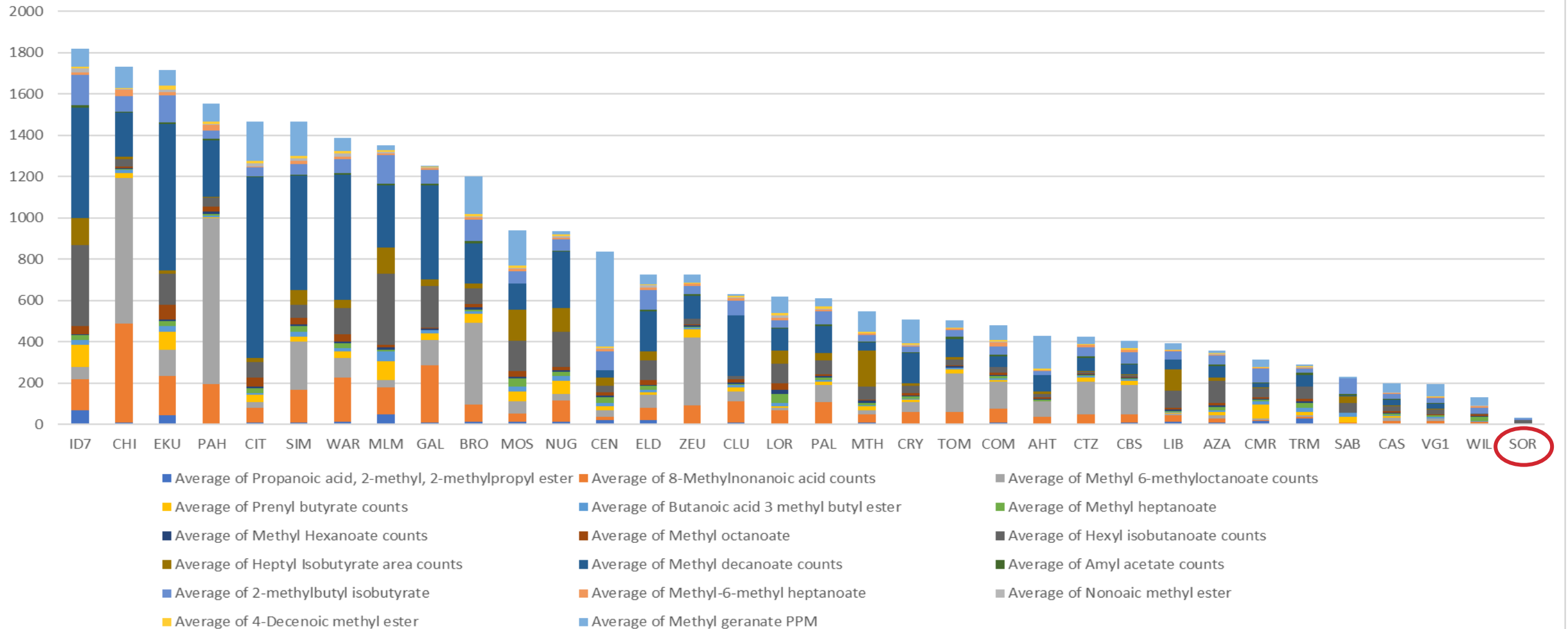
2019 HARVEST HOP VARIETAL AROMATIC ANALYSIS

Figure 3: 2019 Harvest Varietal Averages for ppm Geraniol and Linalool



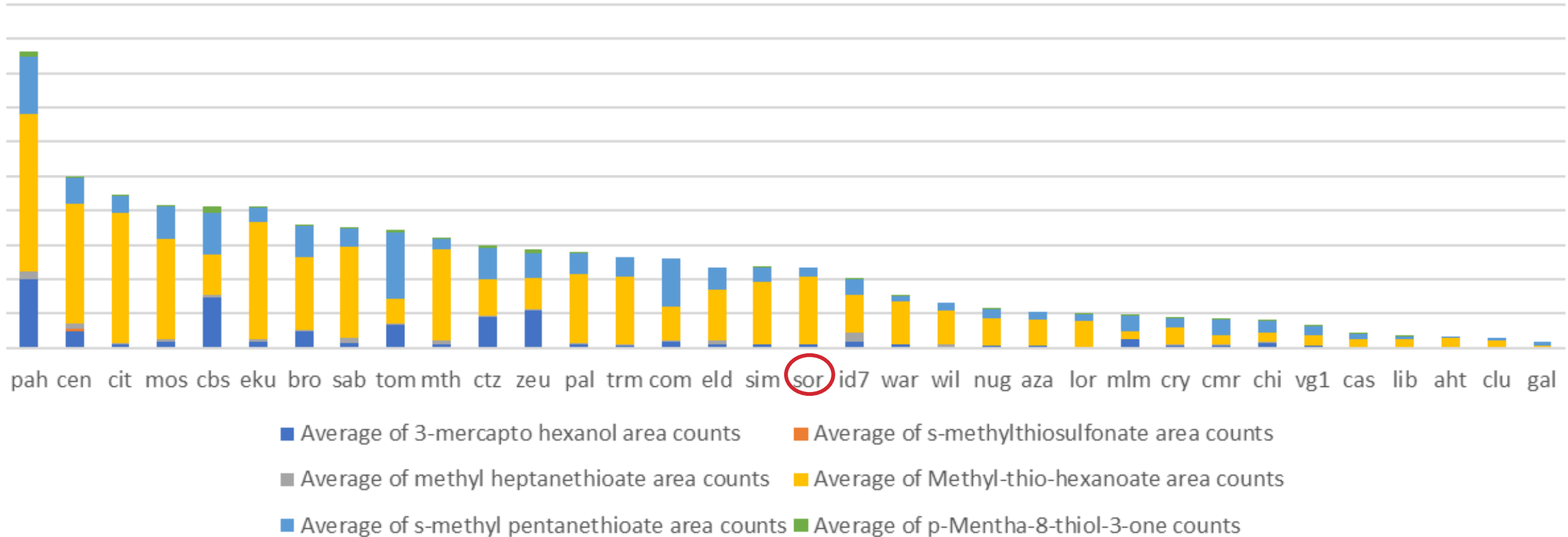
2019 HARVEST HOP VARIETAL AROMATIC ANALYSIS

Figure 4: 2019 Harvest Varietal Averages for Detectable Esters in Area Counts per Micro Gram



2019 HARVEST HOP VARIETAL AROMATIC ANALYSIS

Figure 5: 2019 Harvest Varietal Averages for Detectable Sulfur Containing Compounds in Area counts per Microgram





SULFUR COMPONENTS IN HOPS

AN INTRODUCTION

SULFUR-BEARING COMPOUNDS

3 MAIN TYPES OF CURRENT RELEVANCE

- Sulfides
- Thioesters
- Polyfunctional Thiols

REQUIRE SPECIALIZED EQUIPMENT TO DETECT

- Add-on to current GCMS analysis (SCD Detector)
- YCH now analyzing all lots for thioesters and polyfunctional thiols



POLYFUNCTIONAL THIOLS

SULFUR-BEARING COMPOUNDS

- Very low concentrations in hops (ppb)
- Extremely low aroma detection threshold (ppt)



GENERALLY CONSIDERED TO CONTRIBUTE PLEASANT AROMA

- Contained in tropical fruits
- Can be bound to amino acids, released by yeast enzymes (β -lyase)



3MH AND 3MHA

3-MERCAPTOHEXANOL (AKA 3SH)

- Contained in hops and malt
- Grapefruit, sometimes blackcurrant
- Increases during wort boil

3-MERCAPTOHEXYLACETATE (AKA 3SHA)

- Not found in hops
- Formed by yeast biotransformation of 3MH
- Grapefruit and Passionfruit

YCH tests for 3MH on all lots CY2019 and forward



WHY CARE?

SYNERGY

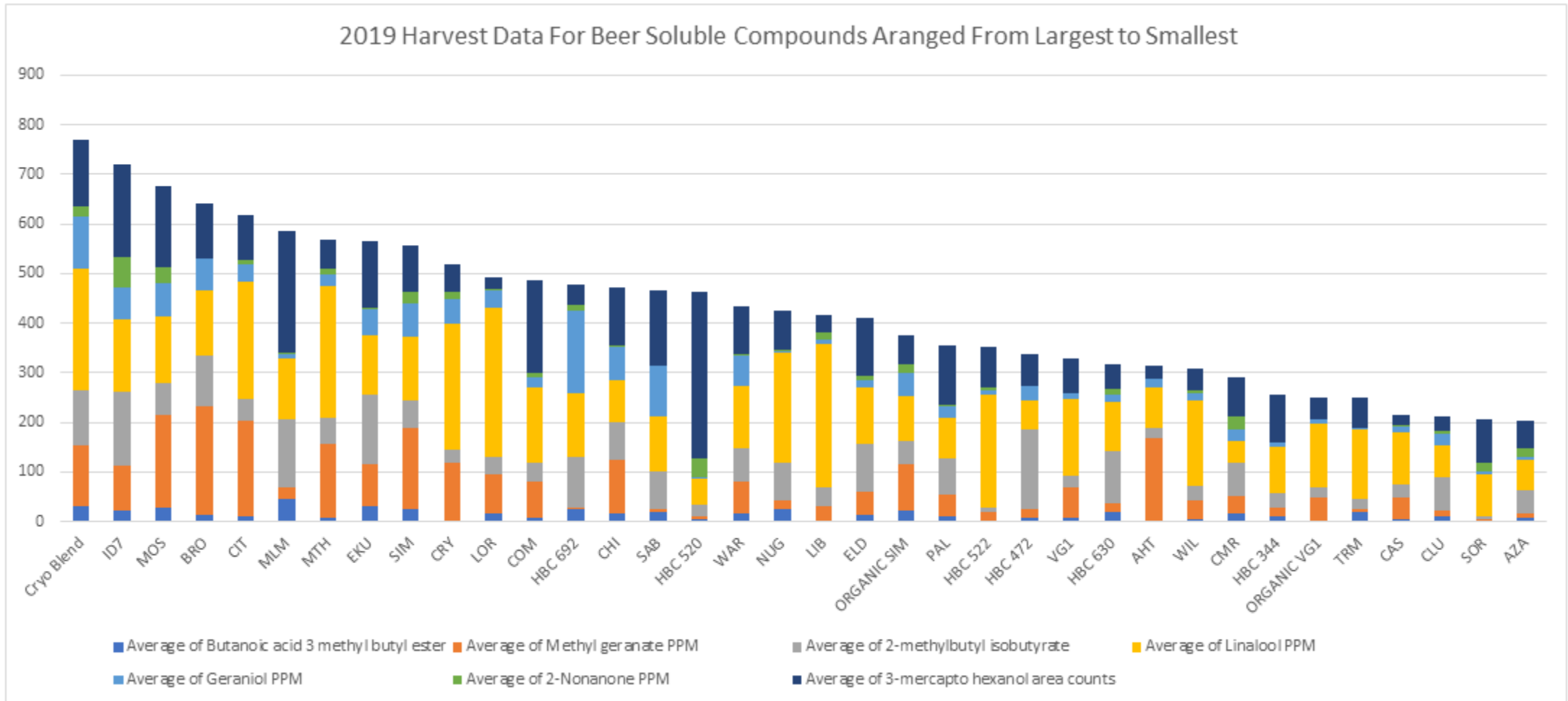
- Thiols could enhance the intensity of monoterpene alcohols (linalool, geraniol, etc)
- Use as blend components
- “Flavor pop” technology

BREEDING

- Better inform decision-making on breeding side



“SURVIVABLES”



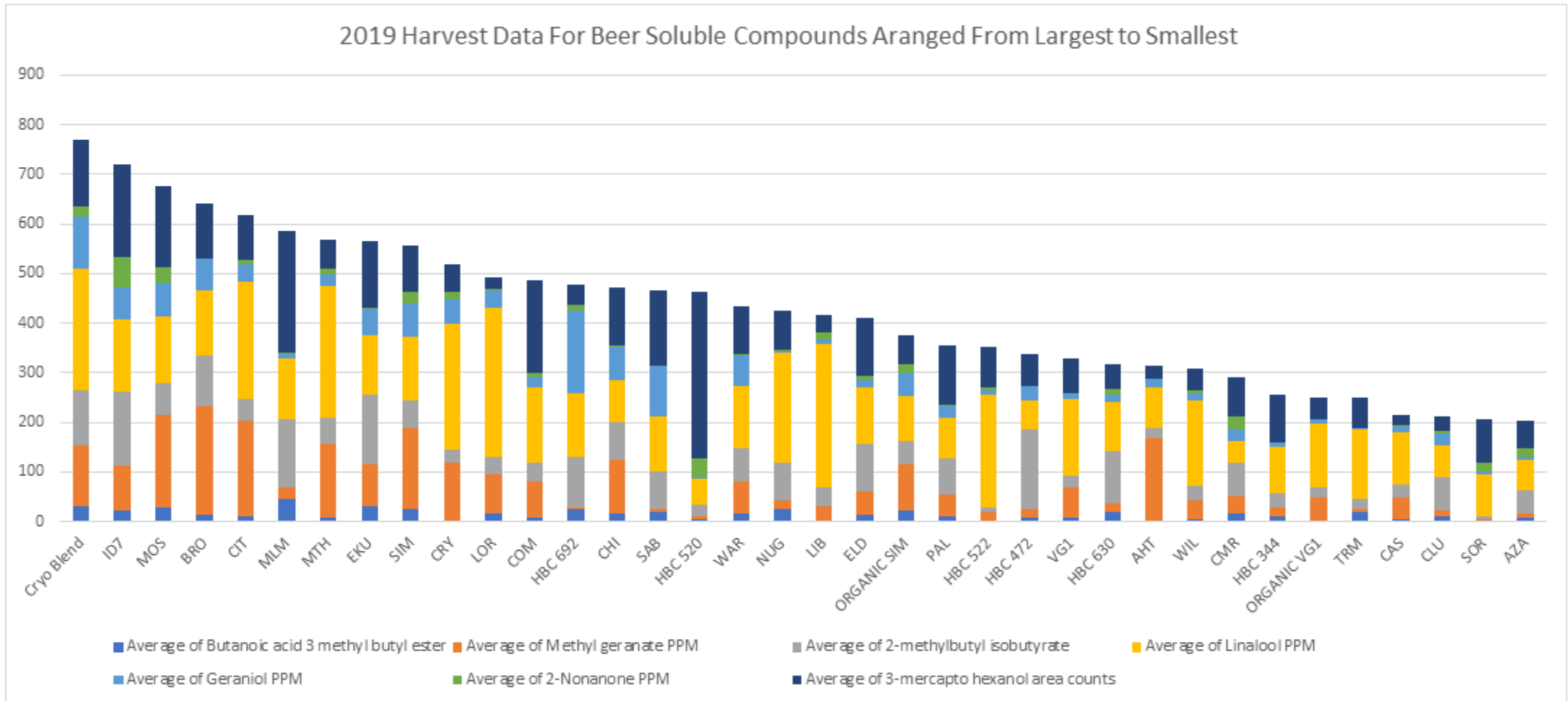
TRI-2304CR CRYO HOPS® BLEND

CRYO HOPS BLEND

- Designed to maximize beer-soluble compounds
- Blended to load WP and early DH with “survivables”
- High in geraniol, linalool, 3MH, methyl geranate
- Targeting synergies between components
- Flavor Pop!

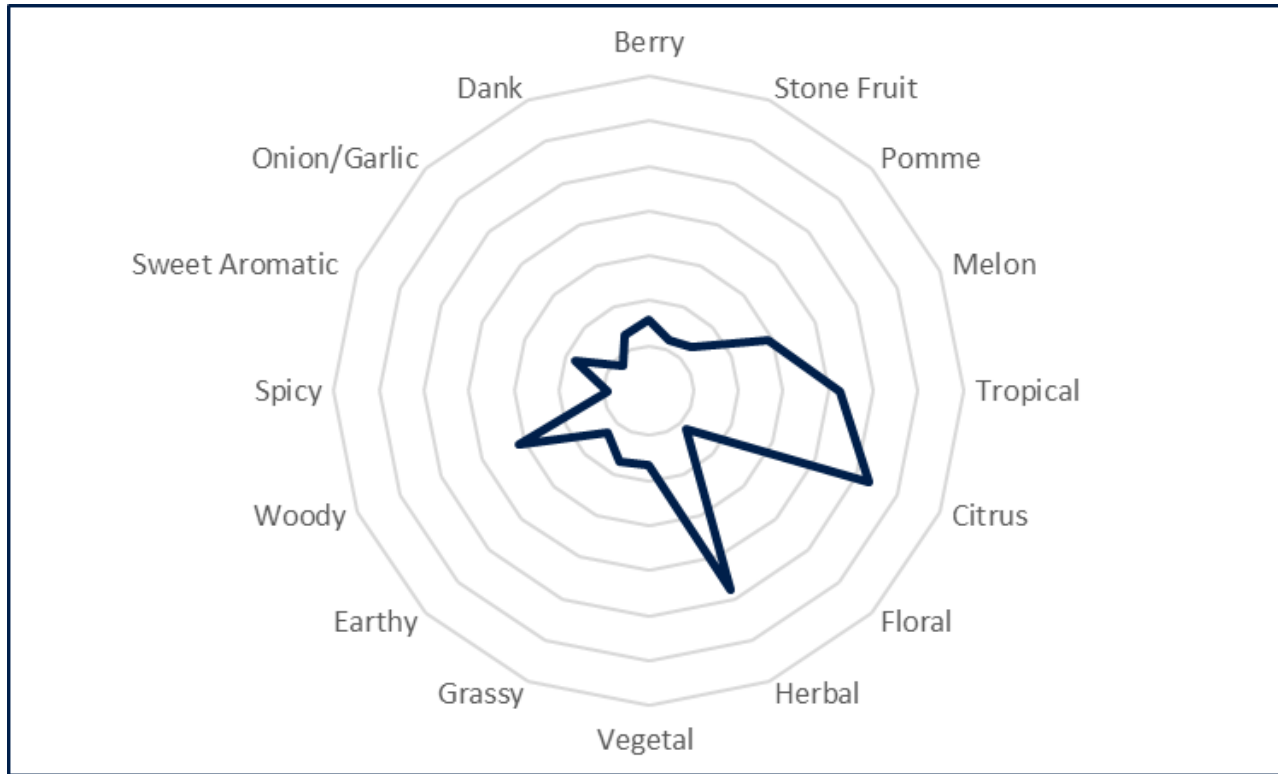


“SURVIVABLES”



TRI-2304CR CRYO HOPS® BLEND

RAW HOP SENSORY



*Lemon,
Lemongrass,
Cantaloupe,
Dill,
Pine,
Resinous*



THE BREWS

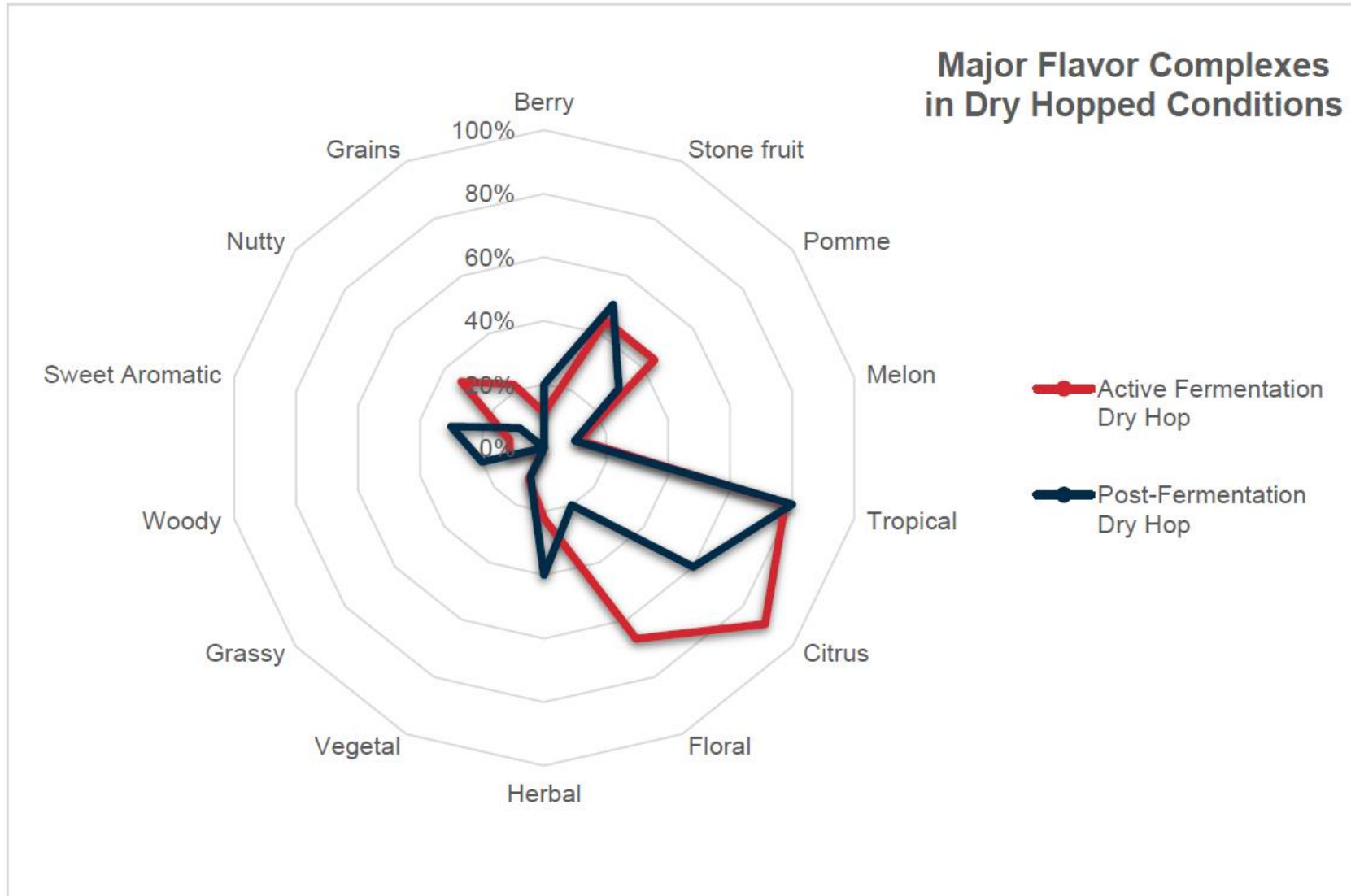
1. TRI-2304CR in Whirlpool Only
2. TRI-2304CR in Whirlpool and Active Fermentation Dry Hop
3. TRI-2304CR in Whirlpool and Post-Fermentation Dry Hop

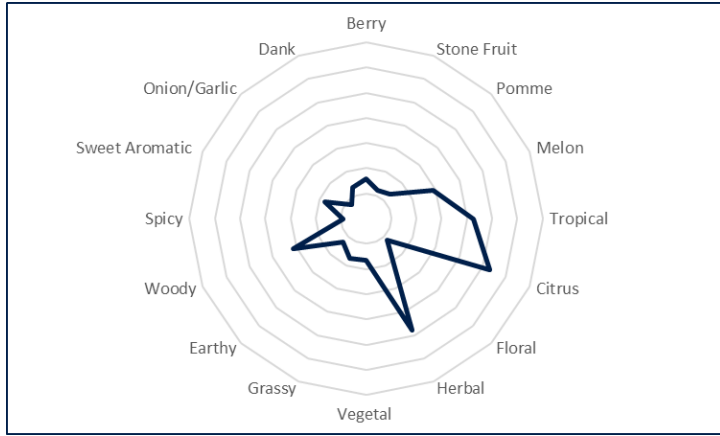
Parameter	Value
Water:Grist (L/kg)	3
Boil Time (min)	75
Initial Fermentation Temperature (°F)	64
Final Fermentation Temperature (°F)	72
Dry Hop Temperature (°F)	58

Grist % of Extract	Fermentable
79%	Pale
10%	Munich 10
5%	White Wheat Malt
3%	Carapils®
3%	Acidulated

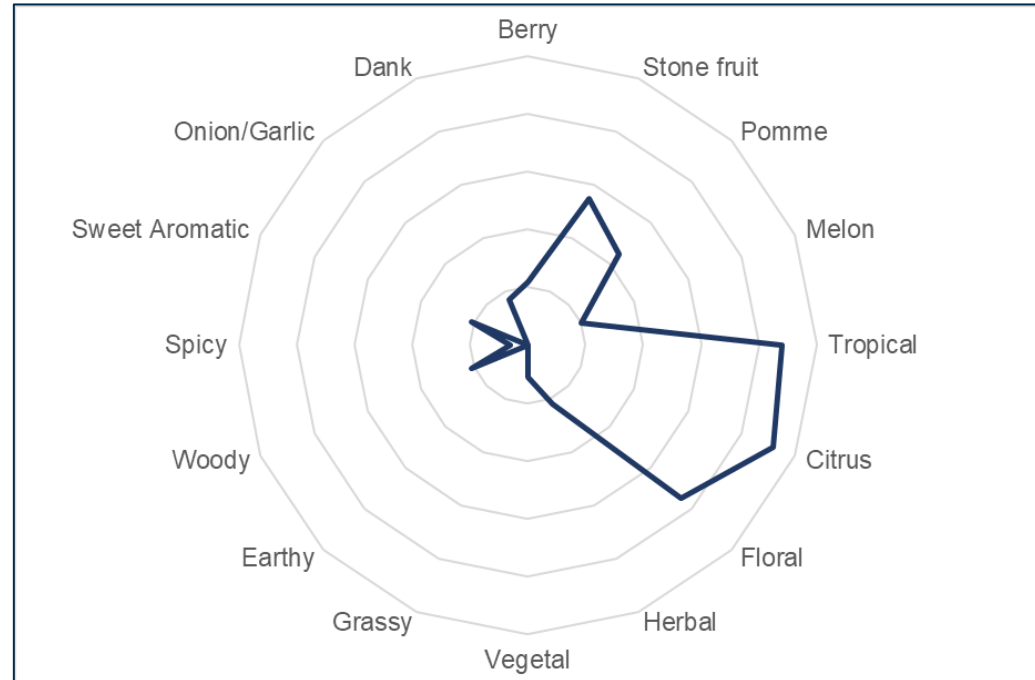
Hop Variety	Type	Dose (g/L)	Time	IBUs
PAHTO	EXTRACT	0.2	75	29.8
TRI2304CR	CRYO®	0.35	15	8.3
TRI2304CR	CRYO®	2.5	Whirlpool	30.0
TRI2304CR*	CRYO®	8	Dry Hop	0.0

THE RESULTS





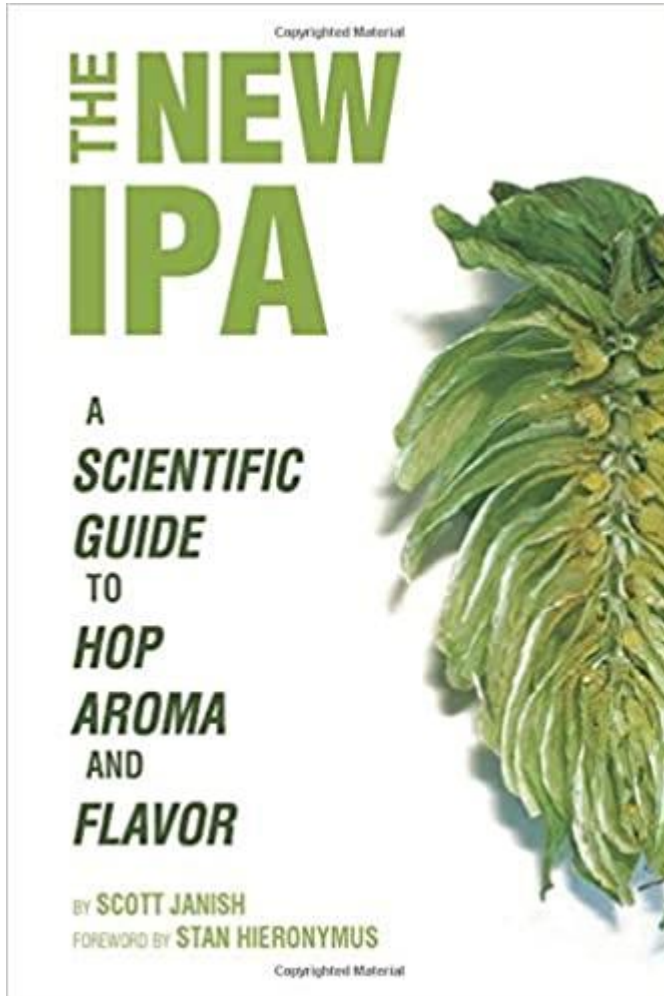
*Lemon,
Lemongrass,
Cantaloupe, Dill,
Pine, Resinous*




*Grapefruit,
Orange, Mango,
Peach, Rose,
Guava*



WHAT'S NEXT?



Scott Janish.com

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Survivables: Unpacking Hot-Side Hop Flavor

Why hops like Idaho 7 might be so good at imparting saturated hop flavor to beer



Scott Janish
@ScottJanish



Don't tell anyone, but Idaho 7 is one of the greatest hot-side hops I've ever used. I don't know the science yet (maybe thiols or hop-derived esters), but the amount of tropical hop saturated flavor pre-dry hopping is unreal compared to other varieties.

1:36 PM · Mar 24, 2019



 138  22 people are Tweeting about this

Questions?

brewinghelp@yakimachief.com
spencer.tielkemeier@yakimachief.com