M-08

Brewer's Hop Creep Cheat Sheet: A Comparative Analysis of Hop Variety, Origin, and Product Type [Part 1]

Jessica Young, University of California, Davis
Glen Fox, University of California, Davis

UC DAVIS FOOD SCIENCE AND TECHNOLOGY

Introduction: Hop creep remains one of the foremost issues in the brewing industry.

- Many contemporary mitigation measures rely on brewdeck work-around techniques and guesswork that lack any empirical basis. When complete, this study will define general parameters of expected creep based on different hop products, varieties, and terroirs.
- Do these variables have measurably different impacts on hop creep, or does it remain consistent regardless?
- This study attempts to better understand which products are the most likely to cause hop creep, and the degree to which different product types or regional varieties affect secondary fermentation. The experiment was designed to focus on production breweries and therefore uses common industry hop products with realistic recipes.

Methods:

- 100mL American golden lager + 1g hop product + .3g Fermentis SO5
- Daily gravity check. Allow fermentation to proceed until completed
- Performed 3x for each variety and product type totaling 69 fermentations
- Hops were added into finished beer directly and mixed gently to simulate natural fermentation convection
- Beer fermented between 22°C-23 °C

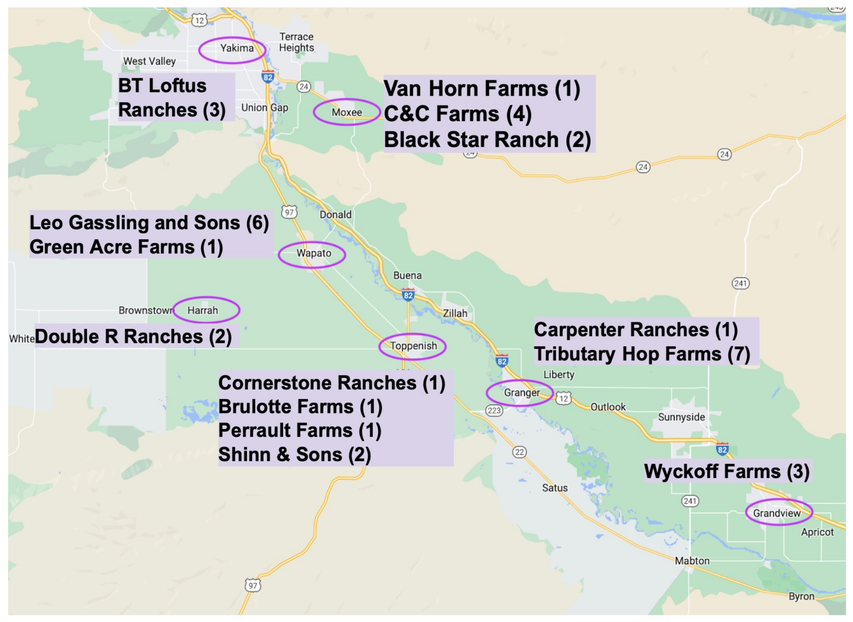
Hop Varieties:

- Cascade, Citra®, Simcoe®, Mosaic®

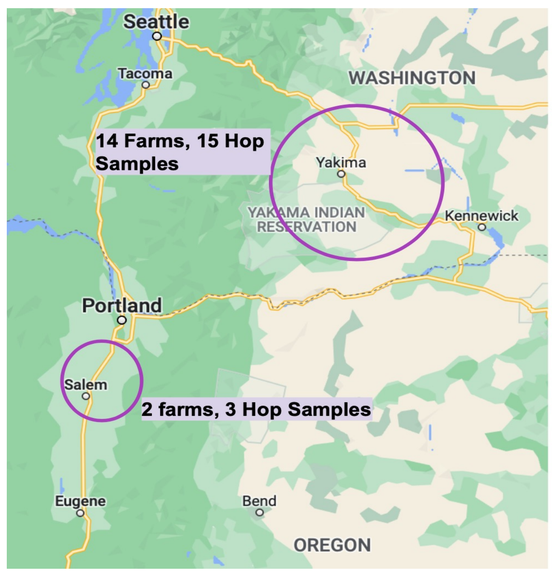
Hop Products:

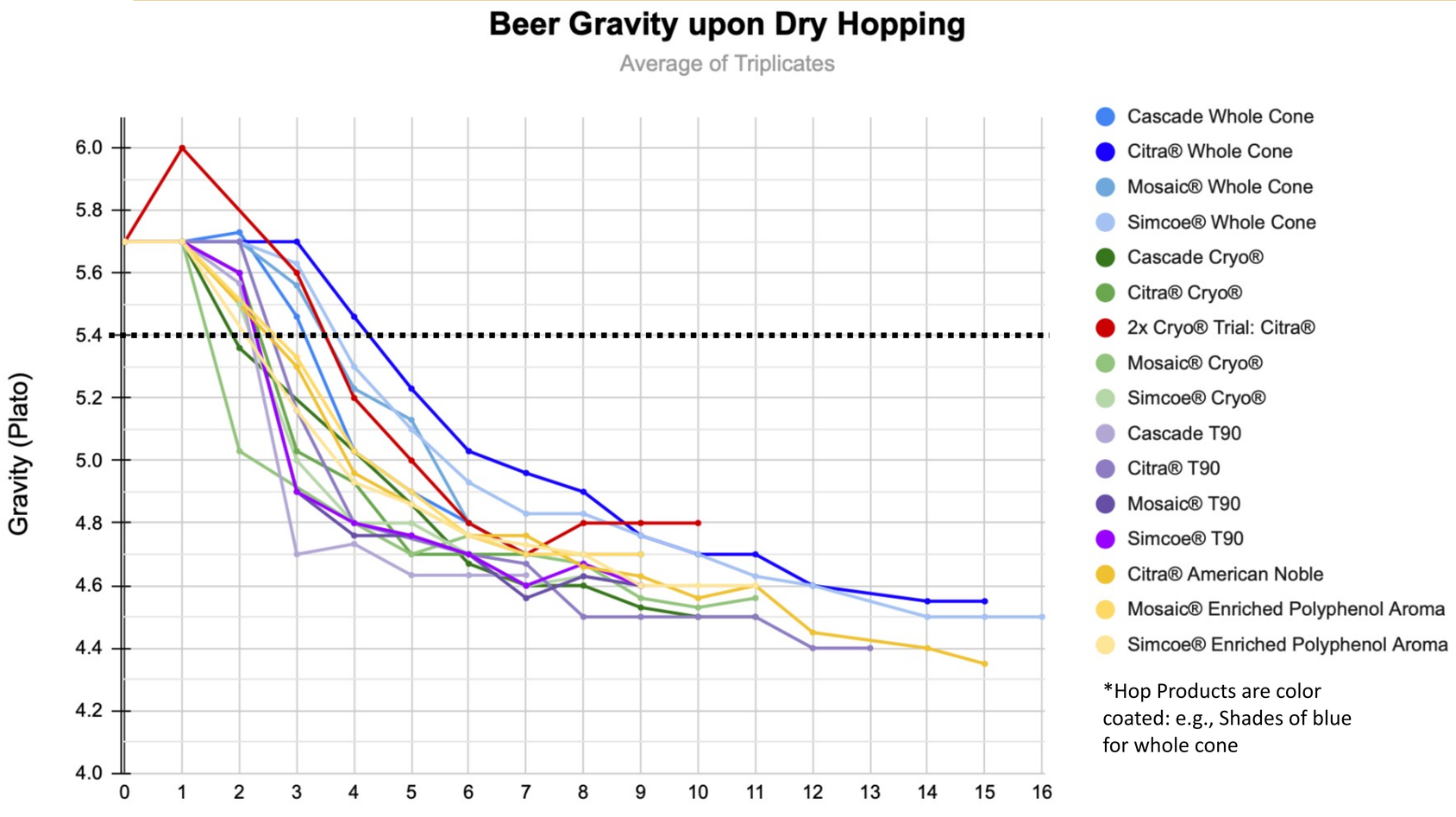
- T90, Cryo®, 2x-cryo®, whole cone, enriched polyphenol aroma pellets, American noble

Above Left: An example of 1g dry hop whole cone and T90 pellets
Above Right: An example of the active fermentations post dry hop



Maps: Hop samples were acquired from the locations indicated on the maps. However, most samples are blends from several farms.





*Hop Products are color coated: e.g., Shades of blue for whole cone

Results and Data:

- Initial beer starting gravity is 5.7P
- Beer + Yeast fermented to 5.4P, denoted by black dashed line in graph. Fermentation below the dashed line indicates hop creep.
- To account for Cryo® containing 50% plant material, a trial fermentation was conducted using 2g of Cryo®. This trial showed an initial increase in sugars followed by expected drop in gravity.
- The table below shows more fermentation information separated by variety and product type

Takeaways and Conclusions:

- **All tested hop products exhibited hop creep**
- T90, Cryo®, and Enriched polyphenol exhibited slightly faster slope while whole cone and American noble products were slower
- Cryo® caused a larger initial increase in sugar (.3P), potentially masking effects of hop creep
- Most deviation: Citra® and whole cone
- Least deviation: Simcoe® and enriched polyphenol

Additional Fermentation Data

	Average Final Gravity	Total Plato Drop	Days to Terminal (Avg)	Slope (Drop/Days)	Std. Deviation
Cascade	4.63	0.77	6.3	0.12	0.09
Citra®	4.5	0.90	10.25	0.09	0.16
Mosaic®	4.67	0.73	6.5	0.11	0.086
Simcoe®	4.57	0.83	7.75	0.11	0.04
T90	4.57	0.83	7	0.12	0.095
Cryo®	4.6	0.80	6.74	0.12	0.079
Whole Cone	4.62	0.78	8.75	0.09	0.116
Enriched polyphenol	4.65	0.75	7	0.11	0.05
Noble	4.4	1.00	13	0.08	0
2x Cryo® Increased to 6	4.8	1P total drop	6	0.2	0

Acknowledgments: Yakima Chief Hops, Vinnie Cilurzo and Russian River Brewing Company, Emily Weintraut, Will Oakley, Kelly Scott, and Joe Williams

Future Directions: Given the time-consuming nature of hop creep this study must be divided into several sections. Part 1 includes common American varieties and products. Subsequent parts will explore international terroirs and varieties.