# Consumer Sensory Engagement

## 2020 Craft Malt Conference

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WASHINGTON GRAIN COMMISSION

Organic Biologically-Intensive BIOAg Sustainable

WASHINGTON STATE UNIVERSITY

NSF

GRFP

*“To appreciate something you must understand it, and to understand something you must experience it.”*

# LYON

- Two-rowed spring feed/malt barley (2013)
- Baronesse/Spaulding

## LYON

SPRING BARLEY

**Lyon** is a two-row dual-purpose malt and feed barley developed by the Agricultural Research Center of Washington State University. Lyon is named in honor of Steven R. Lyon, a farmer and long-time wheat researcher at Washington State University.

Lyon is a high yielding, broadly adapted variety particularly well suited to intermediate and high rainfall zones of the Palouse where Bob, Baronesse, Lenetah, and Champion are currently being grown. Lyon has excellent stem rust resistance, high protein, and plump kernels across a wide range of environments.

**AGRONOMICS**

| | |
|---|---|
| Yield Potential | Excellent |
| Protein | Very Good |
| Test Weight | Average |
| Maturity | Medium |
| Height | Medium |
| Plump Kernels | Excellent |

**DISEASE RESISTANCE**

| | |
|---|---|
| Stem Rust | Excellent |
| Leaf Rust | Excellent |
| Stripe Rust | Moderately Susceptible |

**WSU INSIDER**

FOOD & AGRICULTURE

## WSU-bred barleys delivering unique Northwest beer flavors

May 15, 2018

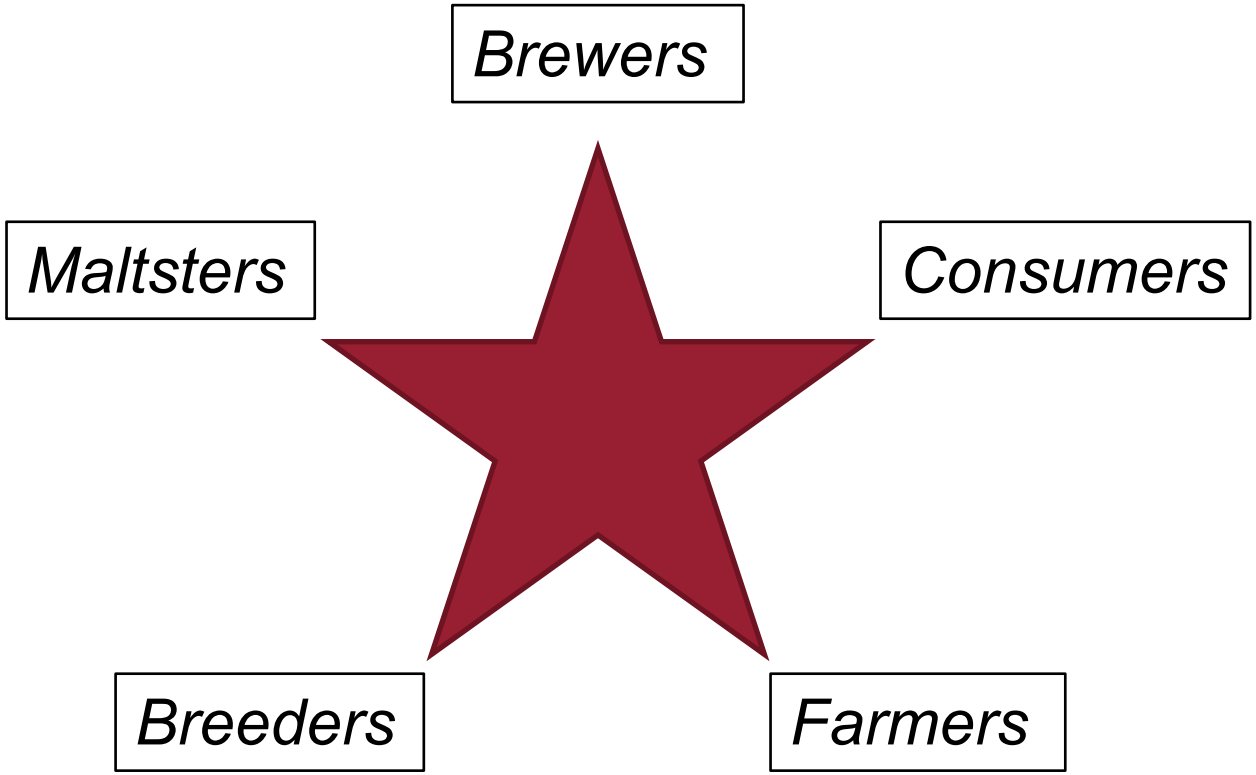
"MAINSTEM HAS PROUDLY WORKED WITH WSU'S LYON 2-ROW BARLEY SINCE 2017. WHILE NOT TYPICALLY USED FOR MALTING, WE'VE ENJOYED ITS LEADING DROUGHT TOLERANCE, DISEASE RESISTANCE, SMALL BATCH MALTING PERFORMANCE, AND SOME NOTEWORTHY CRAFT BREWING QUALITIES. LOOK TO LYON AS THE START OF A GREAT STORY. WE ASK THE BEVERAGE INDUSTRY **JOIN US IN SUPPORT OF WSU'S LAND GRANT RESEARCHERS AND THEIR NEXT CHAPTER OF CRAFT MALTING BARLEYS**, BRED TO THRIVE IN THE UNIQUE DRYLAND CLIMATES OF THE PACIFIC NORTHWEST."

**MAINSTEM MALT, WALLA WALLA, WA**

"**ACROSS MALT STYLES, LYON PRESENTS FOCUSED AND BRIGHT FLAVOR PROFILES**, WITH HONEY AND FRESH GRASS CENTRAL TO LIGHTER MALTS, AND LIGHT EARTH AND CRACKER COMING THROUGH IN HIGHER KILNED RECIPES. THE LYON VARIETAL IS CONSISTENTLY HIGHER IN BETA-GLUCAN THAN STANDARD MALTING BARLEYS, BUT WITH ATTENTION THIS TRAIT HAS PROVEN TROUBLE FREE."

**LINC MALT, SPOKANE, WA**

# Breeding a Malt Quality Barley



TITLE: FROM GROUND TO GLASS: EVALUATION OF UNIQUE BARLEY VARIETIES FOR WESTERN WASHINGTON CRAFT MALTING, BREWING AND DISTILLING

PRINCIPAL INVESTIGATOR(S) AND COOPERATOR(S): STEPHEN BRAMWELL (PI), DR. KEVIN MURPHY (CO-PI), DR. THOMAS COLLINS (CO-PI)

# 2017 Trial: Grain and Malt Quality

- No significant difference in yield; comparable to Copeland
- Replicated (3) data from Cereal Crops Research Unit
- **Grain and micromalt quality (Hartwick, unreplicated)**
- **Pilot Malting (Oregon State University) -> malt quality**
- **Hot steep & beer consumer panel**

*Stephen Bramwell*

Moscow Brewing Company

# 2017 Trial: Grain Quality

| | Moisture (%) | Protein (%, DB) | Test Weight (lbs/bu) | Plump (6/64" %) | GE 4ml (%) | GE 8ml (%) |
|---|---|---|---|---|---|---|
| Copeland | 13.4 | 10.3 | 48.9 | 99.6 | 100 | 91 |
| 117.17 | 14.9 | 9.9 | 50.1 | 98.4 | 100 | 82 |
| 107.43 | 15.0 | 10.0 | 52.9 | 99.1 | 97 | 80 |
| 120.14 | 15.4 | 10.1 | 50.6 | 98.7 | 96 | 90 |
| 120.17 | 16.9 | 10.3 | 49.7 | 99.1 | 97 | 87 |

HARTWICK COLLEGE
est. 1797

Center for Craft Food & Beverage

# 2017 Trial: Micromalt Quality

| | Friability (%) | Fine Extract (%) | Color (°SRM) | β-Glucan (ppm) | S/T (%) | FAN (mg/L) | DP (˚L.) | Alpha Amylase (D.U.) |
|---|---|---|---|---|---|---|---|---|
| Copeland | 94.9 | 81.9 | 2.44 | 75 | 49.9 | 232 | 131 | 58.5 |
| 117.17 | 84.5 | 80.6 | 1.60 | 340 | 40.7 | 156 | 94 | 31.0 |
| 107.43 | 73.2 | 82.4 | 1.57 | 471 | 40.8 | 157 | 86 | 33.9 |
| 120.14 | 82.0 | 81.7 | 2.49 | 195 | 47.5 | 217 | 98 | 46.1 |
| 120.17 | 81.8 | 81.1 | 2.39 | 228 | 45.0 | 202 | 95 | 39.0 |

HARTWICK COLLEGE
est. 1797

Center for Craft Food & Beverage

| | Entry | Steep | Germ | Kiln |
|---|---|---|---|---|
| **Hartwick (standard)** | All | 8 hrs wet (16 hrs air) 6 hrs Wet (14 hrs air) 2 hrs wet @ 14˚ | 96 Hours @ 15˚C | 6 hrs @ 55˚C, 6 hrs @ 65˚C, 6 hrs @ 72˚C, 4 hrs @ 85˚C |
| **OSU (modified minimally)** | Copeland | 8 hrs Wet (16 hrs Air) 8 hrs Wet (12 hrs Air) 2 hrs Wet @ 14˚ C | 96 Hours @ 15˚C | 5 hrs @ 50˚C, 5 hrs @ 55˚C, ΔT = 9 @ 60˚C, 6 hrs @ 72˚C, 4 hrs @ 85˚C |
| **OSU (modified)** | 120.14 120.17 | 8 hrs Wet (16 hrs Air) 8 hrs Wet (12 hrs Air) 2 hrs Wet @ 14˚ C | **120 Hours @ 15˚C** | 5 hrs @ 50˚C, 5 hrs @ 55˚C, ΔT = 9 @ 60˚C, 6 hrs @ 72˚C, 4 hrs @ 85˚C |
| **OSU (modified)** | 117.17 107.43 | **5 hrs Wet (19 hrs Air) 5 hrs Wet (15 hrs Air) 2 hrs Wet @ 18˚** | **120 Hours @ 15˚C** | 5 hrs @ 50˚C, 5 hrs @ 55˚C, ΔT = 9 @ 60˚C, 6 hrs @ 72˚C, 4 hrs @ 85˚C |

# 2017: Pilot Malt Quality

| Entry | Friability (%) | Fine Extract (%) | Color (˚SRM) | β-Glucan (ppm) | S/T (%) | FAN (mg/L) | DP (˚L.) | Alpha Amylase (D.U.) |
|---|---|---|---|---|---|---|---|---|
| Copeland | 87.5 | 81.3 | 2.20 | 85 | 44.4 | 193 | 122 | 64.8 |
| 117.17 | 89.1 | 79.5 | 1.84 | 99 | 40.9 | 151 | 106 | 47.8 |
| 107.43 | 87.9 | 81.5 | 1.87 | 95 | 37.7 | 155 | 101 | 47.6 |
| 120.14 | 86.1 | 81.5 | 2.79 | 127 | 44.7 | 208 | 102 | 60.9 |
| 120.17 | 84.4 | 80.9 | 2.49 | 130 | 42.4 | 190 | 100 | 56.7 |

HARTWICK COLLEGE
est. 1797

Center for Craft Food & Beverage

# Brewing

- 5.5lb mash weight
- 1 oz Tahoma Hop (6.5% alpha) @ 60min
- 3gal fermentation volume
- Wyeast 1056 American Ale Yeast
- Bottled (12fl oz) under $CO_2$

| Entry | OG (sg) | FG (sg) | ABV (%) |
|---|---|---|---|
| Copeland | 1.048 | 1.006 | 5.46 |
| 117.17 | 1.053 | 1.006 | 6.11 |
| 107.43 | 1.050 | 1.006 | 5.72 |
| 120.14 | 1.051 | 1.006 | 5.85 |
| 120.17 | 1.059 | 1.007 | 6.76 |

# Consumer Panels

- IRB #**17398-002**
- Day 1: Hot Steep (30mL)
- Day 2: Beer (30mL)
- 95 participants (same each day)
- Screener and survey
- Willingness to purchase

- Hedonic Scales (1-9)
  - Overall Liking
  - Appearance
  - Sweetness
  - Bitterness
  - Taste/Flavor
- Check all that apply

150
KRUPS

Thank you for attending the sensory panel.
PLEASE PRESS THE BLUE SIGNAL LIGHT TO LET THE EXPERIMENTER KNOW YOU ARE HERE

TOREROS
UNIVERSITY OF SAN DIEGO

PREMIUM

# Hedonic Scales: Hot steep

| Attributes | p-value |
|---|---|
| Aroma | 0.76 |
| **Appearance** | **<0.001** |
| Taste/flavor | 1.0 |
| Sweetness | 0.56 |
| Bitterness | 0.12 |
| Overall | 0.87 |

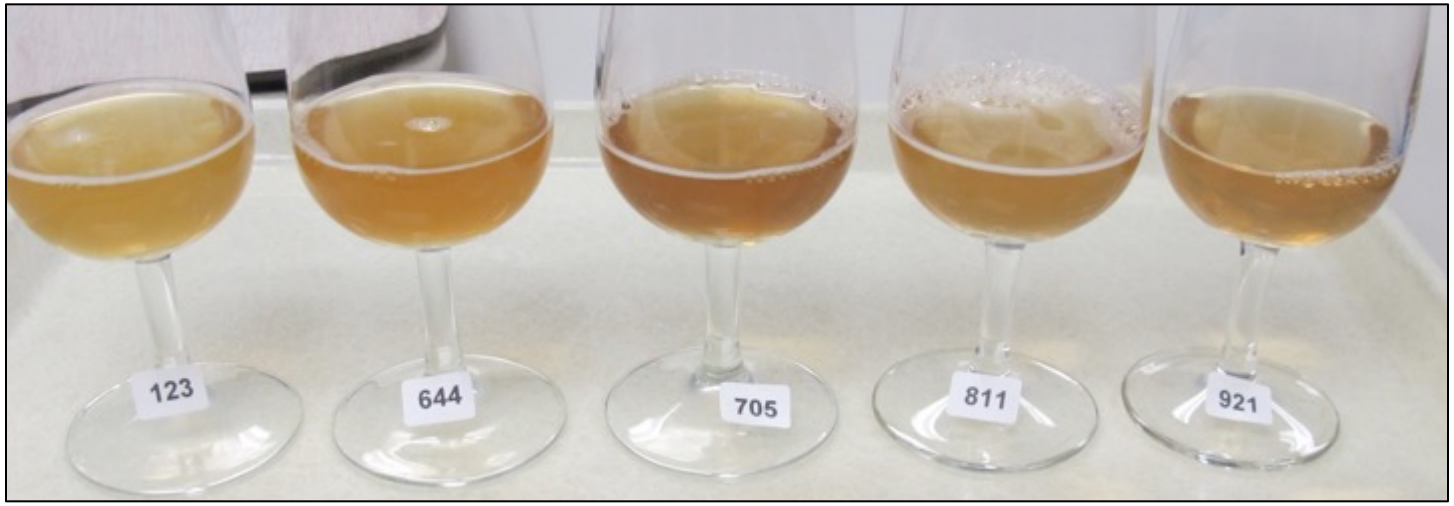
| | COPELAND | 107.43 | 117.17 | 120.17 | 120.14 |
|---|---|---|---|---|---|
| Appearance | 6.24b | 6.15b | 6.13b | **6.56a** | **6.67a** |

# Hedonic Scales: Beer

| Attribute | p-value |
|---|---|
| Aroma | **<0.01** |
| Appearance | **<0.01** |
| Taste/flavor | **<0.01** |
| Sweetness | **0.03** |
| Bitterness | 0.06 |
| Liking overall | **<0.01** |
| Willingness to Pay | 0.65 |

# Hedonic Scores: Beer

| Attributes | Copeland | 120.17 | 120.14 | 107.43 | 117.17 |
|---|---|---|---|---|---|
| Aroma | 5.89 c | 6.33 bc | **6.93 a** | 6.61 ab | 6.96 a |
| Appearance | 6.67 b | 7.04 a | **7.08 a** | 6.89 ab | 6.91 ab |
| Taste/Flavor | 5.53 b | 6.24 a | **6.31 a** | 6.02 ab | 6.01 ab |
| Sweetness | 5.53 b | 5.82 ab | **6.06 a** | 5.85 ab | 5.69 ab |
| Bitterness | 5.15 a | 5.37 a | **5.59 a** | 5.40 a | 5.20 a |
| Overall Liking | **5.52 b** | 6.05 ab | **6.18 a** | 5.89 ab | 5.68 ab |



# Check All That Apply (CATA)

## Hot Steep

| Attributes | p-value |
|---|---|
| Bready | 0.809 |
| Breakfast Cereal | 0.259 |
| Earthy | 0.349 |
| Floral | 0.223 |
| **Fruity** | **0.012** |
| Grainy | 0.377 |
| Grassy | 0.498 |
| Honey | 0.462 |
| Nutty | 0.210 |
| Stale | 0.279 |
| **Other** | **0.010** |

*Cochran's Q Test*

## Beer

| Attributes | p-value |
|---|---|
| Butter | 0.146 |
| Cereal | 0.410 |
| **Chemical** | **0.008** |
| **Citrus** | **0.021** |
| **Earthy** | **0.002** |
| Floral | 0.759 |
| **Fruity** | **0.017** |
| Grassy | 0.055 |
| Nutty | 0.650 |
| **Stale** | **0.028** |
| **Sweet Aromatic** | **0.000** |
| Yeasty | 0.474 |
| Other | 0.078 |

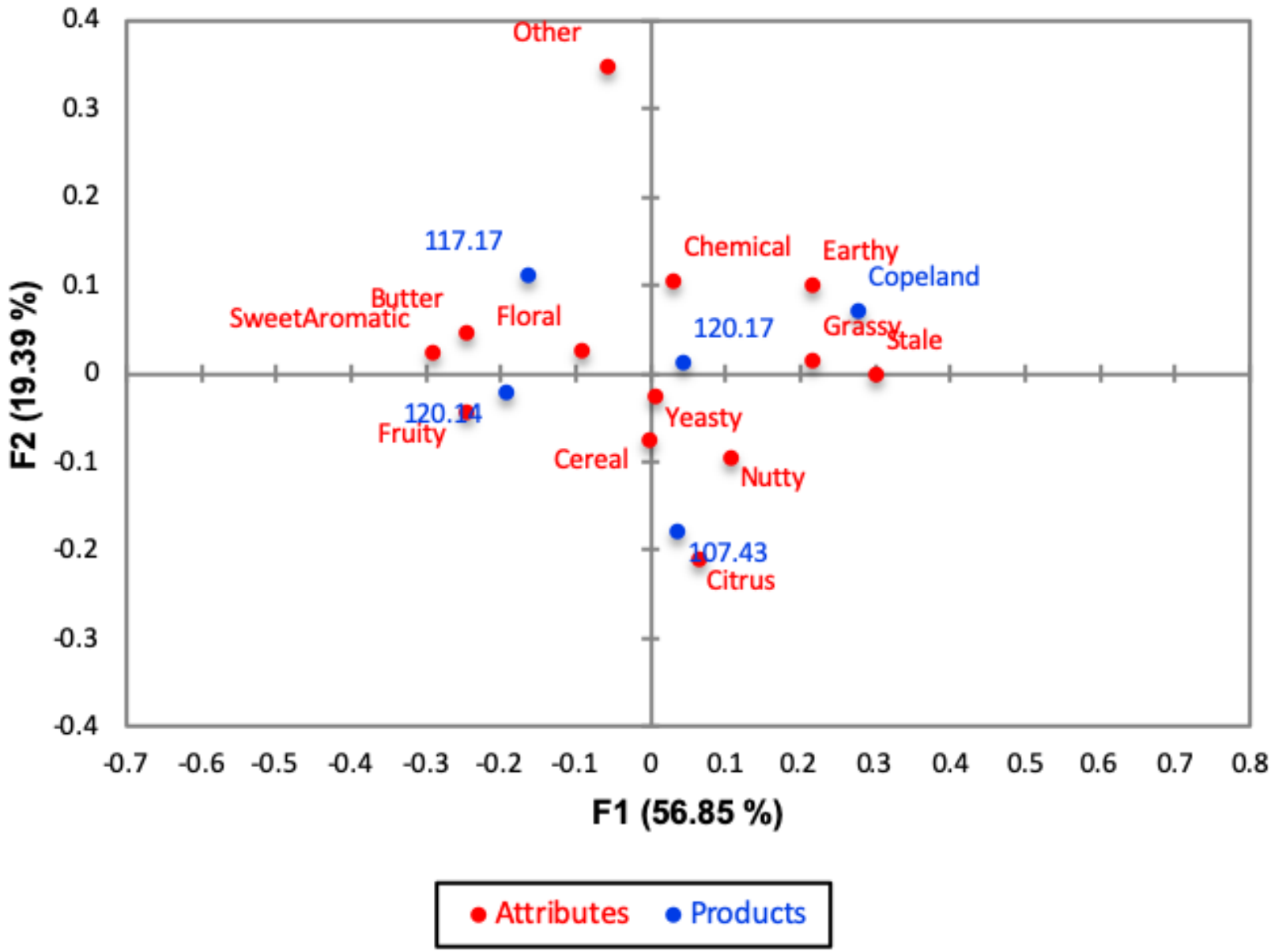
# Fruity Comparison

| Attributes | Copeland | 120.17 | 120.14 | 107.43 | 117.17 |
|---|---|---|---|---|---|
| Hot Steep | **0.200 (b)** | 0.158 (ab) | **0.053 (a)** | 0.126 (ab) | 0.137 (ab) |
| Beer | **0.149 (a)** | 0.170 (ab) | **0.309 (b)** | 0.234 (ab) | 0.277 (ab) |

*Copeland and 120.14 **<u>switch rank</u>** from Hot Steep to Beer*

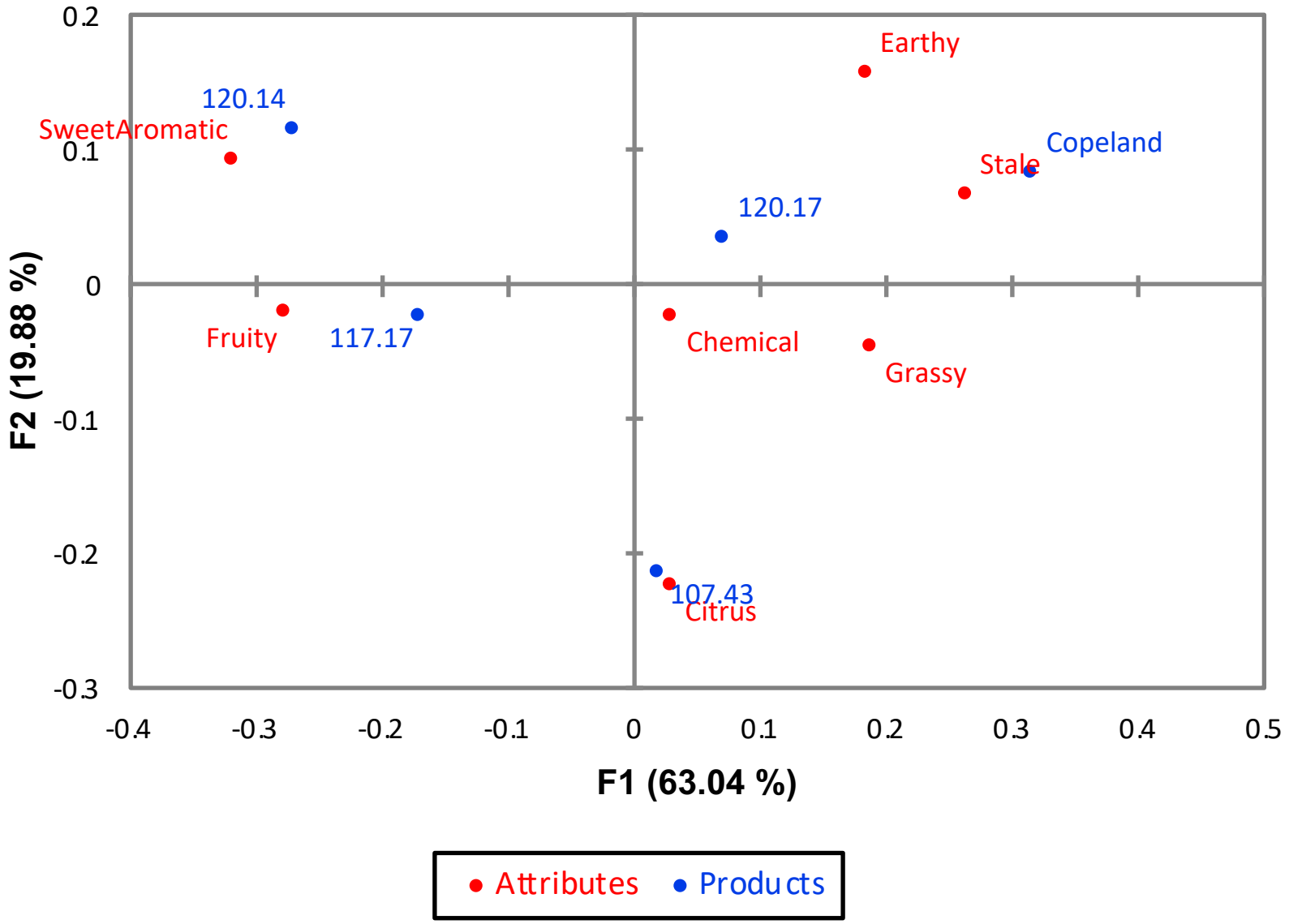
# Beer: Correspondence Analysis (ALL)

**(axes F1 and F2: 76.24 %)**

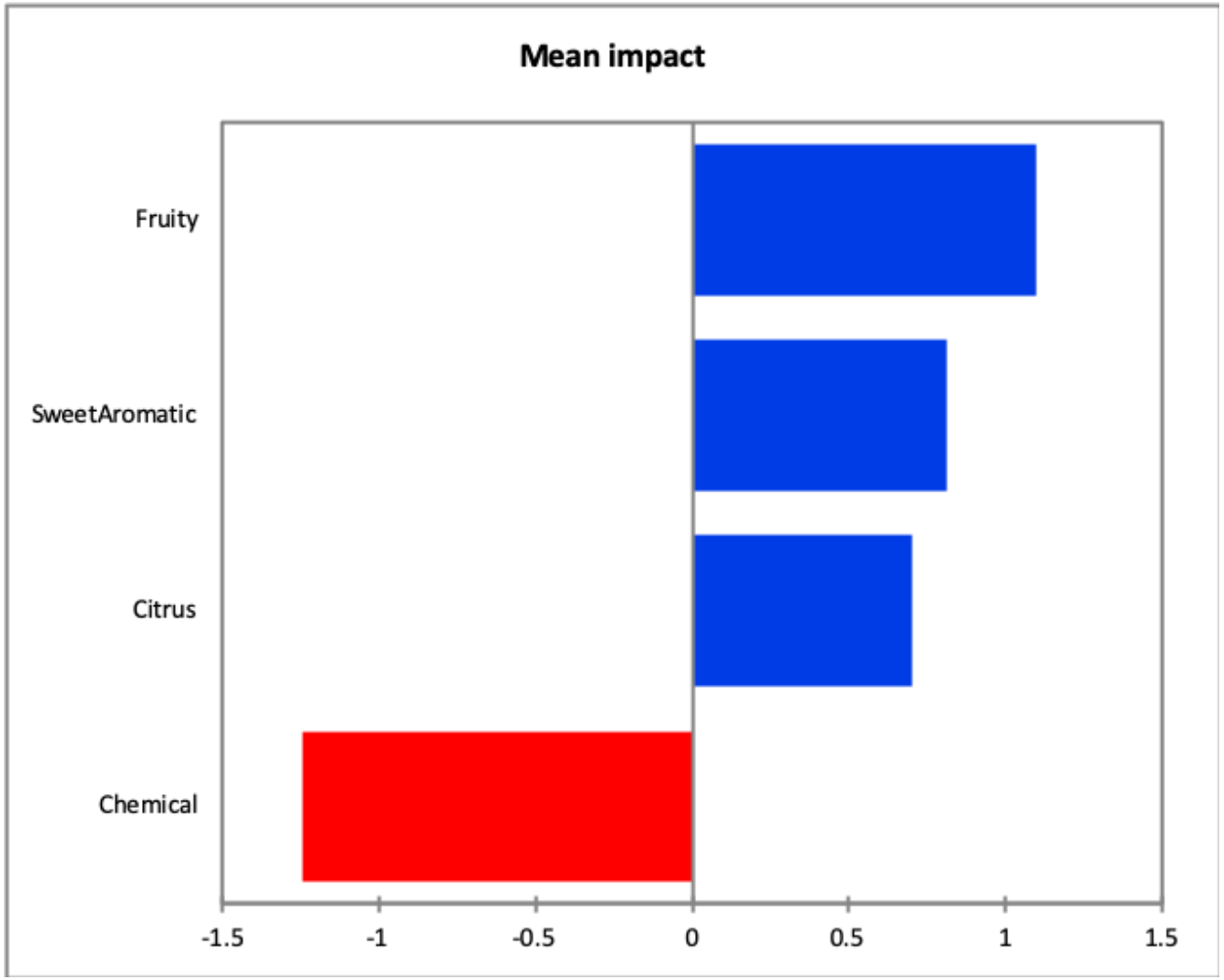


# Beer: Correspondence Analysis

**(axes F1 and F2: 82.91 %)**

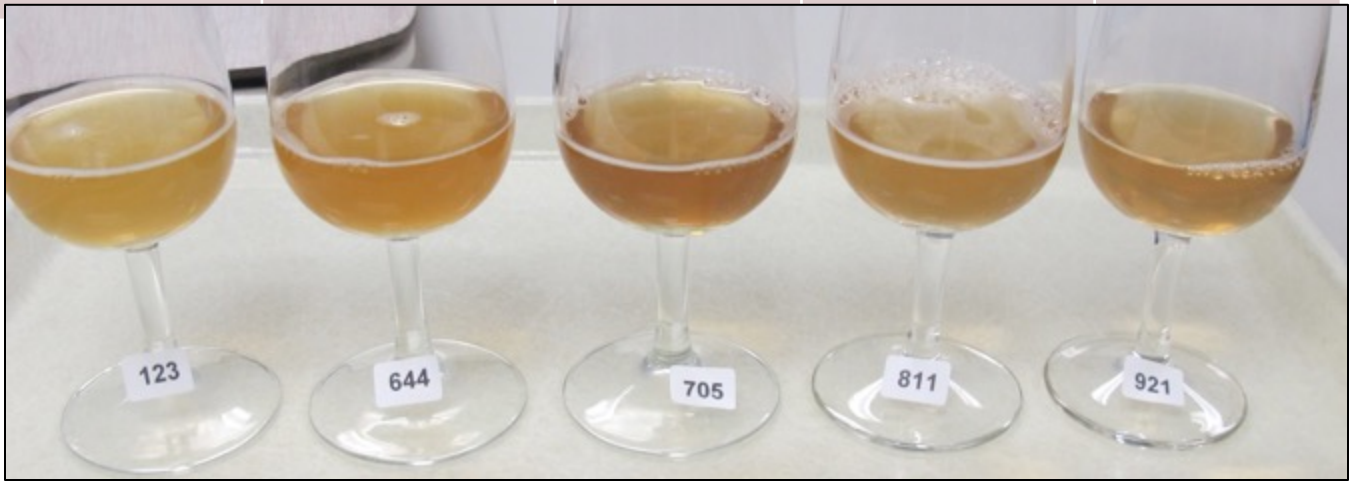


# Attribute Impact on Overall Liking of Beer



# Willingness to Pay for a Six Pack

| Price | Copeland | 120.17 | 120.14 | 107.43 | 117.17 |
|---|---|---|---|---|---|
| $7.99 | 34% | 34% | 25% | 40% | 32% |
| $9.99 | 19% | 18% | 27% | 20% | 24% |
| $11.99 | 6% | 8% | 11% | 5% | 6% |
| $13.99 | 1% | 3% | 3% | 3% | 0% |
| I would not buy this beer | 40% | 37% | 34% | 32% | 38% |



## Impact and Next Steps

- Consumer Behavior
  - Comment Coding
  - Cluster Analysis
  - Logit Models
- 2018 Trial: Sensory at Scale
- MBC Seed Lab SMaSH
- Consumer education and outreach
- Palmer (107.43) variety release

*Evan Mulvaney*

*Brian Thompson*

Port of Olympia

Thurston Conservation District

EST 1947

# Thank you!

Images by Evan Craine