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# Thiols

— Fresh Interest in an Old Friend —

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# Who Am I

- 4.5 years very active homebrewer
- 3 years a BAM member
- Mechanical engineer by trade
- Love anything that gets more from what is already there
  - Turning waste into something useful
- Approach: Hobbyist with and technical background, but by no means an expert on chemistry, biology, yeast metabolism, or rigorous sensory experimentation.
- Let's have some fun!

Follow up questions: [swakopp@gmail.com](mailto:swakopp@gmail.com)

# What IS a Thiol?

- Latin -> sulfur+alcohol
- Key Characteristics
  - Volatile
    - Boiling points: 50-140F
  - Aromatic
    - Thresholds: 10 ppb
    - Goldilocks levels
- Examples
  - **3MH** - 3-Mercaptohexan-1-ol
    - **Grapefruit and passion fruit**
    - Found In Hops, Malt, and Grapes
  - **3MO** - 3-Mercapto-octanal
    - **Peach**
    - Found in some New Zealand Hops
  - t-butyl mercaptan
    - Natural Gas Odorant



- Two major forms
  - **Free (detectable)**
  - **Bound (undetectable)**
- Other aroma compound categories (not covered today)
  - Alcohols, terpenes (typical thresholds in ppm), esters, phenols, other off Flavors

# Yeast and Thiols

- Covering this at a very high level
- Biotransformation
  - Dry Hop timing may impact perceived aroma
- Some yeasts have a natural ability to unlock bound thiols
  - British V
  - London Ale
  - Maxi-Thiol (Wine)
- Yeast producers are developing yeasts with claims to increase 100X more 3MH than parent strain
  - Berkeley Yeast Lab
    - Tropics
  - Omega Yeast Lab
    - OYL-011 Cosmic Punch

# Experiment Time!

About the beer:

- OG:1.048 / FG:1.010(14)
- IBUs (calculated): 26
- SRM: 4
- Grain
  - 45% 2-row
  - 40% Pilsner
  - 10% Wheat Malt
  - 5% Flaked Oats
- Hops
  - 3 Oz Cascade mash hop
  - 1.5 Oz Magnum for 10min
  - 1 Oz each Citra, El Dorado 20min
  - Whirlpool at 160F
  - 0.5 Oz each Citra, Eldorado, Galaxy, Nelson Sauvin for 4 days
- Yeast
  - WLP-013 London Ale
  - Berkeley Yeast Labs - Tropics



- Process: Single infusion mash 154F 1hr, 170F mashout, 10 min boil, 20min 160F Whirlpool, Immersion chiller, Primary 66F ramping to 72F for 5 days, ~1 PSI back pressure
- System: Single vessel, Electric, BIAB

# Experiment Results

Total participants: 23

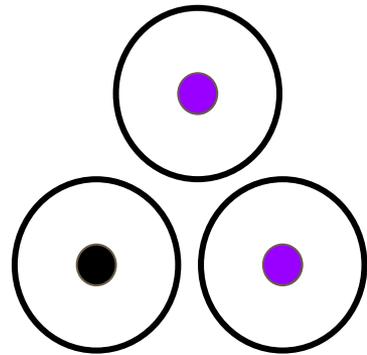
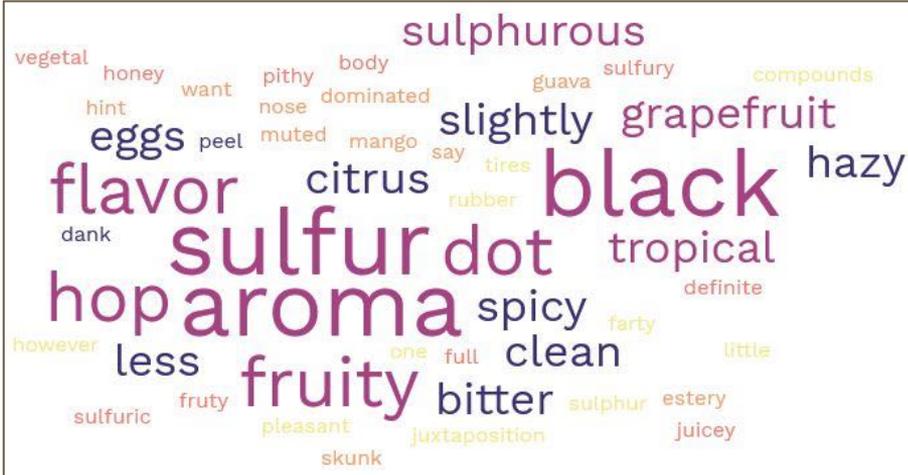
Correct Identifications: 20

Average Confidence: 3.91

Preferences:

- "L" = 11
- Black dot = 10
- No Preference = 1

### Off Flavor Word Cloud

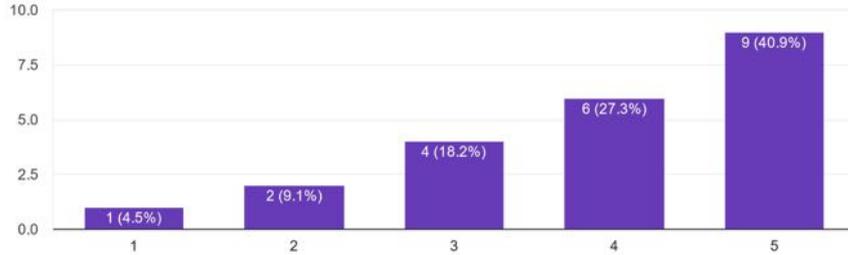


Adjective  
Word Cloud

# Experiment Results Continued

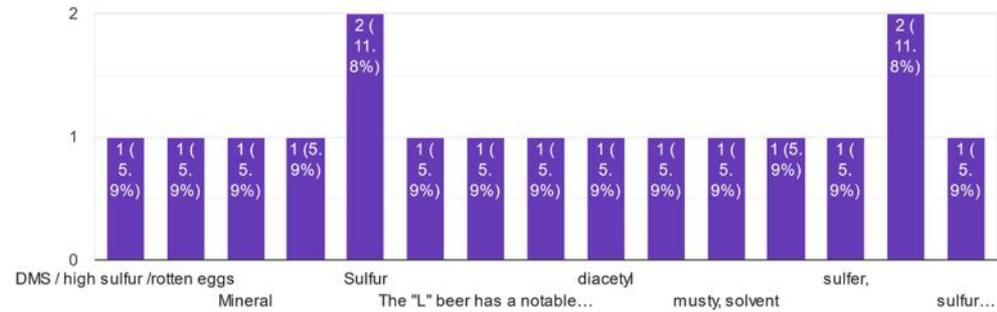
How confident are you in your selection of the unique sample?

22 responses



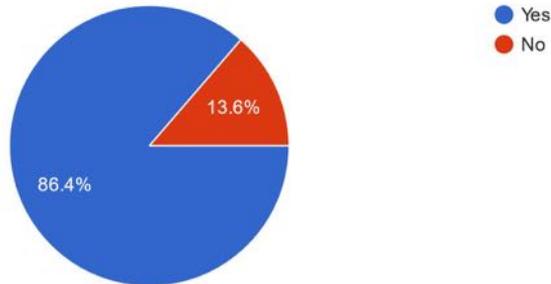
Optional - Did you Identify and off flavors that would be inappropriate in this style (BJCP 2021 21C, Hazy IPA)? if so, please list them.

17 responses



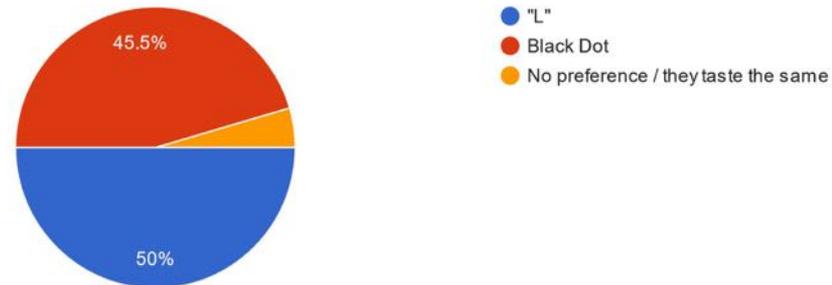
Did you correctly identify the unique sample?

22 responses



Do you have a preference for one sample or the other?

22 responses



# Survey of Tips and Tricks

- Mash hopping - Use hops with high amounts of bound 3MH. (30% IBUs compared to boil)
  - Cascade, Saaz, Calypso, Perle, Hallertau Mittelfrüh
  - Trials maxed out at 7g/L = 1 oz / gal
- Dry hop timing may be important and is hotly debated. Try early, try late, try cool
- Use Hops with high levels of both free and bound thiol precursors
  - Citra, Sabro, Mosaic, Simcoe, Nelson Sauvin
- Apply low pressure to fermentation:
  - (**USE CAUTION:** consider this carefully, no glass fermenters, even low pressure can be harmful, have a back up pressure relief valve)
  - Spunding valve, water column, CO2 pressure
- And Beyond!
  - Phantasm - Dried, powdered, sauvignon blanc skins. Oenobiers.



# Other BAM Experiences

<https://docs.google.com/presentation/d/1xXSEEO4EDdfcBDn46gySdL4bWQGDpiY46JMHBrri8oI/edit?usp=sharing>

# Thank you for your Attention!

Special thank you to Matt Youngblut,  
Thomas Musante, Sean Clinton, Stacy  
at Oak Barrel, Bob Davis, and the BAM  
leadership

# Sources

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- <https://www.freewordcloudgenerator.com/generatewordcloud>

# BACKUP SLIDES

# Water Column Pressure Setup

- Hydrostatic pressure
- Starsan working fluid
- 1 psi = 27.67 inches of water column height

Keep reservoir level at or below inlet on top of fermenter

Lesson Learned!

