



**HOME
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CON
2022**

Yeast Nutrition in Non-Malt Fermentations

Chris Bernardo | Innovation Brewer Omega Yeast



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Chris Bernardo

R&D Brewer

Omega Yeast

Quick Introduction

- Chris Bernardo, Innovation Brewer at Omega Yeast
 - Homebrewer since 2010 before going pro in 2017
 - Tech boy in another life

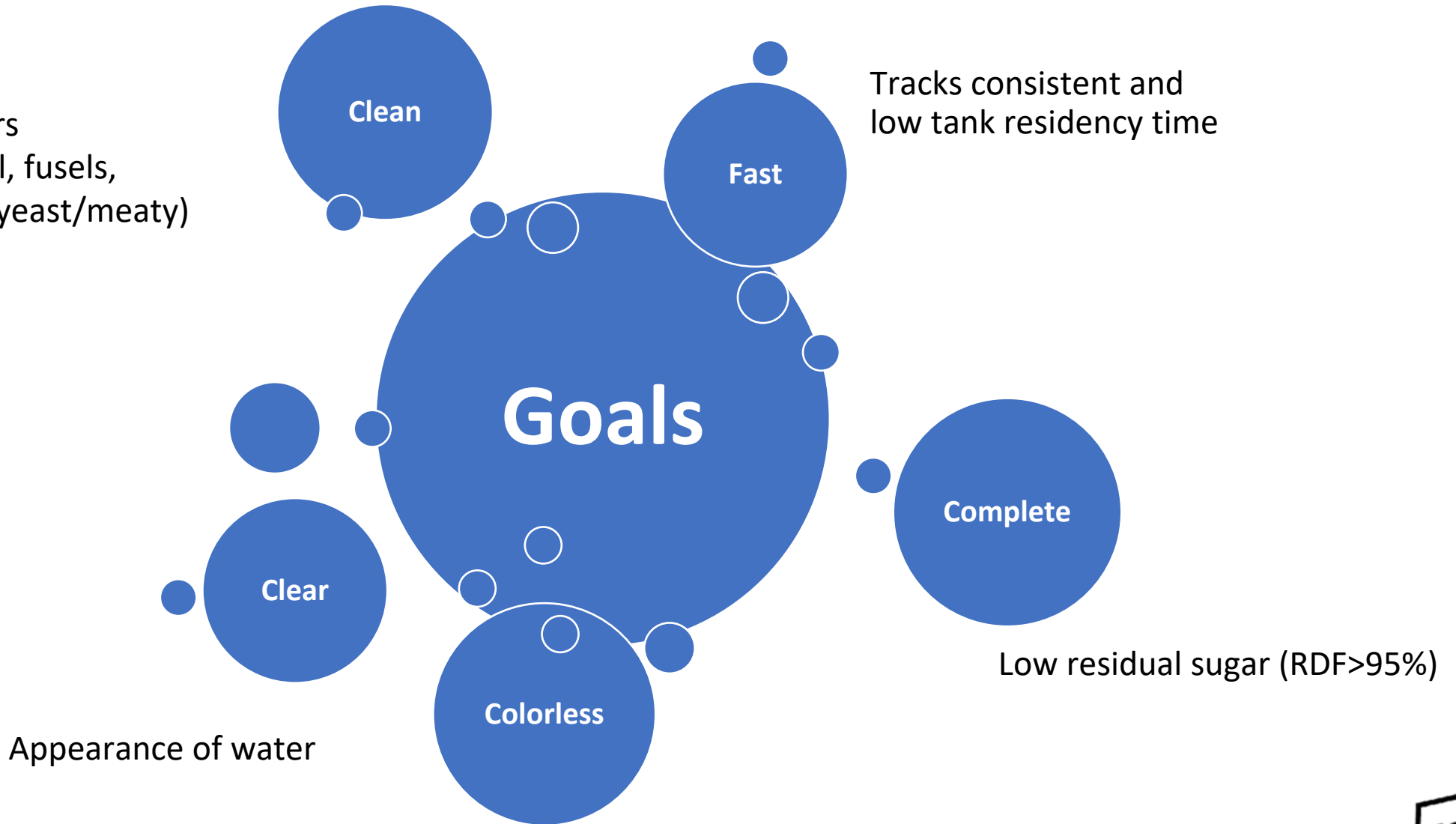
Talk Outline

1. Nutrient Overview
2. Yeast Considerations
3. Study Comparing Nutrient Types and Yeast Strains
4. Fermentation Management
5. Post Fermentation and Considerations

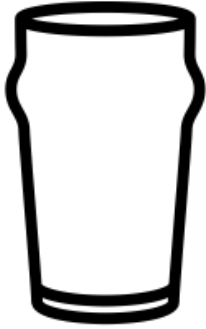


Goals for Hard Seltzer Fermentation

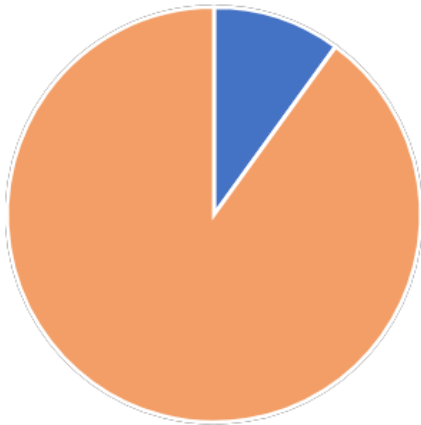
Avoid off flavors
(sulfur, diacetyl, fusels,
acetaldehyde, yeast/meaty)



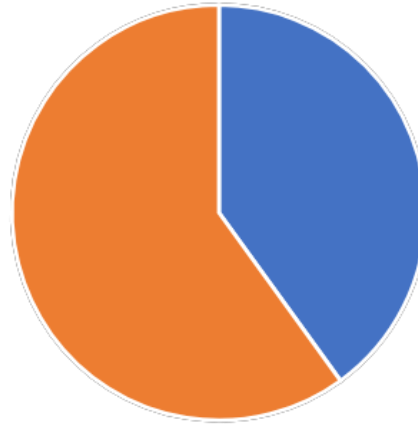
Are Nutrients Needed?



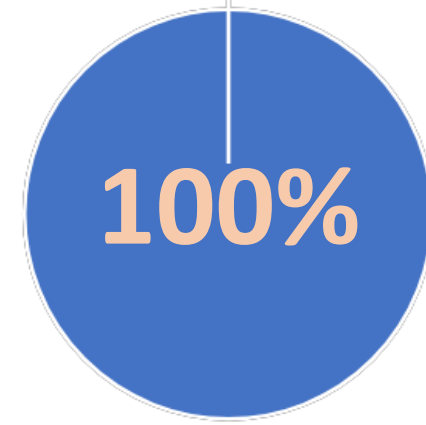
Beer
Low (0.1 g/L)



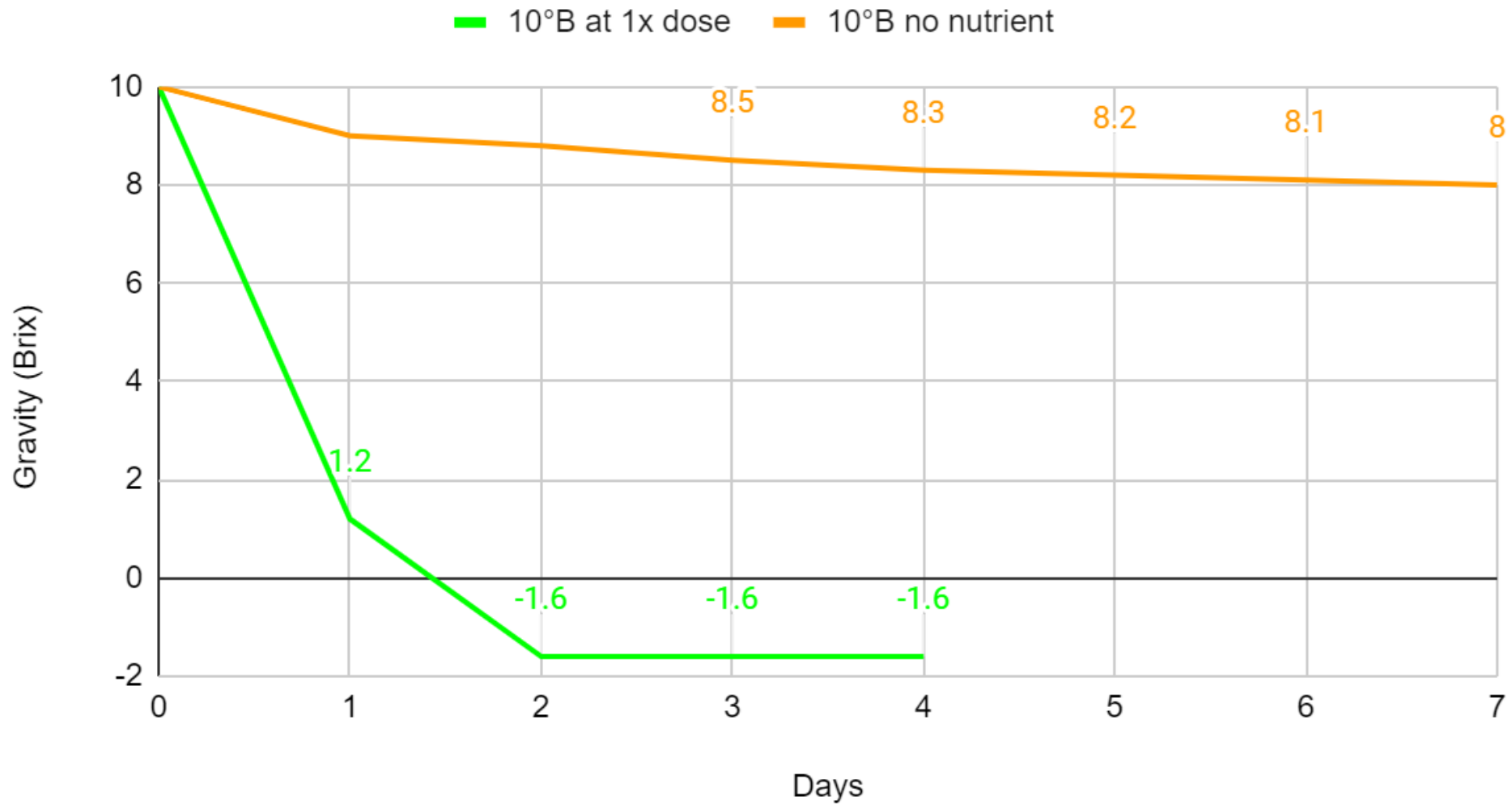
Wine/Cider
Medium (0.4 g/L)



Hard Seltzer
High (1.5 g/L)



Sugar alone will not ferment well!

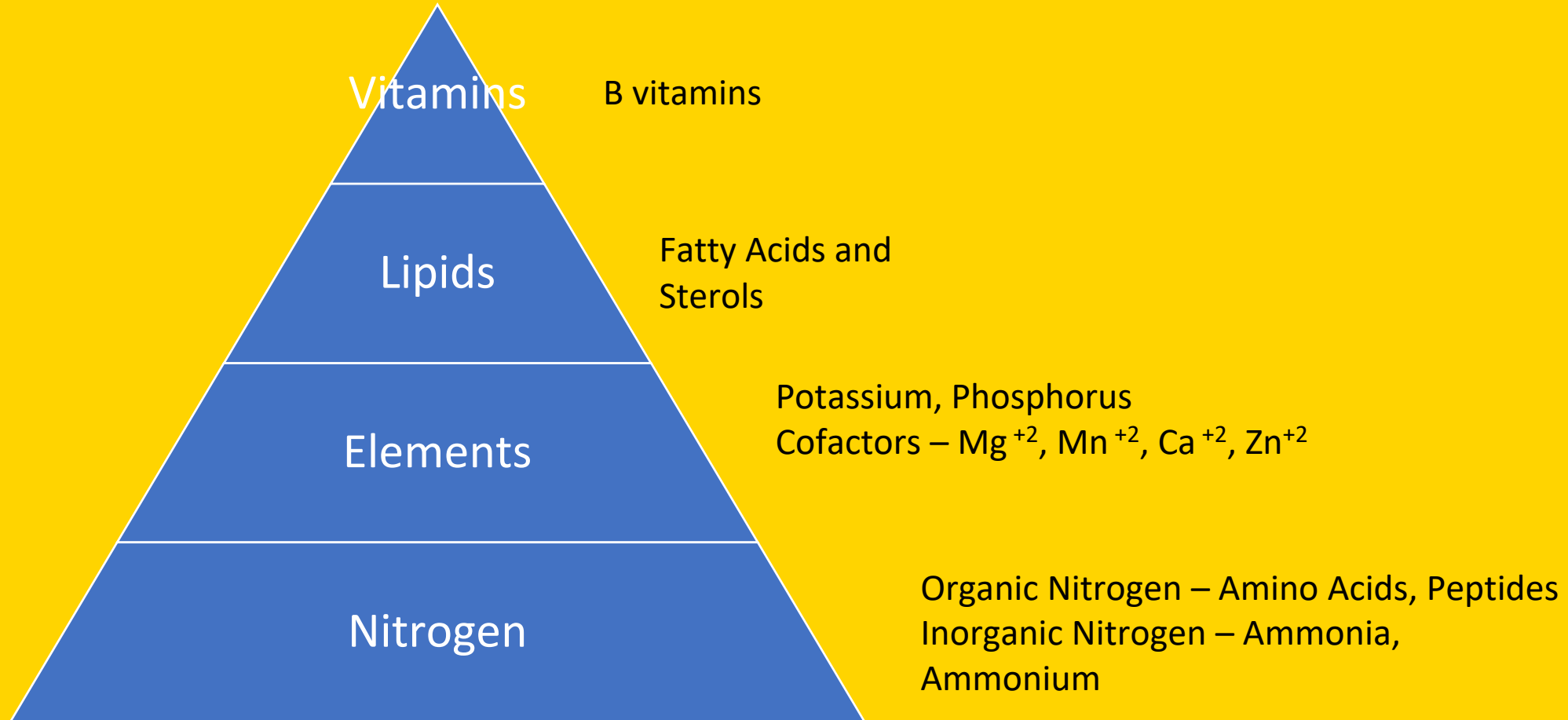




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Yeast Nutritional Needs



Major requirement = Nitrogen

Carbon = 50% yeast dry mass
Nitrogen = 9% yeast dry mass

Beer:

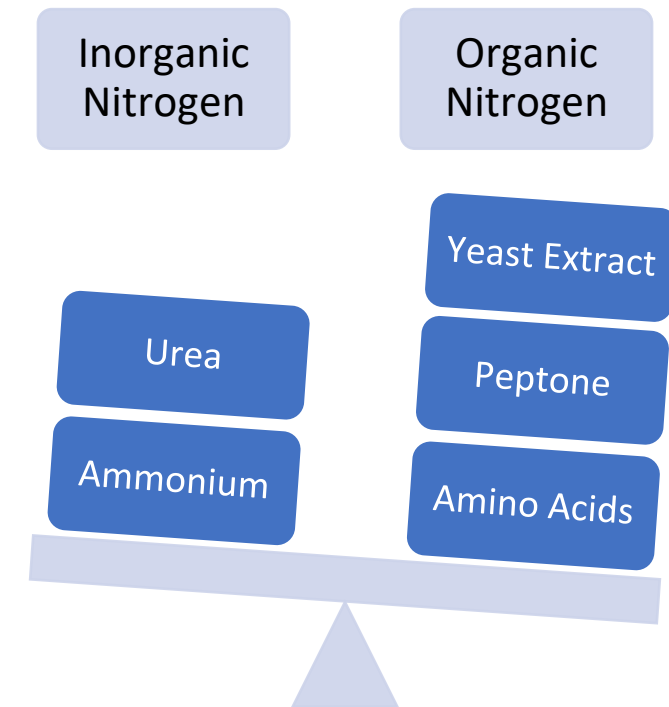
- FAN - free amino nitrogen
- 10-12°P Wort = 150-200 ppm free amino nitrogen (FAN)

Wine/Seltzer:

- YAN = yeast assimilable nitrogen
- Baseline requirements are 1 ppm YAN for every 0.1 Plato
- 10°P = 100 ppm YAN
- 18°P = 180 ppm YAN

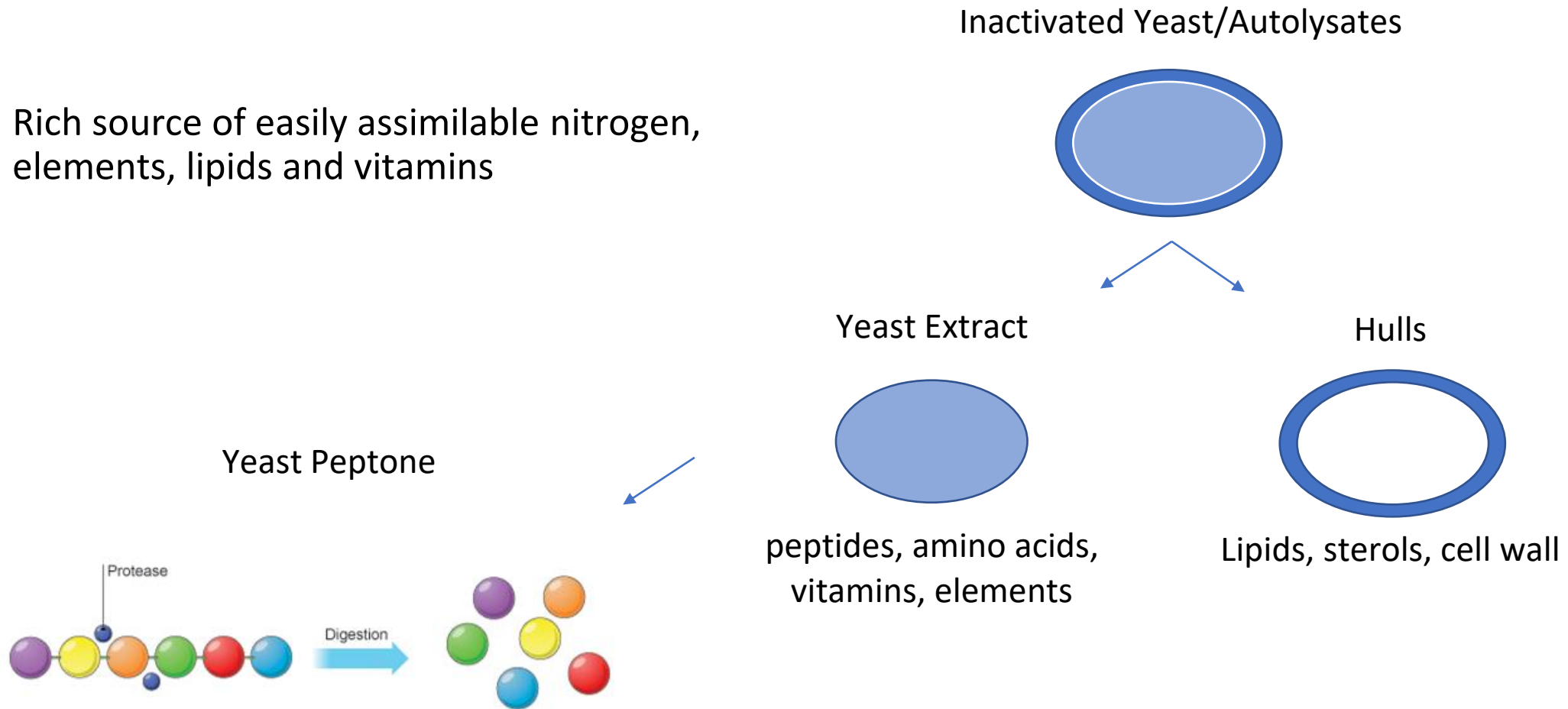
*DEPENDS ON YOUR YEAST, trial and adjust in small increments

Forms of Nitrogen



Yeast-Derived Nutrients

Rich source of easily assimilable nitrogen, elements, lipids and vitamins

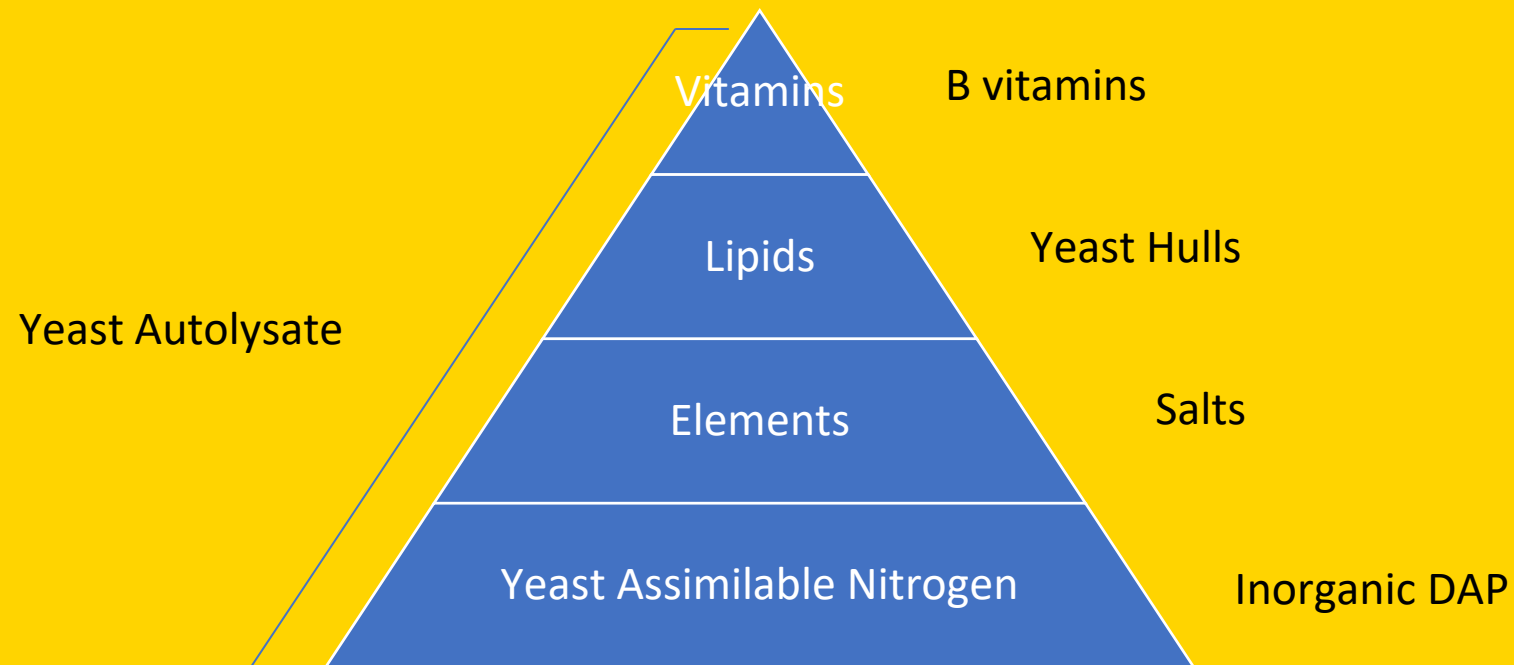


Main Categories of Nutrients Available

YEAST AUTOLYSATE
“organic nitrogen”

vs.

BLENDED NUTRIENT
“inorganic nitrogen”



Yeast Nutrient Compositions by Product Descriptions**

Blended Nutrients
Autolysates

TRADE NAME	INORGANIC NITROGEN	ORGANIC NITROGEN	MINERALS AND TRACE ELEMENTS	LIPIDS	VITAMINS
Fermaid K	DAP	Inactivated Yeast	Magnesium	*	B1, B3, B5, B9
Superfood	DAP	Inactivated Yeast	*	Yeast hulls	B1, B5, B6, B7, B8
Yeastex 82	DAP	Inactivated Yeast	*	*	*
Yeastex 61	DAP	Soy Flour	Potassium, zinc, manganese	*	*
Nutristart	DAP	Inactivated yeast	*	Autolysed yeast	B1
Nutromix	Proprietary	Proprietary	Potassium, zinc, manganese	*	*
Fermax	DAP	Inactivated Yeast	Potassium, magnesium	*	*
SpringFerm NAB-2	Proprietary	Proprietary	Proprietary	-	Proprietary
Seltzer Max	DAP	Inactivated Yeast	*	*	*
Propper Seltzer	DAP	Inactivated Yeast	Proprietary	*	Proprietary
MicroElements	-	Inactivated Yeast	Proprietary, includes Zinc	*	Proprietary
Nutriferm	-	Inactivated yeast	*	*	B1
Fermaid O	-	Inactivated Yeast	*	*	-
Yeastlife O	-	Inactivated Yeast	*	*	-

*Inactivated yeast provides nitrogen, minerals, trace elements, lipids and vitamins

**not a comprehensive list of available nutrients

Selecting a Hard Seltzer Yeast

“Hard Seltzer” yeast... is really

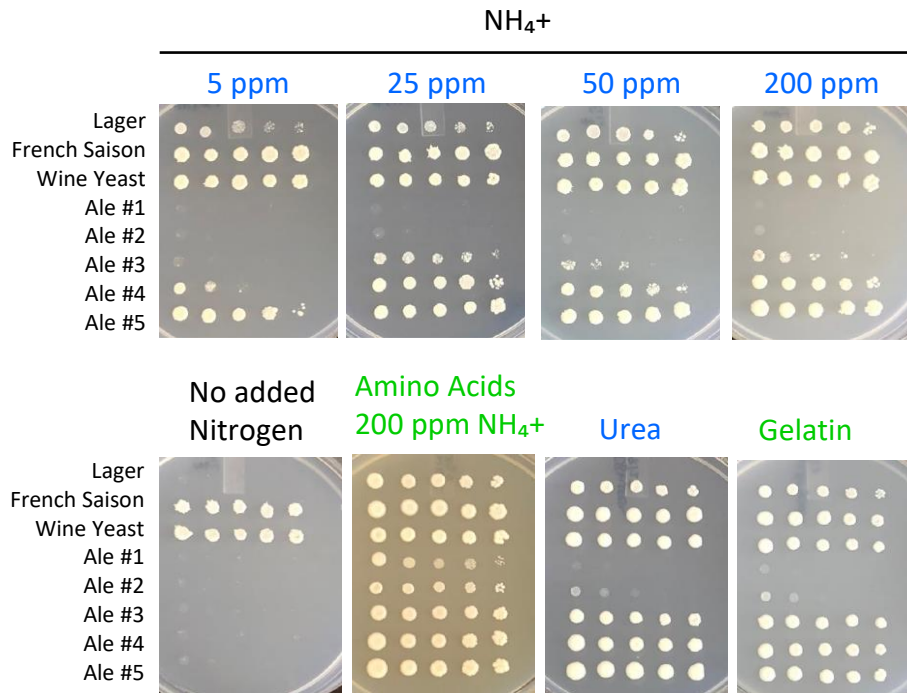
- Wine yeast
- Distillers yeast
- Beer yeast
- Bioethanol yeast

What to look for:

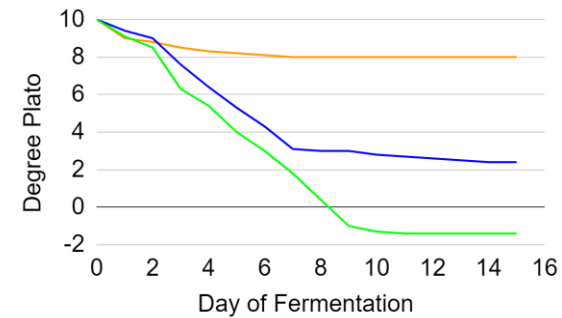
1. Low Nutrient Demand
2. Low pH tolerance
3. High ABV tolerance
4. Flavor
 - Relatively little flavor impact
 - Low sulfur or diacetyl producer
5. Fast, reliable fermentations



Yeast strains have different nutritional requirements



Organic Nitrogen – Ale #2

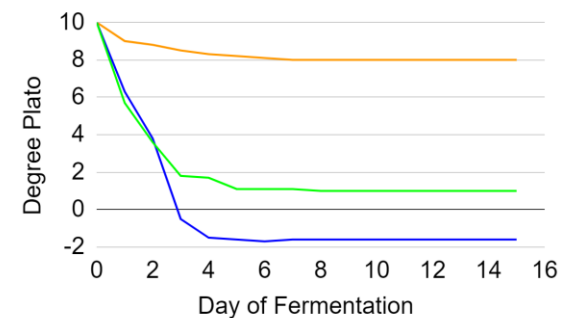


No nutrient

Inorganic nitrogen nutrient

Organic nitrogen nutrient

Inorganic Nitrogen - Ale #5



No nutrient

Organic nitrogen nutrient

Inorganic nitrogen nutrient

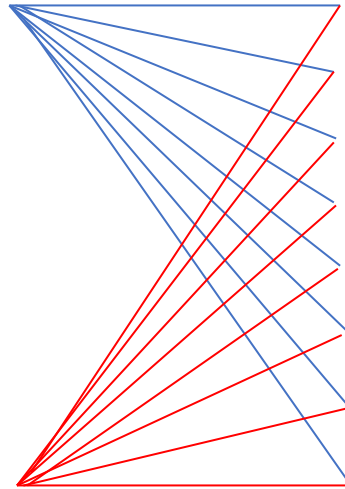


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Evaluating Yeast and Nutrient Combinations for Hard Seltzer Fermentations

Blended Nutrient



Yeast Autolysate

OYL-004 West Coast I Ale

OYL-011 British V

OYL-057 Hothead Kveik

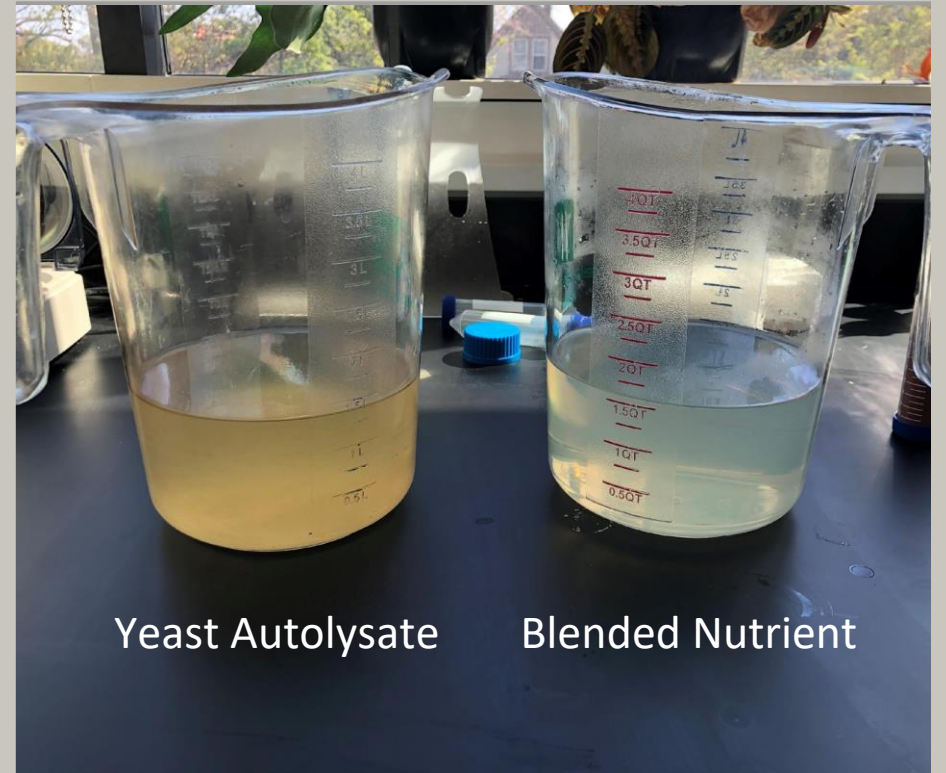
OYL-071 Lutra Kveik

CBC-1 Cask Conditioning

EC-1118 Champagne

D-47 Wine

HG-1 Distilling

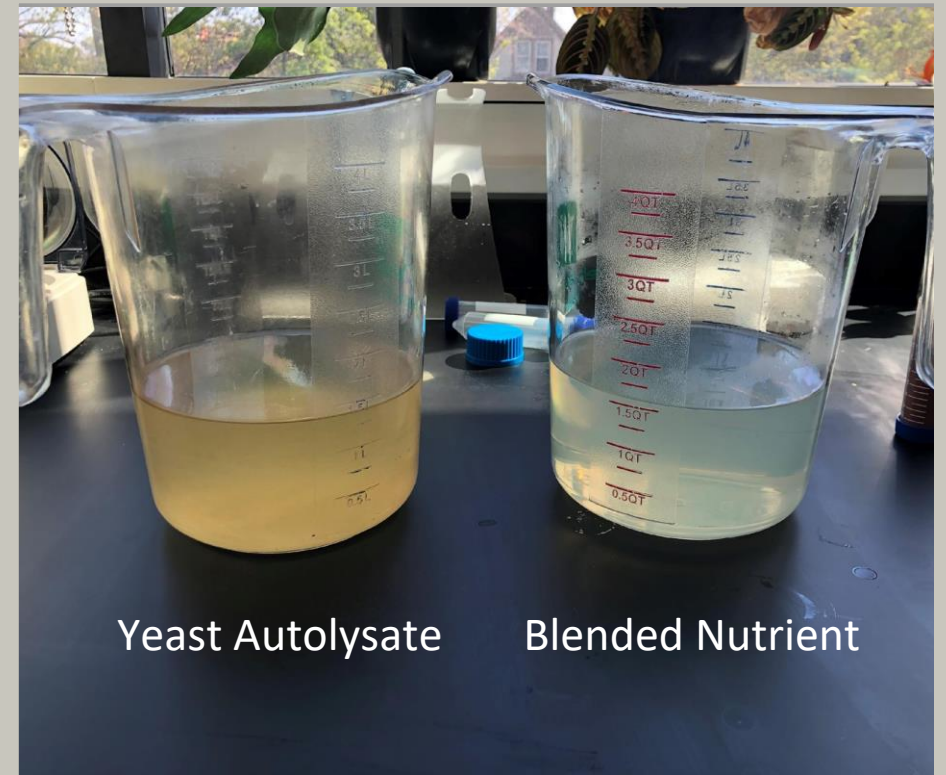


Yeast Autolysate

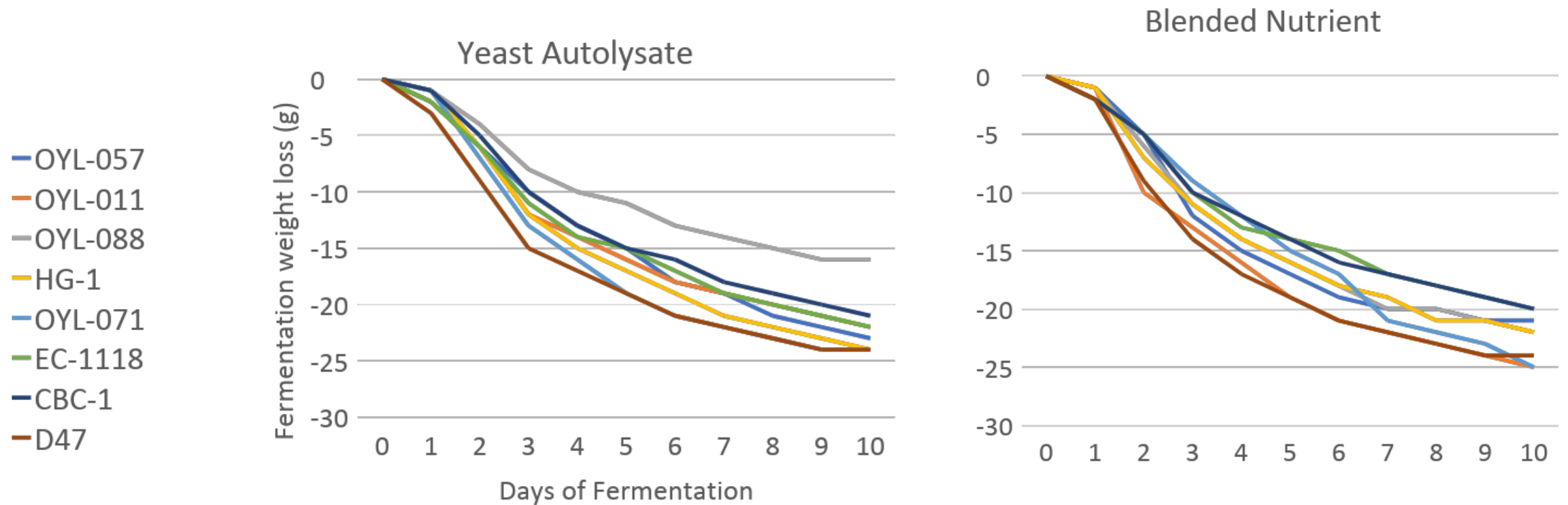
Blended Nutrient

Experimental Setup

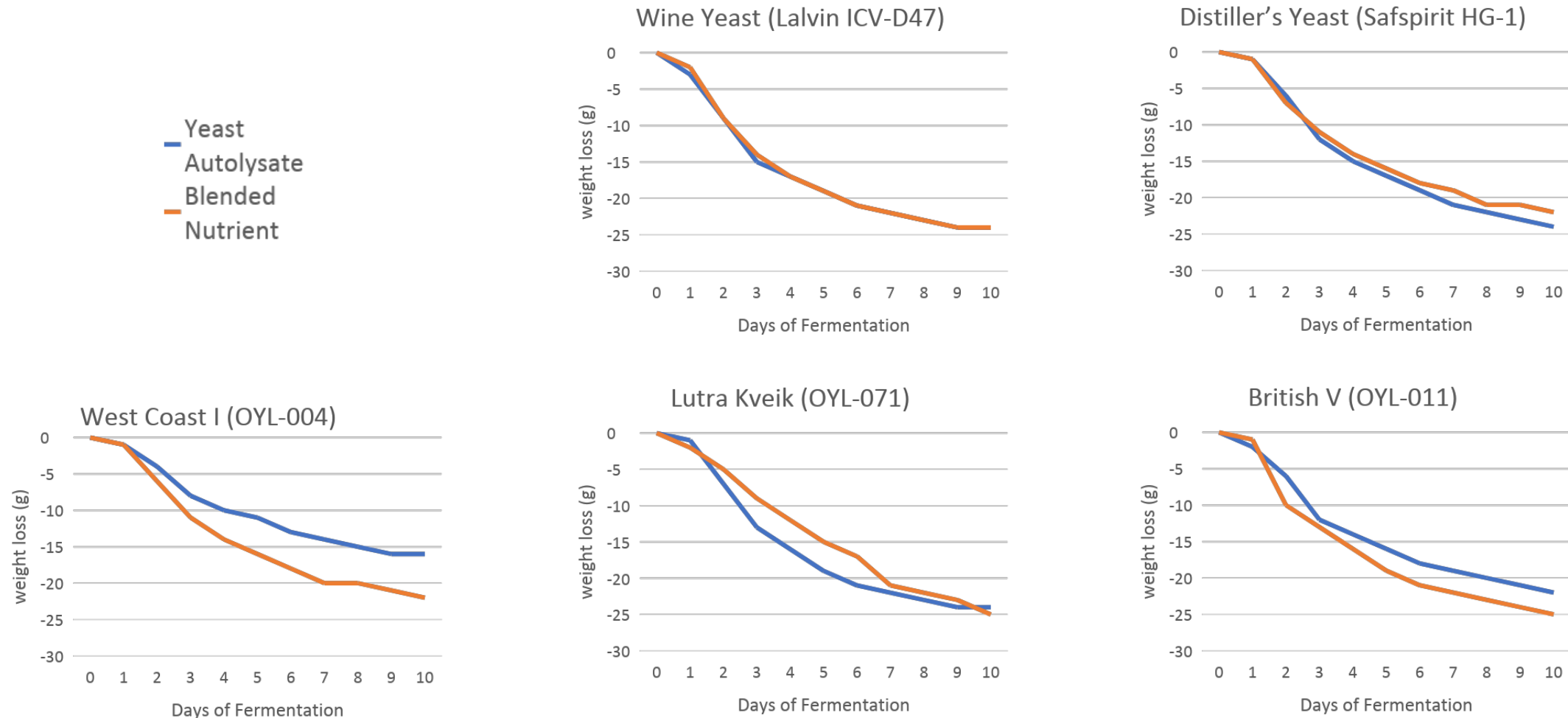
1. 15°P Dextrose Monohydrate Wash
2. 1.5 g/L of each nutrient was added at flameout
3. Yeast pitch rate of 1 million/ml/°P
4. 200 ml fermentations at 30°C
5. Fermentations were tracked by weight loss
6. Final measurements for AE, pH and RDF
7. GC-FID for aroma compounds



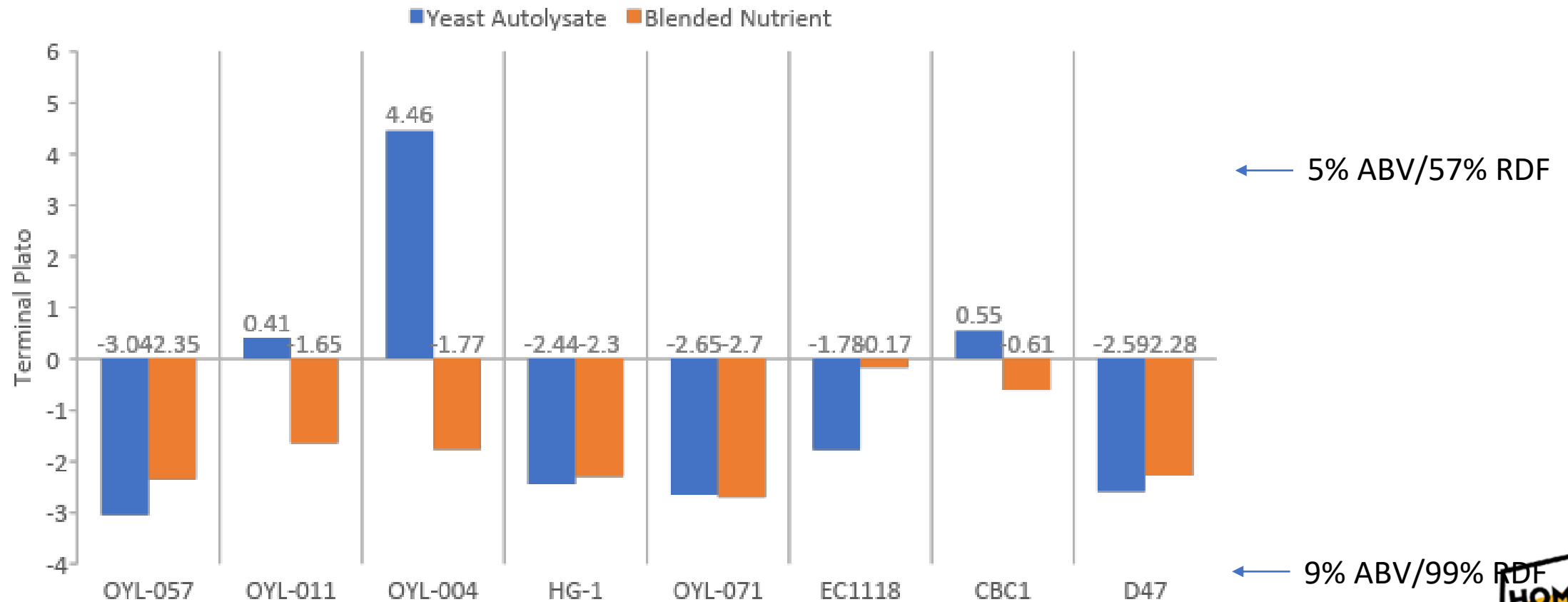
Fermentations Exhibit Similar Kinetics for Both Nutrients



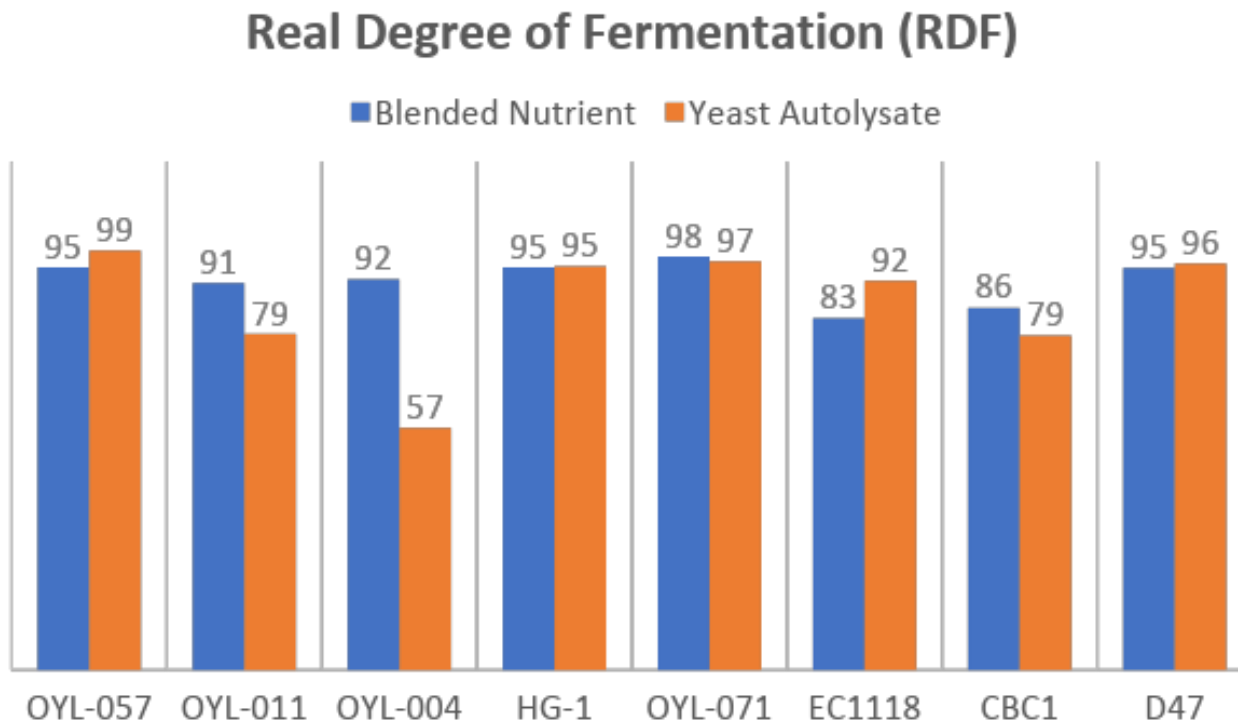
Subtle differences in fermentations show preferred nutrient-strain combinations



Gravity Measurements at 10 days



RDFs Show Preferred Strain and Nutrient Combinations



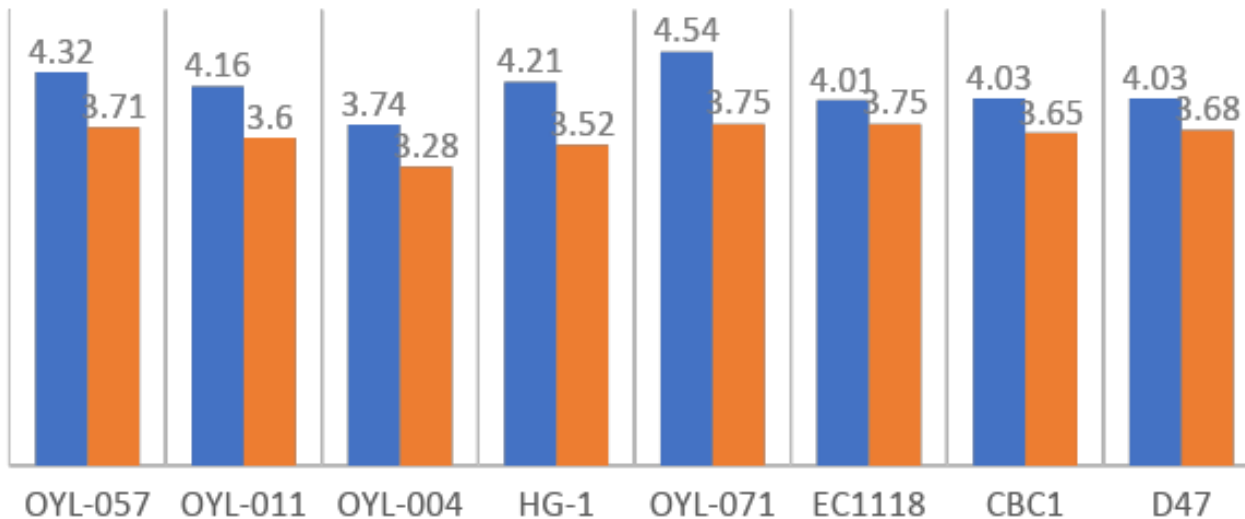
Nutrient	Average RDF
Yeast Autolysate	86.8 +/- 14.2
Blended Nutrient	91.8 +/- 5.1

p value = 0.33, no significant difference

No Buffering Required with Optimized Nutrient

Finishing PH

■ Blended Nutrient ■ Yeast Autolysate



Nutrient	Average pH
Yeast Autolysate	3.6 +/- 0.24
Blended Nutrient	4.1 +/- 0.16

p value < 0.001, significant difference

Sensory Evaluation

Neutral

HG-1 - Distiller Yeast
OYL-071 - Lutra
D47 - Wine Yeast

Incomplete and/or off flavors

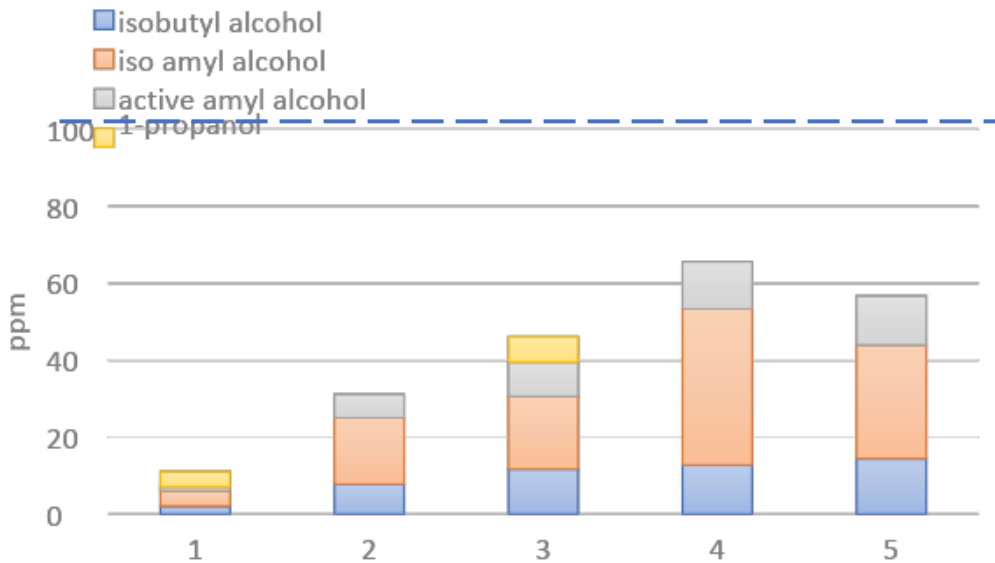
OYL-004 - West Coast Ale I
OYL-011 - British Ale V
OYL-057 - Hothead Kveik
EC-1118 - Champagne Yeast
CBC-1 - Bottle Conditioning Yeast

*subtle color and umami/bready character was present in Yeast Autolysate samples. Picture Blended Nutrient (left) and Yeast Autolysate (right)

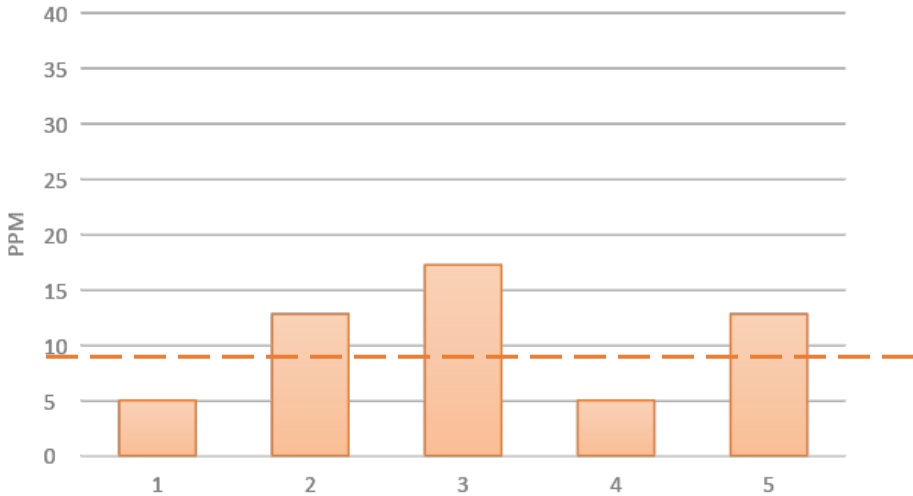


Yeast Aroma Volatiles Remain at Low Sensory Thresholds Showing Benefits to Both Nutrient Choices

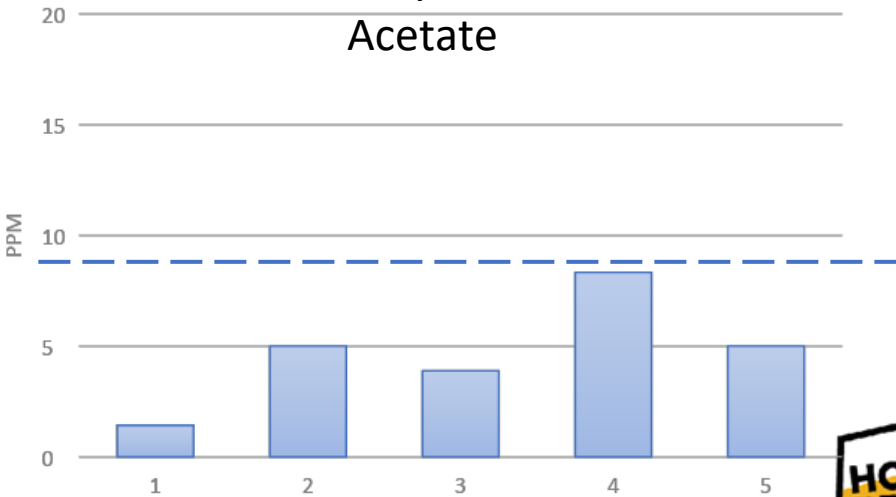
Fusel alcohols



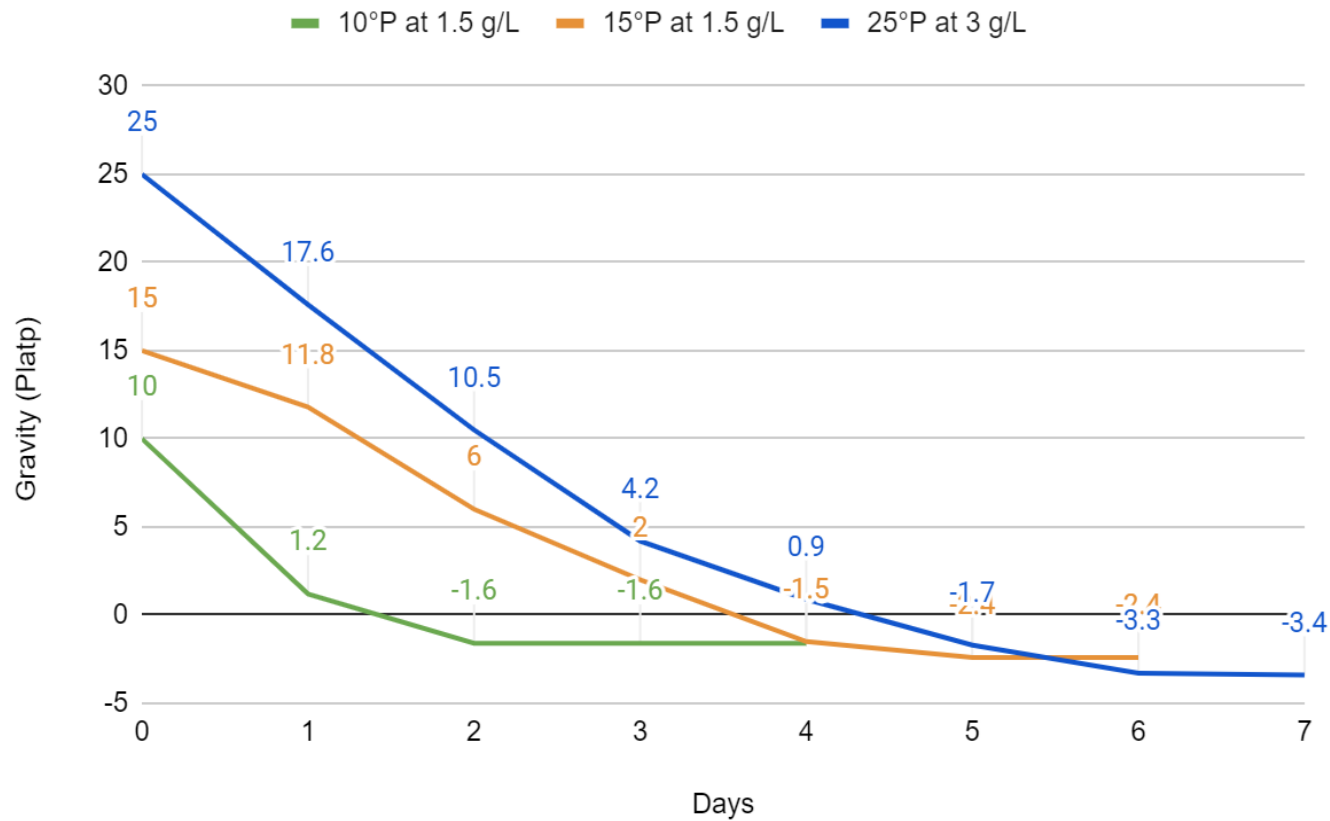
Acetaldehyde



Ethyl Acetate



Blended Nutrient Optimization for Dosing with Lutra



OG	Dose	Duration	ABV	RDF
10°P	1.5 g/L	3 days	6.0%	95%
15°P	1.5 g/L	5 days	9.3%	95%
25°P	3.0 g/L	7 days	16.0%	93%

Conclusions of Study

1. Yeast Autolysate and Blended Nutrients are both well suited for fast and reliable hard seltzer fermentations.
1. It is recommended to trial your specific yeast strain in several nutrients, as their nutritional needs vary.
1. Yeast Autolysate will impart color and flavor, where Blended Nutrients with lower amounts of yeast-derived products may offer a more neutral sensory to the finished product.





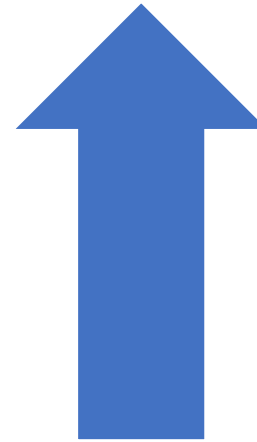
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When it goes wrong...



Invest in optimizing your yeast and nutrient, and you will have less problems to fix downstream!



Too much Nutrient

- Favors biomass
- pH drop
- Off flavors - meaty
- Microbial instability
- Color/clarity issues



Not Enough Nutrient

- Stalled/sluggish/Incomplete
- Off flavors – sulfur, diacetyl
- Low biomass
- Poor yeast health

Nutrient Strategies and Encouraging Fermentation

- Staggered nutrient additions
 - Omega studies have not shown significant benefits in hard seltzers
 - For high starting extract (18°P+)
 - Why? Split the nutrient into additions to support growth and fermentation
 - Do not double up, but supply as needed
 - Lower inorganic nitrogen at start to encourage organic nitrogen uptake
- Aeration
 - 24 hours after knockout, avoid when fermentation is >30% complete
- Rousing with CO₂ or circulation
 - If fermentation begins to slow/stall, rouse to degas and bring yeast into suspension
- Do not add nutrient to stuck fermentations
- If fermentation slows at low pH (<3), add buffer to bring up to pH 4

Buffering Your Fermentation

Yeast fermentation lowers pH:

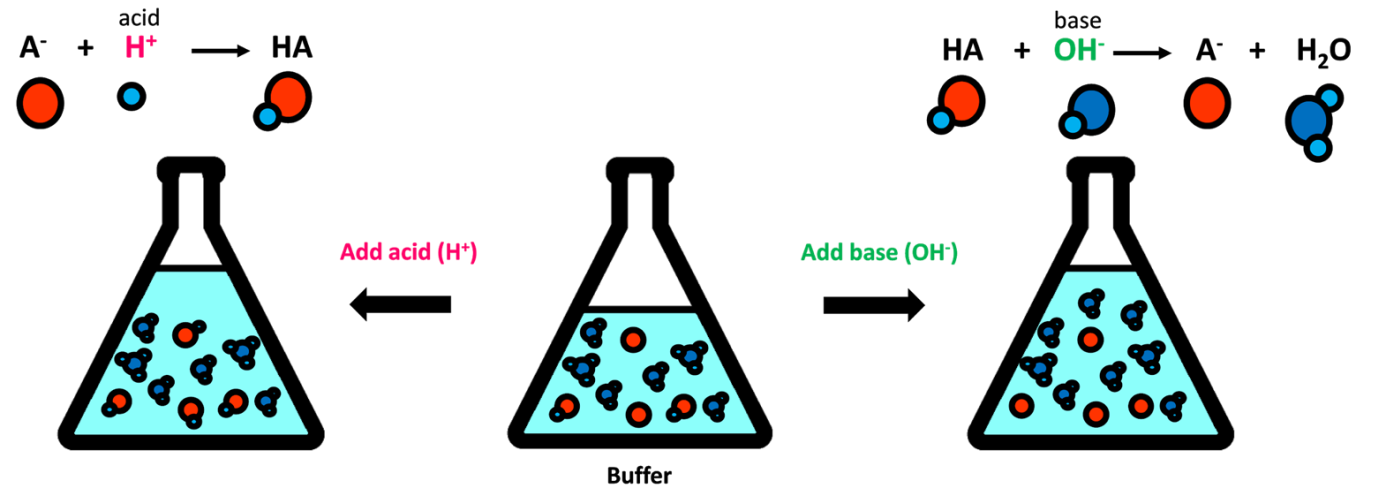
- Remove ammonium ions (strongly basic)
- Add CO₂ (carbonic acid)
- Add organic acids

Acidic pH (<3.0):

- Yeast stress response
- Altered membrane transport
- Lessened nitrogen uptake

Types of buffers:

- Calcium carbonate
- Potassium bicarbonate



Benefits of High Gravity Seltzer Fermentations

Higher Alcohols and Esters Profile:

Sample ID/ Parameter	1957 088 10 Plato	1958 071 10 Plato	1959 Control WC	1960 071 20 Plato	1961 088 20 Plato
Acetaldehyde, (ppm)	69.07	47.86	5.08	18.12	33.13
Ethyl Acetate, (ppm)	12.74	91.23	1.43	24.58	28.93
Methanol, (ppm)	n.d.	n.d.	n.d.	n.d.	n.d.
n-Propanol, (ppm)	12.78	9.74	3.79	13.69	14.30
Isobutanol, (ppm)	57.27	16.98	2.04	22.15	33.01
1-Butanol, (ppm)	n.d.	n.d.	n.d.	n.d.	n.d.
Active and Iso-amyl Alcohol, (ppm)	45.63	69.11	5.26	99.41	97.98
Furfural, (ppm)	0.93	n.d.	11.28	1.25	6.67
Total Fusel Oils, (ppm)	115.68	95.84	11.10	135.25	145.30

n.d. = Not Detected

- Save space by making concentrated base.
- Base is more neutral tasting when fermented at higher gravity and cut post-fermentation with water.

Yeast Pitching Considerations

Pitch rate:

Consistent with beer (1million/ml/degree Plato)

More is not necessarily better! Sops up nutrient and limits the production of new and healthy cells.

Repitching:

Possible, but only with optimized fermentations!

- Consistent, fast tracking, healthy and viable yeast

Yeast has limited growth in hard seltzer fermentations

- May only harvest enough for 1-2 x the fermentation volume

Harvest yeast as soon as fermentation is complete

- Avoid high alcohol and low pH environment and store in sterile deaerated water

Yeast slurry is just yeast! Will be “less” but higher cell concentration

If nutrient does not provide zinc, then supplement zinc when re-pitching

Avoid reusing yeast from high ABV seltzers





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Yeast and Color/Flavor Removal

Best Practices to Avoid Clarity/Color Issues

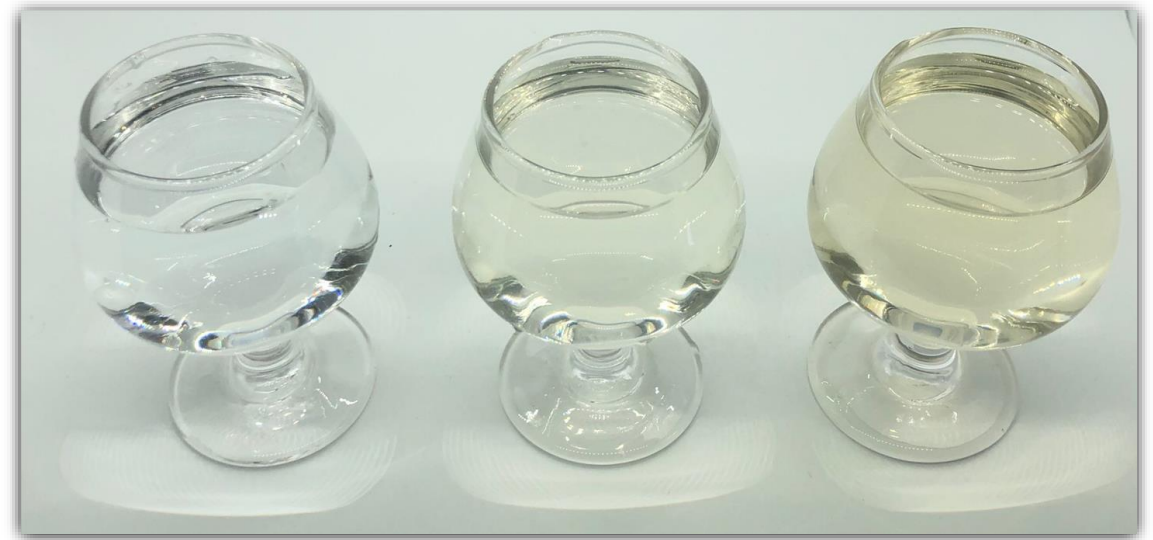
- Do not crash cool too early. Allow fermentation to complete and yeast to begin to settle.
- When adding the nutrient, cool as quickly as possible to minimize color development.

Yeast Removal

- Yeast that flocculates well (ale yeast)
- Centrifuge

Color/Flavor Removal

- Carbon Filter



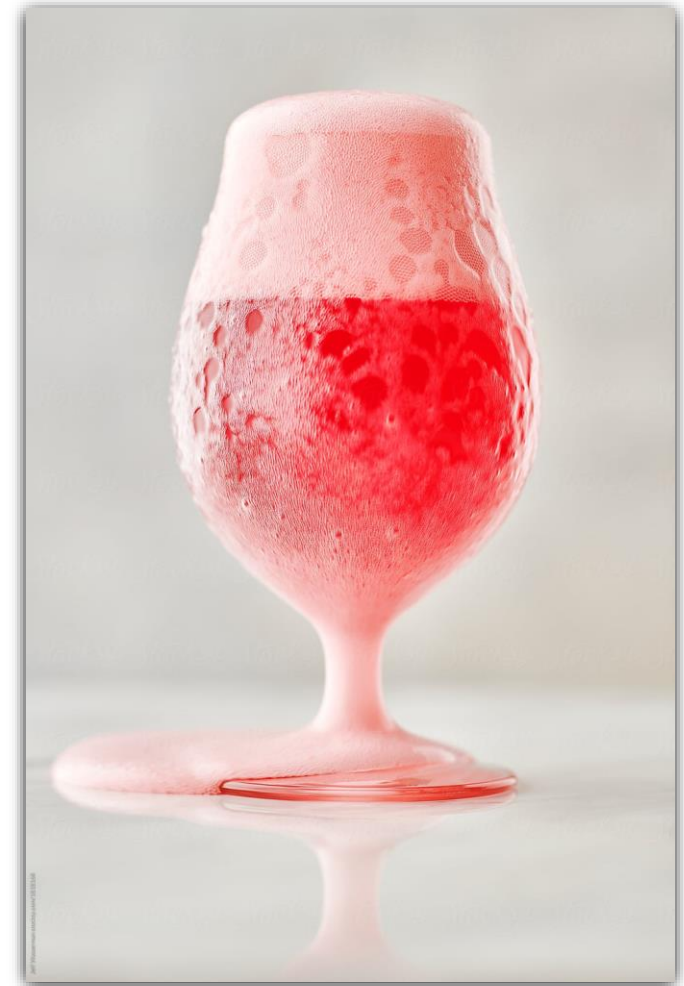
Pictured left to right: Water, 9% ABV seltzer blended nutrient vs. autolysate

How to flavor and have shelf stable product?

Problem: 10% juice/puree can add 1-4% of fermentable sugar, and up to 2-8 volumes of CO₂ to finished product!

Solutions:

1. Allow yeast to re-ferment prior to packaging
2. Preservatives (Potassium Sorbate, Potassium Metabisulfite)
3. Velcorin
4. Pasteurization



Thank you! Questions?

Contact: chris@omegayeast.com

Acknowledgments

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Bianca Alley, Lab Manager

Chris Bernardo, Innovation Brewer



Related Resources

Find hundreds of other member resources on [HomebrewersAssociation.org](https://homebrewersassociation.org)

- AHA Website Resource: [How to Make Hard Seltzer at Home](#)