

OREGON WINE



PORTLAND

SYMPOSIUM

Brettanomyces control strategies

James Osborne, Professor, Oregon State University

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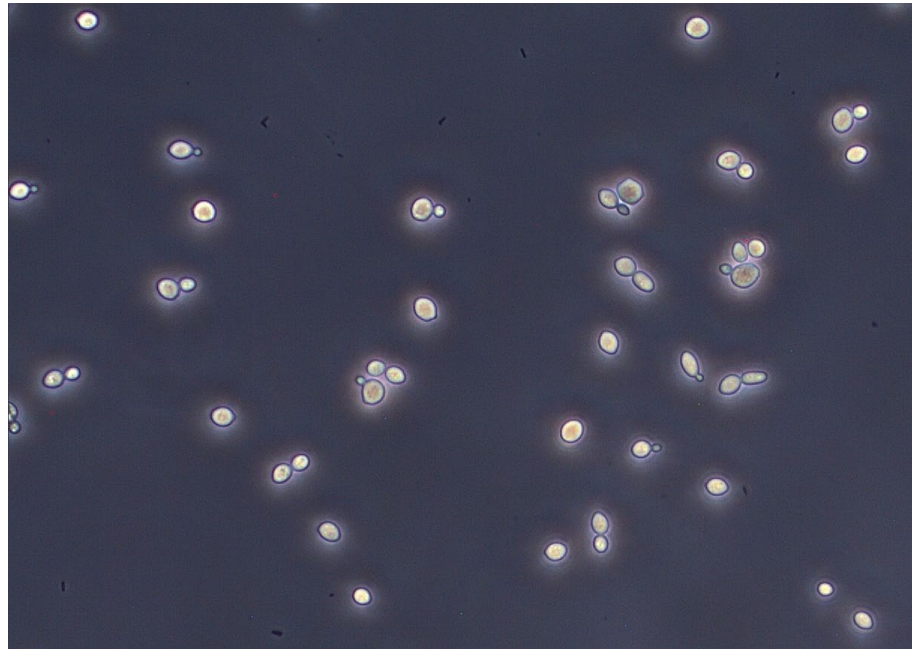


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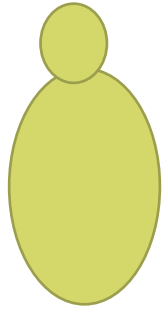
Oregon Wine
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Brettanomyces wine spoilage

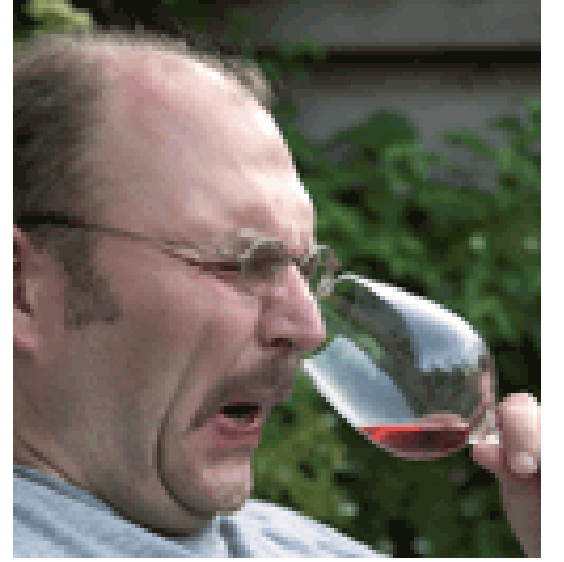
- Preventative vs. Treatment
- Tools and strategies to reduce risk of *Brettanomyces*
- Utilizing interactive effects



Preventing spoilage

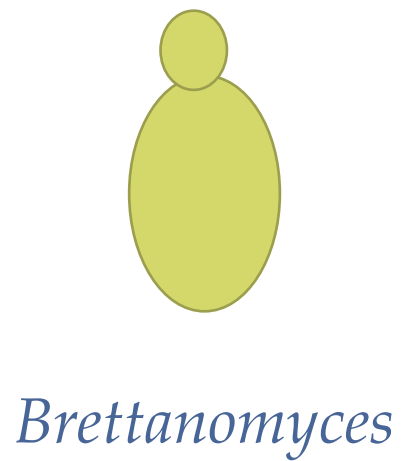


Spoiled wine

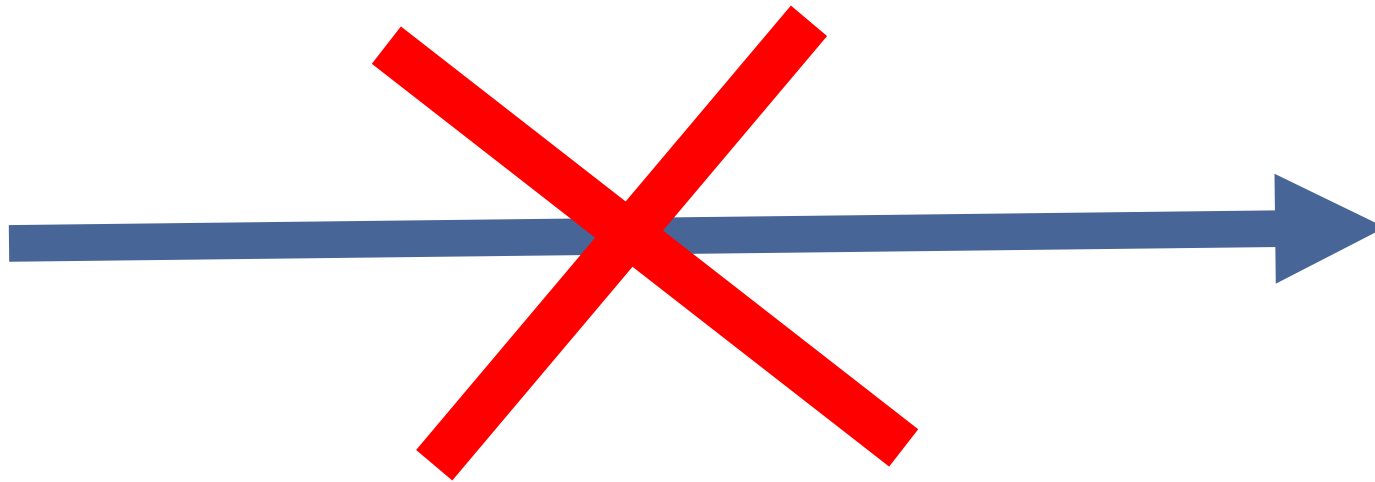


Brettanomyces

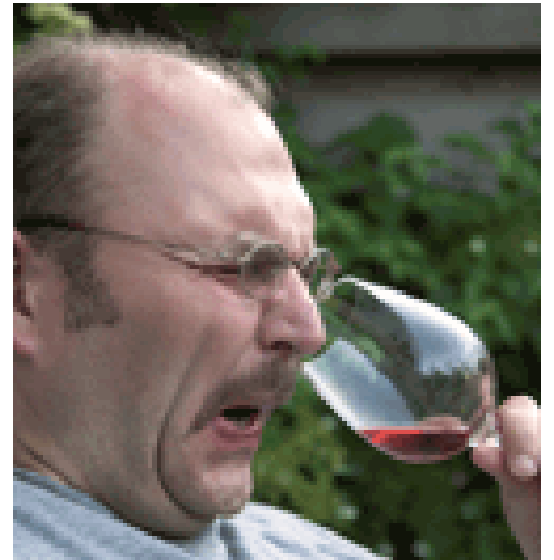
Preventing spoilage



SO_2



Spoiled wine

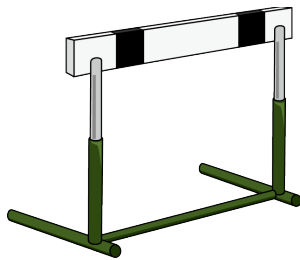
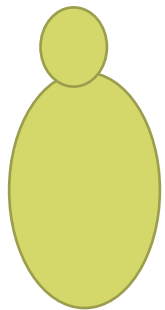


Hurdle Concept

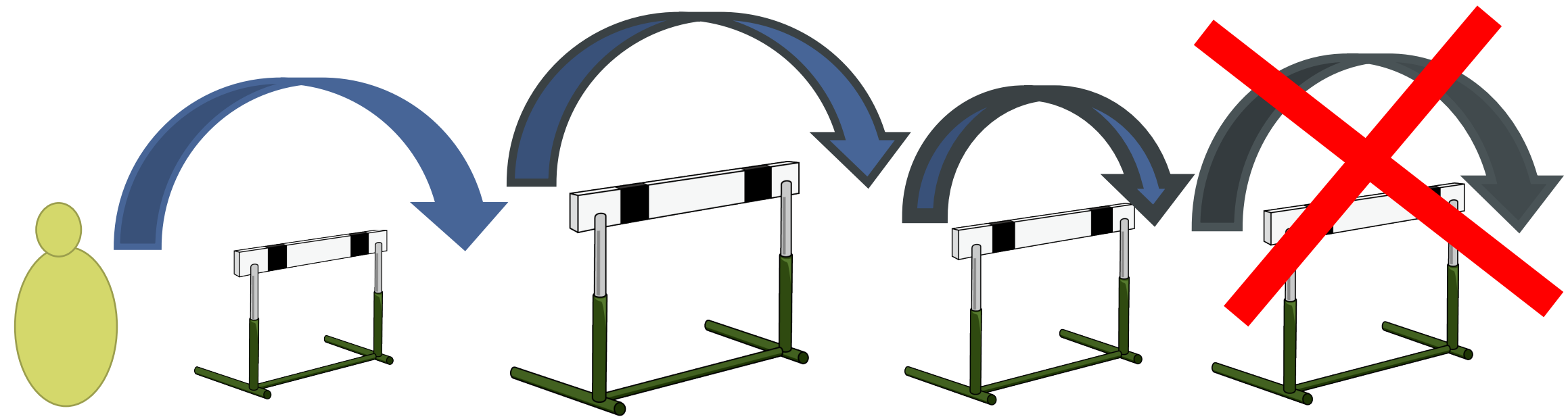
Combining multiple control methods (hurdles) to ensure acceptable reduced microbial growth while retaining desirable product quality and/or nutritional value

Too few hurdles increases risk

Too many hurdles could result in unnecessary costs



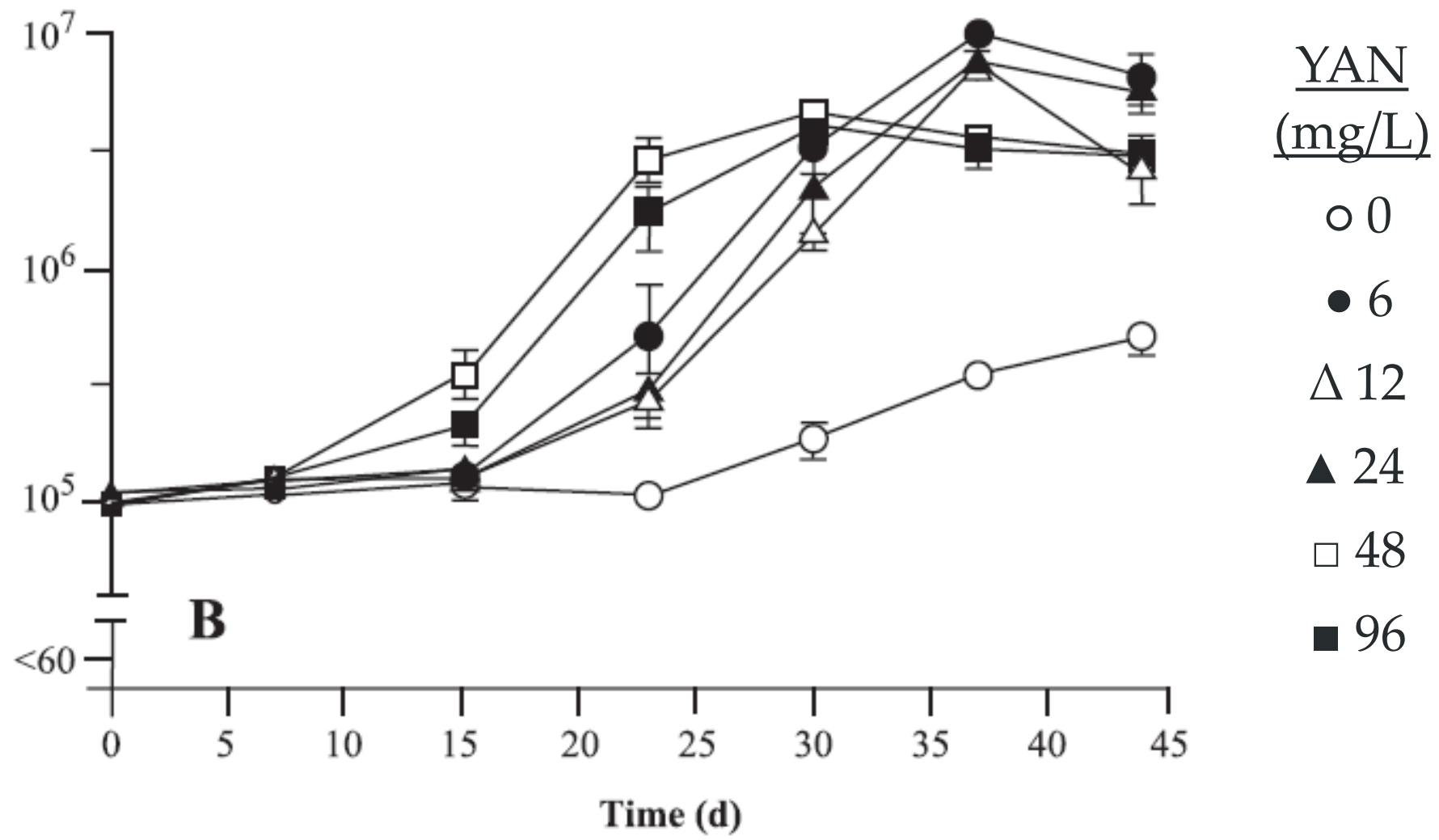
Hurdle Concept



Hurdles for Brett

- Fruit sorting & sanitation – lower initial microbial populations
 - Higher microbial loads place greater demand on SO₂
- Wine residual nutrient management
 - Glucose/fructose
 - Nitrogen
 - Lowers risk but does not prevent spoilage

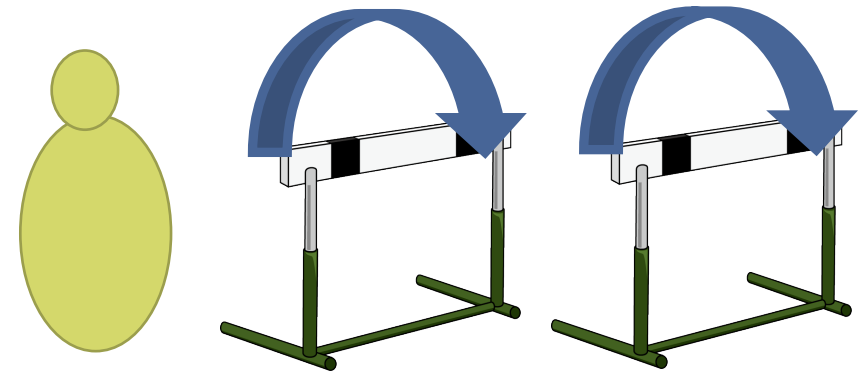
B. bruxellensis E1 in synthetic wine 13% EtOH



Brett Hurdles

Sanitation

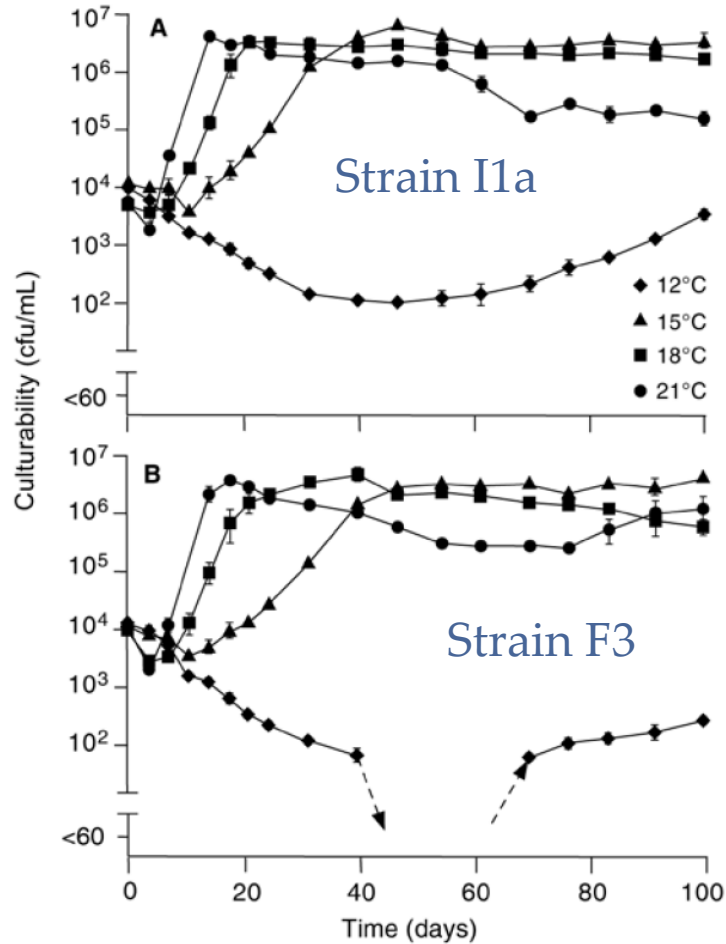
Low residual
sugar/nutrients



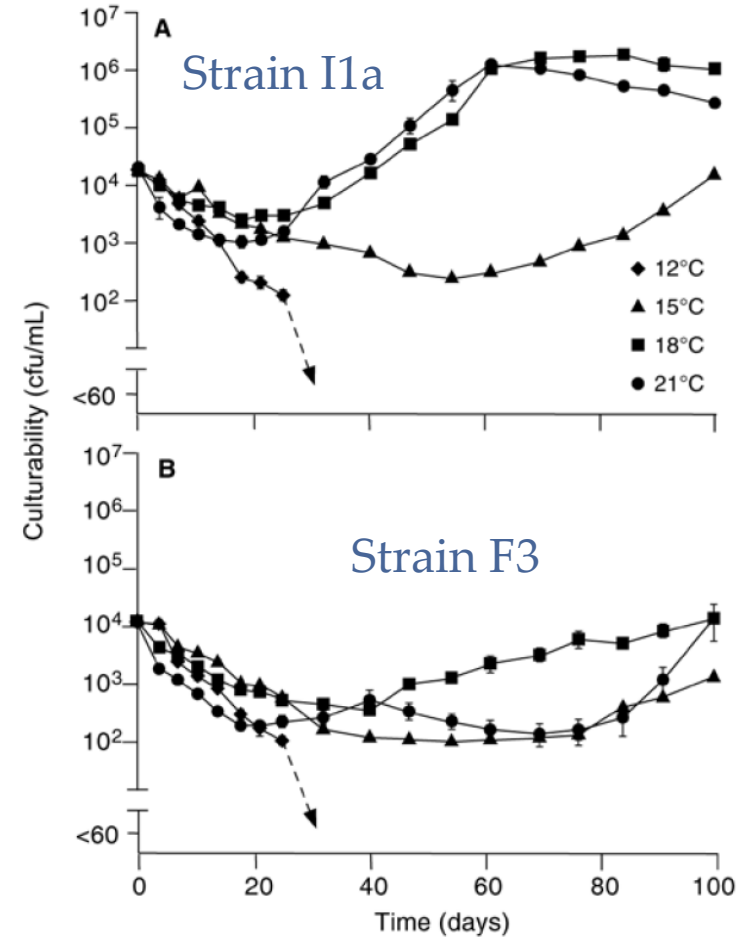
Wine chemistry and conditions as hurdles

- pH
- Ethanol
- Temperature
- SO₂
- Interactive effects

Interactive effect of ethanol and storage temperature on *Brettanomyces* growth



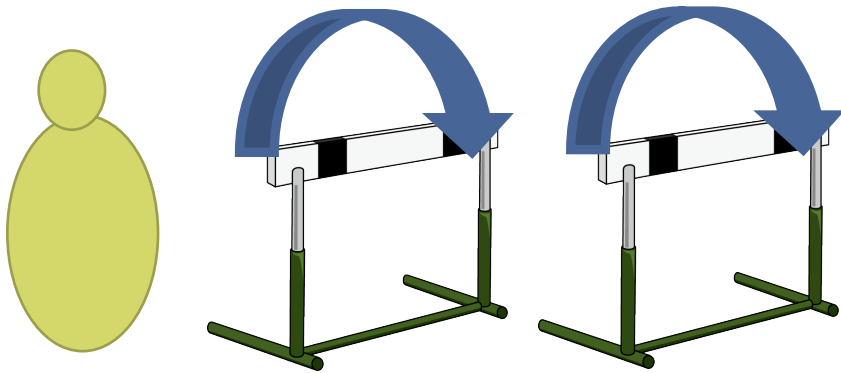
13% ethanol



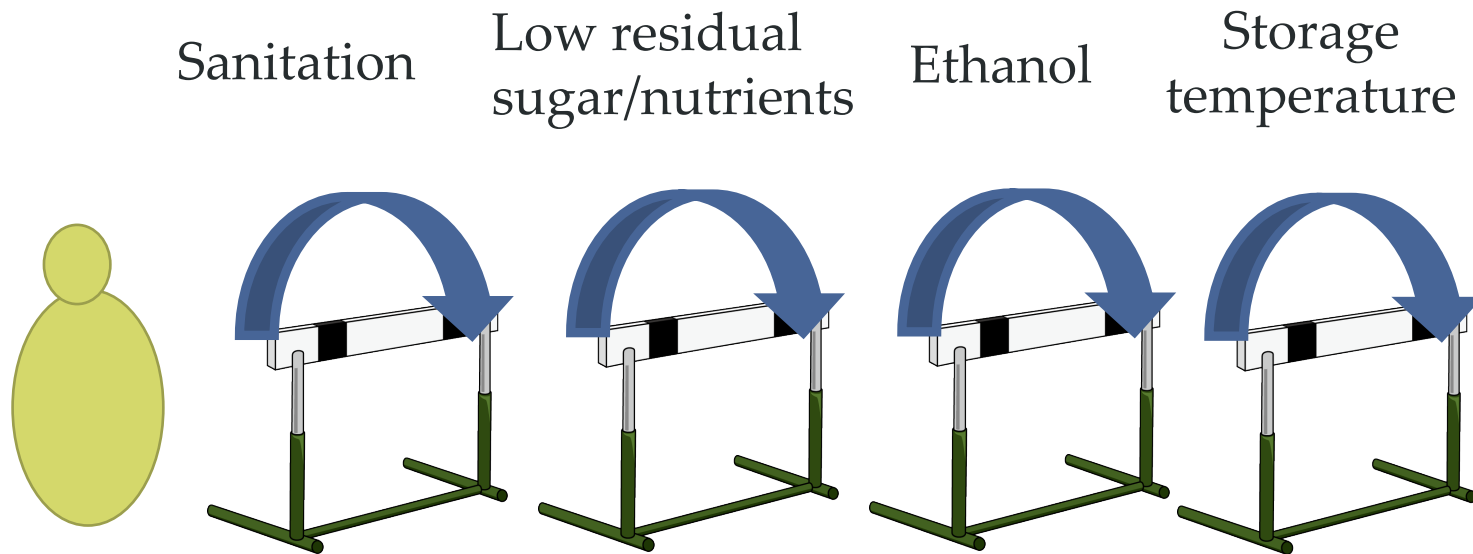
15% ethanol

Brett Hurdles

Sanitation Low residual
sugar/nutrients



Brett Hurdles



Interactions between ethanol, temperature, and SO₂

Ethanol (%)	Temperature (°C)	Total SO ₂ (mg/L)	4-EP (µg/L)
13%	15	0	2380
		60	2110
		100	1230
	18	0	2540
		60	2410
		100	2000
14.5%	15	0	642
		60	123
		100	9.33
	18	0	2180
		60	2090
		100	22.0

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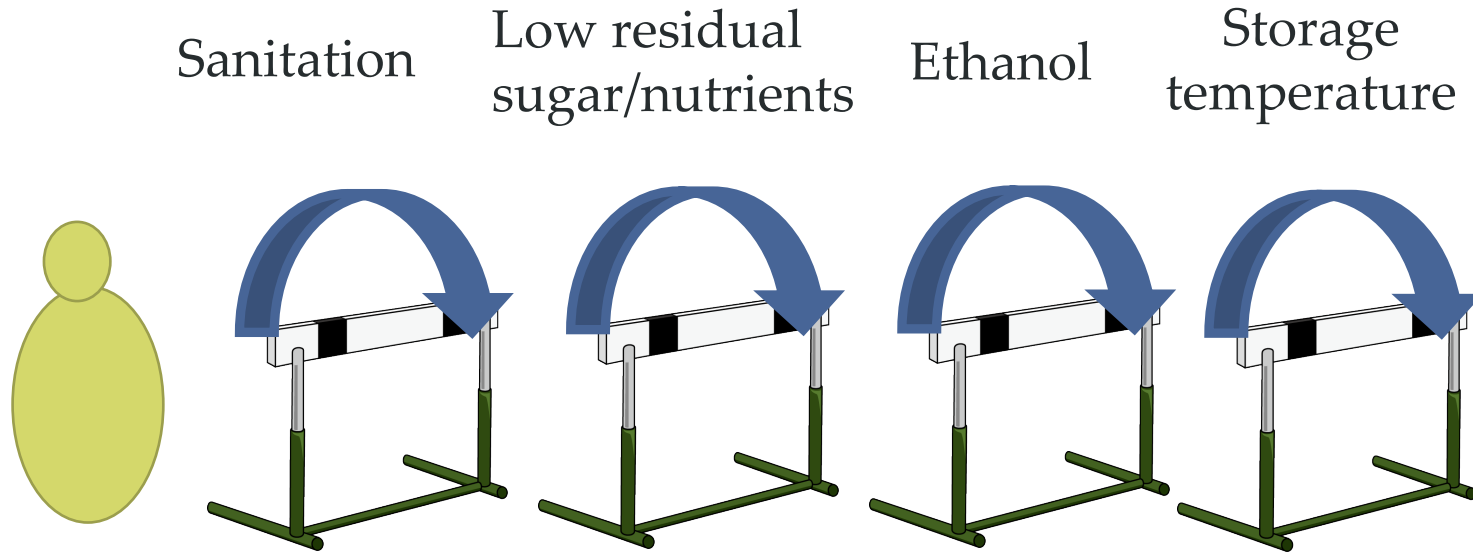
4-EP reduction at high total SO₂ enhanced at lower temp

Interactions between ethanol, temperature, and SO₂

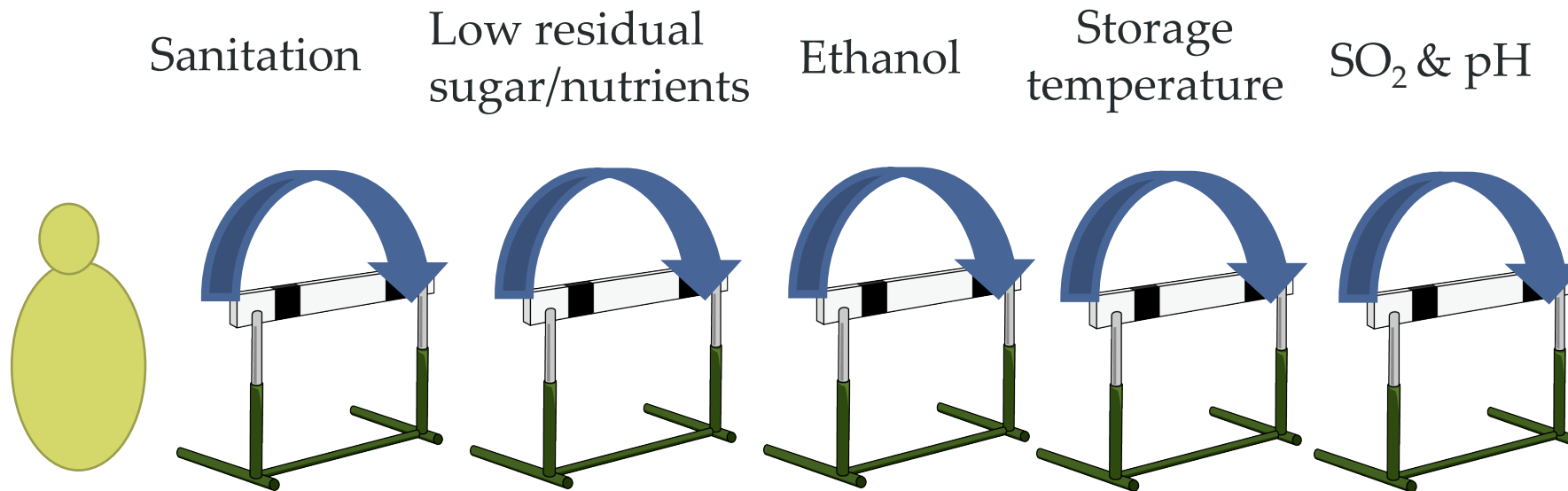
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4-EP reduction enhanced at lower SO₂ levels if temperature lower

Brett Hurdles



Brett Hurdles



Additional hurdles - MLF

- End of MLF increased risk for *Brettanomyces* spoilage
 - No SO₂ added yet
 - Wine still relatively warm to encourage MLF
- Quick vigorous MLF recommended so SO₂ can be added
 - New research findings suggest additional benefit of MLF
 - Suppression of *B. bruxellensis* growth when inoculated at end of MLF

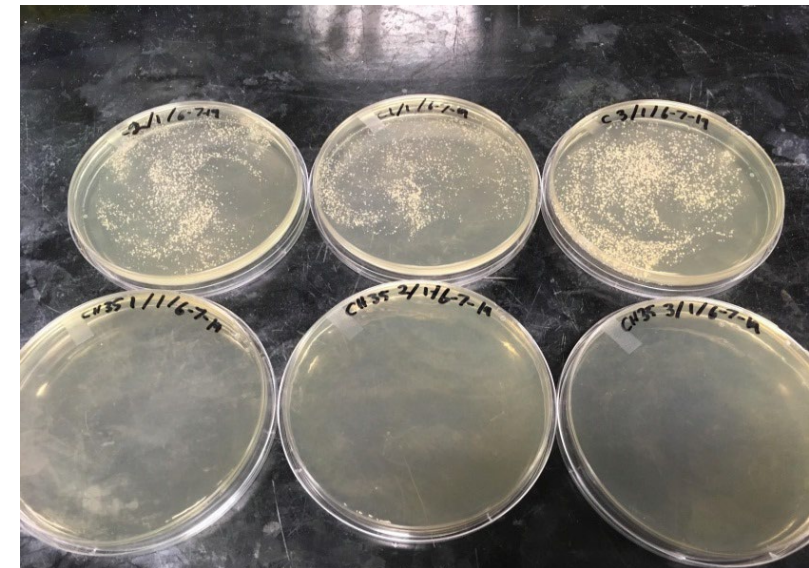
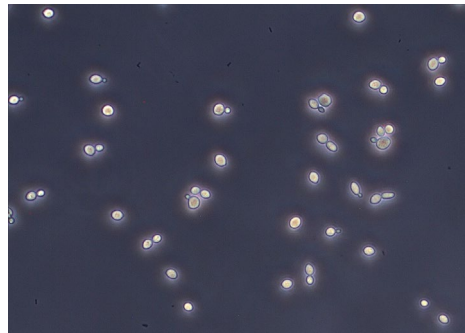
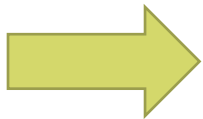
4-EG+4-EP (µg/l)	No MLF (ctrl)	Lalvin 31	Expertise S
	1670	66	47

Gerbeux et al (2009)

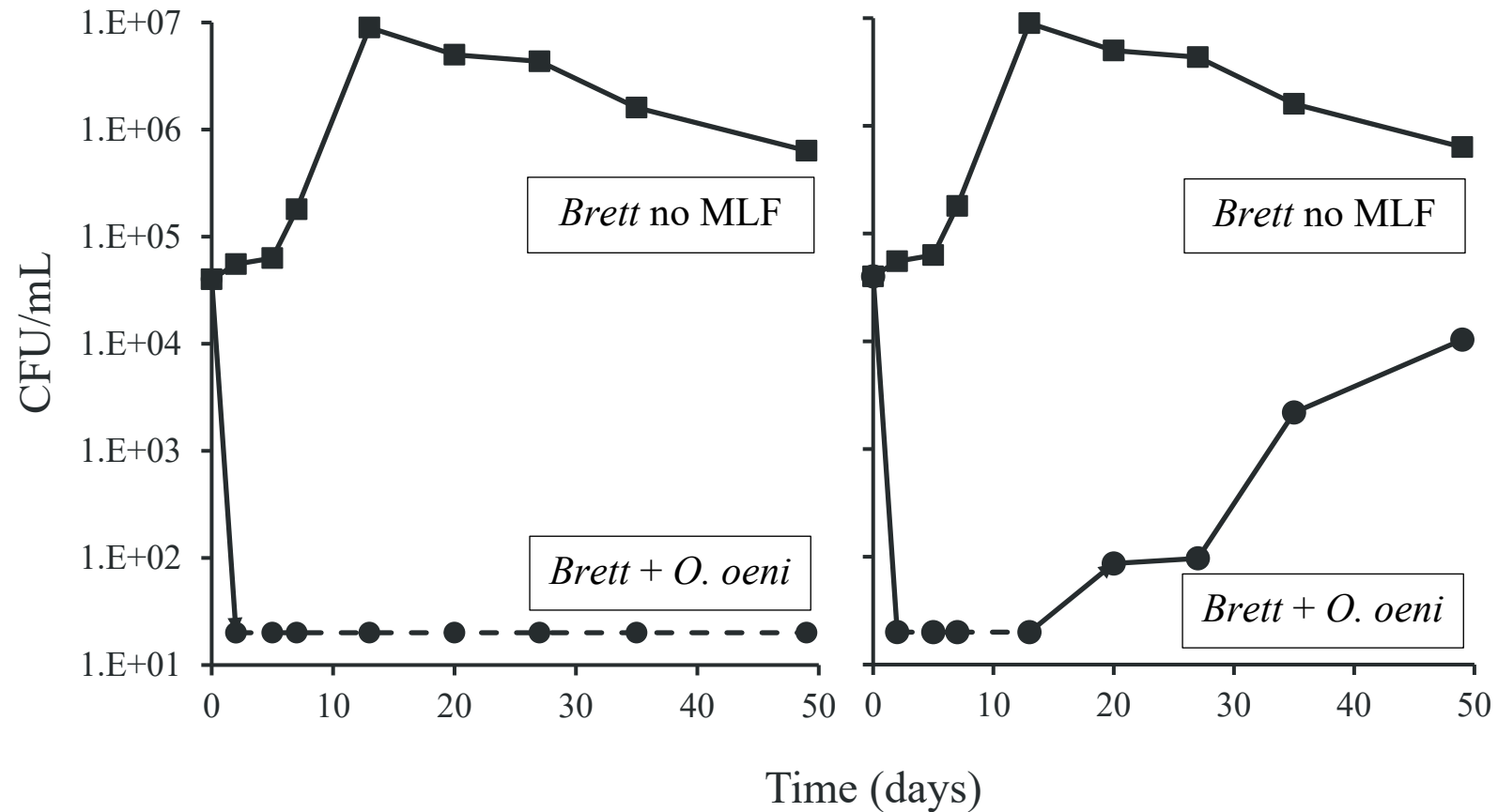
Methods

- Pinot noir wine produced – no SO₂ or MLF (pH 3.60, EtOH 13% v/v)
- Wine sterile filtered
- Treatments inoculated in triplicate with eleven commercial strains of *O. oeni*
- Uninoculated control

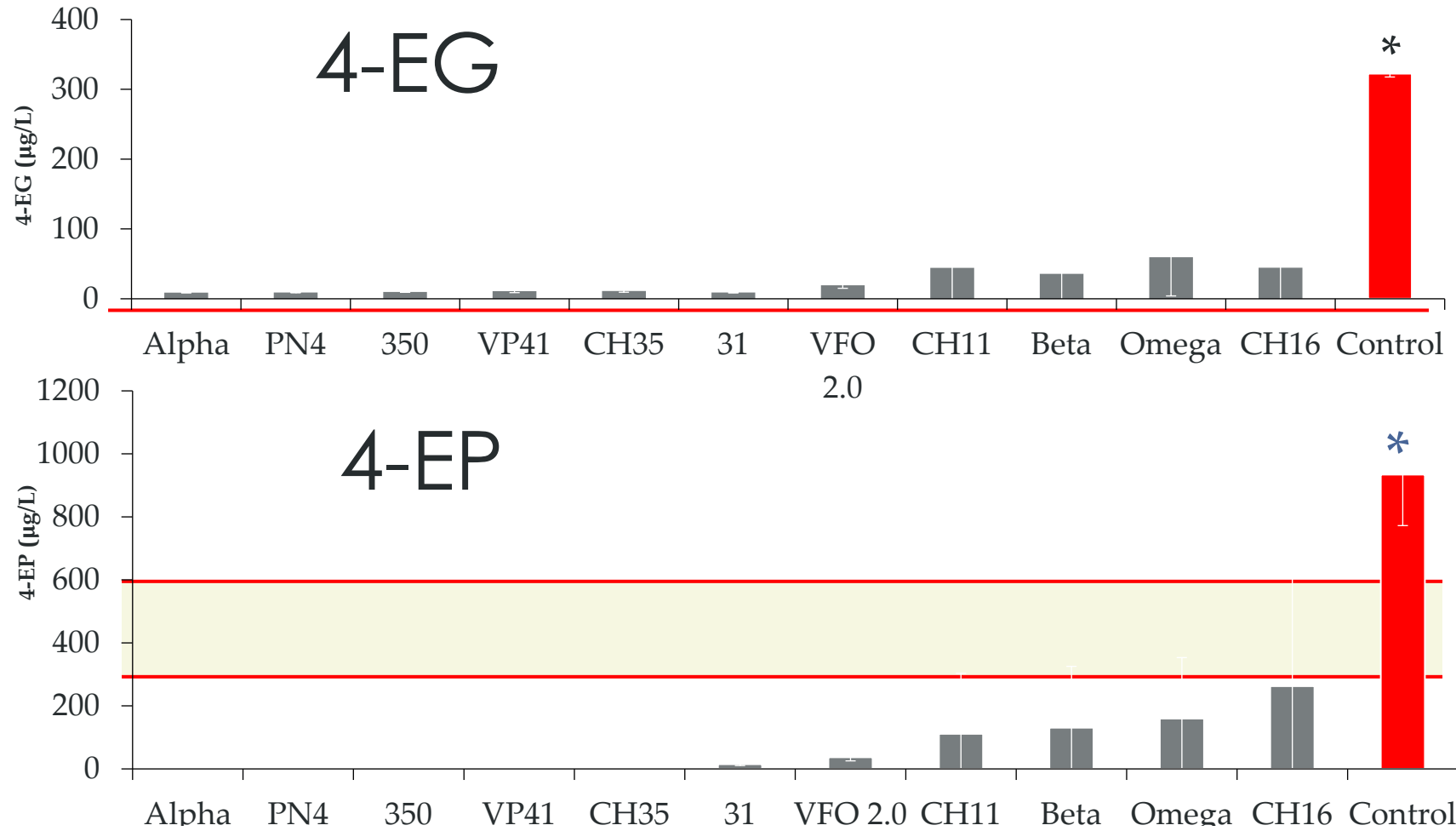
- MLF monitored
- *B. bruxellensis* UCD-2049 inoculated at end of MLF
- Populations monitored on YPD or MR plates
- Samples taken for volatile phenol analysis after 50 days



All *O. oeni* strains inhibited growth and VP production of *B. bruxellensis* strain UCD2049



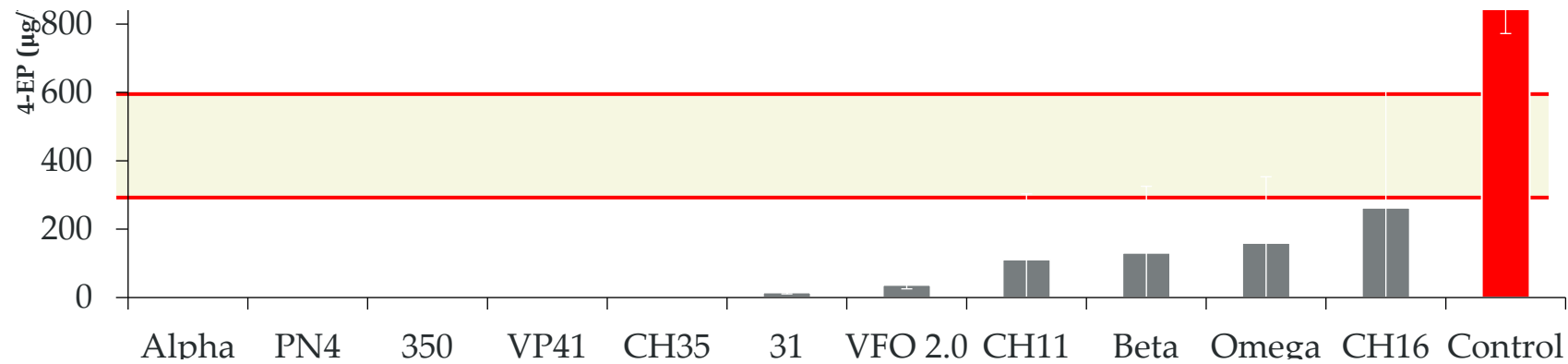
Reduced Volatile Phenol Production



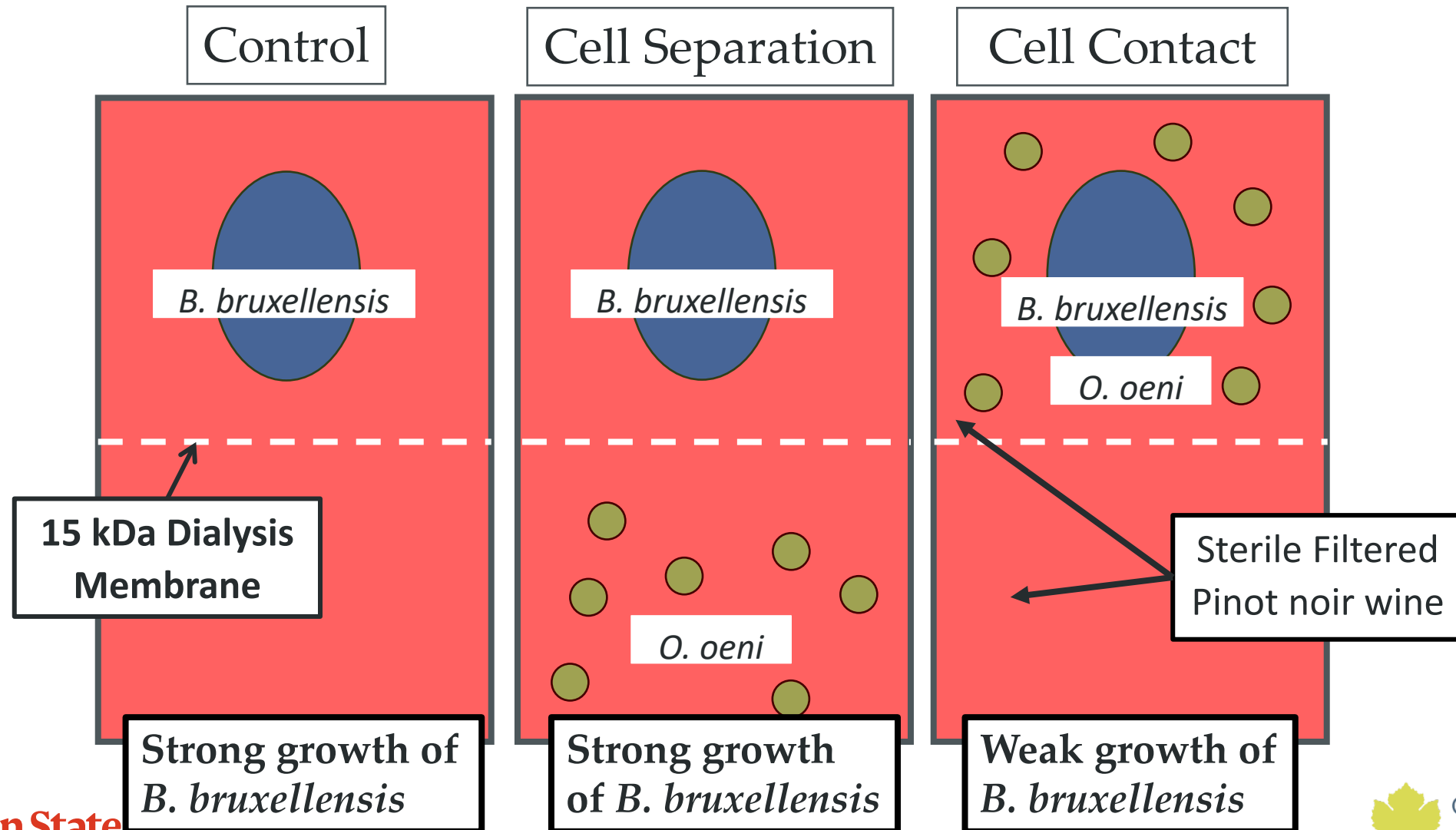
Reduced Volatile Phenol Production



What is causing the inhibition of *B. bruxellensis* by *O. oeni*?



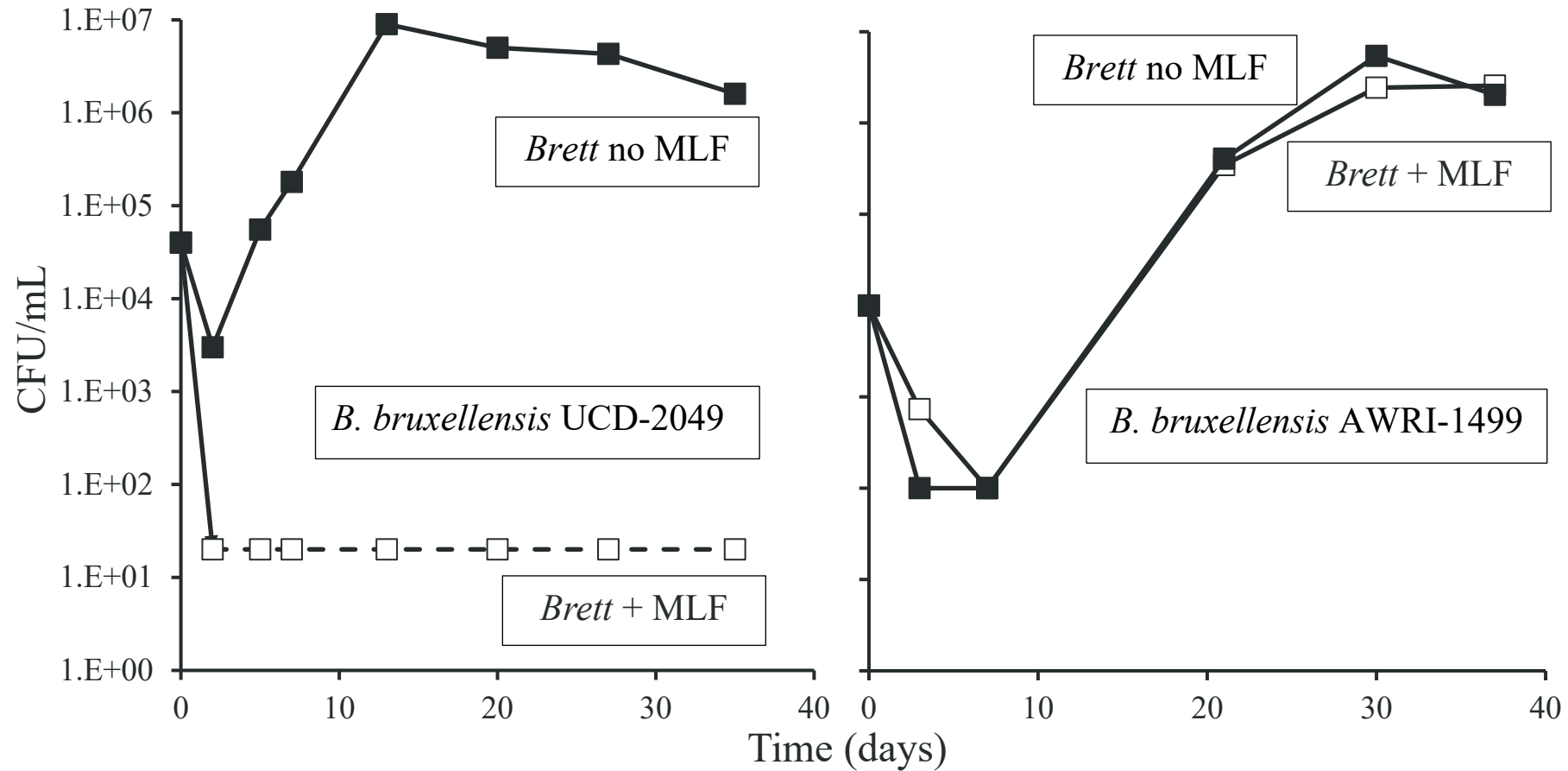
Physical separation relived inhibition



Results summary

- All *O. oeni* strains tested inhibited growth and VP production of *B. bruxellensis* strain UCD-2049
- Mechanism likely due to cell-cell contact
- Variability between *B. bruxellensis* strains?

Additional *Brettanomyces* strains not inhibited by *O. oeni*

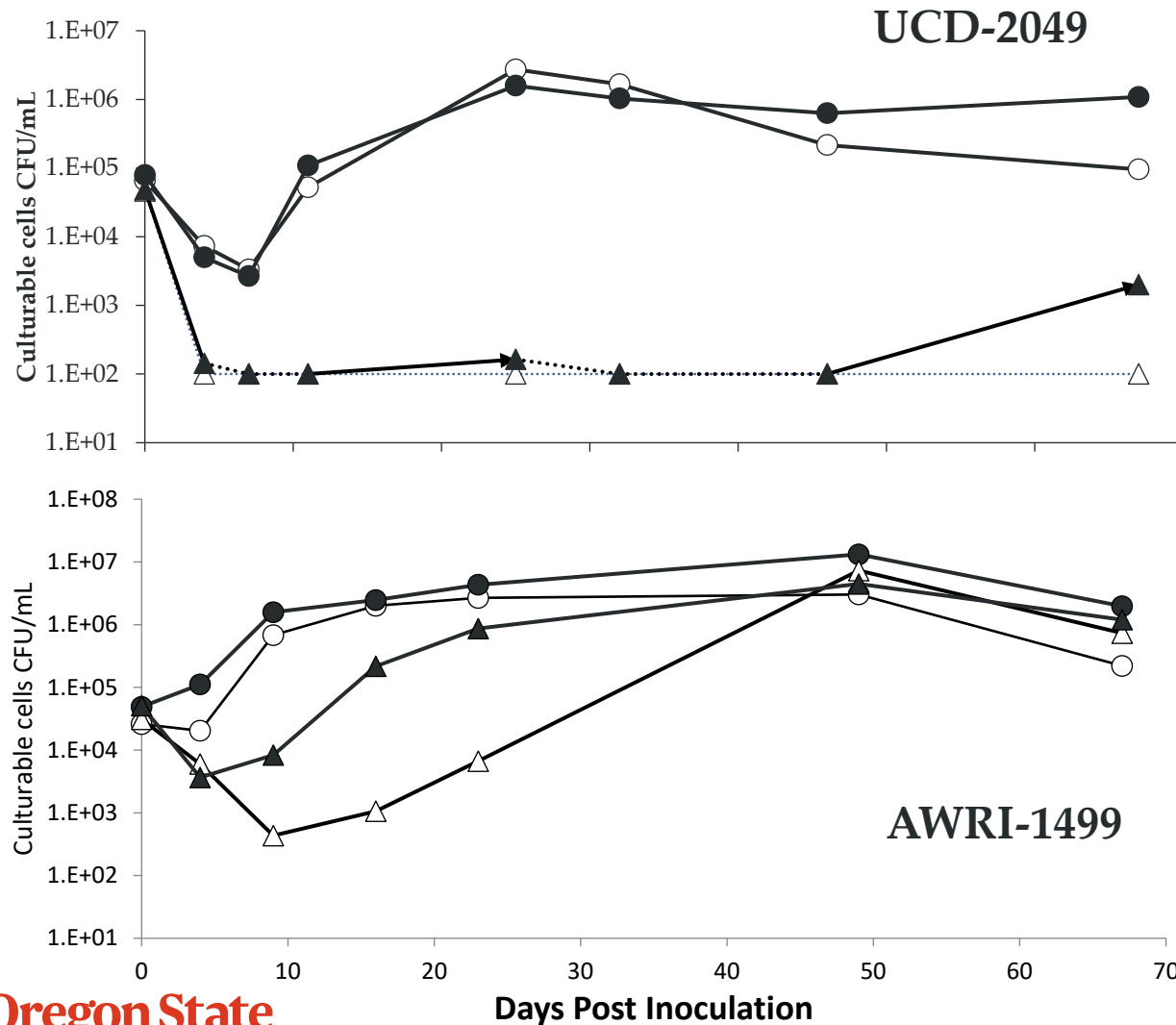


Why were there a difference between *Brettanomyces* strains?

Impact of ethanol + MLF on *Brett*

- *B. bruxellensis* strain differences observed for other wine stressors (Ethanol, SO₂, pH)
- Previous experiments in 13% EtOH Pinot noir
- Adjusted Pinot noir wines to 12.5% and 14% EtOH
- Multiple *B. bruxellensis* strains

B. bruxellensis in high and low EtOH PN



	12.5% EtOH	13% EtOH	14% EtOH
UCD-2049	No inhibition	Growth inhibition	EtOH inhibition
	Reduced 4-EP	Reduced 4-EP	EtOH inhibition
AWRI-1499	No inhibition	No inhibition	Growth inhibition
	No change in 4-EP	No change 4-EP	No change 4-EP

Control



MLF



12.5% EtOH



14.0% EtOH



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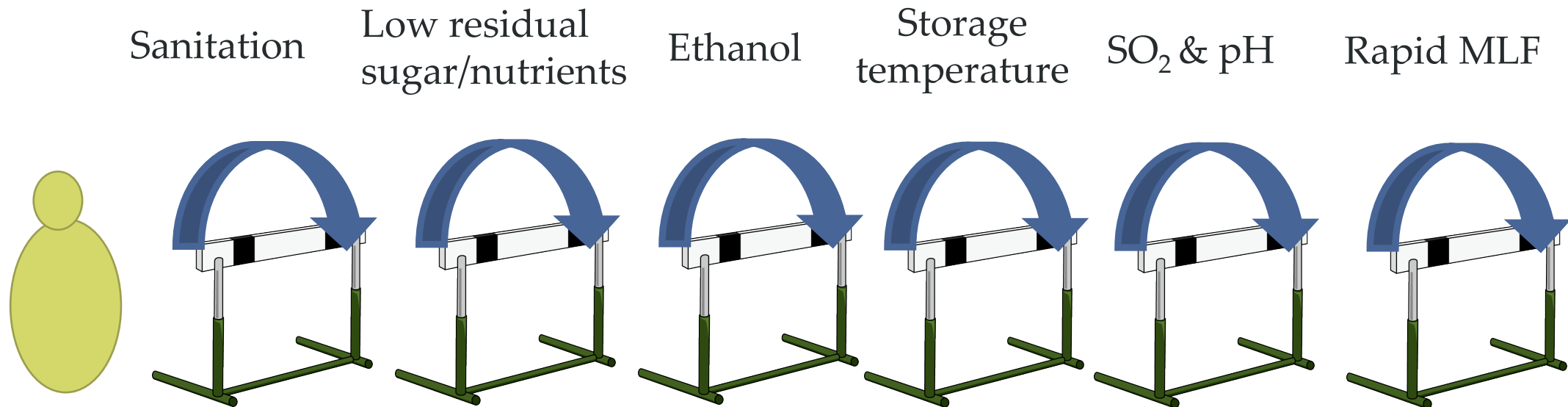


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Project summary

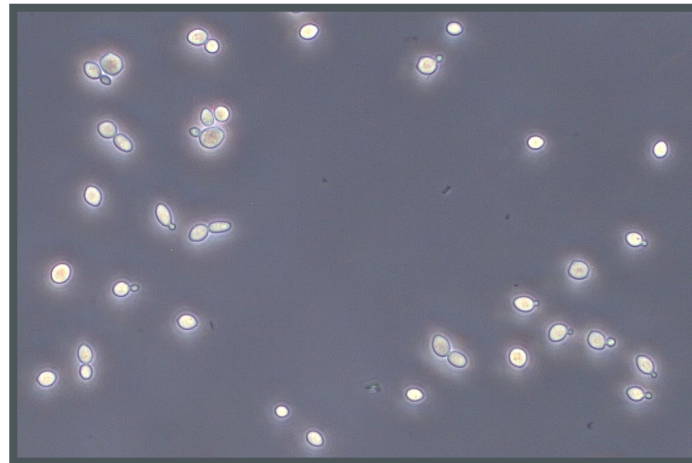
- *O. oeni* strains inhibited growth and 4-EP production of *B. bruxellensis* strain UCD2049 – minor *O. oeni* strain differences
- Mechanism likely due to cell-cell contact
- Variability between *B. bruxellensis* strains – may be impacted by ethanol tolerance
- MLF an added hurdle to put in front of Brett

Hurdle Concept



Reducing the risk of *Brettanomyces* spoilage

- Utilize wine chemistry and conditions to place multiple hurdles in front of *Brettanomyces*
 - Sanitation, nutrient depletion, pH, SO₂, ethanol, temperature, MLF
- Interactions between hurdles important to exploit





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*Oregon Wine Research
Institute Presents*

2023 GRAPE DAY
April 4, 2023 | 9 AM to
3 PM
Corvallis, Oregon

Registration now open!