



- Dashboard
- Tank Groups
- History
- Fermenter Setup
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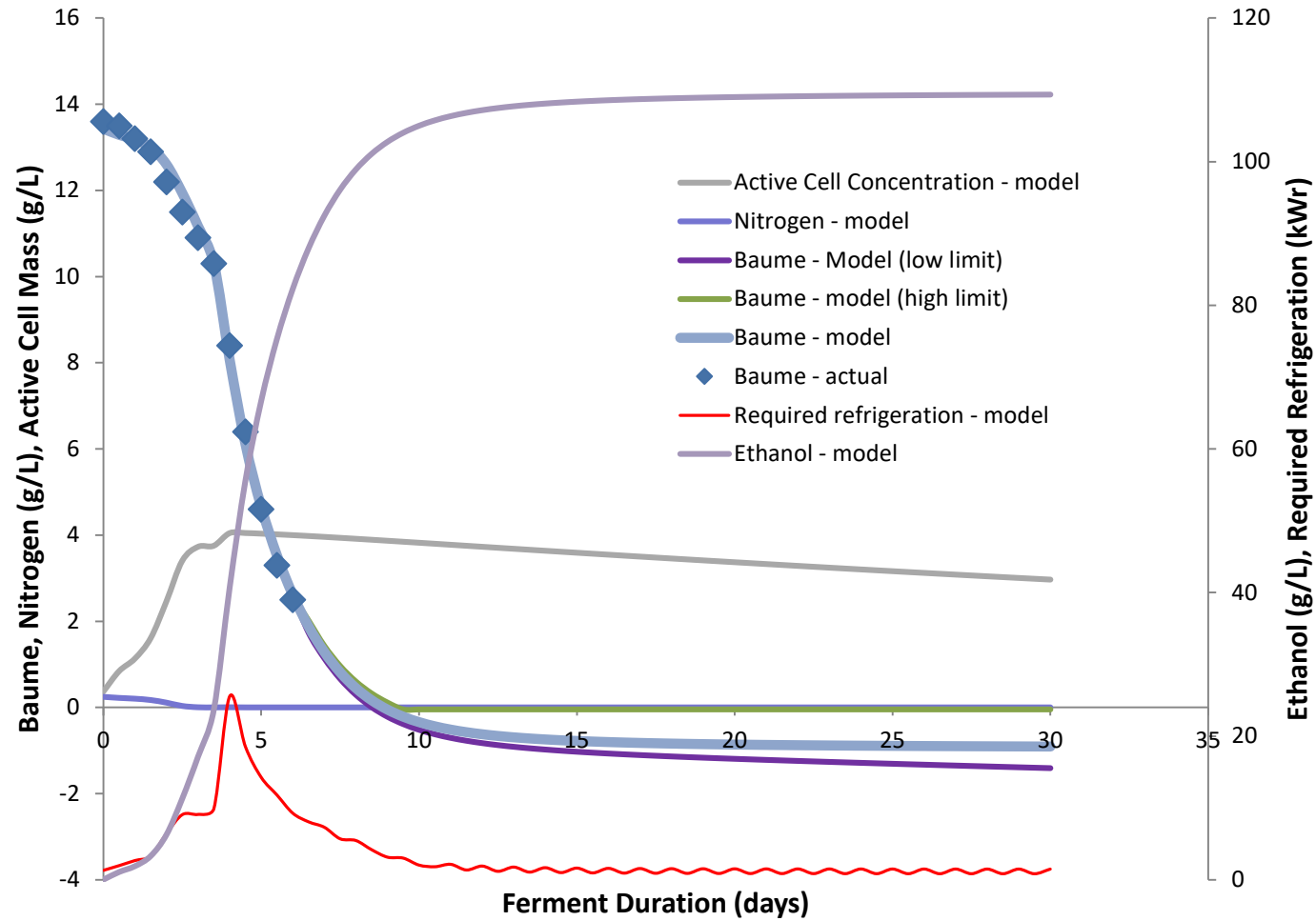


Most of the algorithms used in the Ferment Simulator were developed by Dr Richard Muhlack.

The new online Ferment Simulator is based on his work which was originally implemented in Excel.

The original Ferment Simulator was developed with funds from Wine Australia.

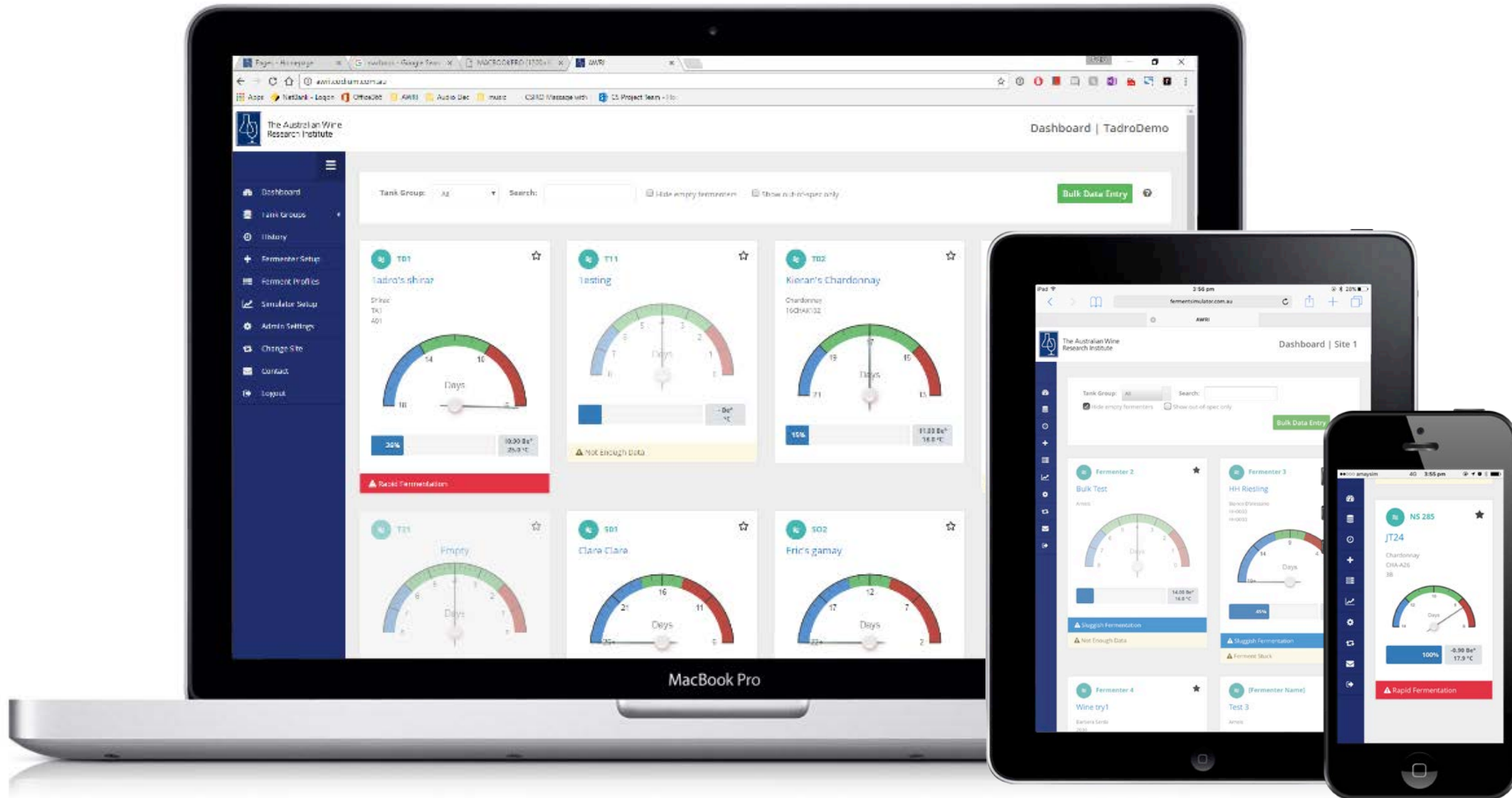
The redevelopment was funded as a Blue Sky project.



Multiple Platforms



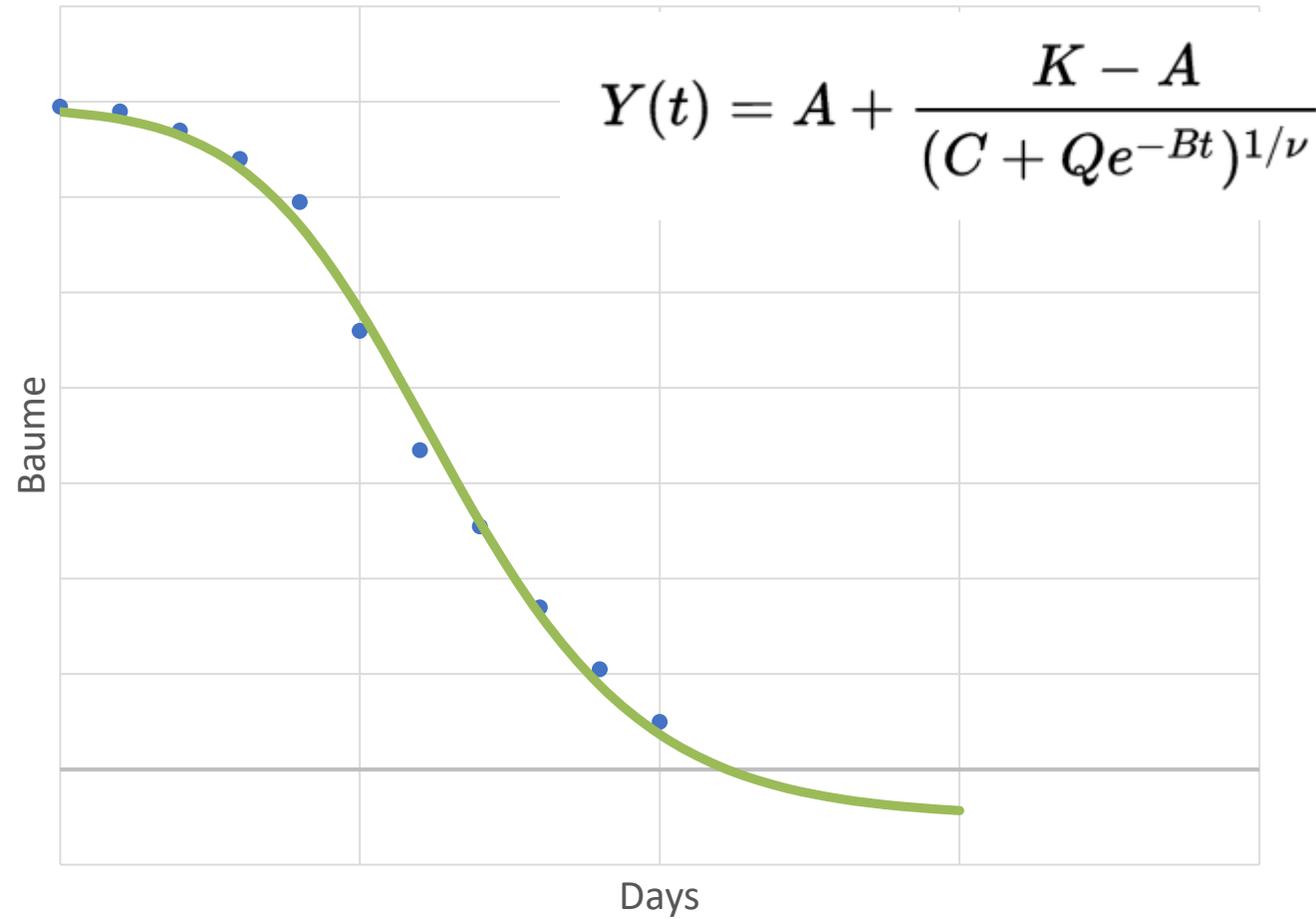
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Research Institute



Parameter Fitting



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- Monod Kinetics with Nitrogen Limitation, Ethanol Inhibition and Cell Death

$$\frac{dX}{dt} = \mu X_a$$

$$\frac{dX_a}{dt} = X_a (\mu e^{-Ek_5} - k_d)$$

$$\frac{dN}{dt} = -\mu_{\max} \frac{N}{K_N + N} \cdot \frac{X_a}{Y_{XN}}$$

$$\frac{dE}{dt} = \beta X_a E'$$

$$\frac{dS}{dt} = -\beta_{\max} \frac{S}{K_S + S} \cdot \frac{X_a}{Y_{ES}}$$

$$\mu = \mu_{\max} \frac{N}{K_N + N}$$

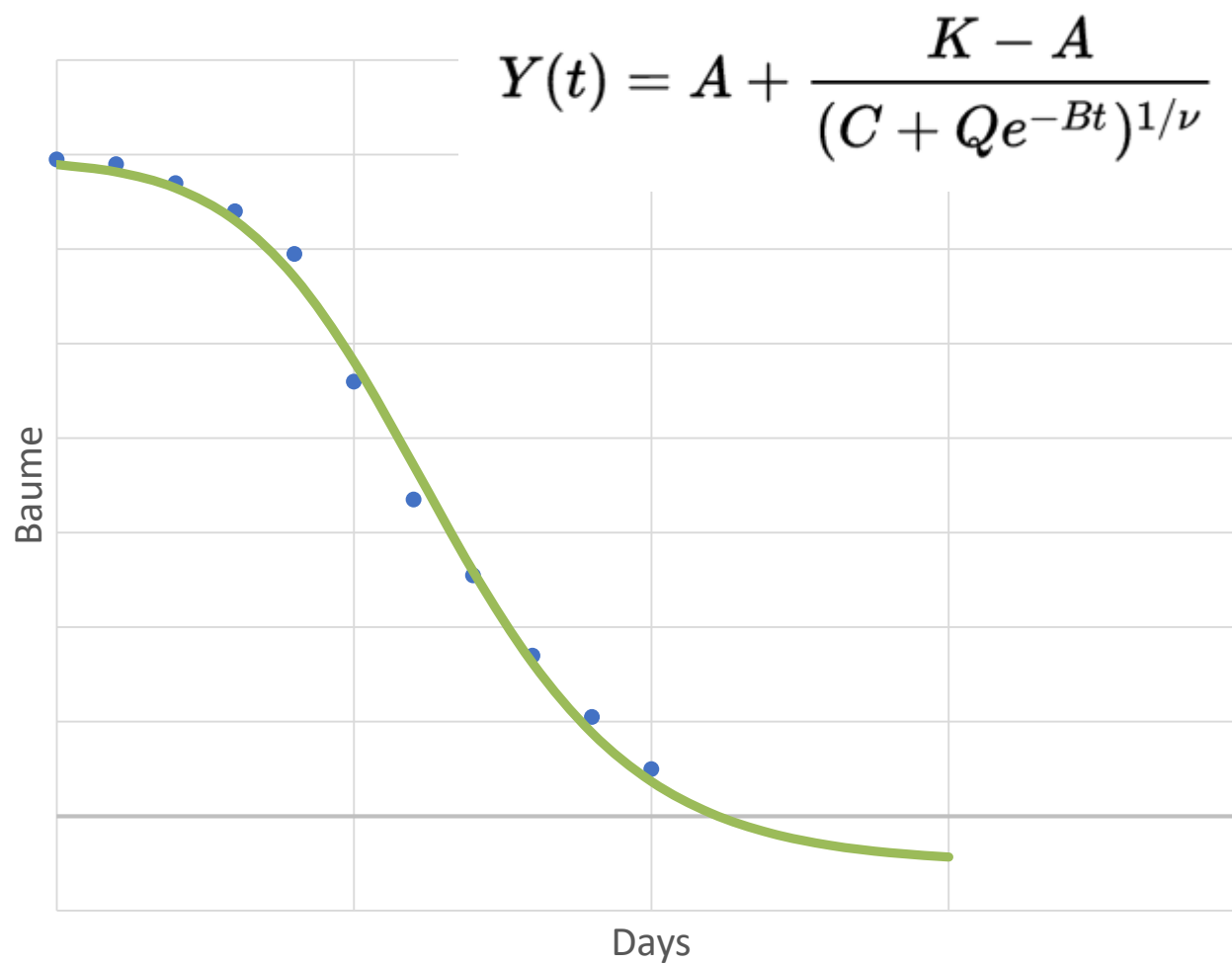
$$k_d = k'_d \cdot E$$

$$\beta = \beta_{\max} \frac{S}{K_S + S}$$

Parameter Fitting



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A

K

C

Q

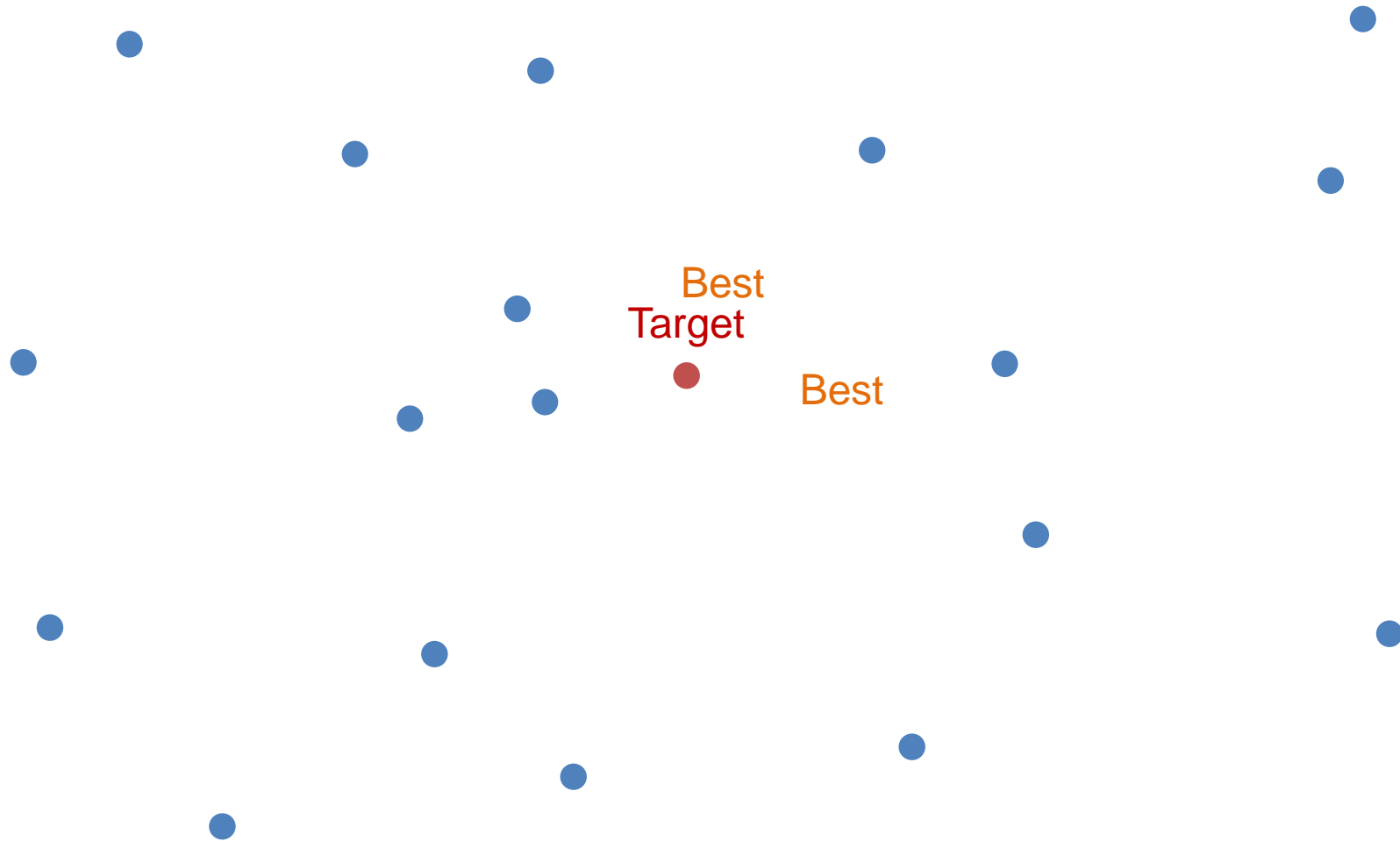
B

ν

Particle Swarm Optimisation (PSO)

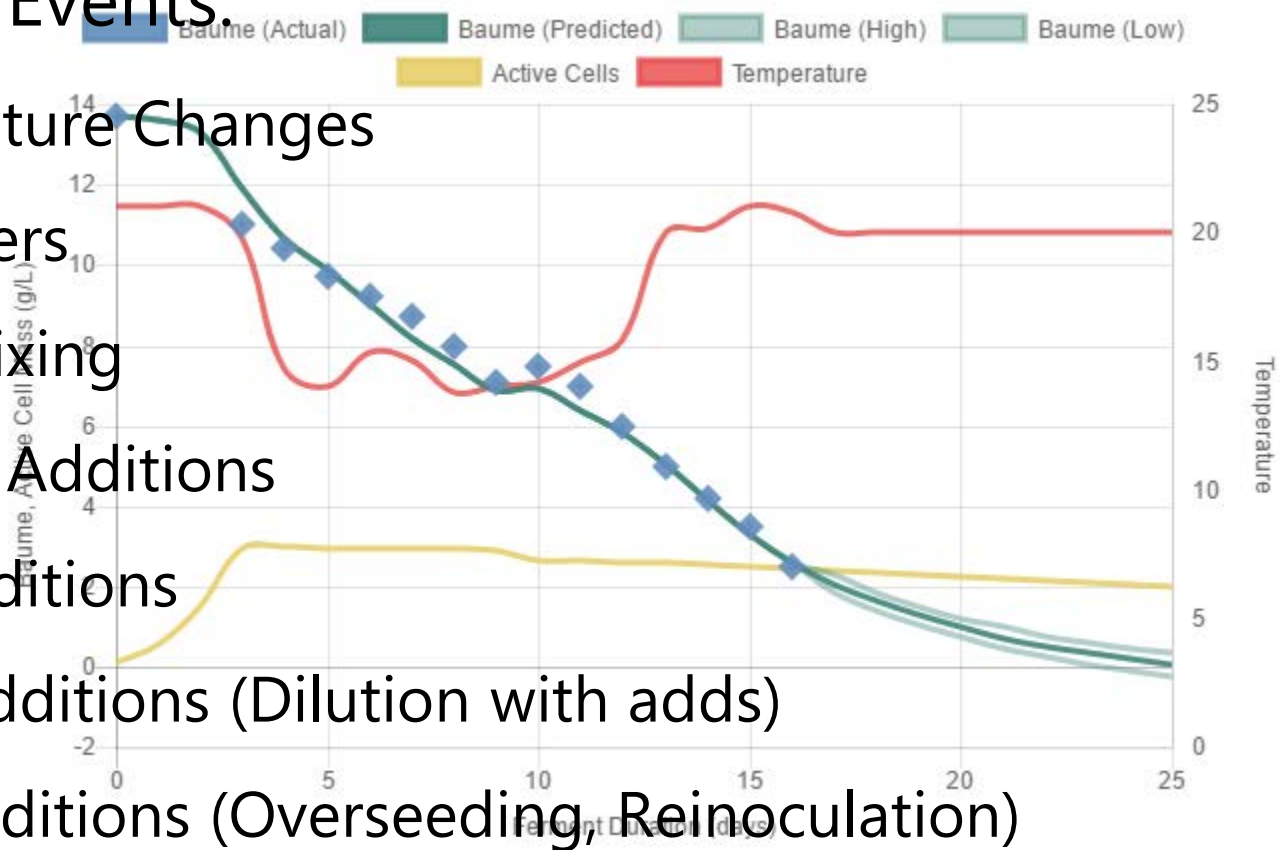


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Simulated Events:

- Temperature Changes
- Pumpovers
- Other Mixing
- Nutrient Additions
- Juice Additions
- Water Additions (Dilution with adds)
- Yeast Additions (Overseeding, Reinoculation)



Quick Walkthrough



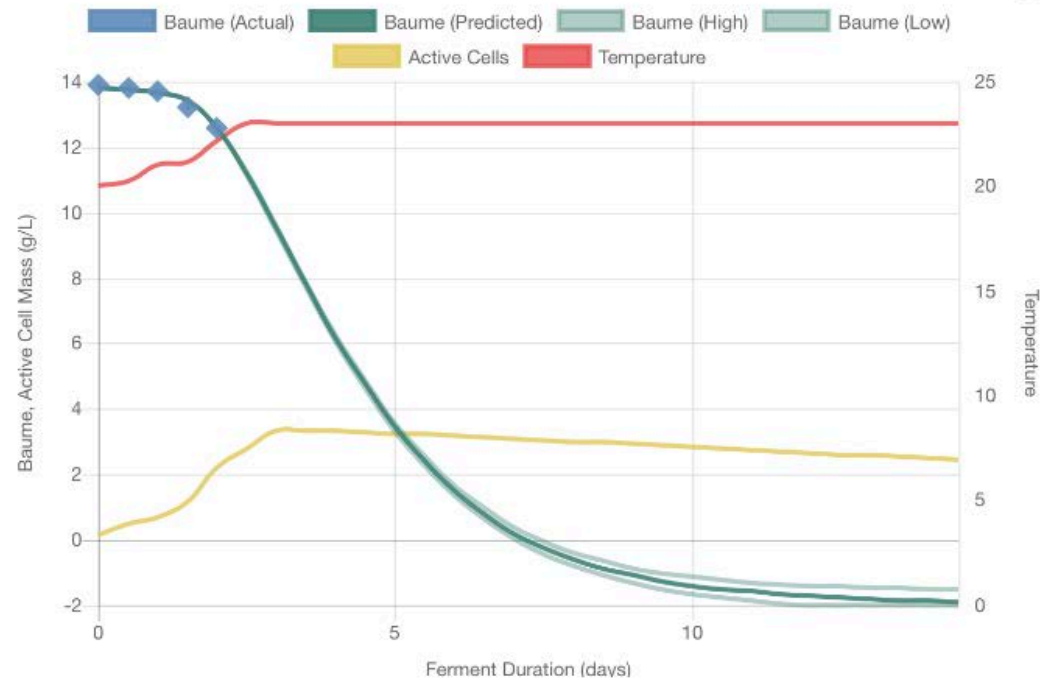
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Ferment Graph

Expand ↗

⚠ Rapid Fermentation



Sugars: 12.60 Be°

Temperature: 23.0 °C

Predicted Duration: 7.5 days

Predicted End Date: 15/12/2016

Run Simulation

What Now?

What If?

Archive Ferment

Quick Walkthrough



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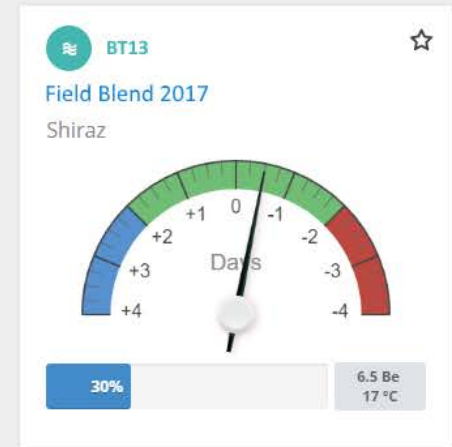
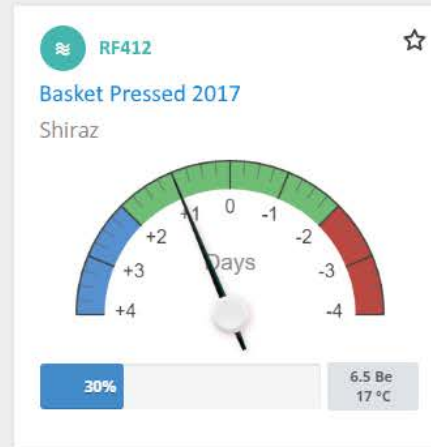
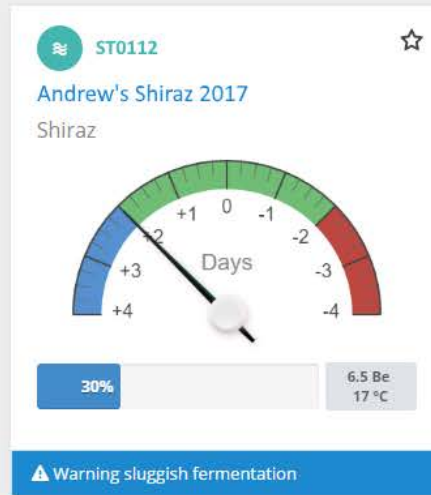
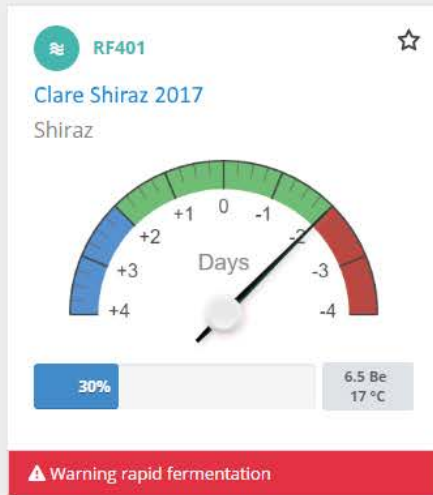


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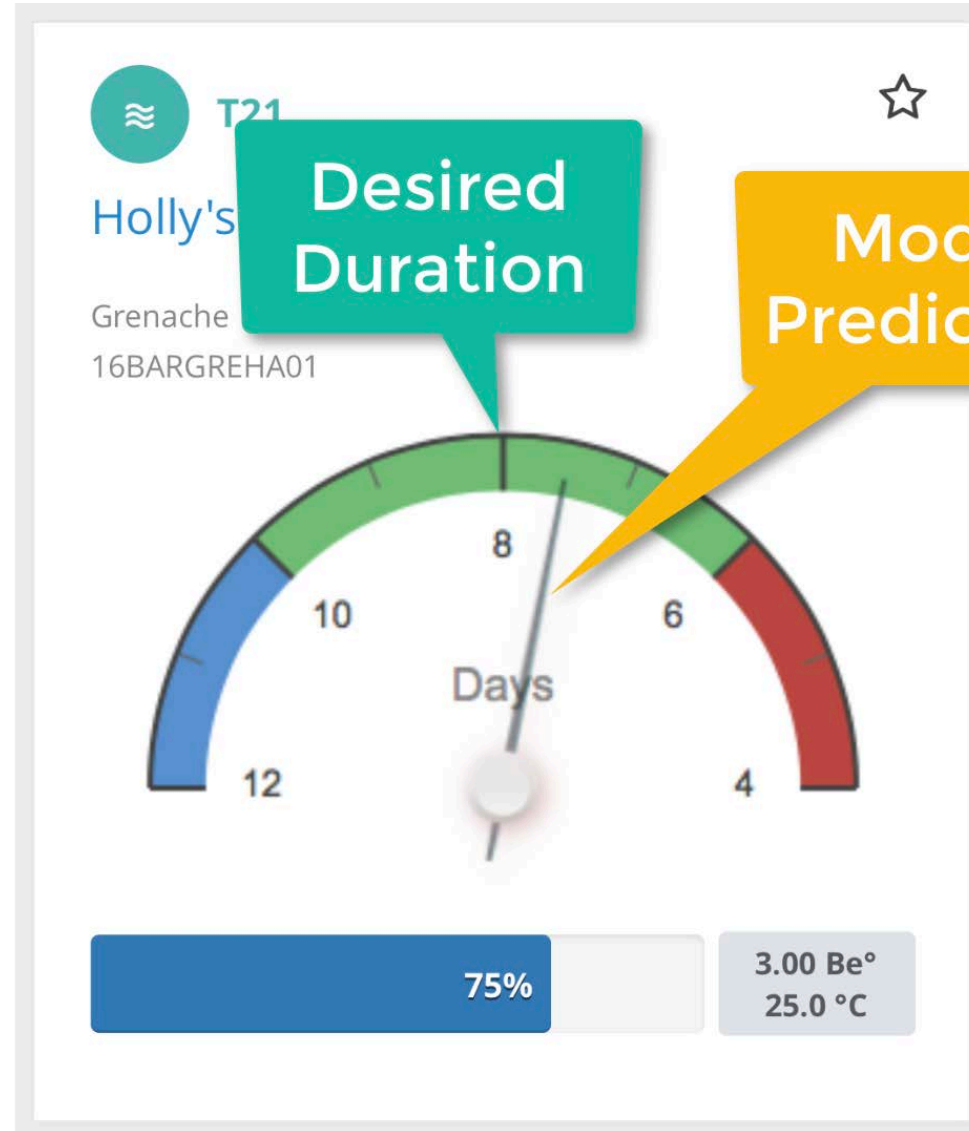
Tank Group: Favourites Search: Hide empty fermenters Show out-of-spec only



Quick Walkthrough



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Quick Walkthrough

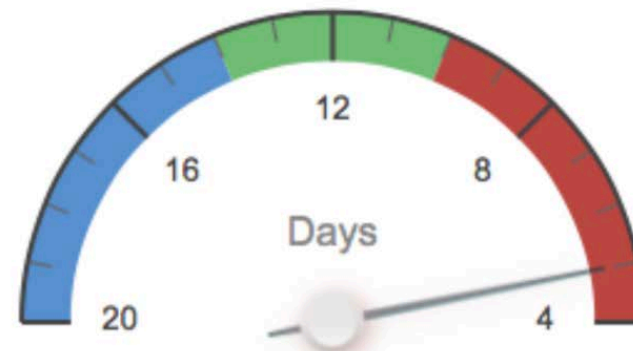


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Tadro's shiraz

Shiraz
TA1
A01



26%

10.90 Be°
25.0 °C

 Rapid Fermentation

Quick Walkthrough



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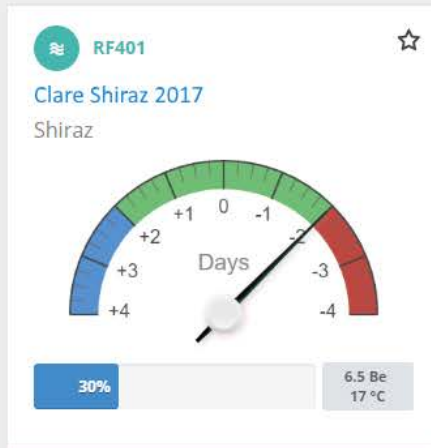


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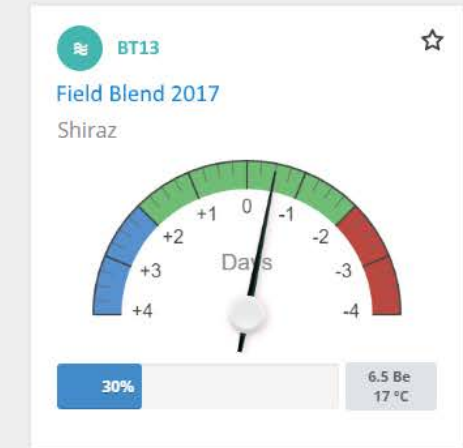
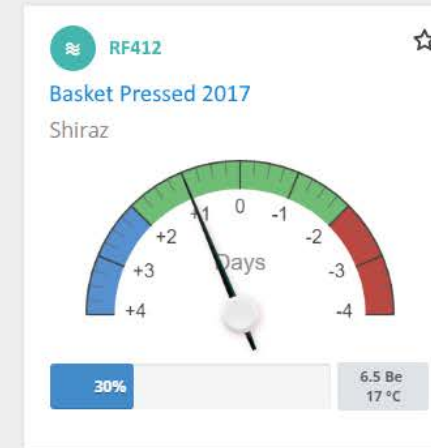
Tank Group: Favourites Search: Hide empty fermenters Show out-of-spec only



Warning rapid fermentation



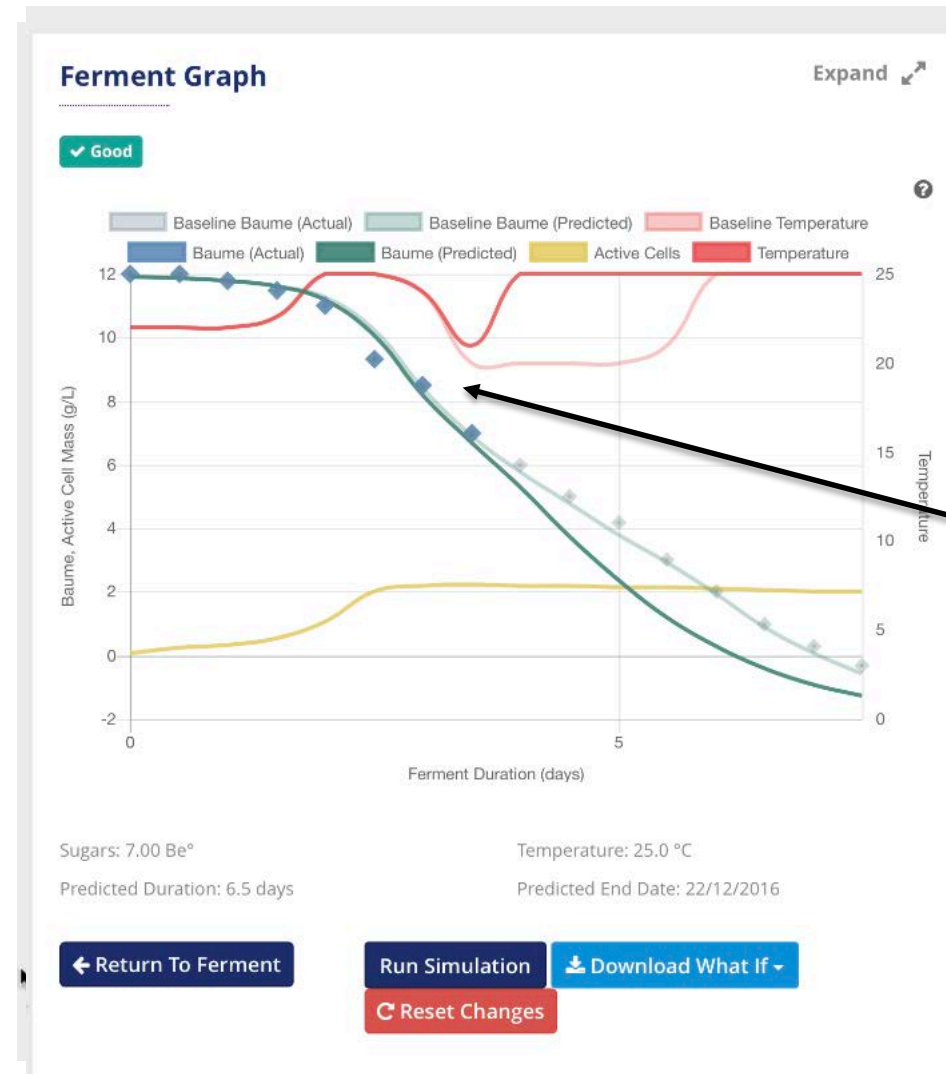
Warning sluggish fermentation



Quick Walkthrough



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Increase temperature
+
Add nutrients

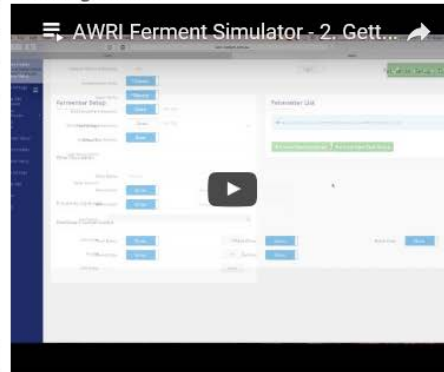


TUTORIAL VIDEOS

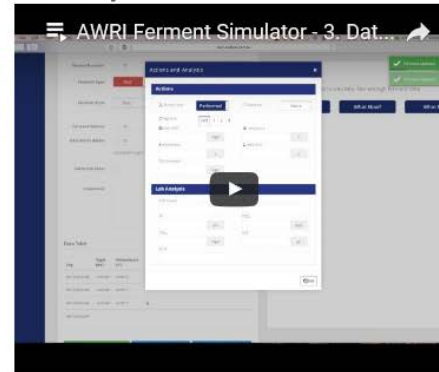
1. Overview



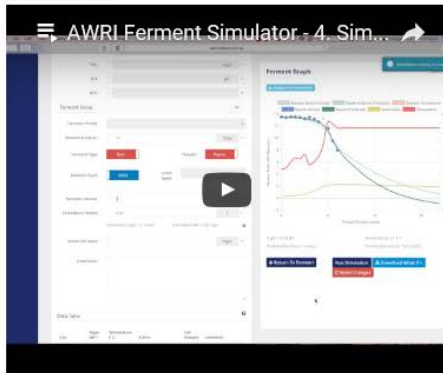
2. Getting Started



3. Data Entry



4. Simulation



5. Reports



6. Dashboards



7. Stuck Ferments



8. Archiving



9. Algorithms



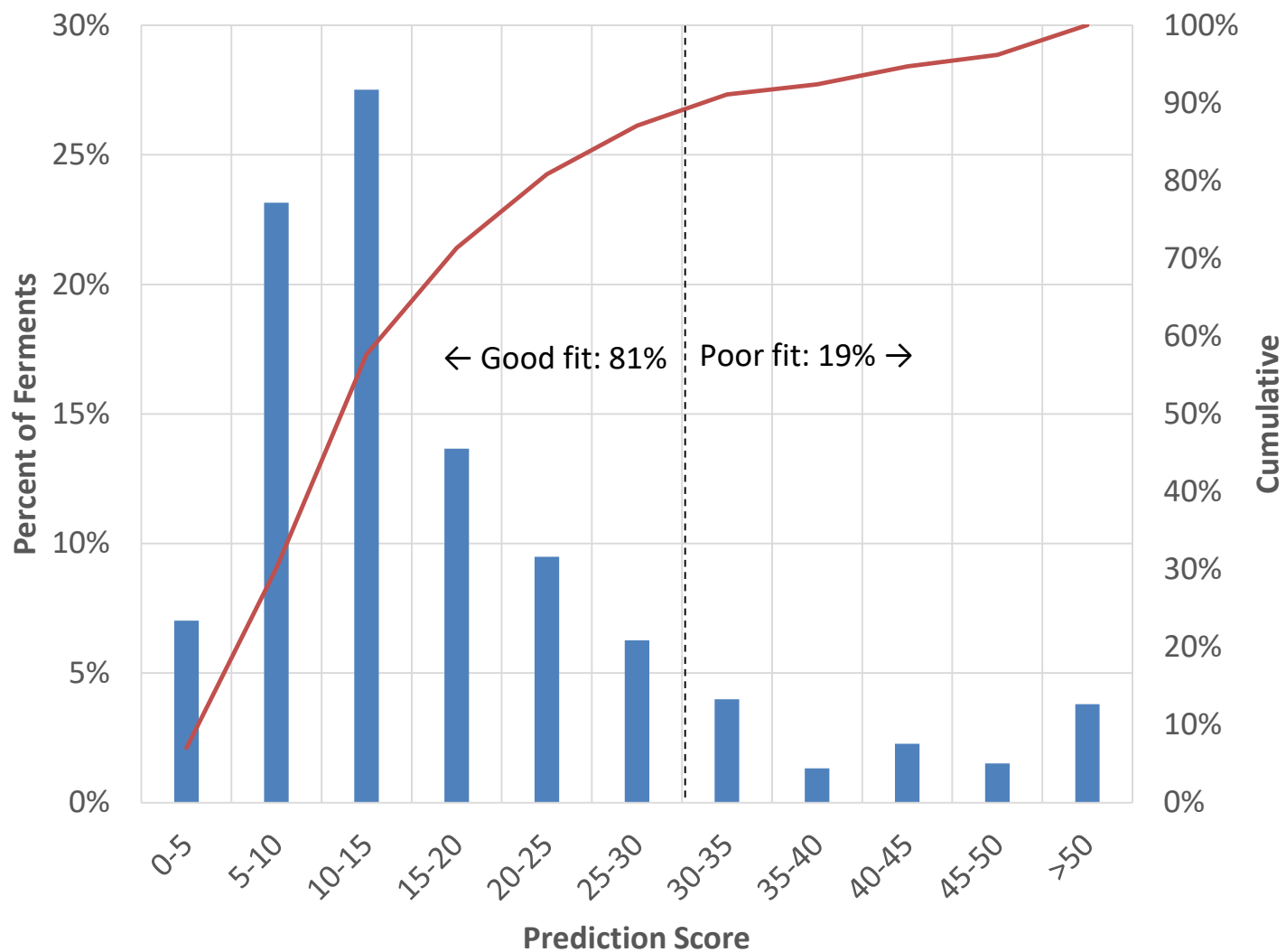
30mins of training videos

1. Overview
2. Getting Started
3. Data Entry
4. Simulation
5. Reports
6. Dashboards
7. Stuck Ferments
8. Archiving
9. Algorithms

Model Performance



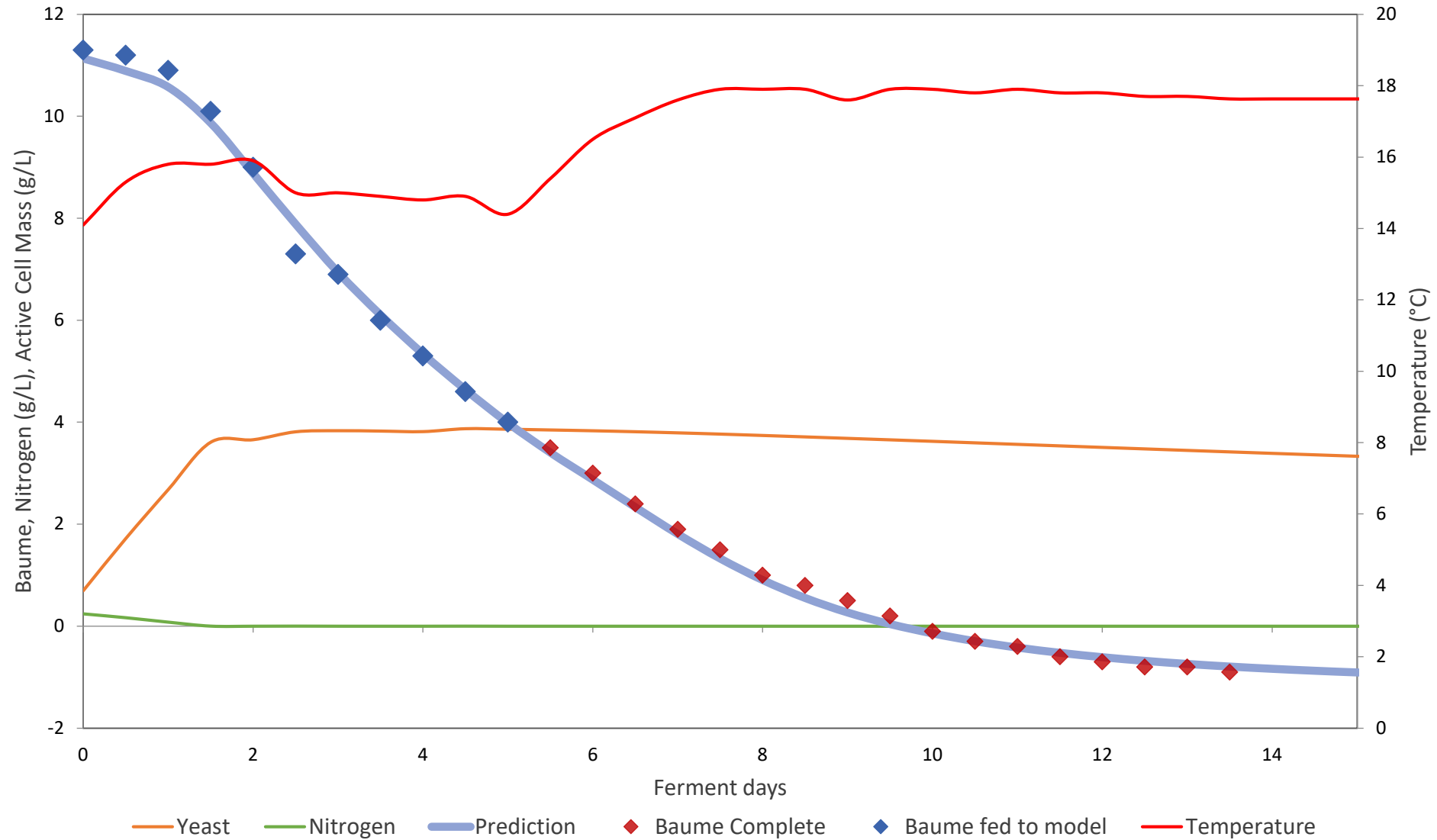
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Model Predictions



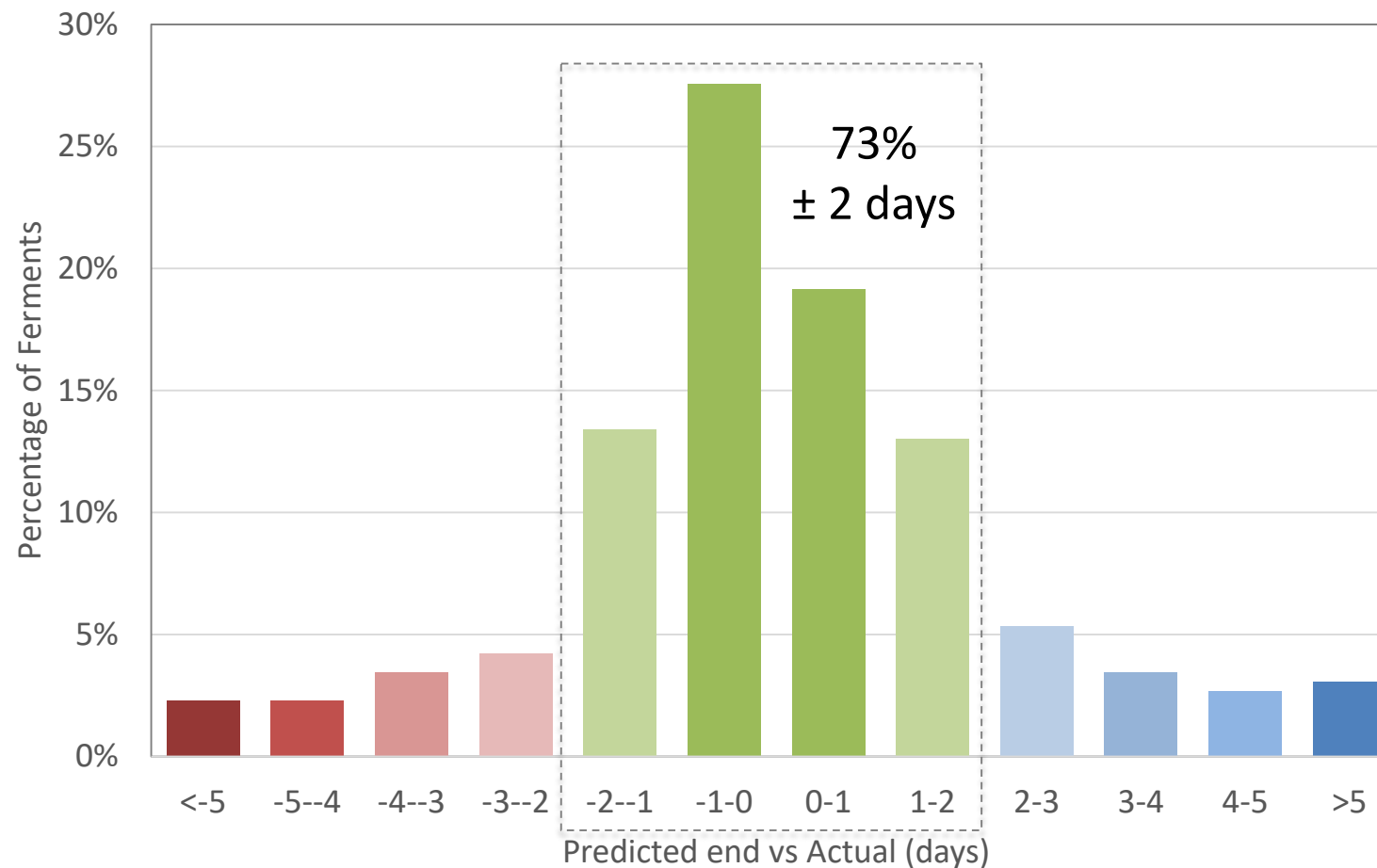
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Endpoint prediction at halfway



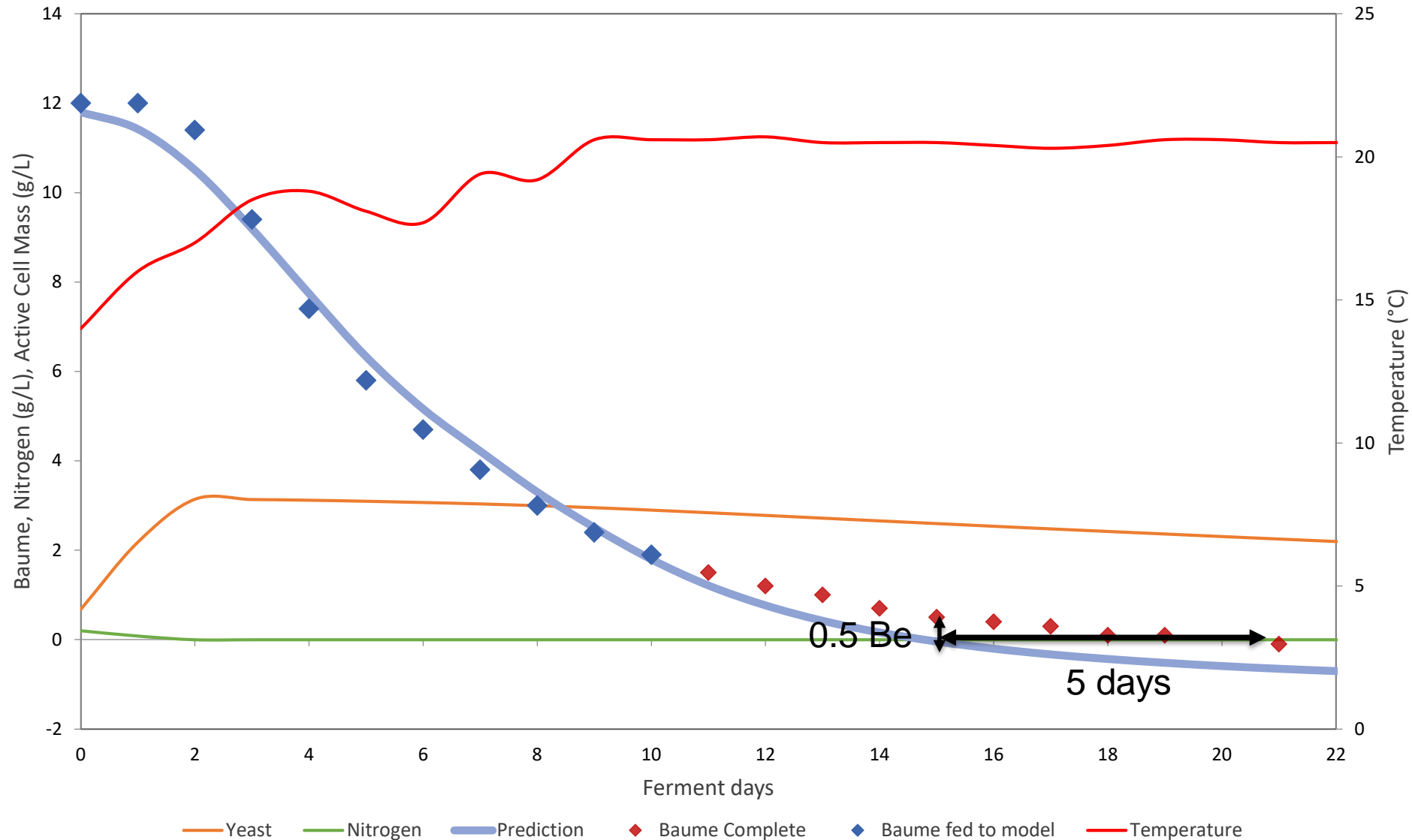
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Model Predictions



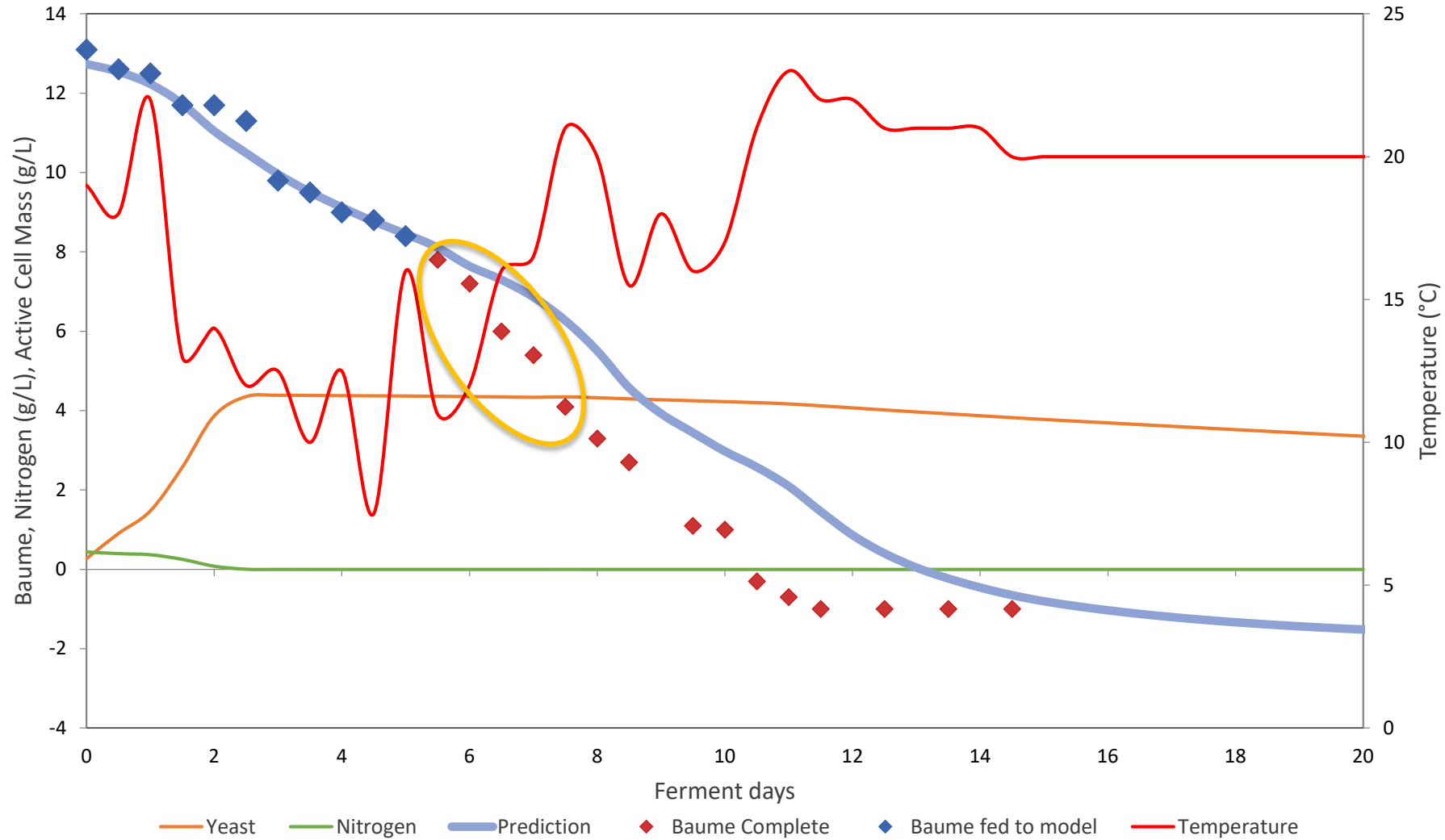
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Model Predictions



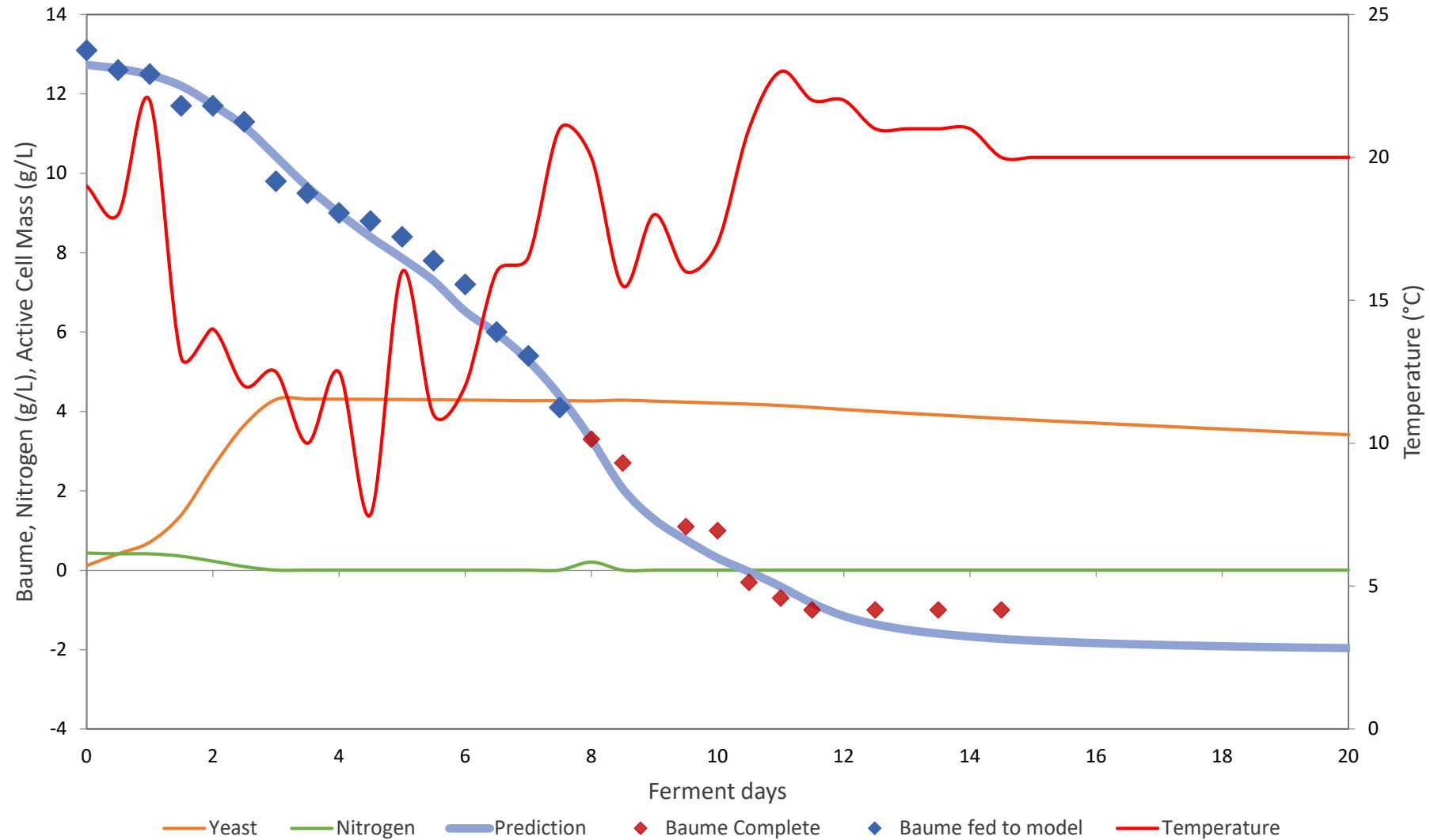
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Model Predictions



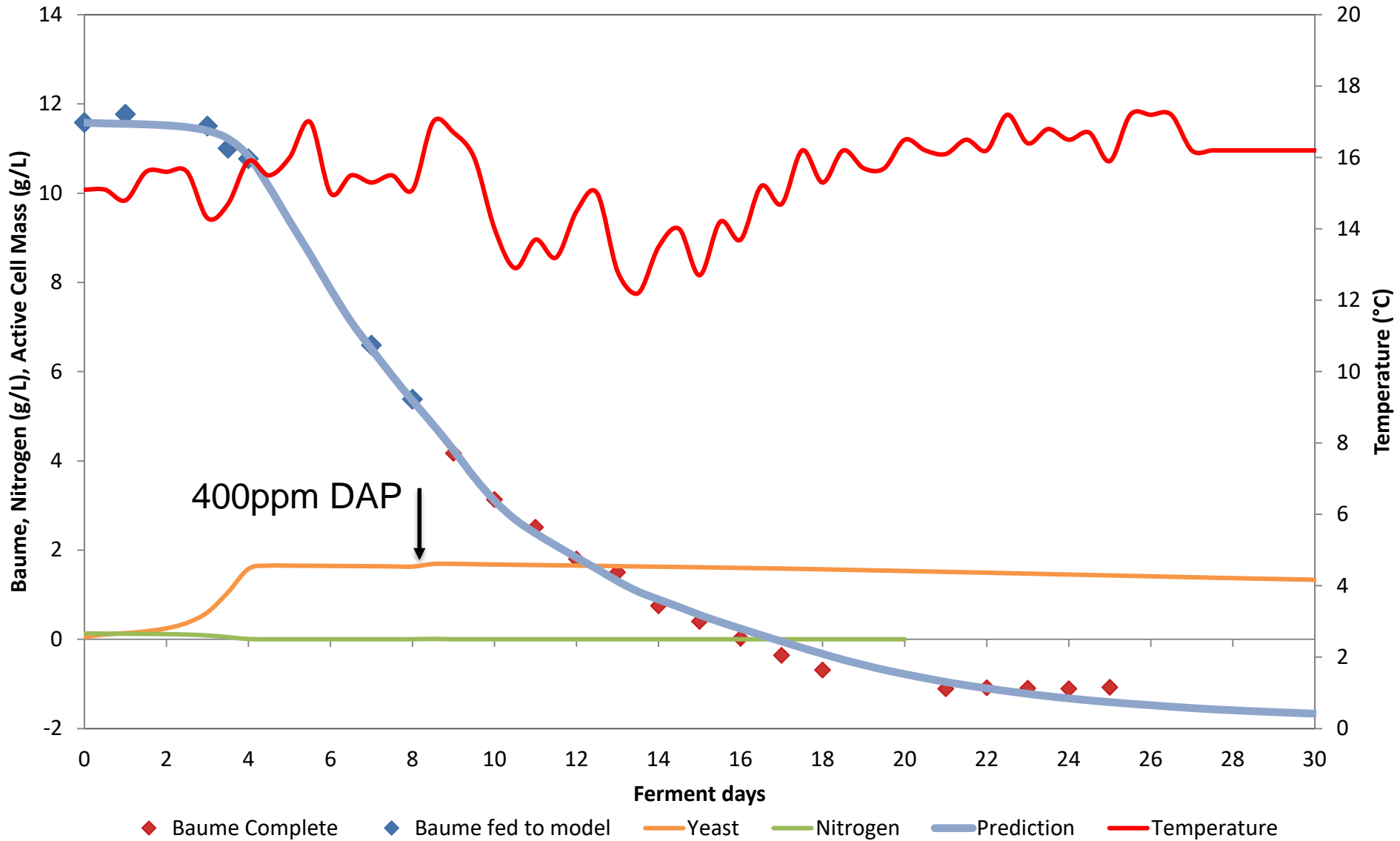
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Model Predictions



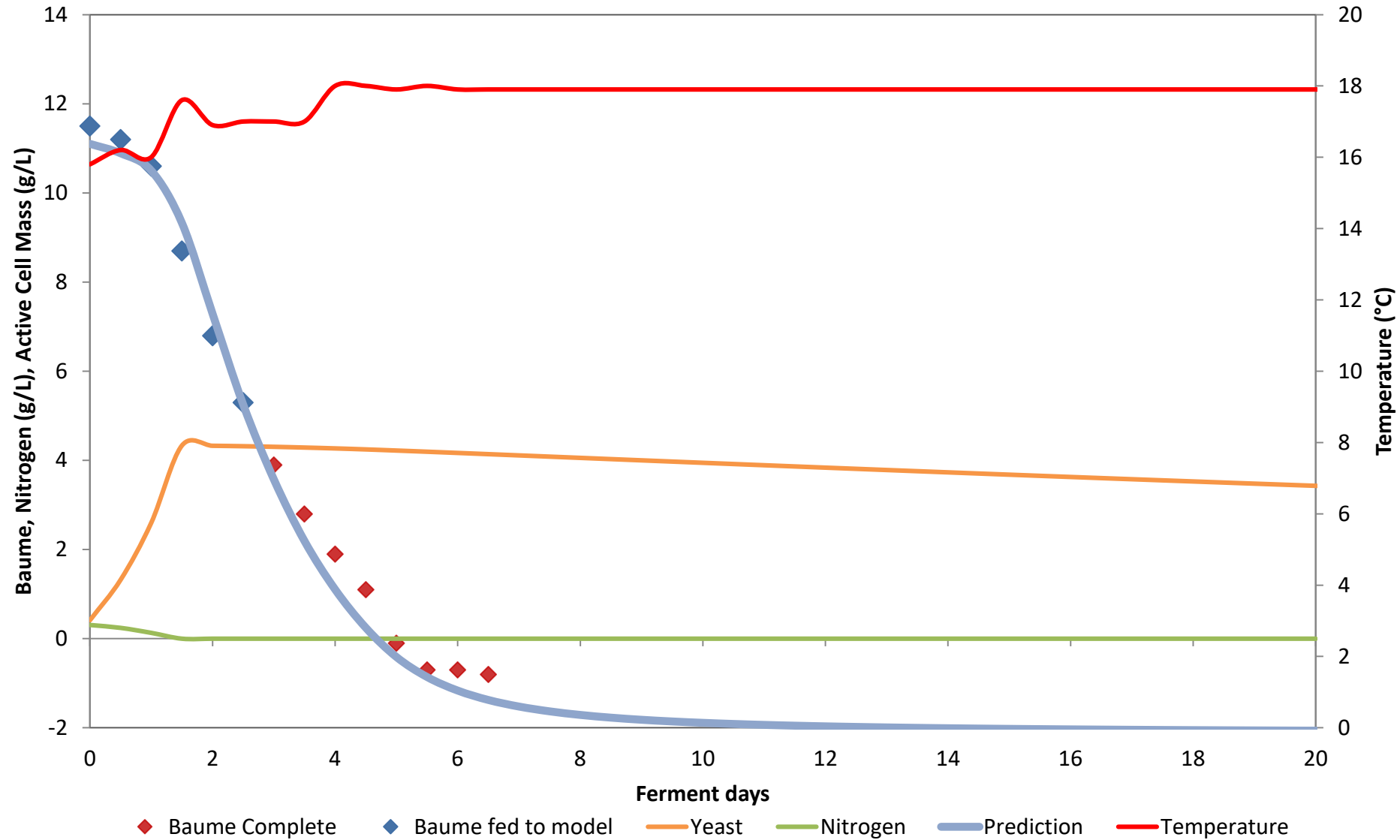
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Model Predictions



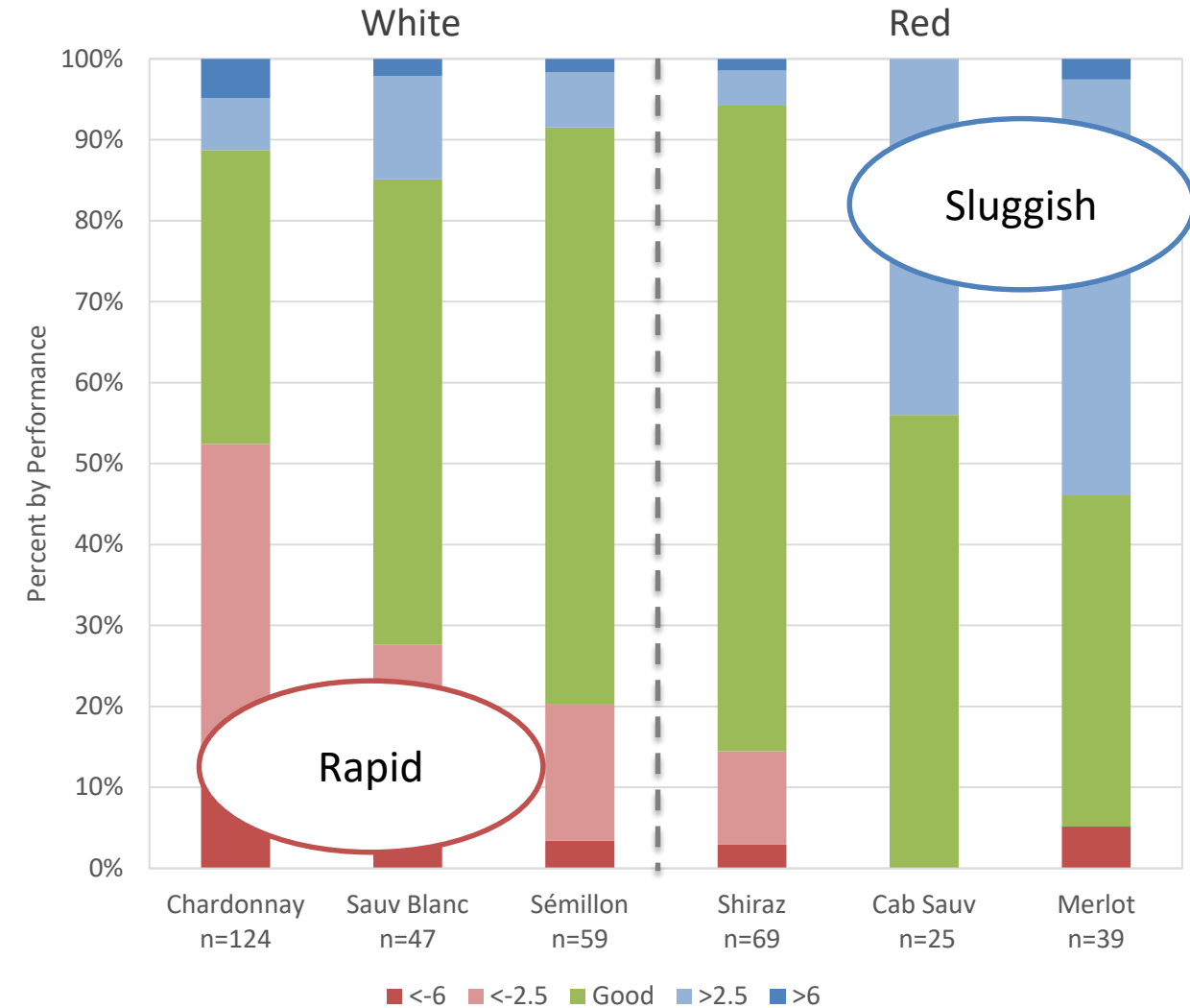
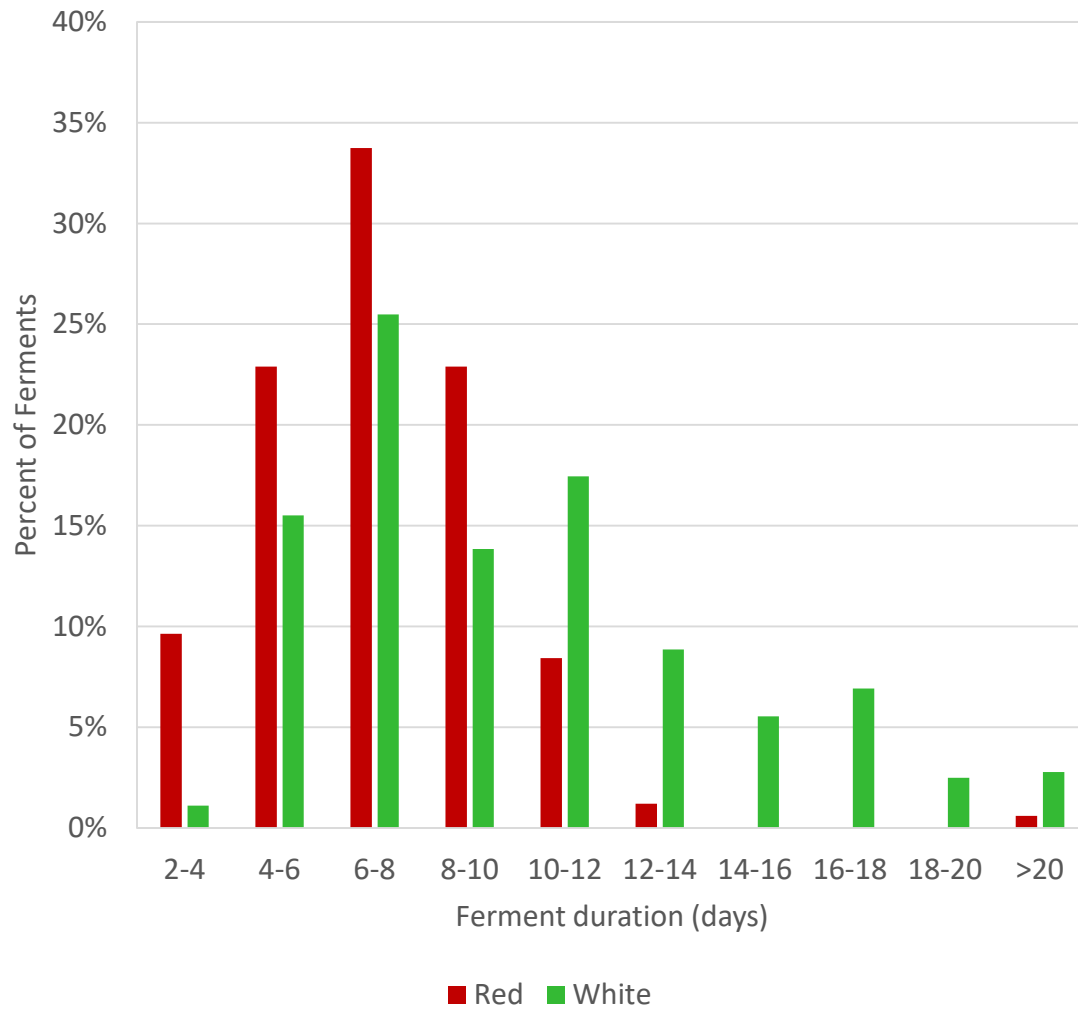
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Ferment Duration



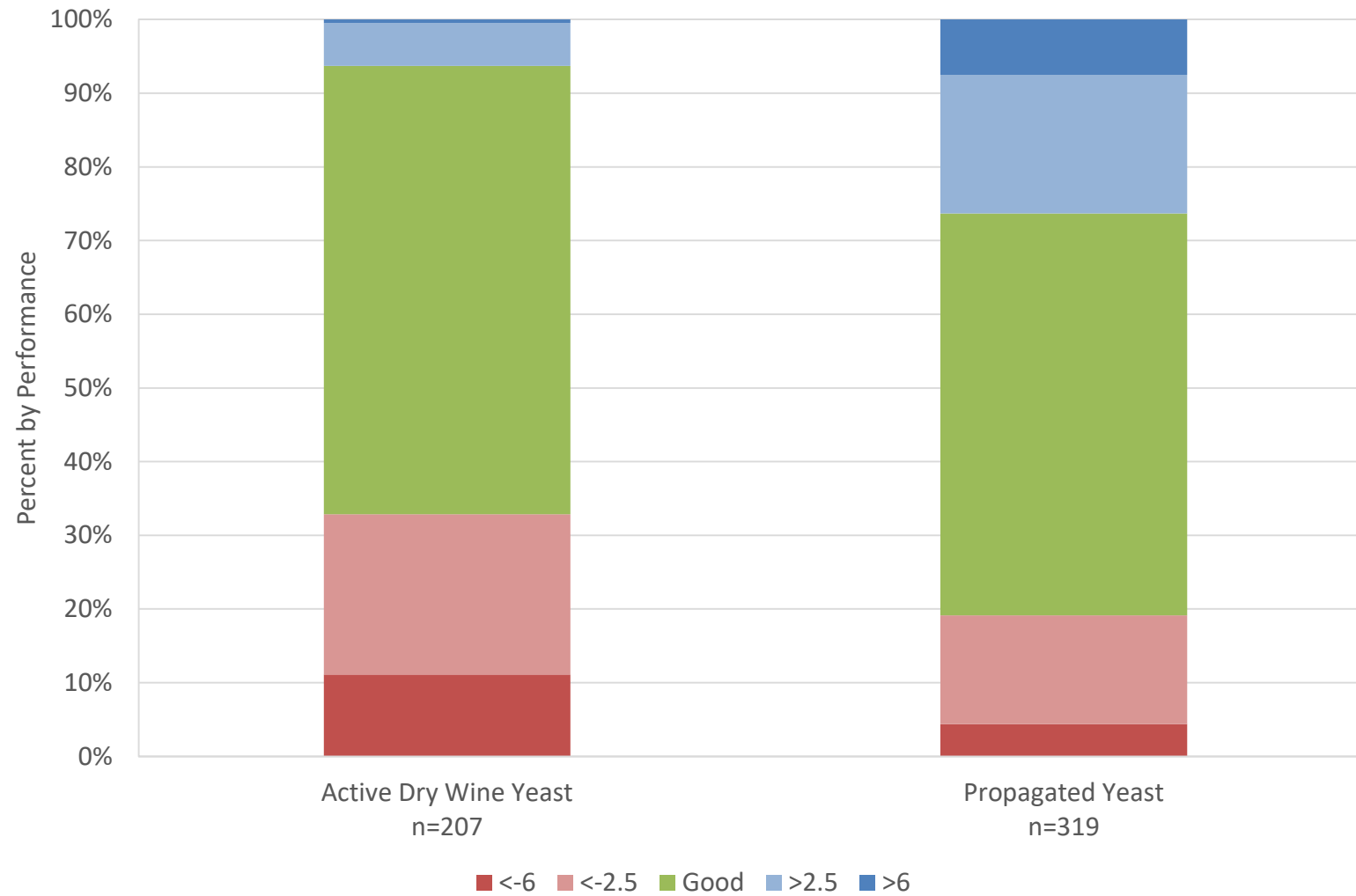
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Inoculation Style



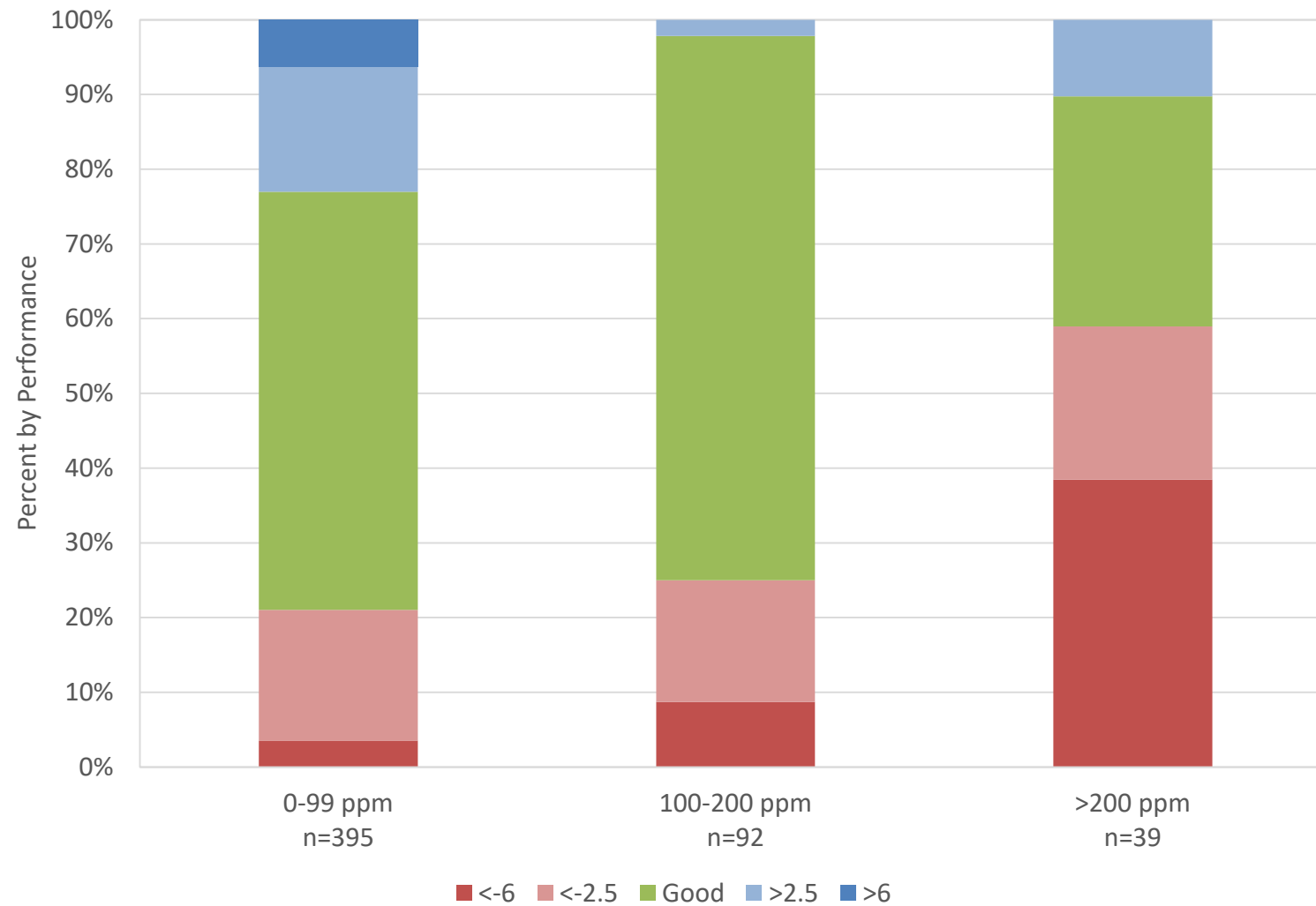
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DAP Additions



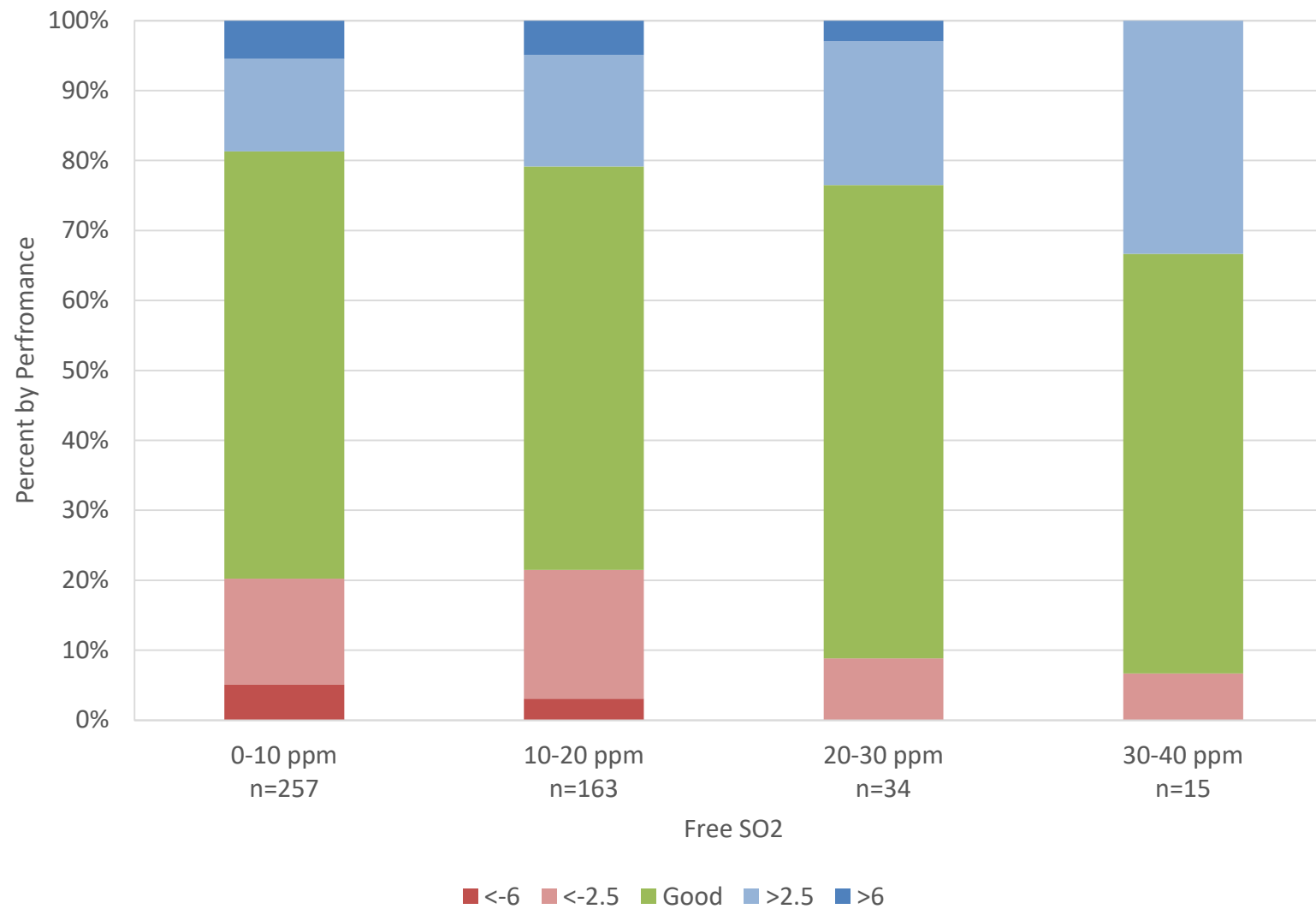
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Free SO₂



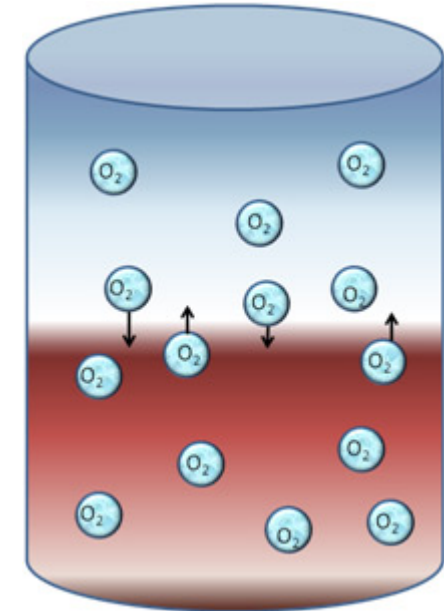
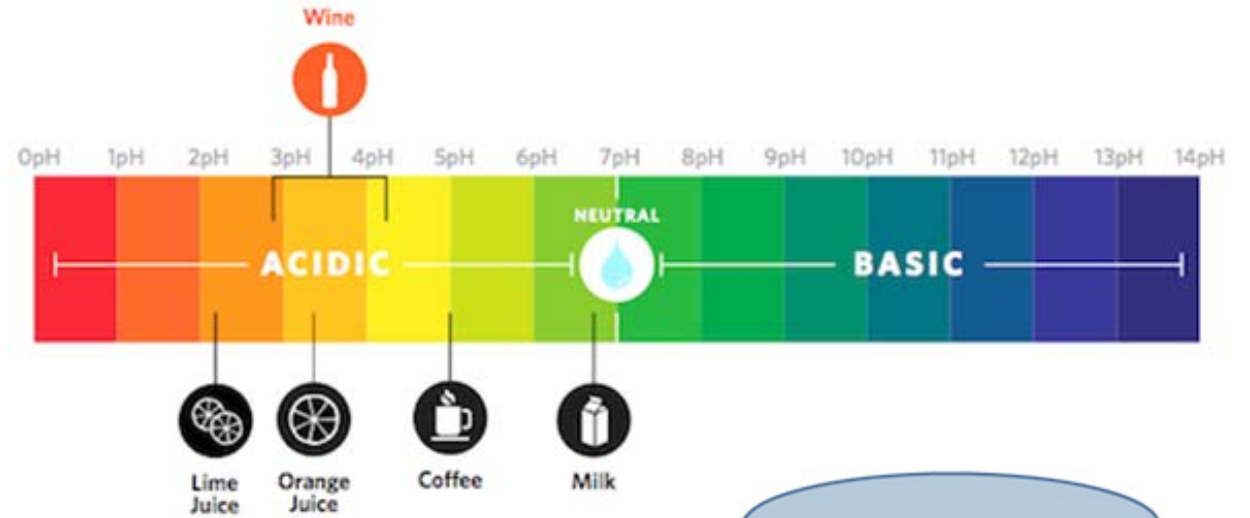
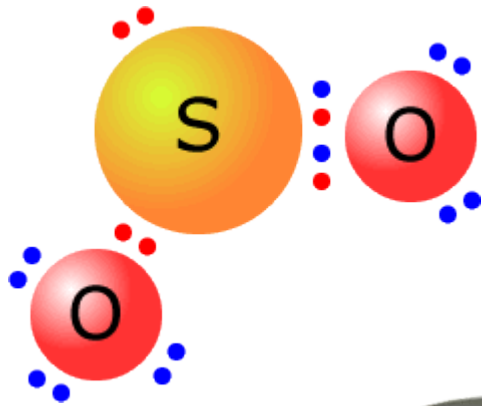
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Looking to the Future



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Fermentation Sensors

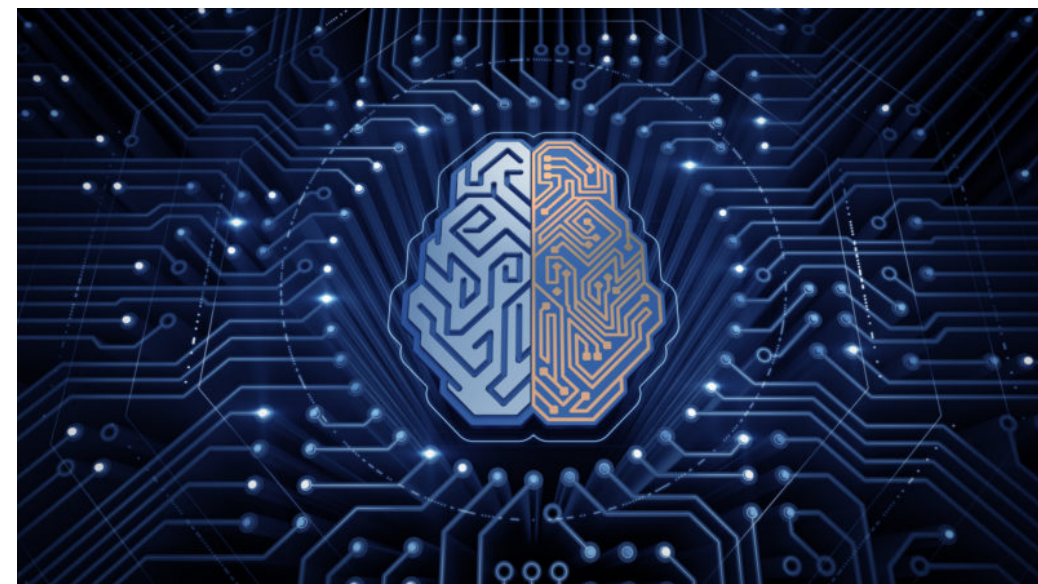


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- ❖ Spectral (e.g. At-line NIR, inline with fibre-optics)
- ❖ Osmotic potential
- ❖ Density
- ❖ Weight loss



- ❖ Learn from thousands of ferments
- ❖ Re-optimize after each vintage
- ❖ Continually improve accuracy
- ❖ Better incorporation of fringe cases



Data

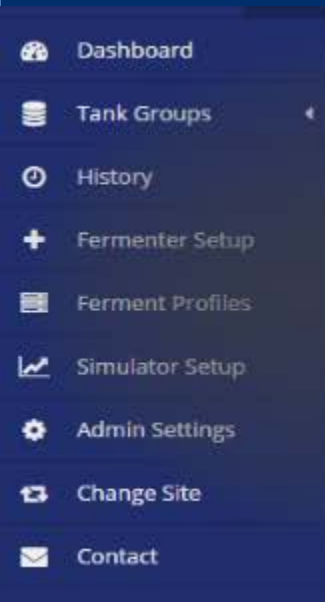
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```

Algorithm



Model

$f(\mathbf{x})$



The AWRI Ferment Simulator Available Now

More Information:

https://www.awri.com.au/industry_support/winemaking_resources/wine_fermentation/awri-ferment-simulator/

Or google "AWRI Ferment Simulator"

Contact:

Ferment.simulator@awri.com.au

Tadro.abbott@awri.com.au