2021 CANNING WEBINAR RECAP & TRIAL PRESENTATION

Jasha Karasek, Enartis USA
Cara Morrison, Sonoma Cutrer

4/20/21

What we discussed in last years webinar series

- Canned packaging
- Copper bound sulfides
- Impact of SO_2
- Other variables
- Cara Morrison – Canning Trial Presentation
- 15 Min Q&A

GEORGE CROCHIERE (Crochiere & Associates)- Can packaging

- Outlined the characteristics of canned wine packaging including information about liners
- Highlighted storage conditions such as temperature on liner integrity
- Emphasized the importance of networking and recording the experiences of winemakers as a whole

Neil Scrimgeour - AWRI

- Discussed the canned wine market growth
- Analytical parameters for determining canned wine shelf life
  - Aluminum
  - H_2S
  - Chlorides
  - SO_2
  - Copper
- Canning Trials involving fining with PVI/PVP

Eric Wilkes - AWRI

- Discussed the various forms of copper in wine
- Highlighted the differences between labile and non-labile copper
- Discussed the impact of aluminum and copper on hydrogen sulfide
- Benefits of reducing SO_2 on H_2S
- Benefits of removing Copper on H_2S

Gavin Sacks/ Rachel Allison – Cornell University

- Emphasized the interactions between SO_2 and Aluminum in producing hydrogen sulfide
- Discussed innovative methods for measuring H_2S
- Impact of wine pH
- Possibility of molecular SO_2 playing role in H_2S formation
- Highlighted the possibility of AO SO_2 measures overestimating Free SO_2 levels

Enartis Solutions

- Utilizing Claril HM and Stabyl Met for treating wines prior to canning for removal of copper sulfides
- Low SO_2 winemaking for canned wines
- Exploring new solutions for canned wine

- PVI/PVP
- Pre-activated chitosan

PVI/PVP

WINEMAKER TRIAL 2021 – CARA MORRISON, SONOMA CUTRER

Canned Wine: Trial Set up and Results

Vintage 2019 Sonoma Coast Chardonnay

4/20/2021

Cara Morrison

Sonoma-Cutrer Vineyards

Sonoma-Cutrer Background

- History of Innovation- screwcaps
- NONE OF THESE CANNED WINES ARE COMMERICALLY AVAILABLE– trial canning ONLY
- Asked to explore canning wine last May, 250 mL cans
- Wines Canned last June, 2019 Sonoma Coast Chardonnay blend in bottle is the control
- This Webinar focus on a canned winemaking trial

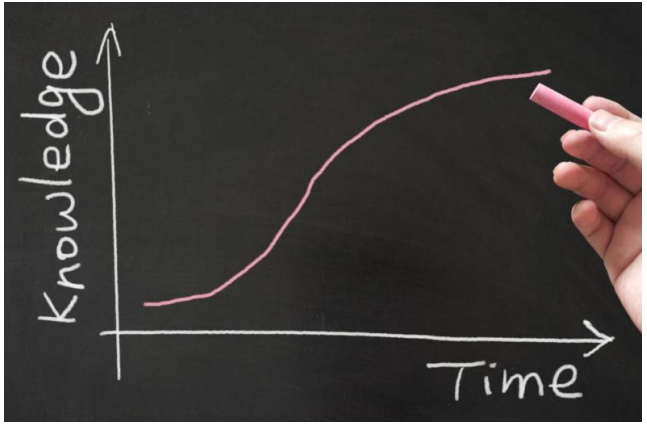
Early in Learning Curve

<1% of wine market is cans

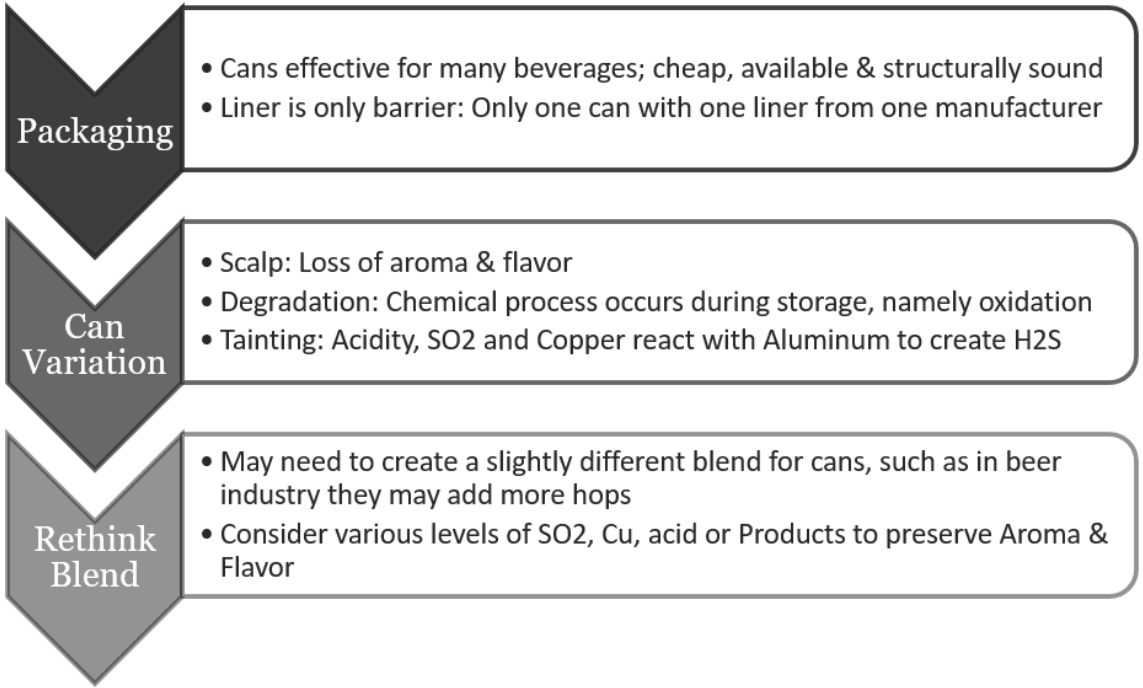
Tiny amount of total Aluminum Cans produced are for wine

Research

- Taste lots of canned wines
- *The Chemistry of Canned Wines*- Cornell – Rachel Allison (research article)
- Enarts: Canned Wine Part 1: New Information for Preparing Wines for Canning
- Enartis: Canned Wine Part 2: New Information on the Impact of SO_2 for Canned Beverages
- Wine Business Monthly Articles
- Ask your winemaker friends or cold call winemakers



Change in mindset: Cans are not made of glass



Can Trial Set up

Can Trial Set up

Goal

- Determine how to preserve wine quality in can.

Plan

- Test various wine treatments in cans to determine how to optimize wine in can quality.
- Compare Analysis and Sensory between can treatments & bottle.

Parameters

- Test on oaked Chardonnay wine that is already blended.
- 250 mL cans

Wine in tank compared to The Can Van recommendations

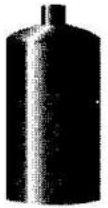
Canned on June 29, 2020

Analysis	Recommended	Actual Wine in Tank
pH	> 3.0	3.4
Free SO2 (ppm)	< 30	22
Total SO2 (ppm)	< 70 (AO)	67
CO2 (ppm)	< 2000	880
Copper (ppm)	< 0.2	0.08
Total Dissolved O2 (DO) ppm	< 1.2	0.24
Chlorides	< 300	< 10
Temperature	<47F	32

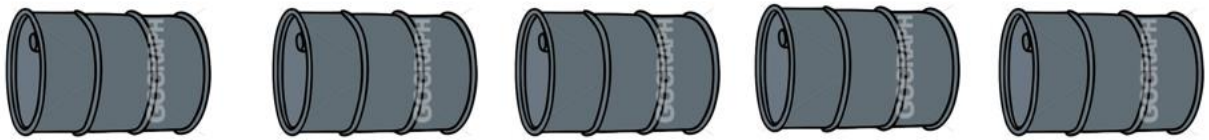
Pass Ball Testing

Canning Procedure: June 29, 2020

Chardonnay in Tank
22ppm FSO2
67 ppm TSO2
880 pm CO2
3.4 pH
2 g/L RS



Stainless Steel tank with wine at 32F
Transferred to 5- 60 gal SS drums



Control | SO2 | CO2 | Claril HM | Claril HM

Control: no action
SO2: Add 5 ppm SO2
CO2: Sparge with CO2 to 1500 ppm
Claril HM: Add 25 g/hL, Mix with SS stirrer for 30 minutes total, 1 hour settle, Nitrogen displace to rack wine

The Can Van: Trial Canning photos

QC flashpoints:
Liquid Nitrogen/Minimizing O_2
Can seaming
Pressure testing/'Squishiness'

Canned directly from 5- 60 gal SS drums

SSD#	Treatment	F SO2	T SO2	CO2 ppm	DO in SS drum	DO in can	TPO (ave 3 cans)	NTU	Cu Level mg/L
recommended		<30	<70	<2000	<0.5	<0.5	< 0.8		1.3 safe in water, <1.0 in wine
1	Control	22	67	879	0.24	0.5	3.0	4.2	0.08
2	CO2	22	67	1659	0.16	0.3	1.7	4.2	0.08
3	SO2	25	84	880	0.37	0.58	1.8	4.2	0.08
4	Claril HM	22	67	860	0.43	0.6	1.9	17.4	0.06
5	Claril HM + high DO	22	67	860	0.42	1.2	2.1	15.3	0.06
	Bottle	28	81	850	0.46 (DO in tank)	0.22 (DO in bottle)	x	x	0.08

Post Canning Analysis and Storage

Performed normal QC analysis:

- DO, FSO_2, and CO_2 on SSD and multiple cans.
- Tested TPO by shaking can for 3 minutes and checking DO.
- The Can Van performed pressure in can & seam test
- Sent out for Al, Cu, and H_2S
- Stored trays of cans in standard warehouse and winemaker library

Bottle Control:

- The same wine blend bottled that day stored in the warehouse

Can Aging

Temperature Variables

Temperature Variable	Start date	To Date	To Date	Time at Enartis tasting	Trial name
Winemaker Library	6/29/20	Current		9 mo	48F
Warehouse	6/29/20	Current		9 mo	58F
Warehouse then offices	6/29/20	11/24/20	Current	5 mo WH + 4 mo OF	68F
Enartis Offices	6/29/20	Current			68F

General Analysis Over Time

No Significant Difference*	Significant Difference
• O_2 • CO_2 • Free SO_2 • Total SO_2 • Acetaldehyde	• Hydrogen Sulfide • Aluminum

*Only differences were intentional treatments
Average analysis of 3 separate cans

Hydrogen Sulfide Over Time

		ave of 3 results from of 3 cans		
		5 months	8 months	9 months
Storage T	Treatment	ug/L H2S	ug/L H2S	ug/L H2S
48F	Claril		ND	
58F	Claril		3.1	2
68F	Claril	0.2	4.2	3.8
48F	SO2		3.9	12
58F	SO2		9.4	
68F	SO2	15.3	28.7	19.4
48F	CO2		0.4	
58F	CO2		ND	19.9
68F	CO2	10.7	1.9	
		Enartis offices		

Enartis ran results blind, different random codes on the cans each time

~2.0 is H2S threshold, depends on wine matrix

Internal Sensory Results Over Time

1 and 2.5 months:	No Clear Differences between treatments or with bottle.
3.5 and 5 months	Starting to see differences between Bottle and cans.
6 months	Some treatment differences, eliminated control and higher DO Clearer Difference between cans & bottle
7 and 8 months	Clear differences between storage temperature

Forced Rank test
5 treatments at warehouse temperature
3-7 tasters per tasting
Tasted in glasses.

Forced Rank test
5 treatments at warehouse temperature, tasted out of cans (poured bottled wine into empty cans).
7-8 tasters per tasting

Forced Rank test
3 treatments (higher CO_2, higher SO_2, and Claril fined) at 3 temperatures
Tasted out of cans
7-8 tasters per tasting

Internal SCV 8-month Results

2.23.21		Rank 1-10	
Storage location	trial	total	ave
58F, xfer to cans	Bottle	25	3.1
48F	Claril	26	3.3
58F	CO2	27	3.4
48F	CO2	40	5.0
58F	Claril	41	5.1
48F	SO2	48	6.0
68F	Claril	53	6.6
68F	SO2	58	7.3
58F	SO2	59	7.4
68F	CO2	63	7.9

Internal SCV 8-month Results

2.23.21		Rank 1-10	
Storage location	trial	total	ave
58F, xfer to cans	Bottle	25	3.1
48F	Claril	26	3.3
58F	CO2	27	3.4
48F	CO2	40	5.0
58F	Claril	41	5.1
48F	SO2	48	6.0
68F	Claril	53	6.6
68F	SO2	58	7.3
58F	SO2	59	7.4
68F	CO2	63	7.9

March 2021 Large Scale Sensory Results

Sensory Analysis: Minimizing Bias

5 Samples sent to 75 Beverage alcohol (mostly wineries) who work with cans

143 responses total!

Instructions to pour Wine into wine glasses & not taste out of can (multiple tasters)

Tasted at room temperature

Generic Label

No appellation or winery listed

3 digit code

Online **survey** randomized the 5 samples order so not everyone tasted in the same order

Samples Tasted

Storage Temp	treatment	3 digit code
58F	CO2	331
58F	Claril	794
68F	Claril	562
68F	higher SO2	262
48F	higher SO2	945

Please tell us about yourself?

Currently package wine in a can	55%
Plan to can wine in the near future	8%
Not sure/ Considering canning wine at some point	28%
Not considering canning wine	9%

How many years have you been doing wine sensory professionally?

Under 5 years	17%
5-10 years	32%
10-20 years	32%
20+ years	19%

Survey Questions for all 5 wines

Asked tasters to first Score wines 1-3

1 = Commercially acceptable wine, lacks obvious flaws

2 = Commercially acceptable wine with a few flaws

3 = Not commercially acceptable, obvious flaws

Describe Oxidative/Reductive Characters:

Reductive characters = H2S, burnt rubber, burnt match, cooked cabbage, onions, garlic

Oxidative characters = aldehydes, dulled fruit

- Neither Reduction or Oxidation
- Obvious Reduction
- Some Reduction
- Some Oxidation
- Obvious Oxidation
- Wow, both reduction and oxidation

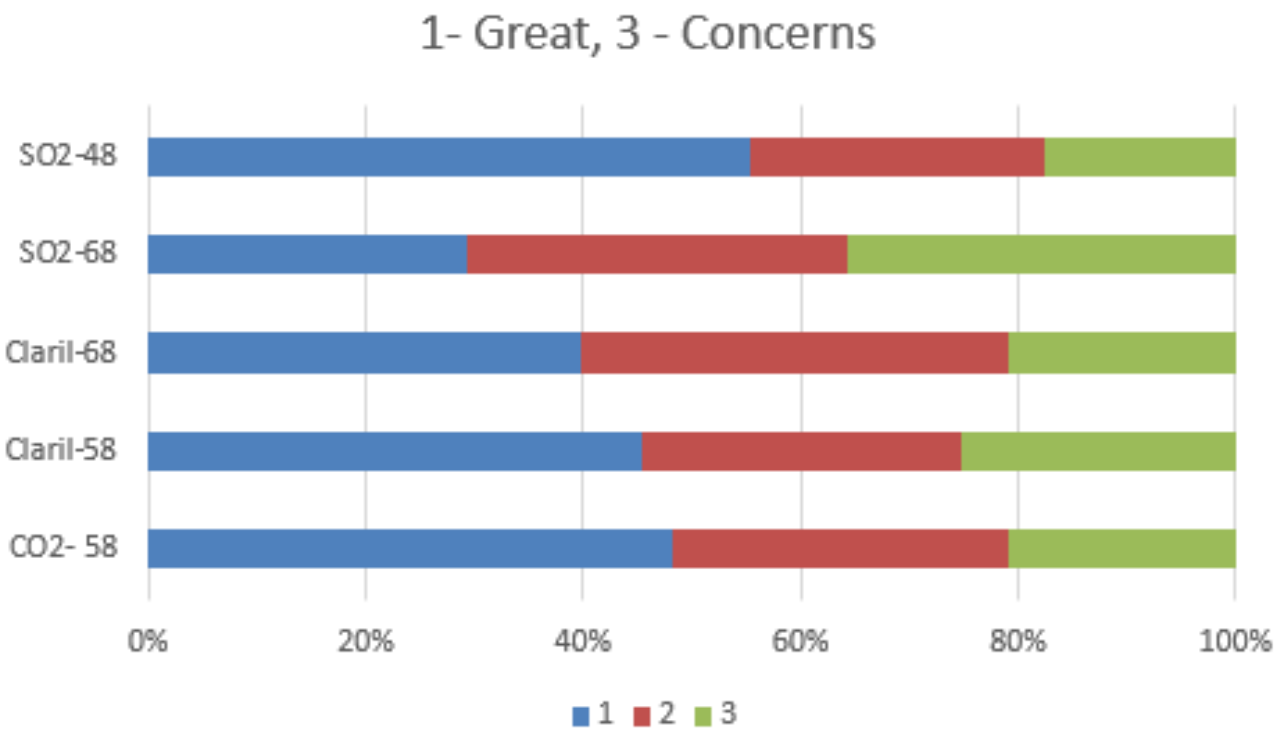
Rank all 5 wines 1-5

1 – Most preferred

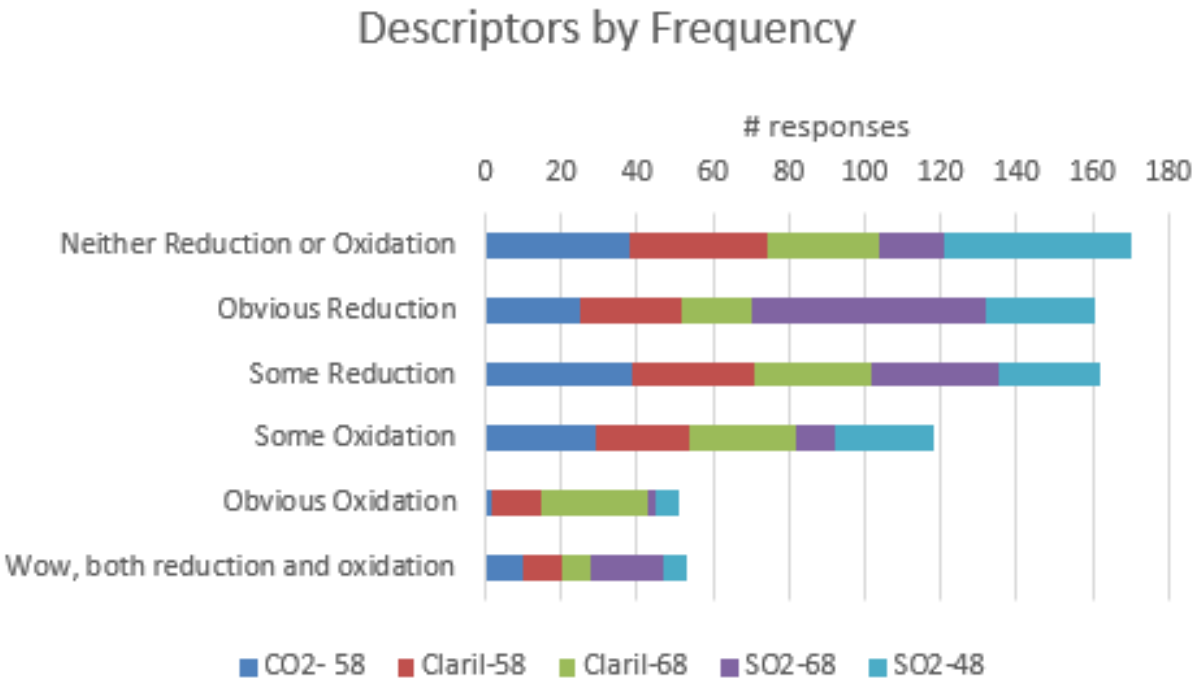
5 – Least Preferred

We enjoyed all your comments, thank you!

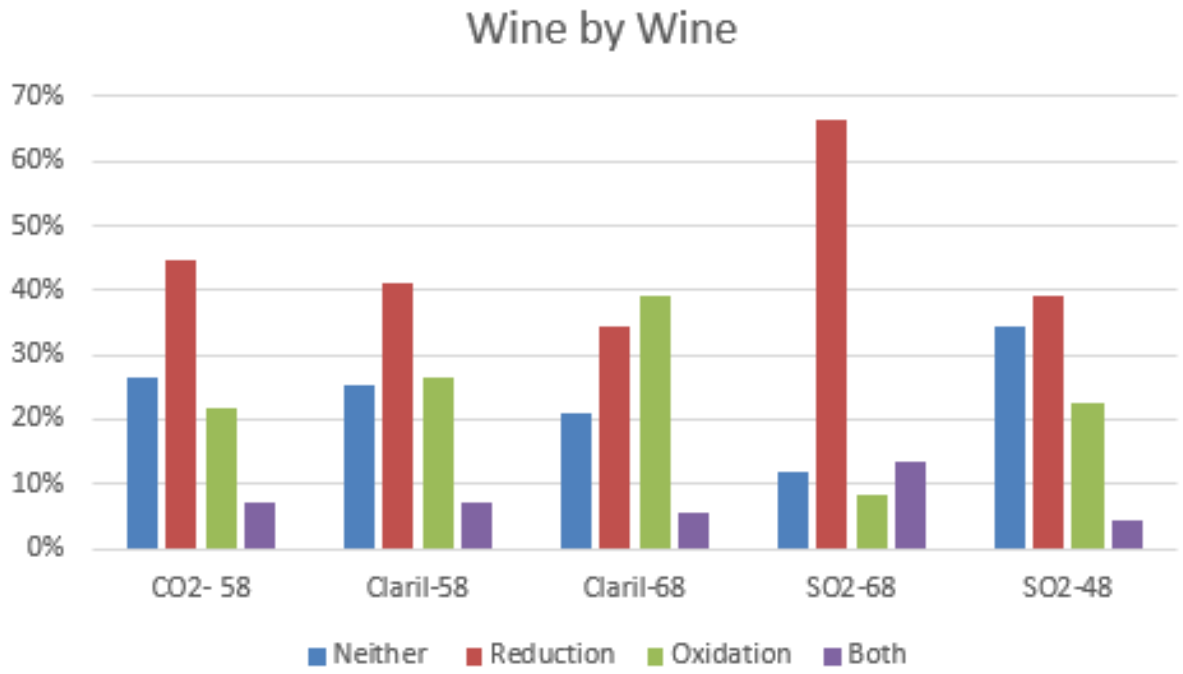
Scoring Treatments 1-3



Descriptors Frequency



Descriptors, Combine Some & Obvious



Ranking Preference 1 - 5

Most Preferred

- SO_2- 48F
- CO_2- 58F

Mid Preferred

- CO_2- 58F
- Claril- 58F
- Claril – 68F

Least Preferred

- SO_2- 68F

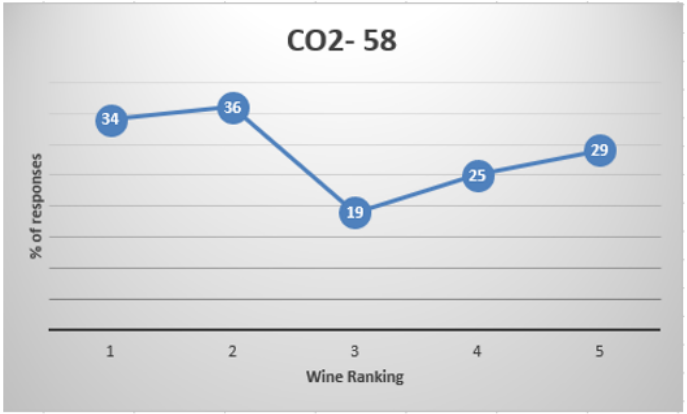
CO2- Love/Dislike

NAILED IT Taster Comment: 331 was a little fizzy, the others were not.

Treatment: 1600ppm, other wines at 900 ppm

Variability in analysis and sensory

- People either loved the wine (1 and 2) or dislike wine (4 and 5 place), least number of 3rd places. Seen this in our internal tastings. Either can to can variation or personal preference?
- Variable H_2S analysis
- Overall favorite, maybe add a little less CO_2



SO_2- Temperature Impact

Taster Comment: Sample 945 was much better than the rest. Sample 262 was much worse.

Sample 945, SO_2 at 48F

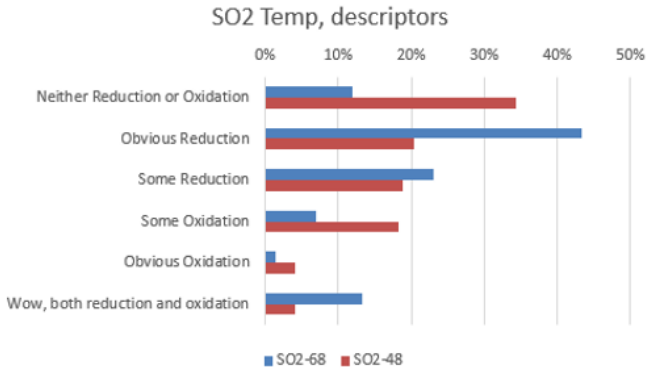
Sample 262, SO_2 at 68F

Treatment: 25 ppm FSO_2 / 84 ppm TSO_2

Other wines: 22 ppm FSO_2/ 67 ppm TSO_2

Clear difference between storage temperatures

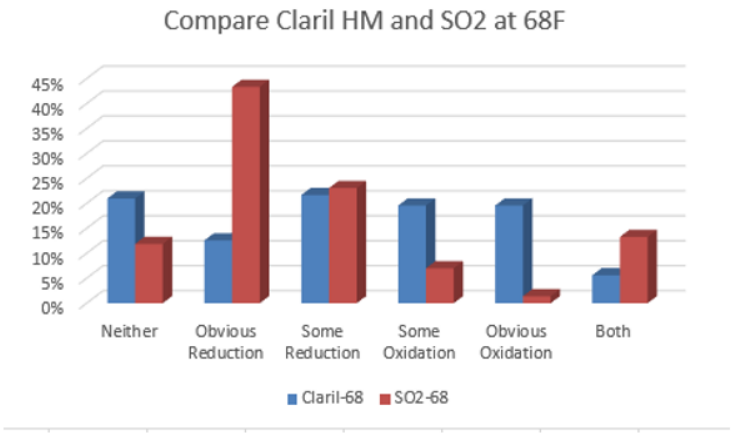
- Room/Retail store temperature clearly accelerated the reaction of Al + SO_2 = H_2S
- Higher SO_2 at ideal temperature greatly decreased the Reduction AND Oxidation sensory attributes.
- Speculation: Shows what is possible if there would be a better liner to help quality?



Claril HM Fining

Reduces the can off flavors at room/retail store temperature
Speculation: More oxidative characters than other treatments- removing the H_2S allows people to taste more of the oxidative character? Reminder- all wines have the same acetaldehyde.
No 'oak' characters mentioned in comments

Trial idea: *Higher SO_2 to avoid oxidation & Claril HM fining to reduce reduction?*



Conclusions

Key takeaways

- Liner is everything
- Temperature accelerates reactions
- Can to Can variability
- Early in learning curve

What can you do?

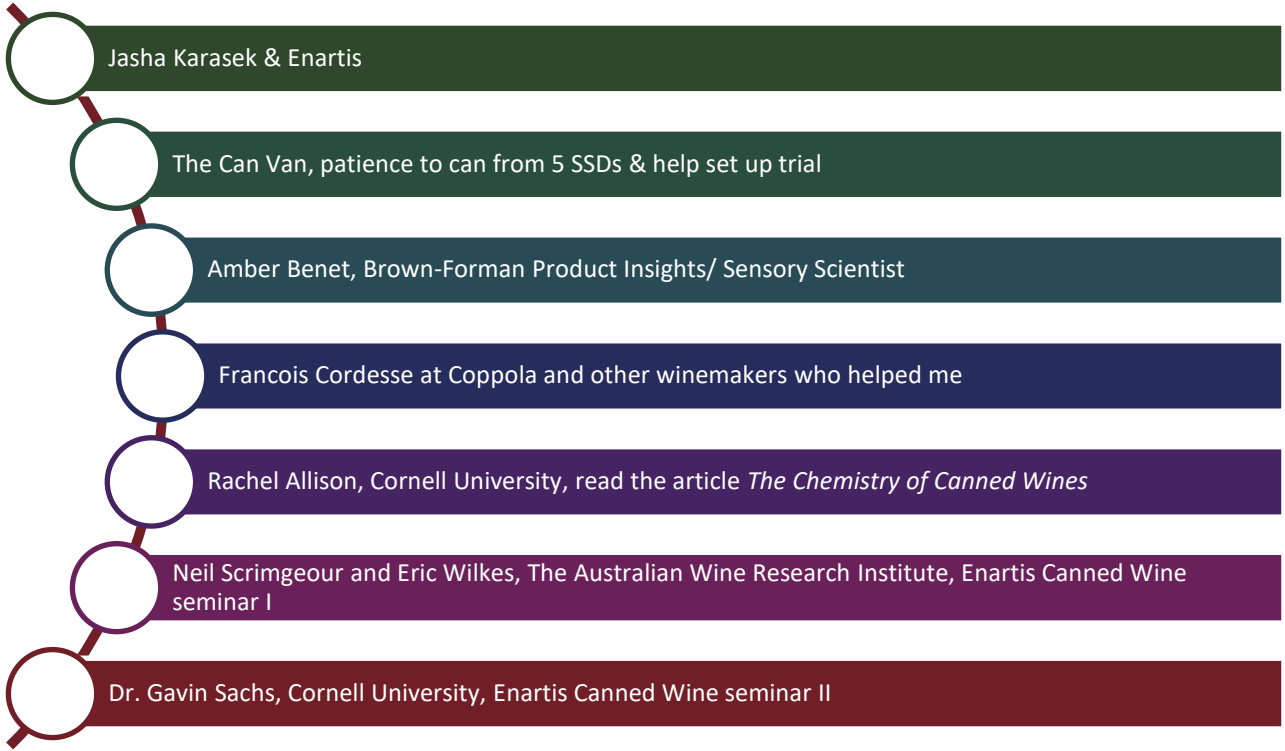
- Small canning runs per demand
- Adjust wine for cans
- Claril HM fining- helps in analysis and sensory
- Learn from each other

Help is on the way

- Research on new can liners
- Winery H_2S potential test
- Winery accelerated heat test for wine in can

Who is running the next trial to share?

Thank you


Jasha Karasek & Enartis
The Can Van, patience to can from 5 SSDs & help set up trial
Amber Benet, Brown-Forman Product Insights/ Sensory Scientist
Francois Cordesse at Coppola and other winemakers who helped me
Rachel Allison, Cornell University, read the article *The Chemistry of Canned Wines*
Neil Scrimgeour and Eric Wilkes, The Australian Wine Research Institute, Enartis Canned Wine seminar I
Dr. Gavin Sachs, Cornell University, Enartis Canned Wine seminar II

Is this the same wine? If so, wooo, these are substantial differences

Canned wine is a fool's errand

(Note: Let's change this perception!)

Toasty oak clashes with reduction - the same level of reduction would be more acceptable in a less-oaked wine.

Surprisingly good

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THANK YOU FOR YOUR PARTICIPATION!

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