WINEMAKERS RESEARCH EXCHANGE

Sensory Session 3: Jacks & Stems

Pros and cons of stem inclusion and sorting

Stone Tower Winery, March 22, 2023

Shane McManigle, Doug Fabbioli, Kirsty Harmon, Joy Ting

Upcoming Events	
March 22	WRE Sensory Session: Jacks and Stems In-person, Stone Towner Winery, 1PM
April 6	Postponed
April 18	Eastern Viticulture & Enology Forum: Pet Nat roundtable
April 19	VWA Ask the Experts: Tracking grape phenolics during ripening, including a Virginia case study
April 27	WRE Sensory Session: Aging strategies part 1 Virtual
May 5	Virginia Wine Benefit
May 24	WRE Sensory Session: Building a bigger red In-person, Central Virginia (TBD)

VWA Ask the Expert

Phenolic Maturation in Grapes

Case Studies and FAQ with Steve Price, ETS Labs

April 19 1-2 PM

Steve developed the phenolic assays offered by ETS, works with client support for the phenolic program and works on a range of ETS research projects.

He will present information on phenolic maturation in general, as well as case studies from Virginia grapes

Register through VWA

Virginia Wine Benefit

Engaging the Virginia wine industry to benefit our community

May 5 @ 6:30 PM

The Generous Pour

Inaugural auction event at Veritas Vineyard and Winery

Reggie Leonard MC/Auctioneer

Beneficiaries: WRE and Blue Ridge Food Bank

Tickets $150

Virginia Wine Benefit

Introduction

Introduce yourself

Do you include whole clusters in any of your fermentations?

- What winemaking goals does this fulfill?
- Which varieties?
- What are the benefits?
- What are the drawbacks?

Traditional practice

(Destemmer invented in 19th Century)

- Beaujolais, Rioja, Georgia
- Burgundy, Rhône, Australia, and California

“greater complexity and silkier tannins”
“to add freshness”
“fragrance and perfume”
“add strength and firmness to the tannins”

“dull the fruit”
make the wine “too herbal”
give it a “mulch/compost character”

Jamie Goode, “Stemming the Tide”, 2012

Three fractions

Teznier & Flanzy 2011

Fraction 1

Intact clusters

CO_2 rich atmosphere

Autofermentation

(carbonic maceration)

Strawberry, raspberry, cherry and kirsch (fruity)

Ethyl cinnamate & benzaldehyde (cinnamon, spice)

No alcoholic extraction from skins

(Low tannin, low color)

Potential for aerobic spoilage organisms (Klockera)

- Acetic Acid
- Ethyl Acetate

Three fractions

Teznier & Flanzy 2011

Fraction 2

Intact clusters
Surrounded by fermenting must

Autofermentation
Break down more quickly (alcohol)
More alcoholic extraction from skins
More varietal aromas, less CM character

Less oxygen, less potential for spoilage

Three fractions

Teznier & Flanzy 2011

Fraction 3

More traditional yeast fermentation

Stems are present

Potassium

Methoxypyrazine

- 50% of IBMP in clusters
- Decreases with ripening

C-6 and Hexanol (vegetal)

Phenolics

Water

Aromas

- Rotundone (spicy, pepper)
- Methyl Saliicilate (minty, fresh)

Before we start…

Purpose of sensory sessions

- Personal experience, but also sensory statistics
  - Different groups for tasting order
- Is there a difference?
  - Triangle test
  - Descriptors - some we will define together beforehand

Good sensory requires focus; please remain quiet.

All experiments will be explained; draft reports provided once sensory is complete.

Fruit Character

Its not just about intensity

Bright, Fresh, Red

Dark, Dried, Black

Astringency Quality

Standards

Flight 1

Scan the QR code provided for your group number

NOT a triangle test!

4th wine is for demonstration only.

Scores for first three wines.

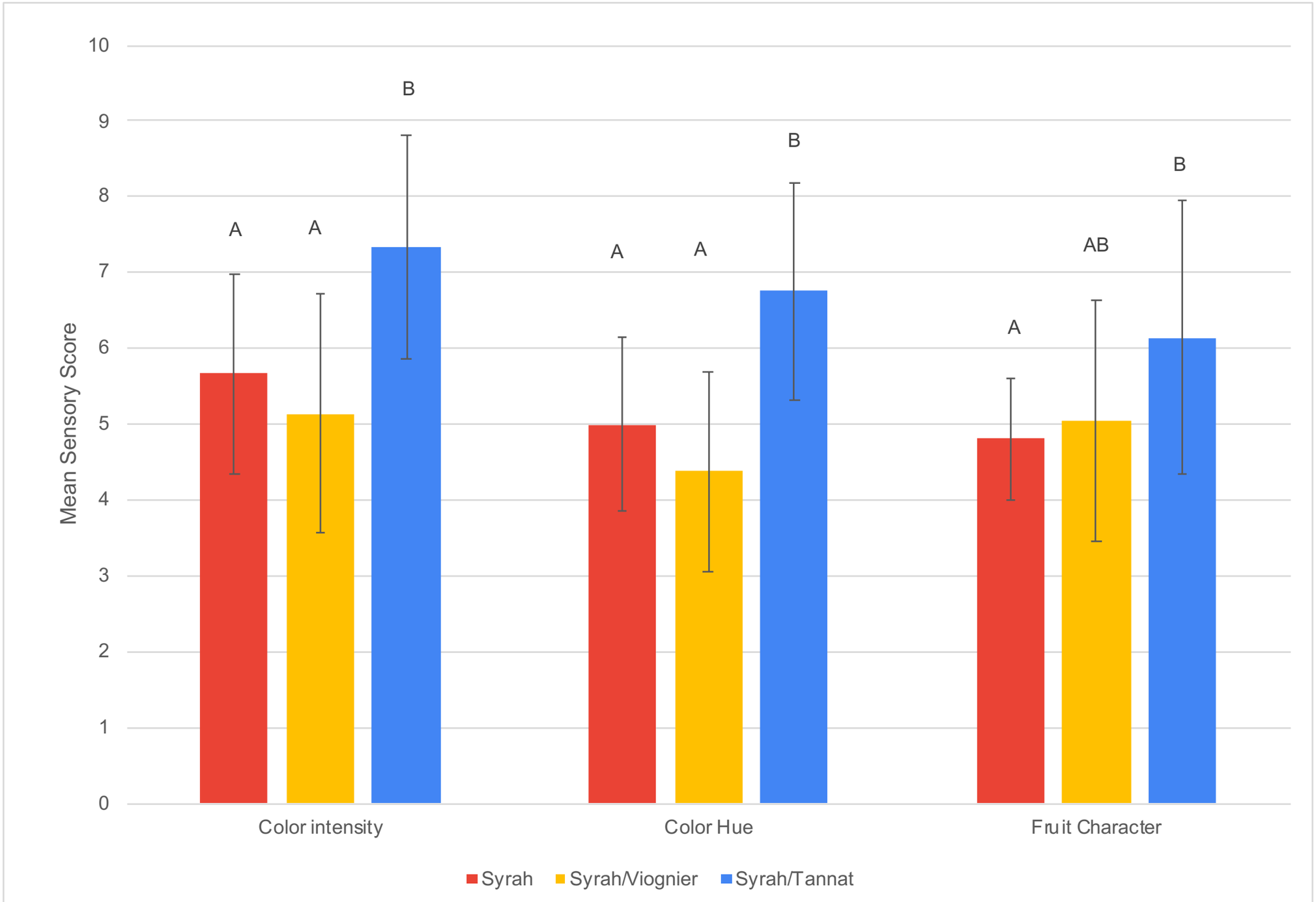
Don’t forget to submit form when you are done!

Background: Exploring the effects of co-fermentation in Syrah (2021)

Doukenie Winery

Dawn Stein

Syrah was co-fermented with 15% Viognier or 15% Tannat



Do whole clusters lead to better Syrah varietal expression?

Doukenie Winery

Shane McManigle

Cultivated in Rhône since the Romans

Late bud break

Shrivels when ripe (>21 Brix)

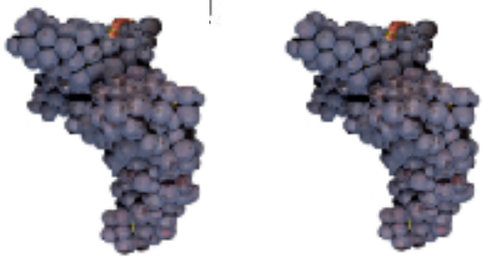
Susceptible to Botrytis (shoots and clusters)

Cold tender, bud necrosis

2021 Grape Report - 25 tons (out of 7688 total *vinifera*)

100% Destemmed

75% Destemmed 25% Whole Cluster



50% Destemmed 50% Whole Cluster

Rotundone

Syrah varietal character

Responsible for “peppery” aroma in Shiraz
Positive wine aroma

Associated with cool temps, high vigor, water availability

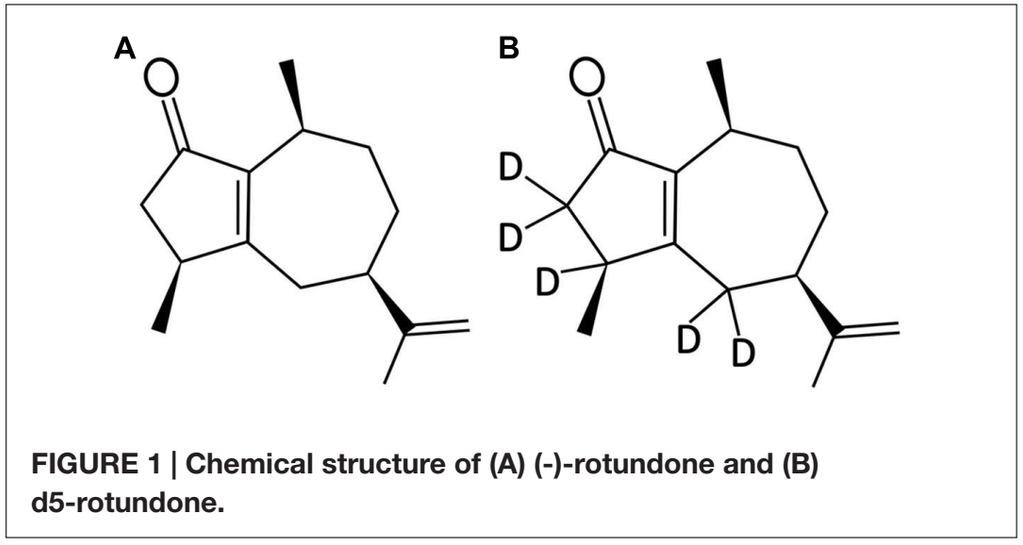


FIGURE 1 | Chemical structure of (A) (-)-rotundone and (B) d5-rotundone.

Zhang et al 2016

Highly variable within vineyards, vines, bunches

Higher concentration in stems and leaves

Produced by skins of grapes

- Extracted by crushing and fermentation
- Increase concentration with whole cluster ferments

Zhang et al 2015, 2016

General Methods

All bins the same

50 mg/L SO_2 at processing
7 day cold soak
Inoculated with D254 rehydrated in GoFerm
Addition of 2 g/L tartaric acid
Chaptalized by 2 Brix
Cool fermentation
20 days total maceration
Free run only for the experiment

Put the wines in order of whole cluster inclusion

Harvest

Juice chemistry, Vinterra, Sept 9, 4 tons

Treatment	Brix	pH	Titratable Acidity (g/L)	Acetic Acid (g/L)	YAN (mg/L)	Potassium (mg/L)
100 DS	18.05	3.5	5.29	0	50.87	1858
75 DS 25 WC	18.85	3.54	5.42	0	84.01	1533
50 DS 50WC	19.39	3.57	5.35	0.09	118.74	1319

In 2021, harvested on Oct 8, 2.5 tons, 19 Brix

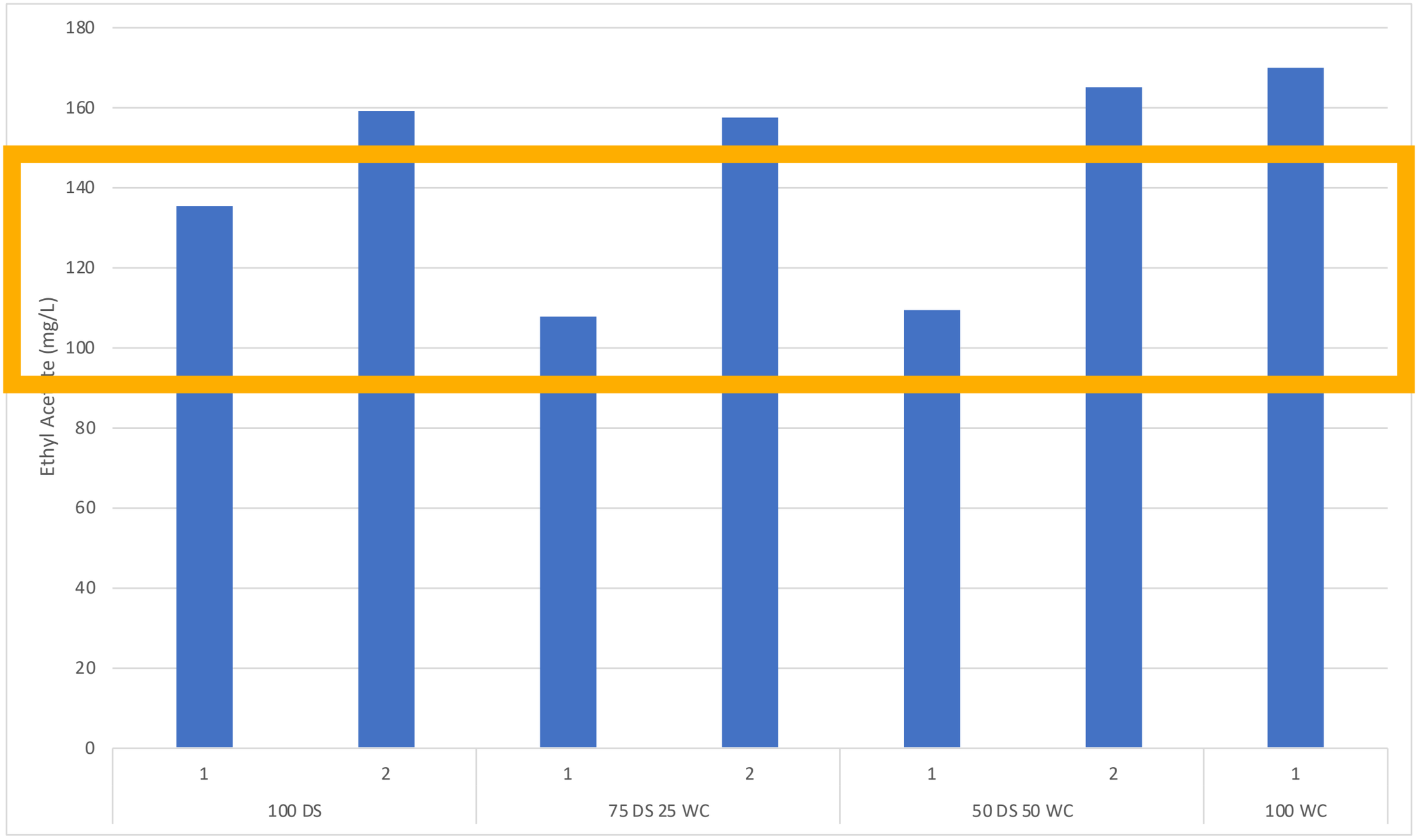
Wine Chemistry

ICV Labs, January and March 2023

	BBI	Acetic Acid (g/L) (January)	Acetic Acid (g/L) (March)	pH	Titratable Acidity (g/L)	Alcohol (%)	free SO_2 (ppm)
100 DS	1	0.71	0.79	3.8	4.68	12.63	18
	2	0.7	0.78	3.81	4.71	12.66	20
75 DS 25 WC	1	0.89	0.94	3.87	4.58	12.21	21
	2	0.91	0.97	3.87	4.64	12.26	18
50 DS 50 WC	1	0.88	0.95	3.92	4.48	12.01	34
	2	1.01	1.1	3.95	4.56	12.06	9
100 WC	1	0.98	1.05	4.02	4.53	11.59	12

Ethyl Acetate

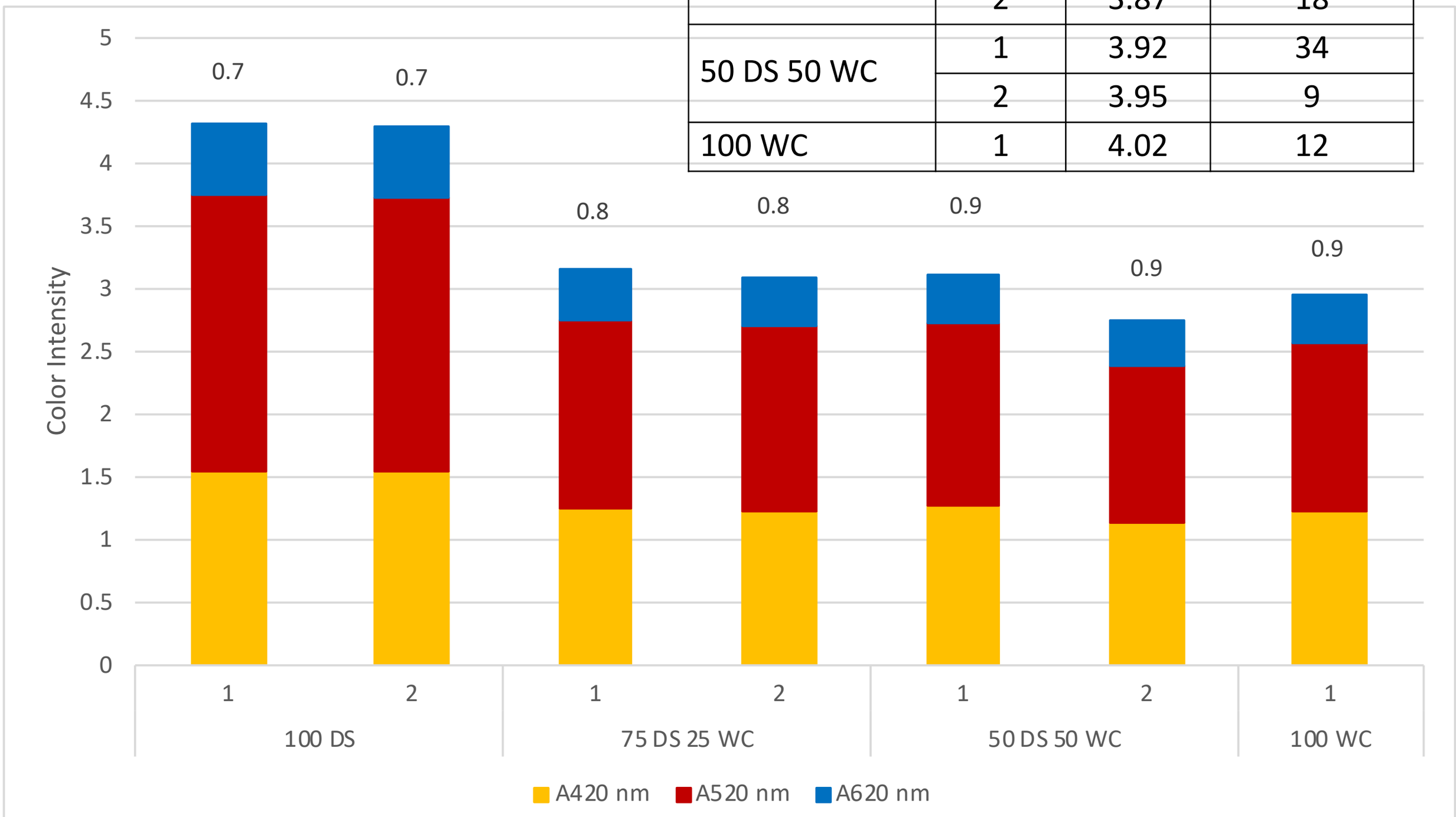
ICV Labs March 2023



Color

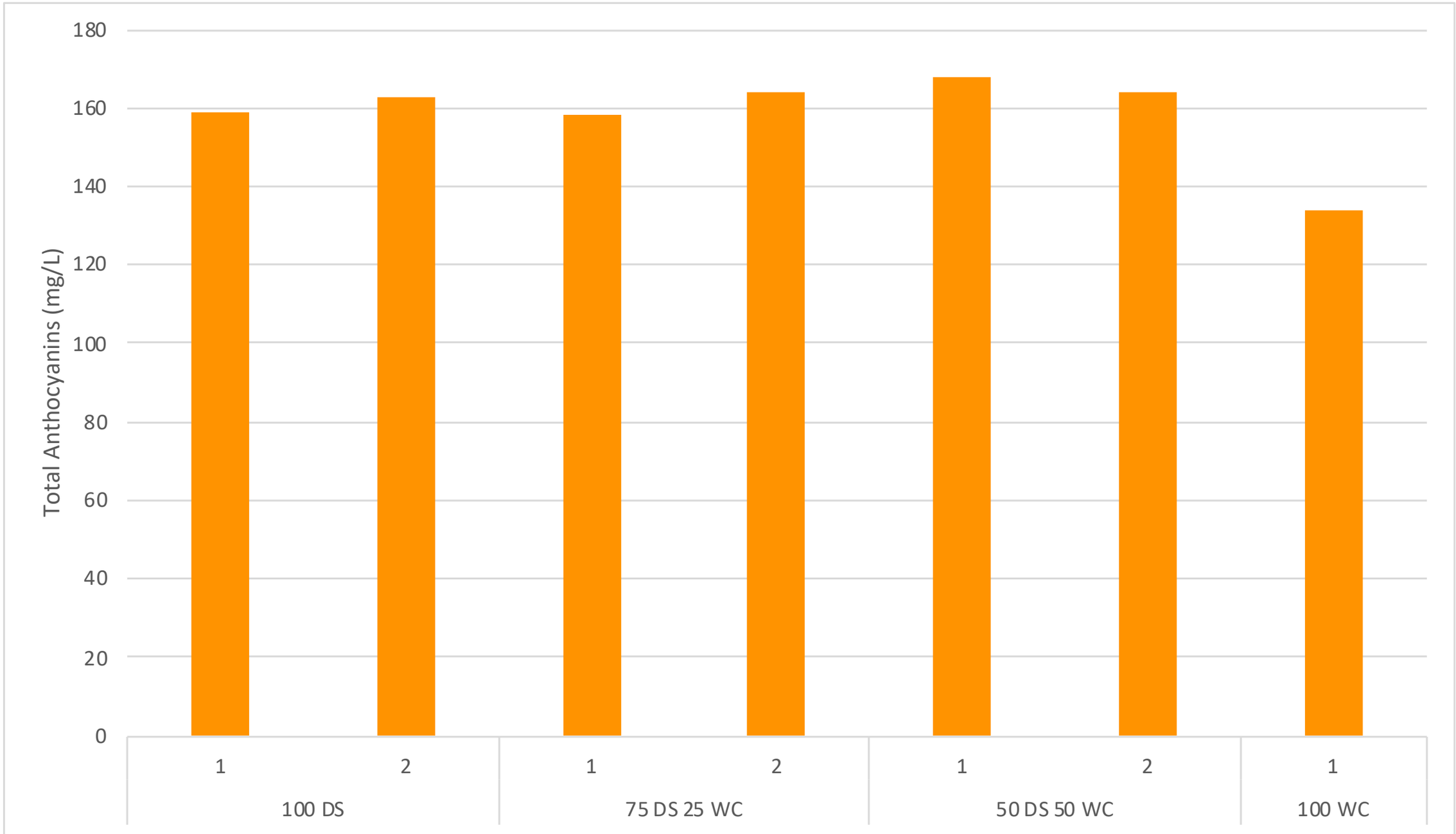
ICV Labs, ETS Labs

	BBL	pH	free SO_2 (ppm)
100 DS	1	3.8	18
	2	3.81	20
75 DS 25 WC	1	3.87	21
	2	3.87	18
50 DS 50 WC	1	3.92	34
	2	3.95	9
100 WC	1	4.02	12



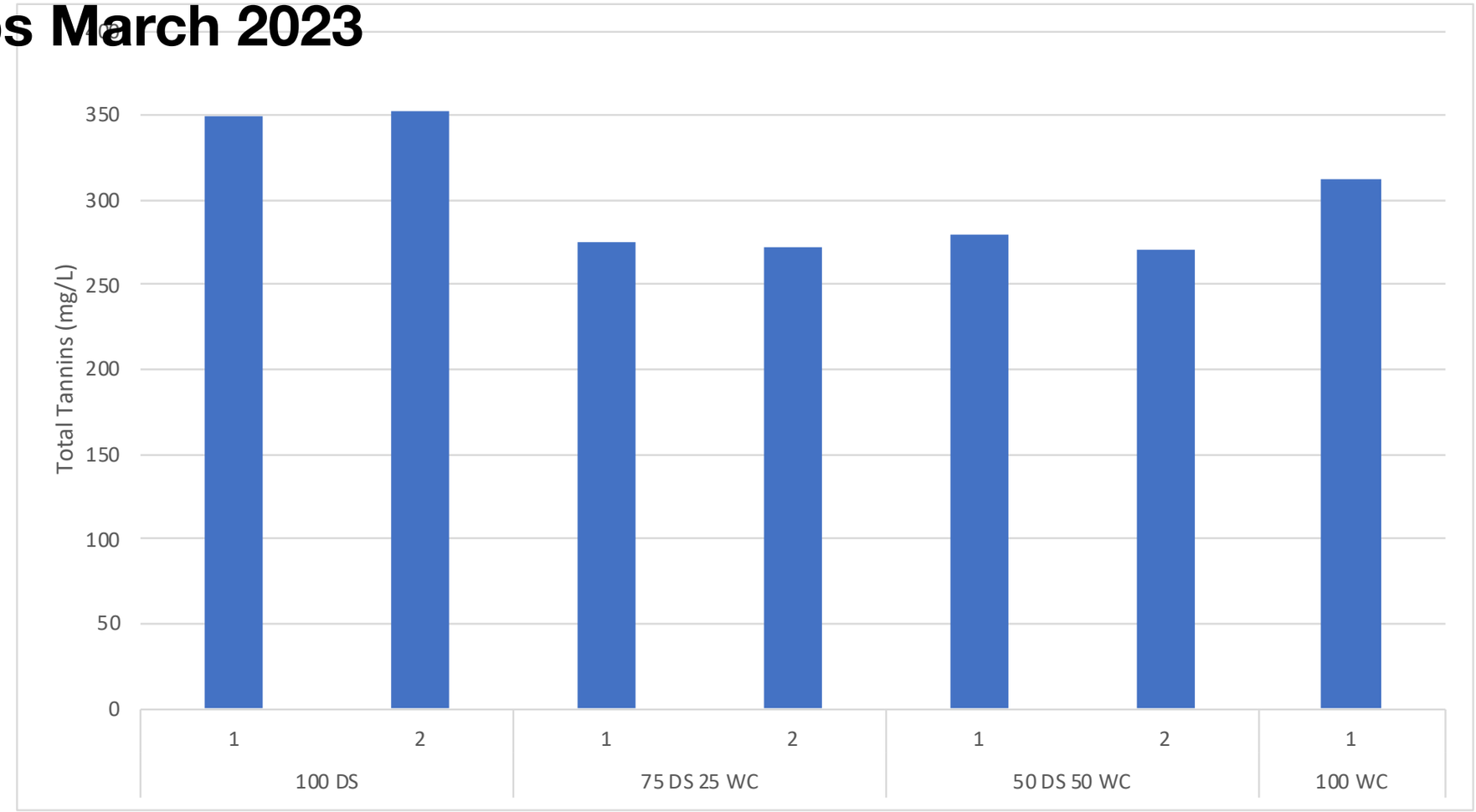
Anthocyanins

ETS Labs March 2023



Tannins

ETS Labs March 2023



		Anthocyanins		Catechin	Tannin
	Barrel #	Polymeric	Total		
100 DS	1	27	159	20	350
	2	28	163	21	353
75 DS 25 WC	1	22	158	16	275
	2	22	164	16	272
50 DS 50 WC	1	21	168	18	279
	2	21	164	18	270
100 WC	1	22	134	22	312

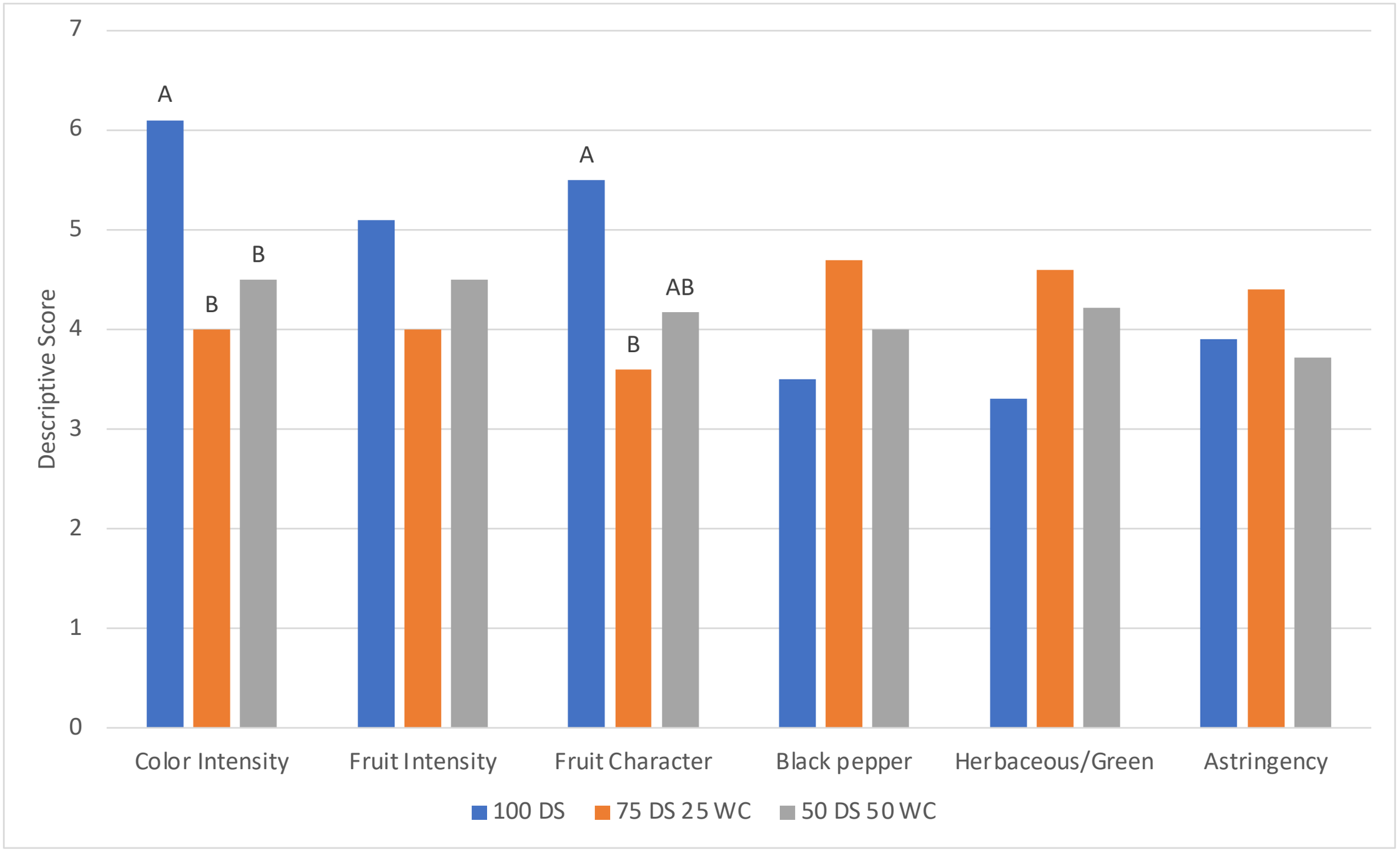
Flight 1

Sensory Impressions

Table 4: Repeated measures ANOVA of descriptive scores from blind sensory analysis of Syrah

	100 DS		75 DS 25 WC		50 DS 50 WC			
	Mean	SD	Mean	SD	Mean	SD	F	P
Color Intensity	6.1	1.55	4	1.37	4.5	1.62	22	< 0.0001
Fruit Intensity	5.1	1.75	4	1.82	4.5	1.25	2.89	0.07
Fruit Character	5.5	2.23	3.6	1.72	4.17	1.69	4.86	0.01
Black pepper	3.5	2.12	4.7	2.52	4	2.28	0.21	0.22
Herbaceous/Green	3.3	2.09	4.6	2.5	4.22	2.1	2.5	0.09
Astringency	3.9	1.77	4.4	1.76	3.72	1.49	1.39	0.26

Figure 3: Mean descriptive scores for five attributes of three treatments of Syrah. Endcaps show significant differences.



Summary of Whole Clusters

15 WRE Experiments over 7 years

Increased: potassium, pH, acetic acid, ethyl acetate

Decreased: color, body/volume

Inconsistent Effects on Phenolics

Dependent on stomping, heat?, variety?

Whole cluster fermentations have not always lead to sensory differences

Only when >50% WC inclusion, and not always

Winery	Year	Variety	Setup	Result
Blenheim	2017	Merlot	Destemmed vs. carbonic in tank	Higher ethyl acetate, lower color and tannins in whole cluster, statistically significant sensory, slight preference for carbonic maceration wine
Blenheim	2016	Merlot	Destem vs. carbonic with 20 L of juice in the tank	Little difference in chemistry (VA), lower color in carbonic, high hue, much lower phenolics of all kinds (almost rose), warmer ferm temps in traditional, much more ester in CM, much more body and astringency in trad
Blenheim Vineyards	2015	Cabernet Franc	Destem vs. 30% whole cluster	WC had much lower tannin, few other differences, no sensory difference
Blenheim Vineyards	2014	Cabernet Franc	Desetem, 70/30, 100%	Decline in color in proportion to WC inclusion, descriptors often the same among wines, WC more savory with lighter body
Bluestone	2017	Chambourcin	Destem and crush, 30% whole cluster, 30% stems only	Inconsistent differences in phenolics, sensory not consisent
Bluestone Vineyards	2016	Chambourcin	Destem and lightly crushed, 70/30, 50/50	Whole cluster led to less color intensity, lower phenolcs across the board, lower anthocyanins, and slightly lower tannin, few sensory trends
Chrysalis	2017	Norton	Destem and crush vs. carbonic maceration	Lower lactic acid in carbonic, much higher color intensity in carbonic, much higher pulp phenolics, much higher tannins, sensory statistically different, with preference for cabonic (higher body). Higher Va in the carbonic
Early Mountain	2017	Petit Verdot	Destem vs. 100% whole cluster	Very little difference in wine chemistry, higher tannin and phenolics, lower anthocyanins (small differences), no sensory difference
Early Mountain	2017	Cabernet Franc	Destem vs. 100% whole cluster	Increase in potassium in whole clusters, slightly lower color in whole cluster, lower anthocyanins, sensory not significantly different.
Early Mountain	2015	Syrah	Destem vs. 75/25, 25/75	All had RS, WH had higher tannin, lower pigment, lower color intensity, preference for 75/25
Keswick Vineyards	2016	Cabernet Franc	All destemmed, added 0, 5, 10% stems back in	Very little difference in wine chemistry or phenolics, not different in sensory
King Family	2016	Merlot	Desetem vs. 70% destemmed/30% whole cluster	Whole cluster somewhat lower anthocyanins but slightly higher color, wine was different in triangle, no real difference in attributes
King Family	2016	Cabernet Franc	Destem, 60/40%, 10/90% (ds/wc)	VA notably higher with whole clusters, notably higher catechin lower anthocyanins in whole clusters, slightly higher tannin in wc, different in triangle, difference between "estery" and "ripe" fruit
King Family	2015	Cabernet Franc	Destem vs. 75/25	WC had higher pH, slightly lower color, no significant sensory difference
Rosemont of Virginia	2017	Syrah	Destem vs. 30% whole cluster	Whole cluster had slightly higher color, higher catechin and epicatechin in whole cluster, no sensory differences

Flight 2

Scan the QR code provided for your group number

Triangle Test

Why is that one different?

Answer each of the questions.

Don’t forget to submit form when you are done!

Bitterness vs. Astringency

Bitterness is a taste

- Often at the back of the tongue

Astringency is a tactile feeling

- “Shrinking, drawing or puckering of the epithelium”
- Drying of the mouth

Flight 3

Scan the QR code provided for your group number

Triangle Test

Why is that one different?

Answer each of the questions.

Don’t forget to submit form when you are done!

Comparing chemical and sensory effects of destemmer speed in Cabernet Franc & Petit Verdot

Kirsty Harmon and Scott Wilcox
Blenheim Vineyards

Experiment:
Auger speed “low” (1) and “high” (5)
Cabernet Franc and Petit Verdot
Not distinguishable in triangle test
No significant differences in sensory characteristics

But… all those jacks!

Do Jacks really Matter? Investigating the need for sorting after destemming in Cab Franc and Petit Verdot

Doug Fabbioli
Fabbioli Cellars

Do you sort?

When?

Why?

At what cost?

Does it really make a difference?

We know that prefermentation sorting is important with regard to phenolic composition of wines, as is gentle fruit handling. …An area traditionally overlooked is post-destemming sorting to remove cap stems or jacks. Stem tannins are chemically different from skin tannins, and impart a different sensory profile. Stem tannins, including cap stem tannins, are more astringent and harsher than skin tannins. Jack stems in the fermentor can be a problem, if the concentration is high and the stems are green or not lignified, resulting in increased tannin intensity and astringency.

Zoecklein, Enology Notes #117 (2006) when discussing phenolic compounds in red wine processing

Use care in destemming. A high concentration of immature cap stems suggests the need for post-destemming sorting. This may be a requirement for consistent premium red wines in this region, and is always a good idea. This may be essential if the red must contains a high concentration of immature cap stems or jacks.

Zoecklein, Enology Notes #107 (2005) when discussing immature cap stem phenols caused by truncated ripening

Red Wine Phenolic Panel

Goup (AKA)	Chemical	Source	Typical (Range) mg/L	Role in wine/indicator of	Sensory Impact
Non-flavenoid					
Cinnamic acids	Caffeic acid, Caftaric Acid	skins, stems, pulp	250	Measure of oxidative stress; can be copigments for anthocyanins	Can be precursors to aromatic phenols (4-EP, 4-EG), participate in browning
	Gallic acid	seeds and oak cooperage	10-100	Indicator of new oak influence	
Flavenoids					
Anthocyanins	Malvidin Glucoside	skins	150 (20-200)	Most common anthocyanin (39-72% of total)	Color in young red wines, 50% lost first year, affect astringency by capping tannin polymerization
	Monomeric Anthocyanins			5-17 different types depending on variety, can be lost to SO2 bleaching or to polymerization with tannins to form polymeric anthocyanins	
	Polymeric Anthocyanins			Tannin associated color molecules	stable color over time
	Total Anthocyanins			Sums monomeric and polymeric forms	
Flavenol	Quercetin Glycosides, Quercetin	skins and stems	10-50	Protects grapes from UV, copigment with anthocyanins to stabiliz color	Yellow, bitter (above 30 mg/L), velvety astringency
Flavan-3-ol	Catechin, epicatechin	seeds and stems	5 (10-400)	Monomers that make up tannins	Astringent; bind to anthocyanins to stabilize color; bitter near 200 mg/L, epicatechin more bitter than catechin
Catechin: Epicatechin ratio is a re ble indicator of seed mat ty and tannin development; ratio gets smaller with ripening as catechin gets les extractable and epicatechin gets more extractable; catechin terminates the tannin chain					
Condensed or hydrolyzable	Tannin	skins, seeds, stems	7 (100-2000)	Antioxidant; polymer of catechin, epicatechin , gallic acid	Strongly affects flavor, color, mouthfeel, body, astringency
Polymeric Anth				Measure of tannin modification, increases as polymeric	
	Resveratrol	grape skin	0-10 mg/L	Concentration related to grape variety and stress from UV light and fungal attack	
	IBMP	skins, seeds, stems	Sensory threshold 6 - 15 ppt	3-isobutyl-2-methoxypyrazine, potent flavor compound	Herbaceous and/or green bell pepper aromas

Do Jacks really Matter? Investigating the need for sorting after destemming in Cab Franc and Petit Verdot

Doug Fabbioli
Fabbioli Cellars

30 minutes/harvest bin
4-6 people

Experiment:
Sorted vs. Not Sorted
Cabernet Franc
Petit Verdot

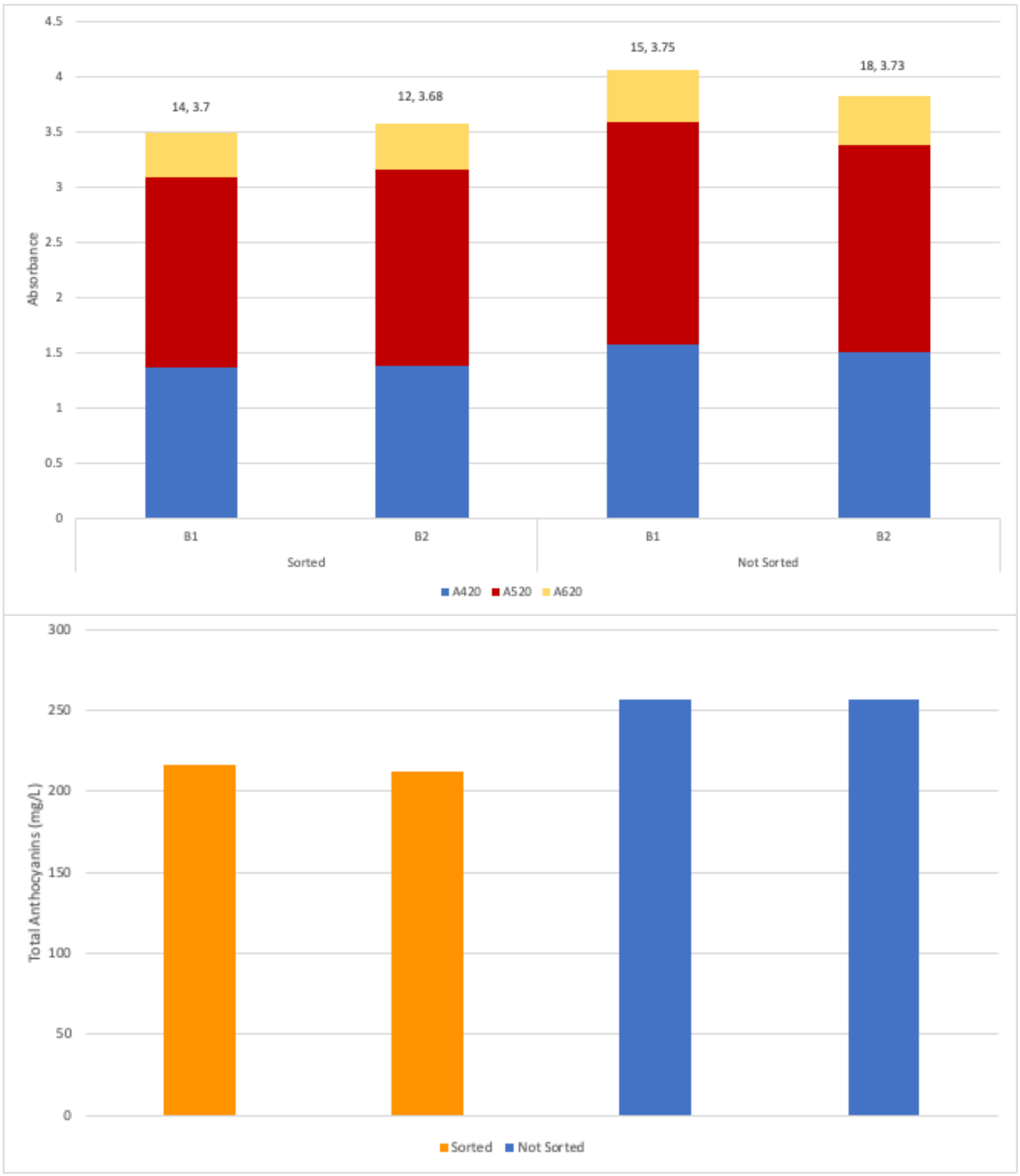
Guess which are sorted vs. not sorted in your triangle

Table 1: Juice chemistry for Cabernet Franc (October 3, 2023)(Vinterra)

	Brix	pH	Titratable Acidity (g/L)	Acetic Acid (g/L)	Malic Acid (g/L)	YAN (mg/L)
Not Sorted	19.83	3.83	4.95	0.13	2.5	156.92
Sorted	18.75	3.79	4.98	0.09	2.45	173.88

Table 2: Wine chemistry of Cabernet Franc wine made from sorted and not sorted fruit (ICV Labs, March 2023)

					SO2 (ppm)		
	Acetic Acid (g/L)	pH	Titratable Acidity (g/L)	Ethanol (%)	Total	Free	Molecular
Sorted	0.63	3.7	4.85	12.46	32	14	0.26
	0.69	3.68	4.91	12.44	37	12	0.23
Not Sorted	0.67	3.75	4.87	12.72	29	15	0.25
	0.67	3.73	4.85	12.71	35	18	0.31


4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Absorbance
14, 3.7
12, 3.68
15, 3.75
18, 3.73
B1
B2
B1
B2
Sorted
Not Sorted
A420
A520
A620
300
250
200
150
100
50
0
Total Anthocyanins (mg/L)
Sorted
Not Sorted

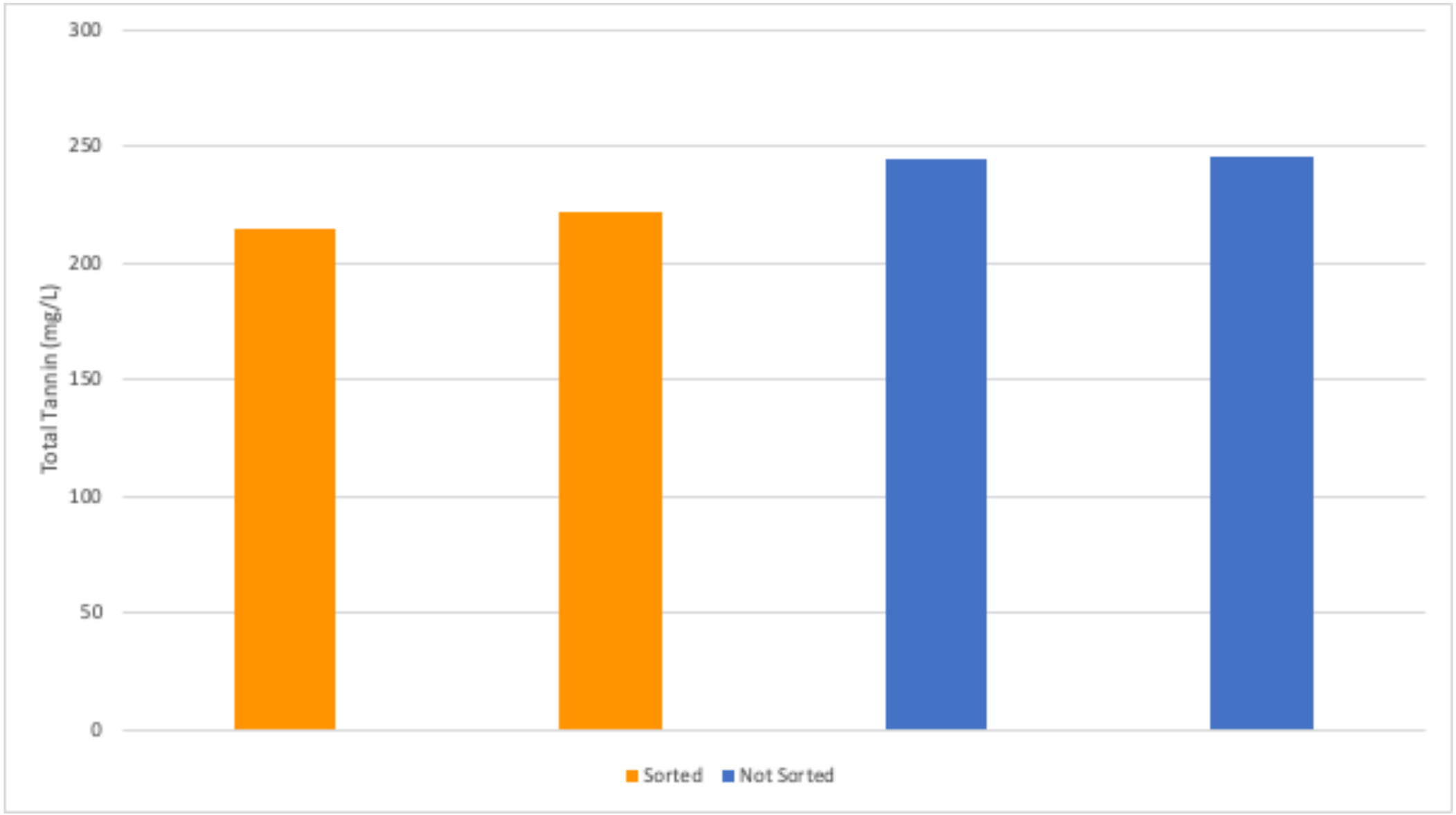


Table 3: Phenolic composition of Cabernet Franc wine made from sorted and not sorted fruit (mg/L) (ETS Labs, March 2023)

	Polymeric Anthocyanins	Total Anthocyanins	Catechin	Tannin
Sorted	18	216	12	214
	18	212	12	222
Not Sorted	20	257	17	244
	20	257	17	245

Flight 2

Sensory Impressions

Table 6: Mean descriptive scores for five attributes of sorted vs. not sorted Cabernet Franc
7 out of 18 winemakers could distinguish the wines in a triangle test
Not significantly different

	Sorted		Not Sorted			
Descriptor	Mean	SD	Mean	SD	F	P
Fruit intensity	5	1.16	5.9	1.68	2.84	0.12
Fruit character	3.6	1.72	5.7	1.11	8.44	0.01
Herbaceous/green	4.7	1.89	4.6	2.17	0.02	0.9
Bitterness	5.1	2.27	4	2.08	1.49	0.25
Astringency	4.3	1.98	6	0.84	6.18	0.03

Figure 3: Fabric selected by respondents to represent astringency of each Cabernet Franc treatment

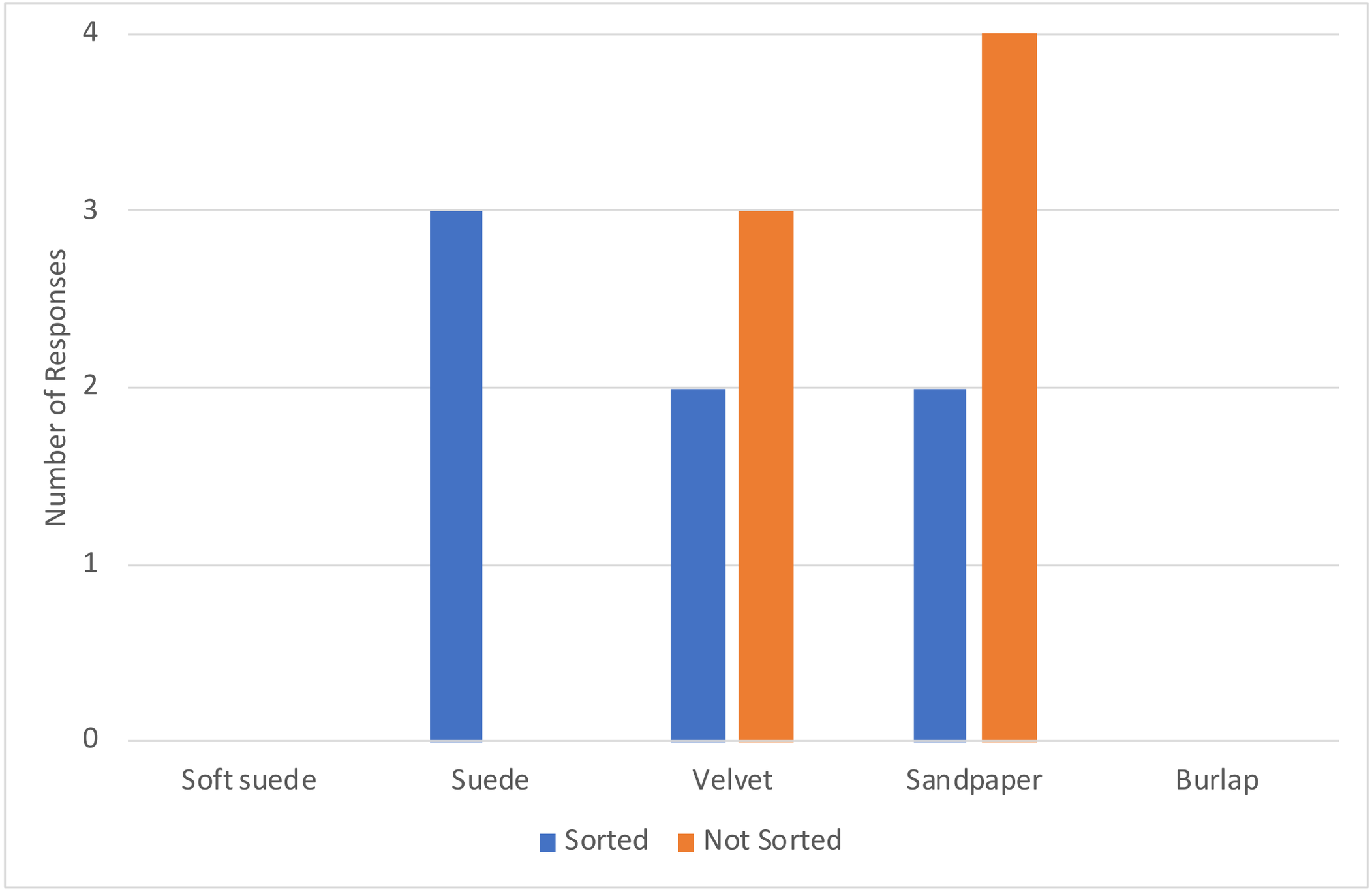
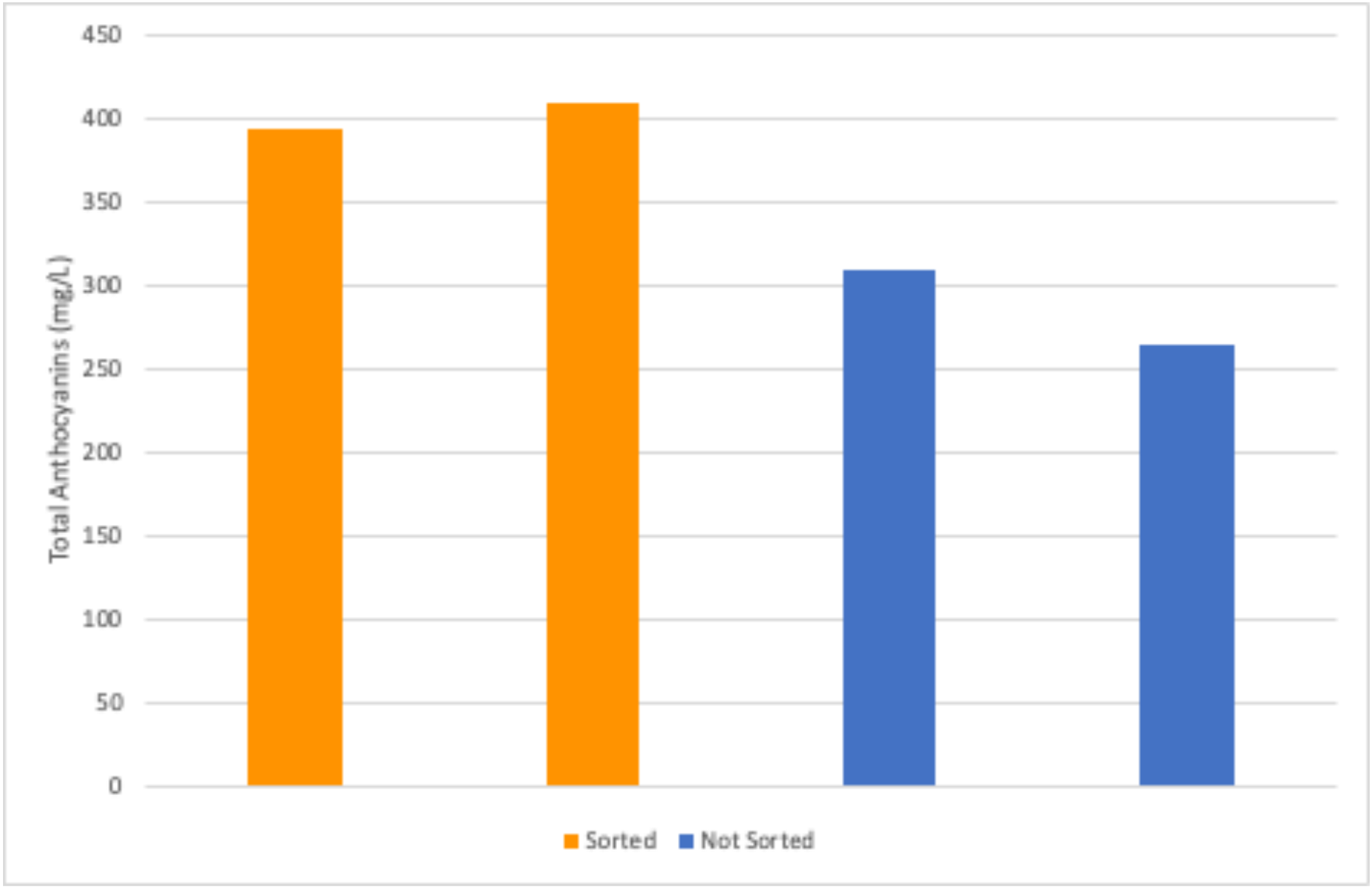


Table 4: Wine chemistry of Petit Verdot wine made from sorted and not sorted fruit (ICV Labs, March 2023)

					SO2 (ppm)		
	Acetic Acid (g/L)	pH	Titratable Acidity (g/L)	Ethanol (%)	Total	Free	Molecular
Sorted	0.7	4.02	5.65	10.57	43	20	0.17
	0.68	4.03	5.57	10.65	45	24	0.2
Not Sorted	0.69	3.97	5.83	10.76	26	9	0.08
	0.77	3.96	6.11	10.73	20	< 7	0



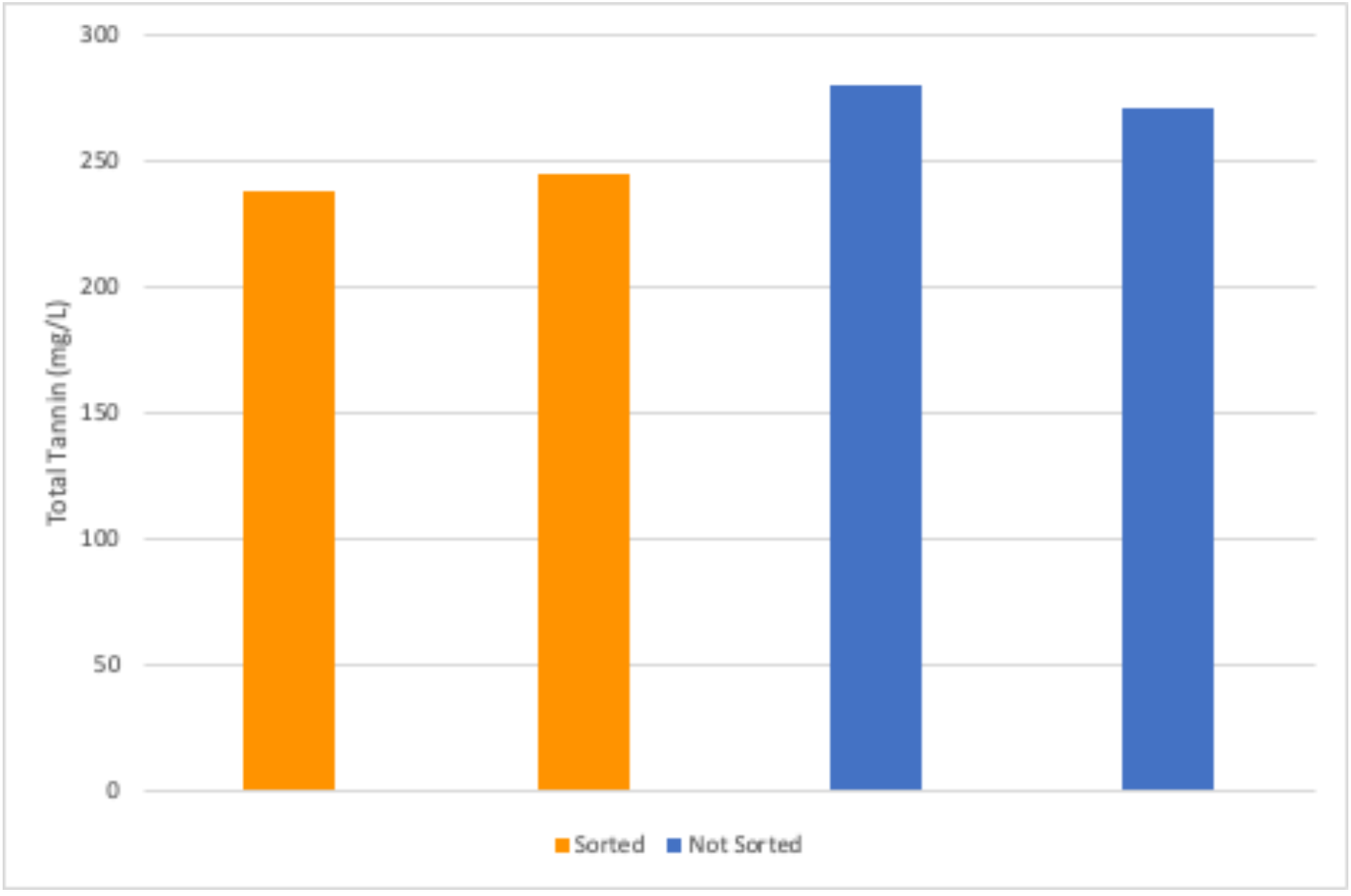


Table 5: Phenolic composition of Petit Verdot wine made from sorted and not sorted fruit (mg/L) (ETS Labs, March 2023)

	Polymeric Anthocyanins	Total Anthocyanins	Catechin	Tannin
Sorted	26	393	43	238
	26	408	44	244
Not Sorted	30	308	35	279
	29	264	33	270

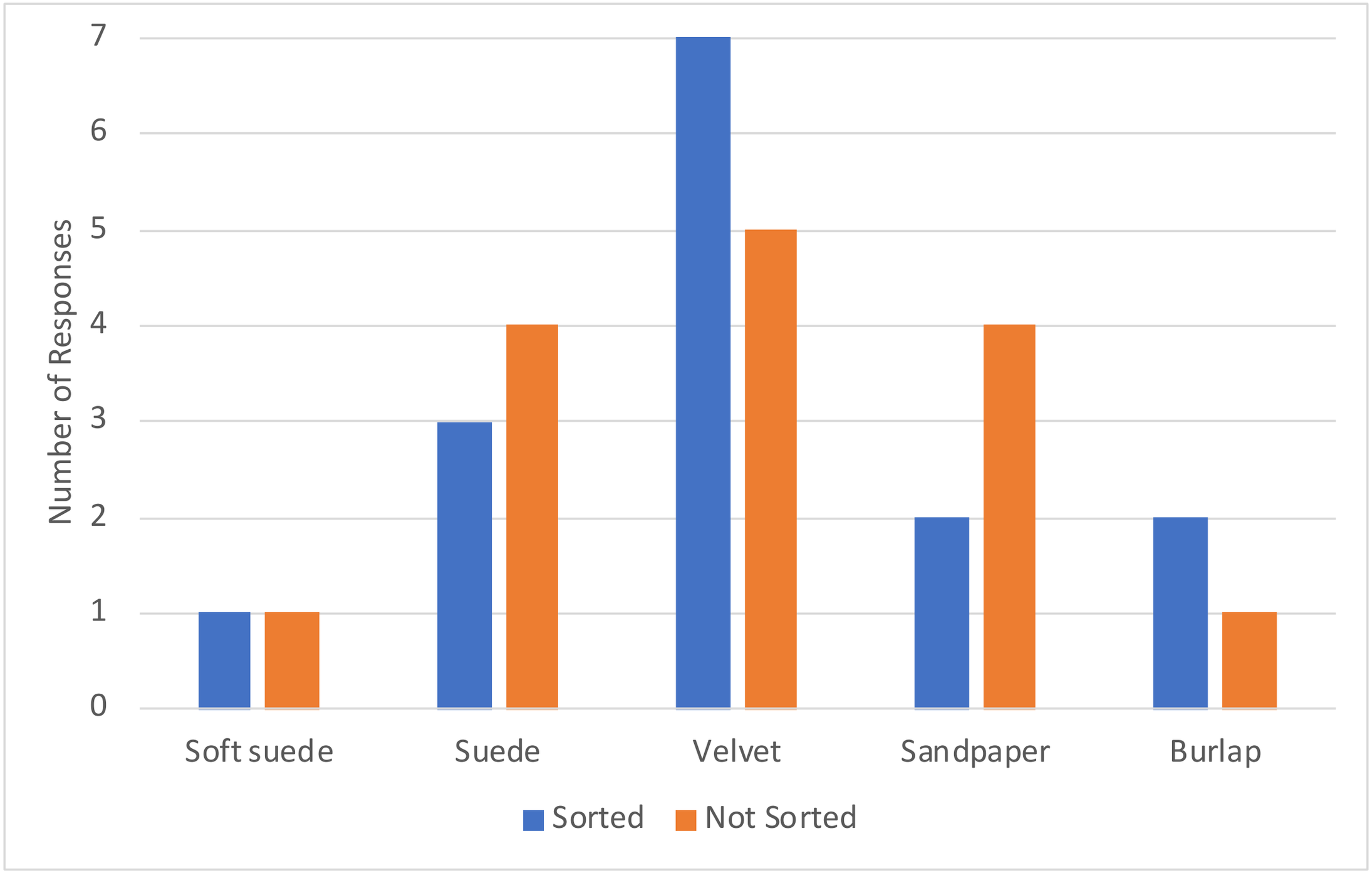
Flight 3

Sensory Impressions

Table 7: Mean descriptive scores for five attributes of sorted vs. not sorted Petit Verdot
15 out of 16 winemakers were able to distinguish the wines in a triangle test
The wines were significantly different

	Sorted		Not Sorted			
Descriptor	Mean	SD	Mean	SD	F	P
Fruit intensity	5.9	1.69	5	1.96	2.94	0.1
Fruit character	4.8	2.4	4.9	2.22	0.03	0.86
Herbaceous/green	4.6	2.35	4.4	2.53	0.07	0.79
Bitterness	4	1.93	4.5	2.54	0.62	0.44
Astringency	4.6	1.68	4.8	2.27	0.18	0.68

Figure 4: Fabric selected by respondents to represent astringency of each Petit Verdot treatment



Do Jacks really Matter? Investigating the need for sorting after destemming in Cab Franc and Petit Verdot

Kirsty Harmon and Scott Wilcox

Blenheim Vineyards

I think this will be the only way that I will be able to sleep soundly at night thinking about all of the jacks that end up in fermentations! (Kirsty Harmon)

2 tons/hour
"Slow" speed

3(CF) - 5(PV) people

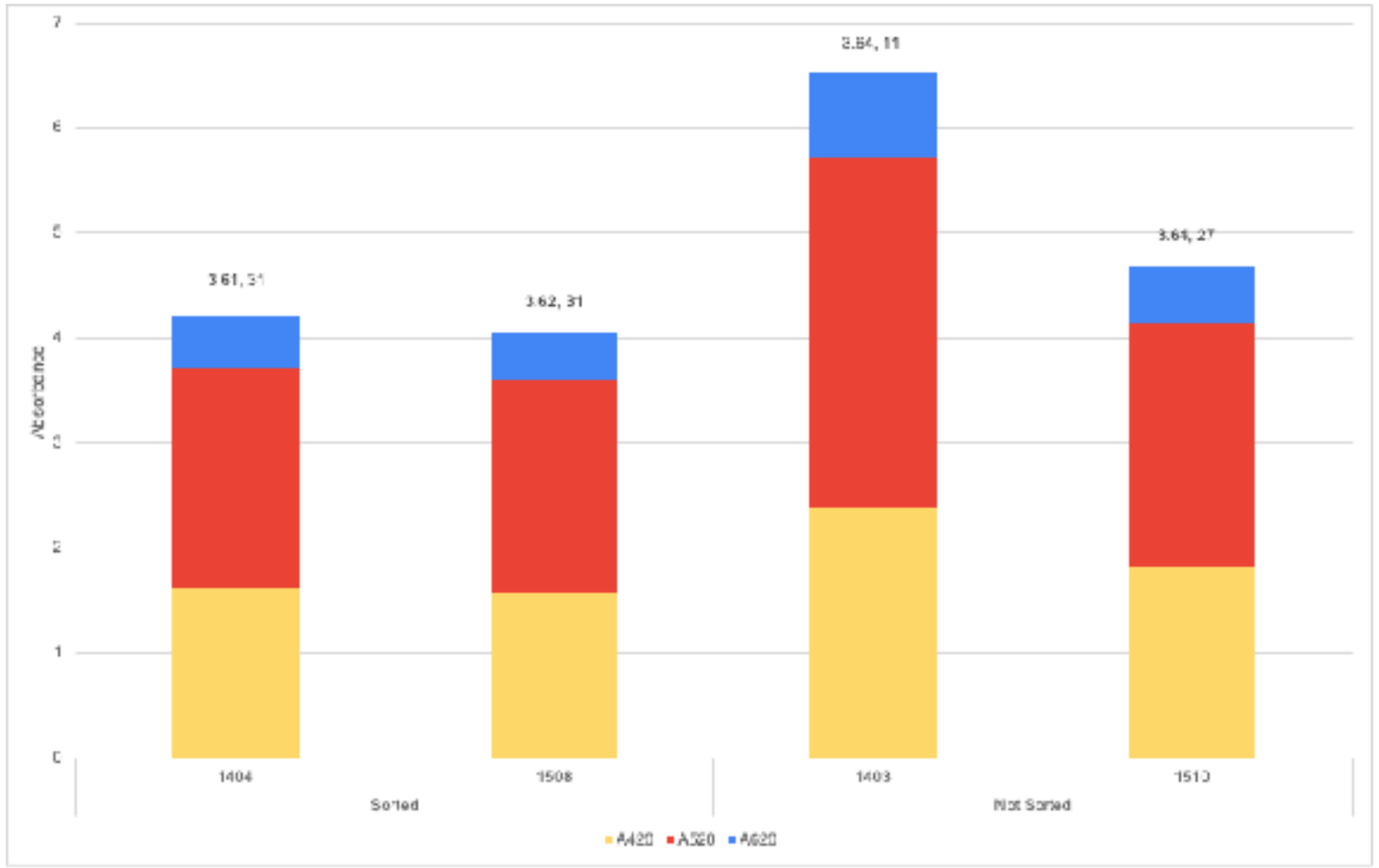
Not Sorted

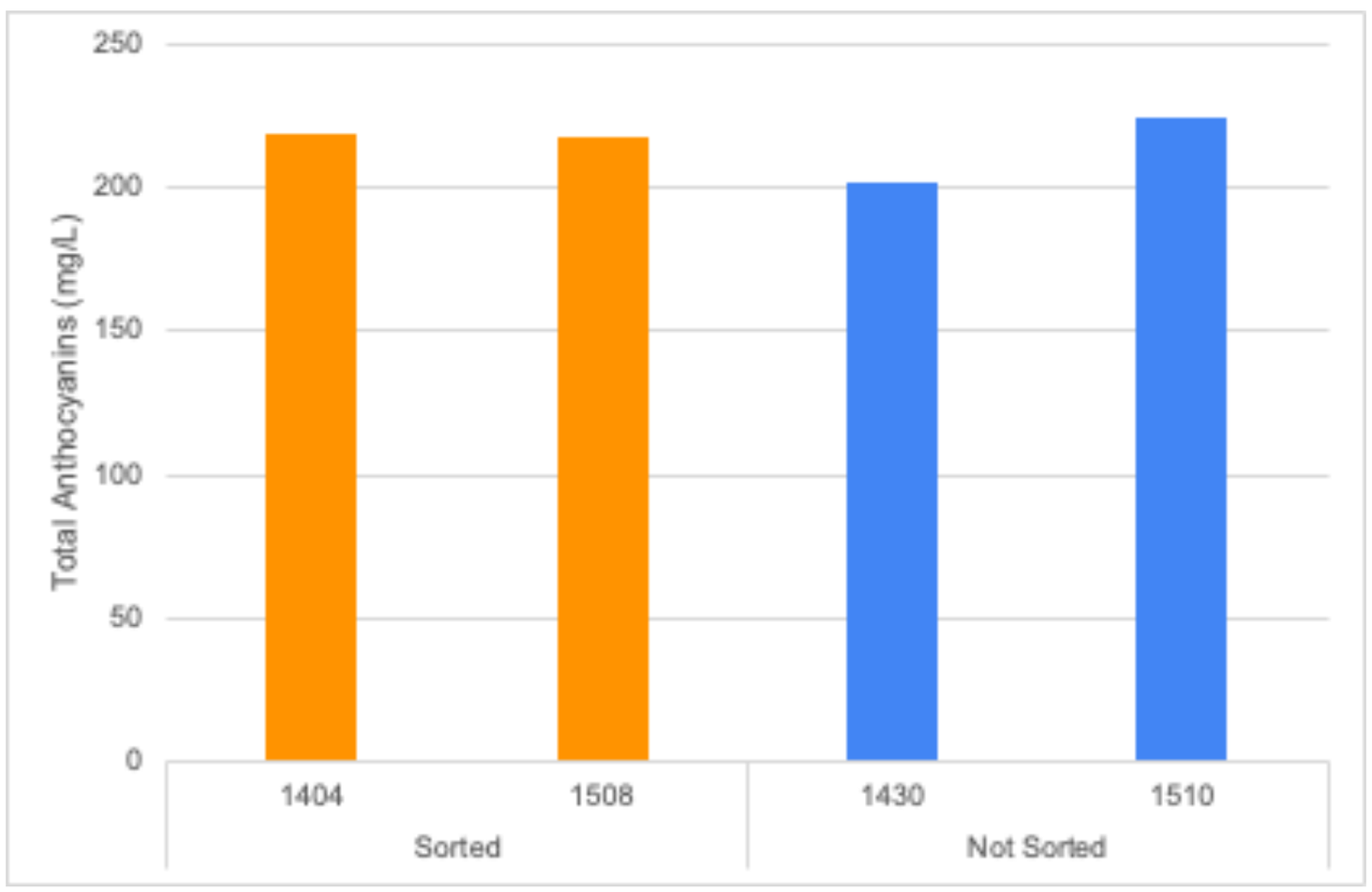

Sorted

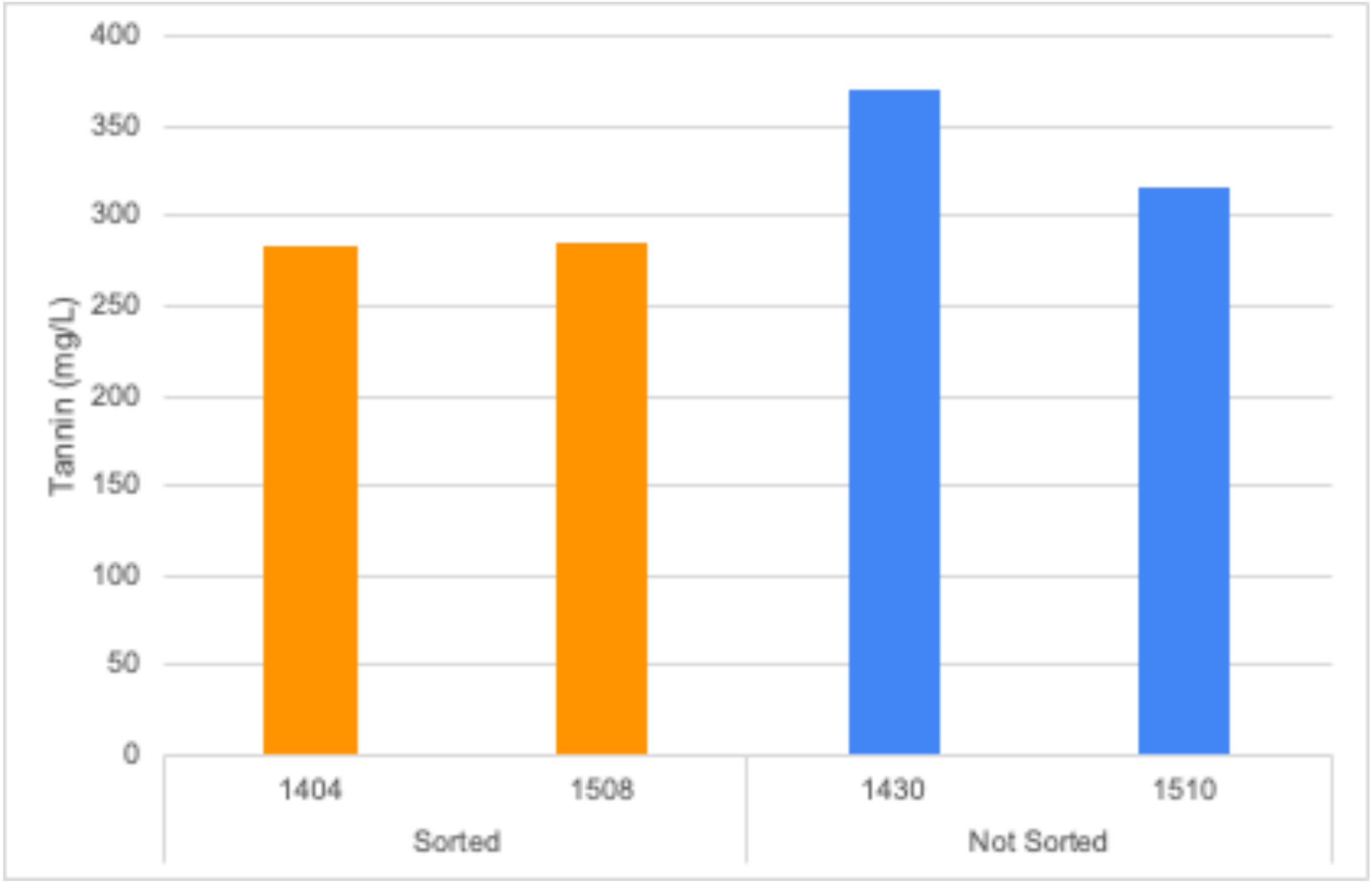
		Brix	pH	Titratable Acidity (g/L)	Malic Acid (g/L)	YAN (mg/L)
Cabernet Franc	Sorted	21.4	3.67	3.3	1.47	98
9/18/23	Not Sorted	21.8	3.67	3.4	1.41	95
Petit Verdot	Sorted	23.9	3.34	5.5	3.25	66
9/23/23	Not Sorted	23.9	3.34	5.7	3.25	71

Table 2: Wine Chemistry for Cabernet Franc with and without sorting (ICV Labs, March 2023)

						SO2 (ppm)		
		Acetic Acid (g/L)	pH	Titratable Acidity (g/L)	Ethanol (%)	Total	Free	Molecular
Sorted	1404	0.49	3.61	4.78	12.3	78	31	0.69
	1508	0.49	3.62	4.79	12.4	76	31	0.67
Not Sorted	1403	0.54	3.64	4.74	12.6	86	11	0.23
	1510	0.53	3.64	4.79	12.69	75	27	0.57


3.61, 31
3.62, 31
3.84, 11
3.64, 27
1404
1508
1403
1510
Sorted
Not Sorted
A420
A520
A620


250
200
150
100
50
0
Total Anthocyanins (mg/L)
1404
1508
1430
1510
Sorted
Not Sorted


400
350
300
250
200
150
100
50
0
Tannin (mg/L)
1404
1508
1430
1510
Sorted
Not Sorted

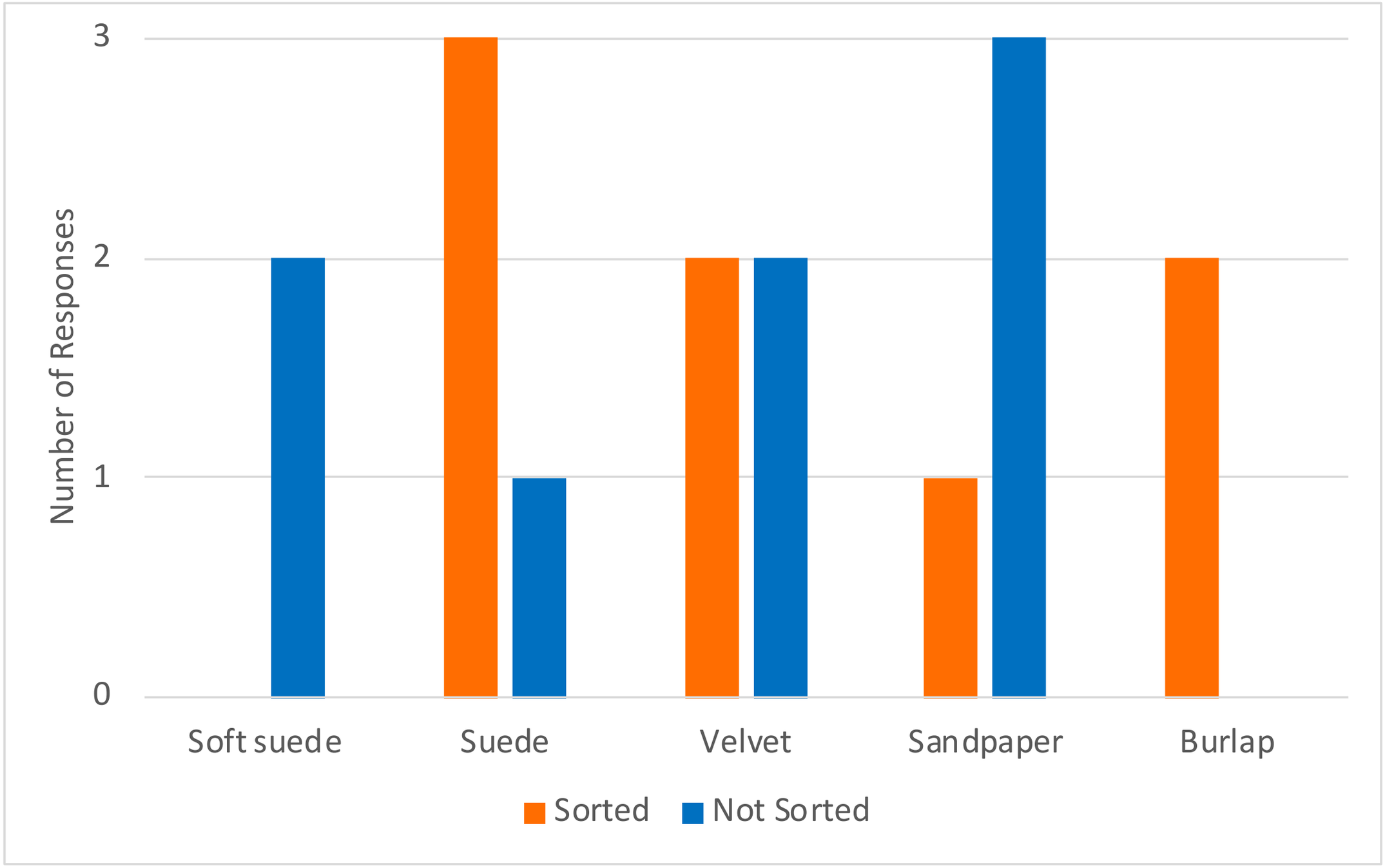
Flight 4

Sensory Impressions

Table 5: Mean descriptive scores for five attributes of sorted vs. not sorted Cabernet Franc
8 out of 18 winemakers could distinguish the wines in a triangle test
The wines were not significantly different

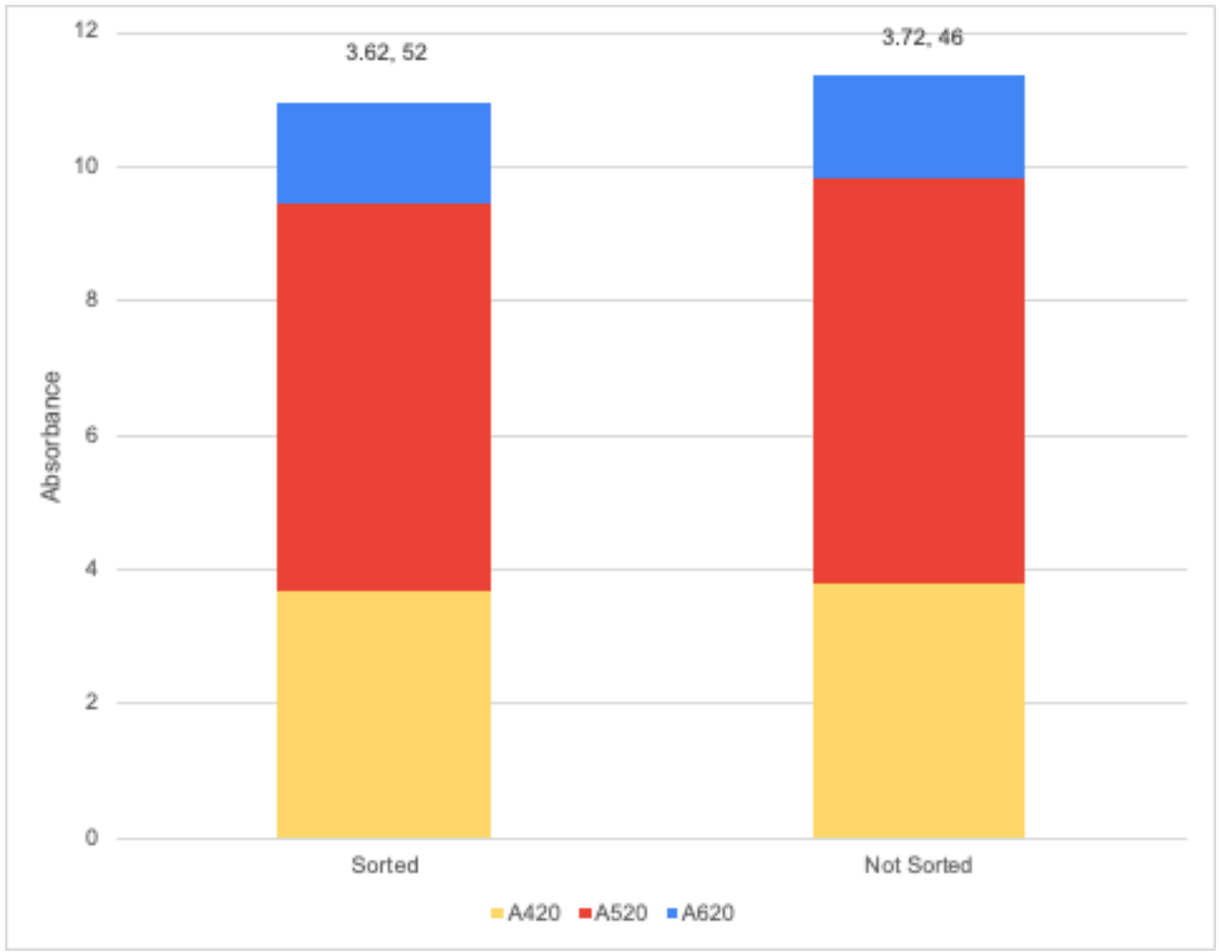
	Sorted		Not Sorted			
Descriptor	Mean	SD	Mean	SD	F	P
Fruit intensity	5.6	2.07	5.4	1.3	0.37	0.55
Fruit character	4.4	2.23	4.6	1.92	0.04	0.85
Herbaceous/green	3.5	2	3.3	1.79	0.05	0.82
Bitterness	4.1	2.1	3.9	1.64	0.18	0.68
Astringency	5.9	1.36	4.5	1.6	4.09	0.06

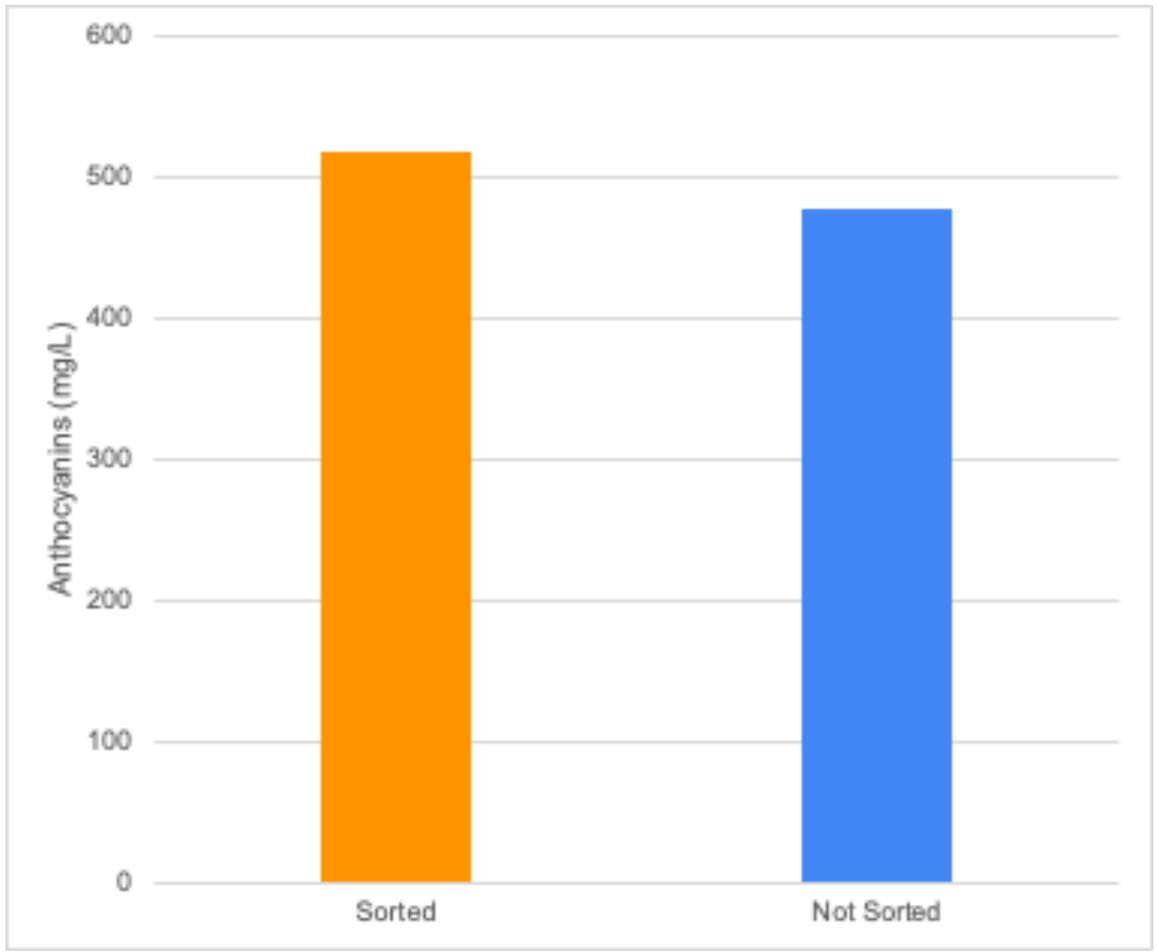
Figure 3: Fabric selected by respondents to represent astringency of each Cab Franc treatment



		Brix	pH	Titratable Acidity (g/L)	Malic Acid (g/L)	YAN (mg/L)
Cabernet Franc	Sorted	21.4	3.67	3.3	1.47	98
9/18/23	Not Sorted	21.8	3.67	3.4	1.41	95
Petit Verdot	Sorted	23.9	3.34	5.5	3.25	66
9/23/23	Not Sorted	23.9	3.34	5.7	3.25	71

					SO2 (ppm)		
	Acetic Acid (g/L)	pH	Titratable Acidity (g/L)	Ethanol (%)	Total	Free	Molecular
Sorted	0.68	3.62	5.72	14.03	109	52	1.21
Not Sorted	0.67	3.72	5.39	13.9	89	46	0.86





	Polymeric Anthocyanins	Total Anthocyanins	Catechin	Tannin
Sorted	61	518	26	558
Not Sorted	64	477	23	555

Flight 5

Sensory Impressions

Table 6: Mean descriptive scores for five attributes of sorted vs. not sorted Petit Verdot
6 out of 17 winemakers were able to distinguish the wines in a triangle test
The wines were not significantly different

	Sorted		Not Sorted			
Descriptor	Mean	SD	Mean	SD	F	P
Fruit intensity	5.3	1.21	6.3	1.63	3.75	0.08
Fruit character	6.8	0.75	6.5	1.38	0.22	0.65
Herbaceous/green	5	2.45	4.2	1.47	1.4	0.26
Bitterness	4.8	2.4	4.3	1.75	0.48	0.5
Astringency	7	1.27	6.7	1.51	0.19	0.67

Summary

Chemistry

Fabbioli CF: Sorted fruit produced wine with

decreased color, decreased anthocyanins, decreased tannins

Fabbioli PV: Sorted fruit produced with

increased anthocyanins, decreased tannins

Blenheim CF: Sorted fruit produced wine with

Same color, same anthocyanins, decreased tannin

Blenheim PV: Sorted fruit produced with with

Same color, increased anthocyanins, no change in tannin

Funding: The Virginia Wine Board

Shane McManigle, Doukenie Winery

Doug Fabbioli, Fabbioli Cellars

Kirsty Harmon, Blenheim Vineyards

Stone Tower, Host

For full reports and background: www.winemakersresearchexchange.com

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