EMS USA PRESENTS

WINEXPO

TRADE SHOW & CONFERENCE

2012 10th ANNIVERSARY 2022

DECEMBER 1 • SONOMA COUNTY, CA

Track: Winemaking

11:00am - 12:00pm

Conference Track Presented by:

WINE INDUSTRY ADVISOR & AFTERNOON BRIEF NEWS

MODERATOR

Christian DeBlasio

Founder & CEO / Purfresh

Margherita Modesti

Post Doctoral Researcher / Università degli Studi della Tuscia

Katerina Axelsson

Founder & CEO / Tastry

Ken Bernards

Winemaker Consultant / Porter Family Vineyards, Co-Founder & Winemaker / Ancien Wines

New O3/Ozone Uses in the Winemaking Process: Treating Fruit at Arrival to Mitigate Future Challenges

EMS USA PRESENTS WINEXPO TRADE SHOW & CONFERENCE 2012 10th ANNIVERSARY 2022

purfresh® wine

UNIVERSITÀ DEGLI STUDI DELLA Tuscia

tastry

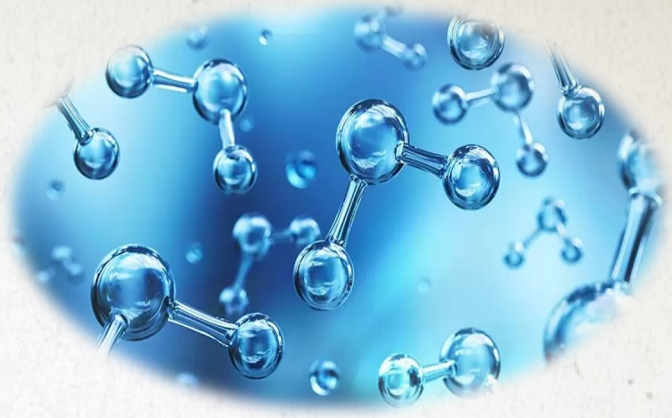
ANCIEN

A BRIEF HISTORY OF.....

"OZONE" FROM GREEK "OZEIN" MEANING "TO SMELL"

- 1840 – O3 discovered by Christian Schönbein University of Basel, Switzerland
- 1957 – USDA approves use of O3 for storage of special food types
- 1975 - FDA declares O3 as good manufacturing practice for bottled water industry
- 1992 – O3 washing begins to be used for cleaning and sanitizing wineries
- 2000 – FDA issues O3 approval for food & produce processing, storage, & treatment
- 2007 – USDA & NOP in US CFR make O3 approved for organic processing of fruit
- 2011 – First O3 treatment applications tested on wine grapes in Italy
- 2020 – 5000 Tons of wine grapes treated with O3 at harvest in CA, OR, BC

PANELISTS & DISCUSSION



- **Christian DeBlasio** – Founder & CEO Purfresh Wine, O3 Applications – San Francisco CA
  - Moderator, O3 expert fresh fruit and produce post-harvest applications, wine-tasting host
- **Margherita Modesti,** PhD - Post-doctoral researcher, viticulture, Tuscia University, Viterbo, Italy
  - Leading global researcher for O3 wine grape & vine applications, Italy, Australia, UK
- **Katerina Axelsson** - Founder & CEO Tastry AI (wine flavor chemistry), San Luis Obispo CA
  - Using AI, analytical & flavor chemistry to predict how consumers will perceive wine & sensory-based products
- **Ken Bernards** - Winemaker Porter Family Vineyards, Co-Founder Ancien Wines, Napa CA
  - Winemaking observations and results of why, how, & what O3 does & can be used for

USE OF OZONE IN WINE PRODUCTION
A SCIENTIFIC APPROACH

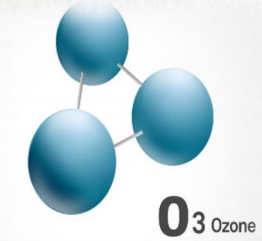
Margherita Modesti, PhD

Margherita.modesti@unitus.it

DIBAF - Tuscia University - Viterbo, Italy

NEW SOLUTIONS FOR NEW CHALLENGES IN THE WINE WORLD

1. Increasing bioactive compounds → Inducing a controlled oxidative stress

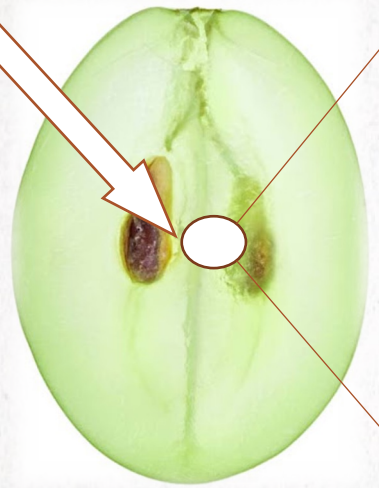


2. Reducing sulfur dioxide use in wine → O3 substitution for SO2

3. Mitigating smoke taint → Oxidizing the responsible compounds

OZONE INSIDE THE CELLS – INCREASING BIOACTIVE COMPOUNDS

O_3



ROS

Oxidative burst

Hormonal signaling

JAs

SA

Lipid peroxidation

LOX-HPL patway

PAL patway

Antioxidant responses

Antioxidant enzymes

Antioxidant compounds

Isoprenes

MEP patway

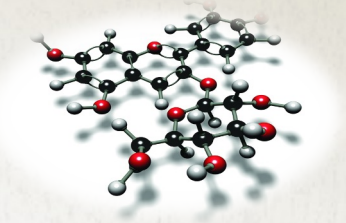
C_6 volatiles

Polyphenols

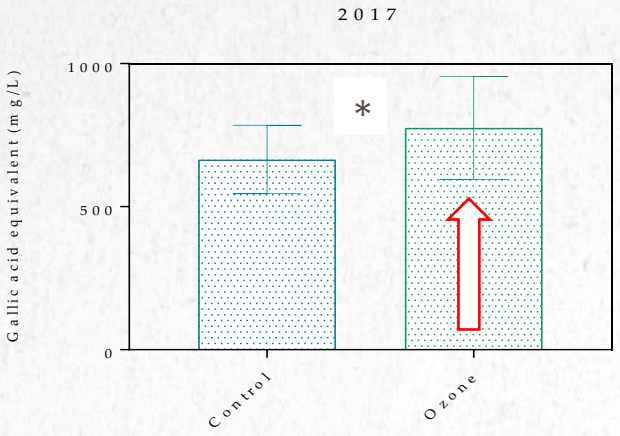
Terpenoids

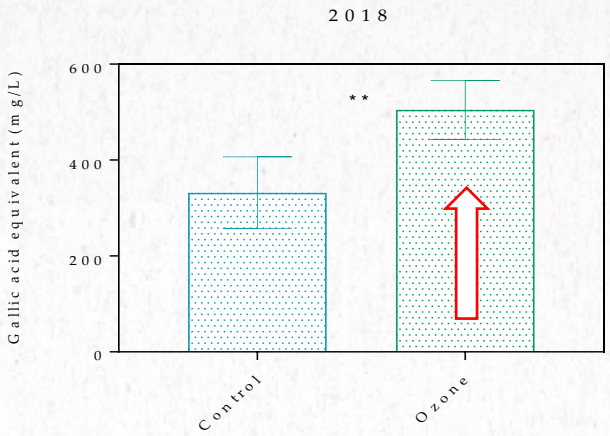
Modesti Margherita; Macaluso M; Taglieri I; Bellincontro A; Sanmartin C. Ozone and Bioactive Compounds in Grapes and Wine. Foods 2021, 10, 2934. https:// doi.org/10.3390/foods10122934

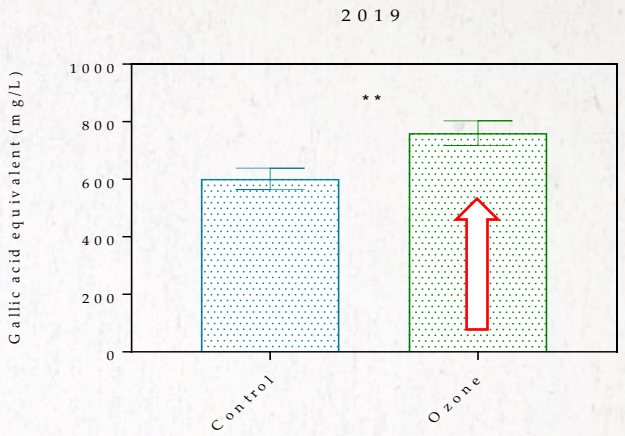
WINE GRAPE POLYPHENOLS

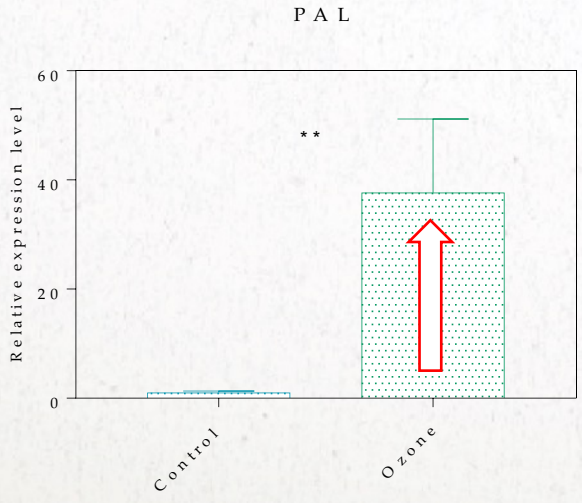


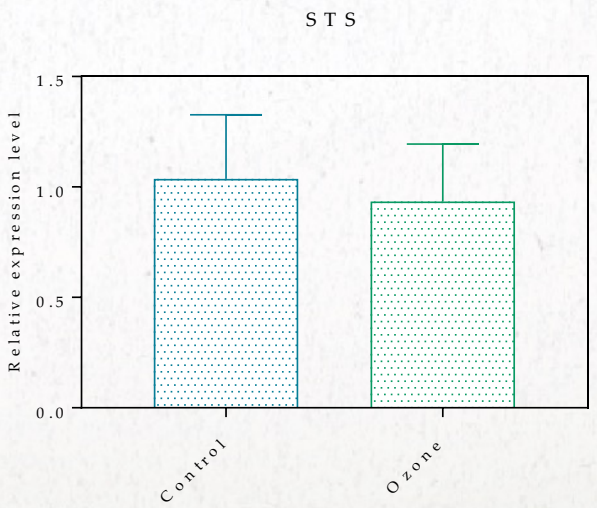
Total Polyphenols Content

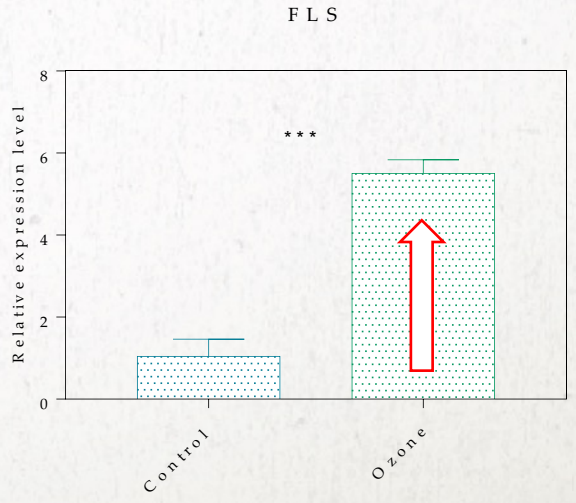






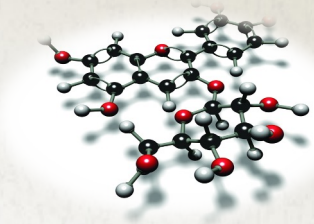


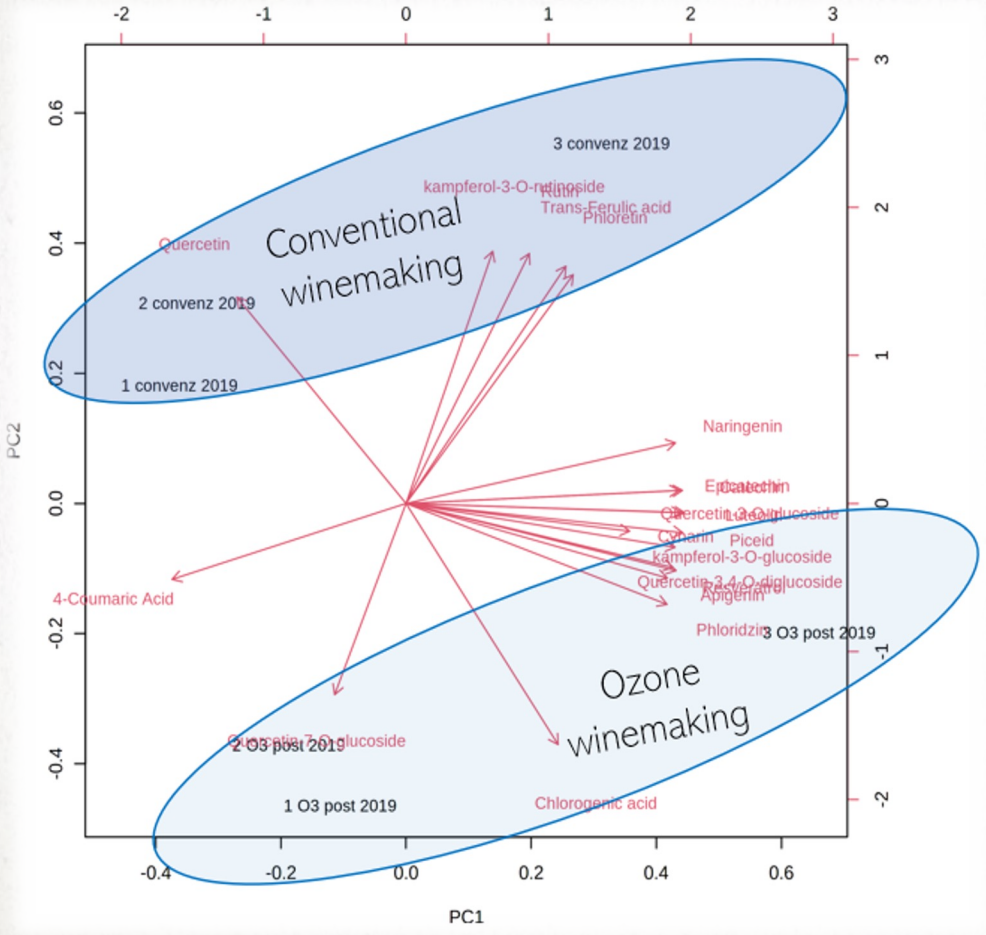


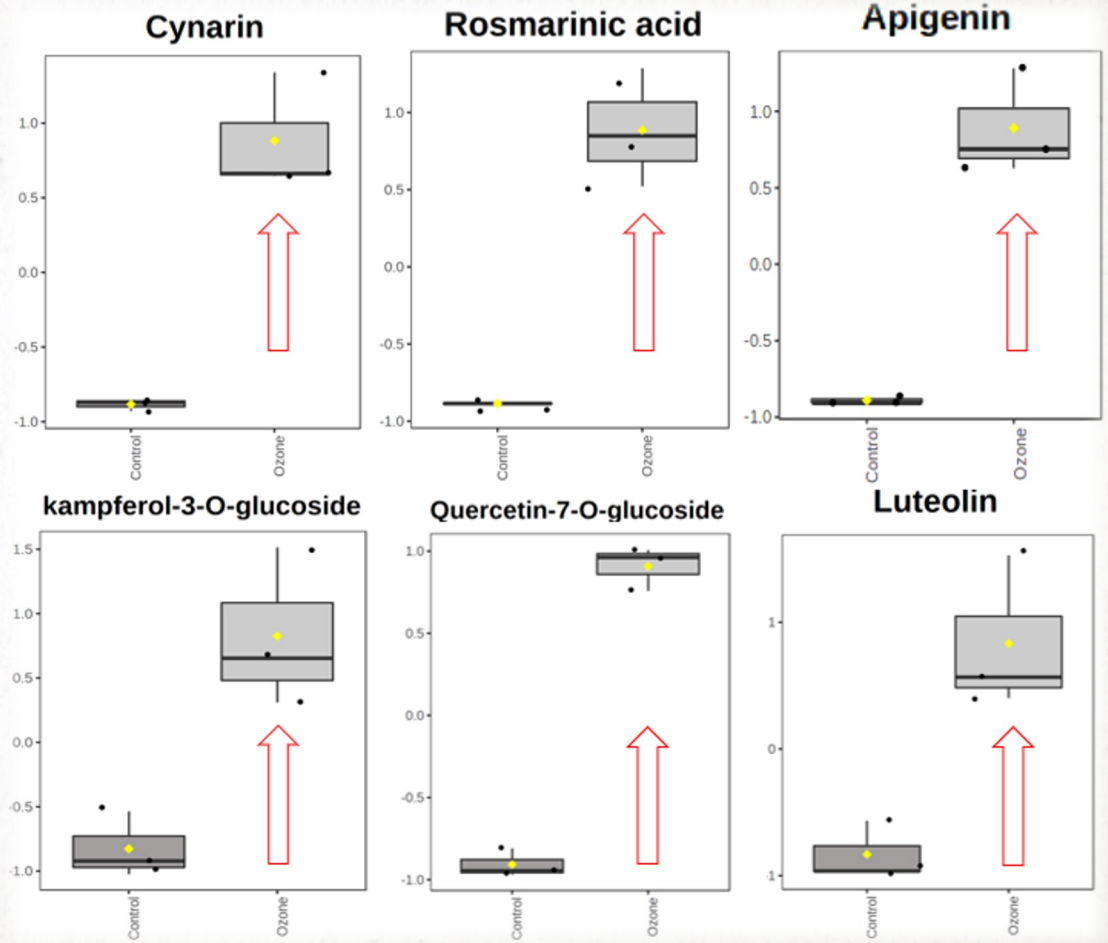


Postharvest ozone fumigation of grapes (cv Sangiovese) differently affects volatile organic compound and polyphenol profiles of berries and wine. Margherita Modesti, Brizzolara S., Forniti R., Ceccantoni B., Bellincontro A, Catelli C., Mencarelli F., Tonutti P.

WINE GRAPE POLYPHENOLS







OZONE TO REDUCE OR ELIMINATE THE USE OF SULFITES IN WINE

US Patent Ref.
11332703B2

Post-harvest treatment of grapes

- Gaseous ozone
- 12 hours
- 10 °C

Clean-in-place

- Ozonated water to clean the equipment

Sulfur dioxide free-reduced winemaking

- O3 reduces the BYM pressure

Three year experiment

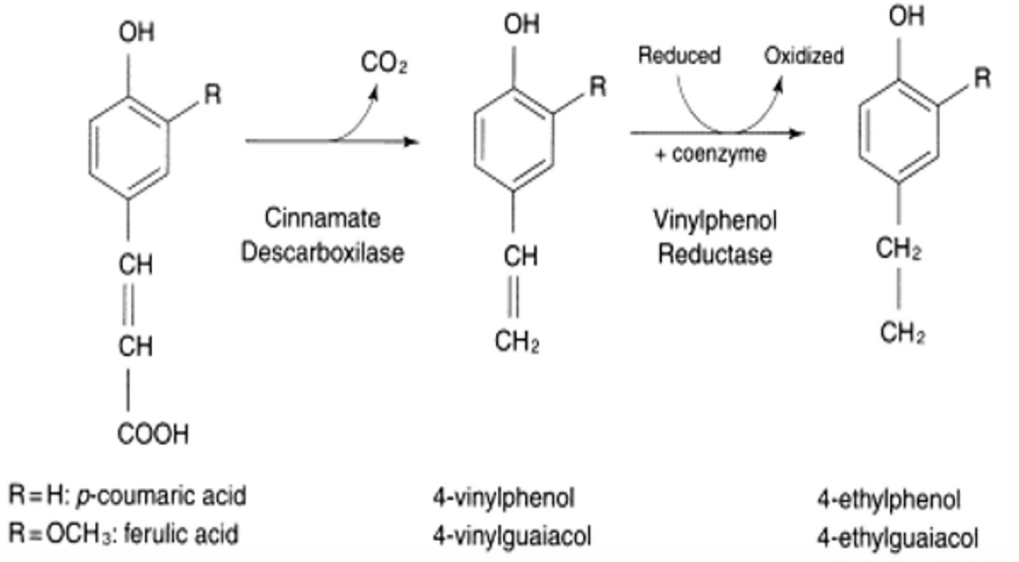
- 2017 - 2019

Vineyard Rossi (Morellino di Scansano, Tuscany, Italy)Cv Sangiovese

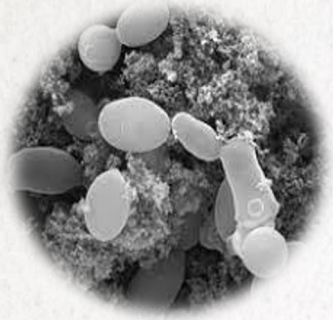
Postharvest ozone fumigation of grapes (cv Sangiovese) differently affects volatile organic compound and polyphenol profiles of berries and wine. Margherita Modesti, Brizzolara S., Forniti R., Ceccantoni B., Bellincontro A, Catelli C., Mencarelli F., Tonutti P.

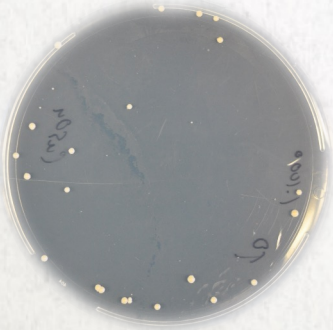
OZONE TO PREVENT BRETTANOMYCES BRUXELLENSIS

- *Brettanomyces* considered a wine spoilage yeast due to its ability to produce **off-flavors** (described as **Brett character**) and **high levels of acetic acid**
- Brettanomyces control in wineries is very difficult due to its **ability to tolerate sulfur dioxide**
- **Ozone** is a strong oxidant able to **attac**k several **cellular constituents** of the microorganisms
- Broad **disinfectant action against microorganisms**, **eco-friendliness** and **easiness** of on-site application are among the main advantages of the ozone



OZONE TO PREVENT BRETTANOMYCES BRUXELLENSIS

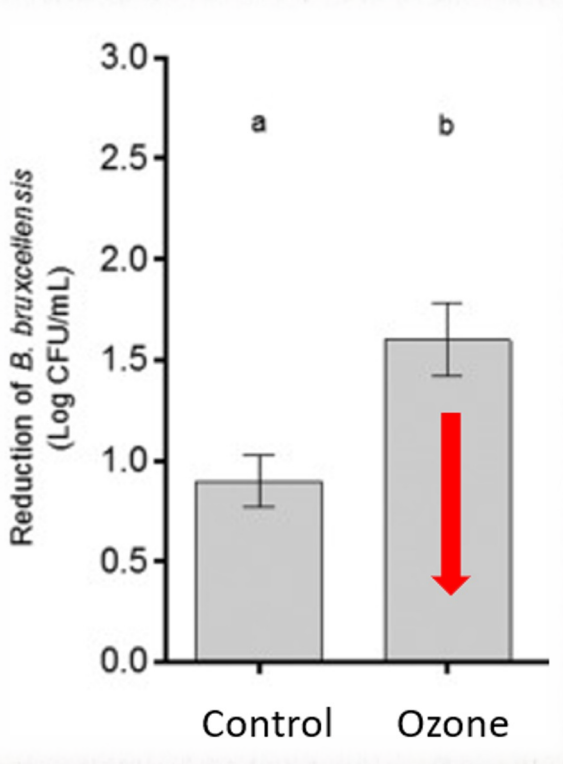


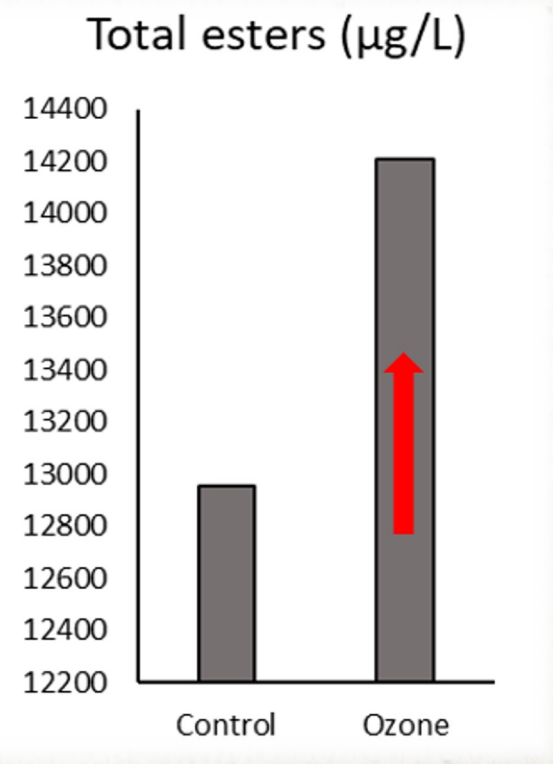


Grapes inoculation

Ozone treatment for 12 h

Microbiological analysis
Wine volatiles analysis





Data from Cravero, Englezos, Rantsiou, Torchio, Giacosa, Segade, Gerbi, Rolle, Cocolin. Control of Brettanomyces bruxellensis on wine grapes by post-harvest treatments with electrolyzed water, ozonated water and gaseous ozone, Innovative Food Science & Emerging Technologies,

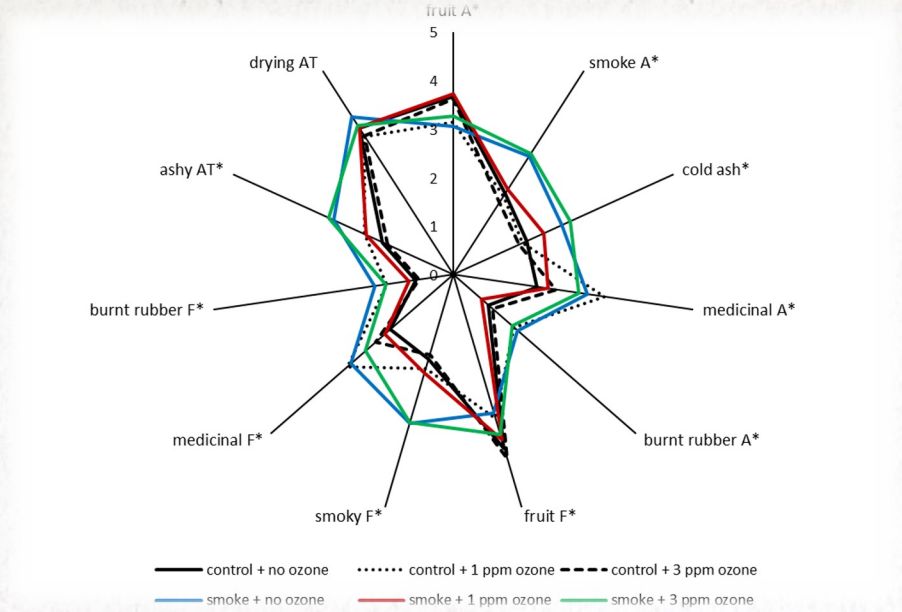
COULD OZONE OXIDIZE VOLATILE PHENOLS?

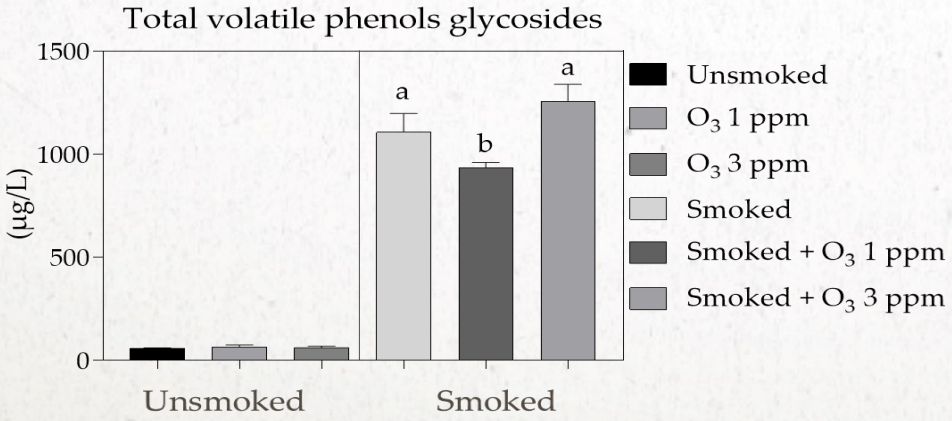
Preharvest smoke treatments

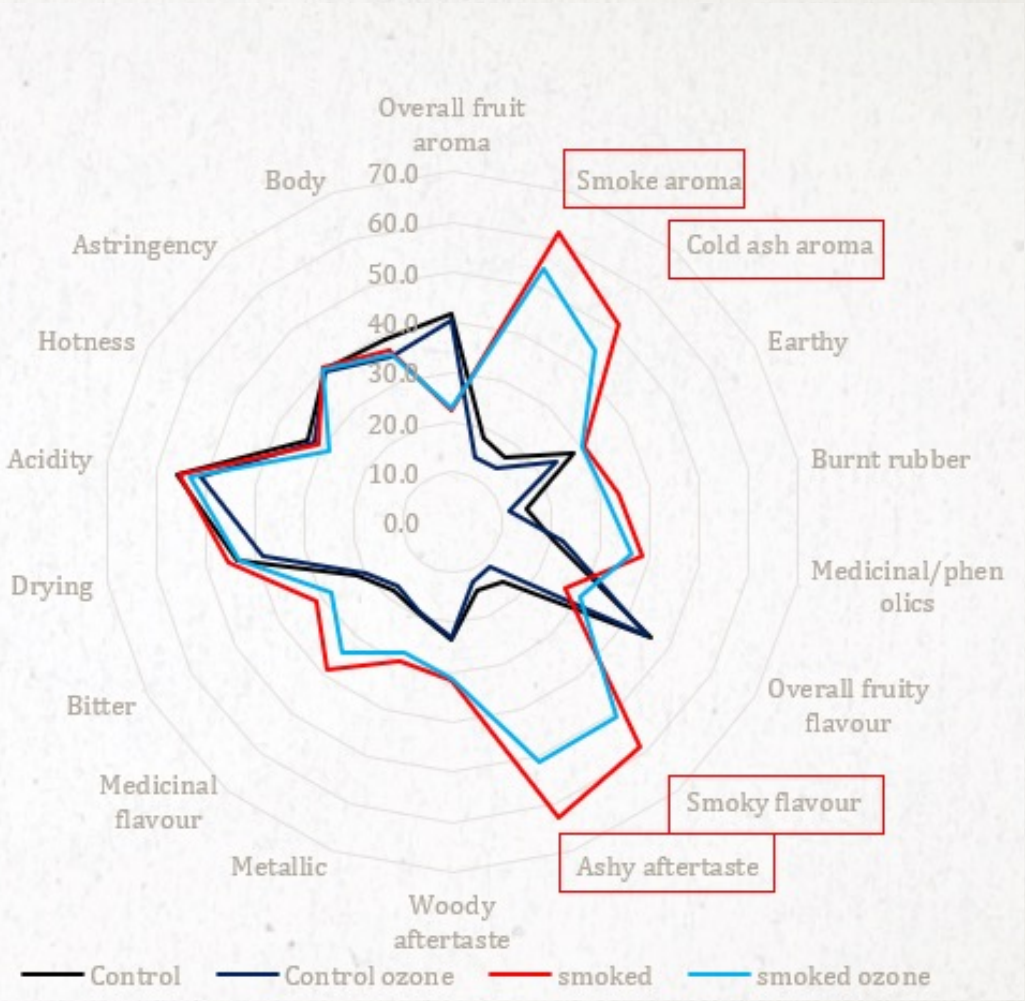
Postharvest ozone treatments

Winemaking

SMOKE TAINT VOLATILE PHENOLS & TASTING NOTES 2020-2021







Modesti Margherita, Szeto C., Ristic R, Jiang W, Culbert J, Catelli C, Mencarelli F, Tonutti P., Wilkinson K. Amelioration of Smoke Taint in Cabernet Sauvignon Wine via Post-Harvest Ozonation of Grapes. Beverages 2021, 7, 44.

MULTIPLE APPLICATIONS & DIFFERENT IMPACTS FOR OZONE USE IN FUTURE WINEMAKING

- make sulfur dioxide-free wines
- reduce undesiderable yeasts population
- reduce the smoke taint
- induce controlled oxidative stress to increase bioactive compounds

O3 treatments have real potential to show progress towards producing **wine without chemicals** and to **preserve – or even enhance - the quality of** harvested grapes and the resulting wines

Most importantly, ozone treatments can be very **practical** to implement, O3 generation production is extremely **cost effective** and it **can be easily and safely incorporated into the wine production chain**

ANALYZING FLAVOR CHANGES AND CONSUMER PREFERENCE IN WINES TREATED WITH O3

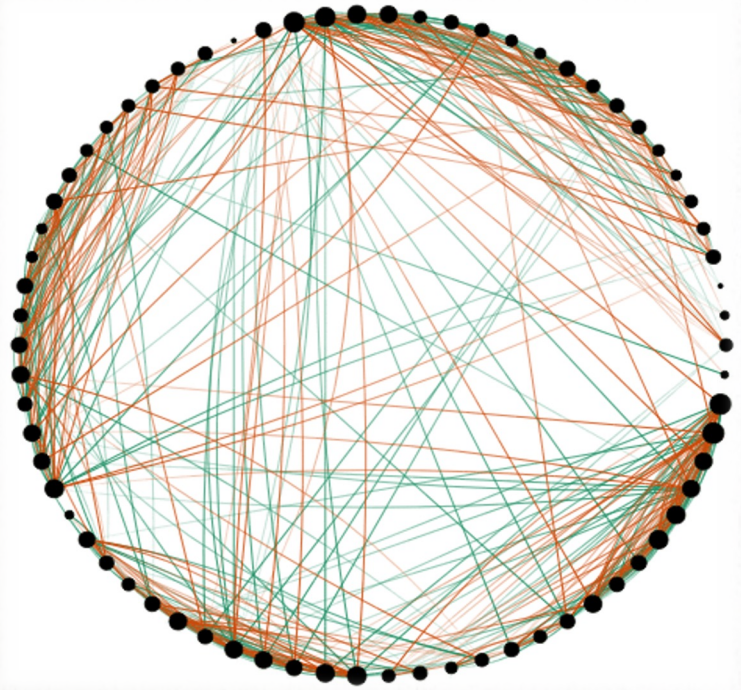
Katerina Axelsson

kat@tastry.com

TASTRY – San Luis Obispo, California

tastry

WHY THE RATIOS BETWEEN FLAVOR AND AROMA COMPOUNDS ARE IMPORTANT

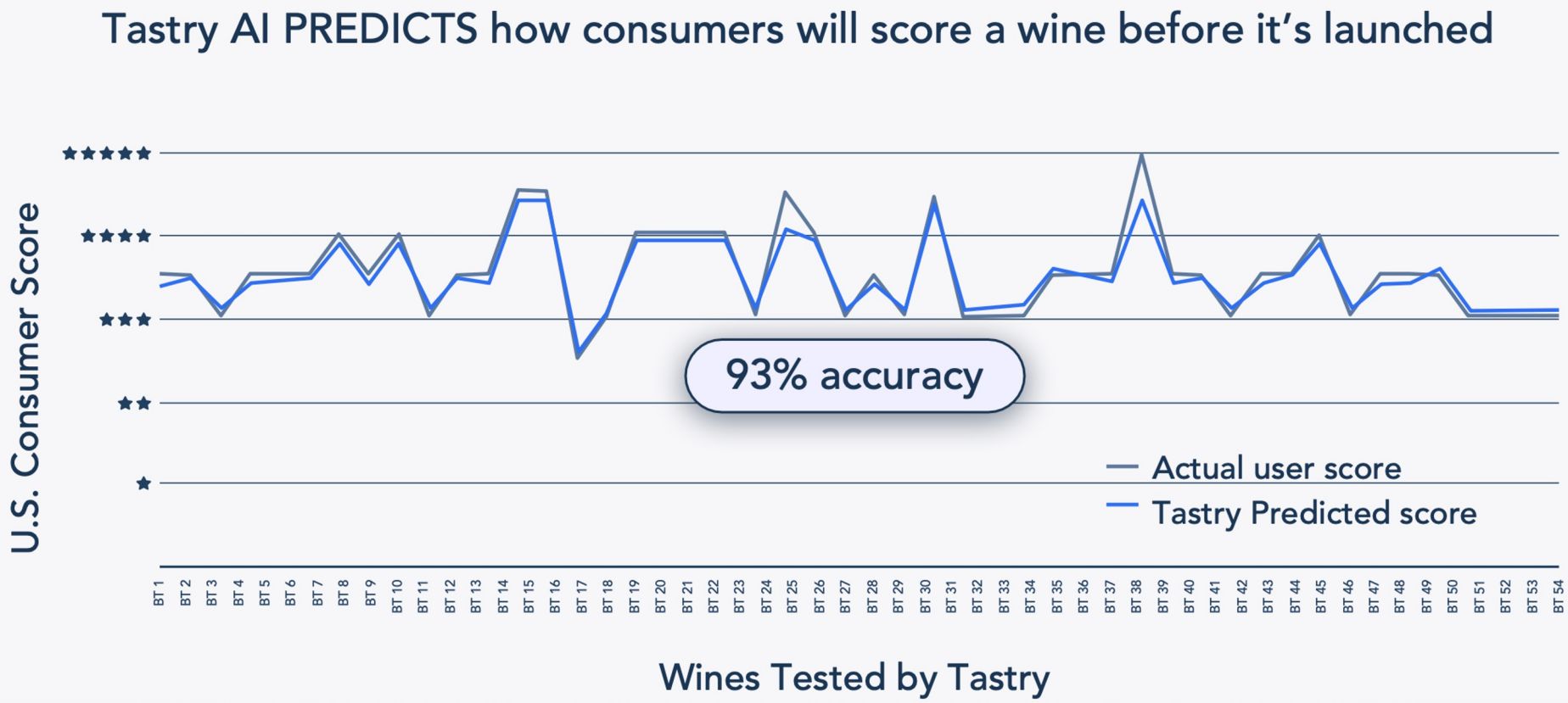


1. Flavor perception is not predictable using traditional methods

2. Consumers perceive flavors differently

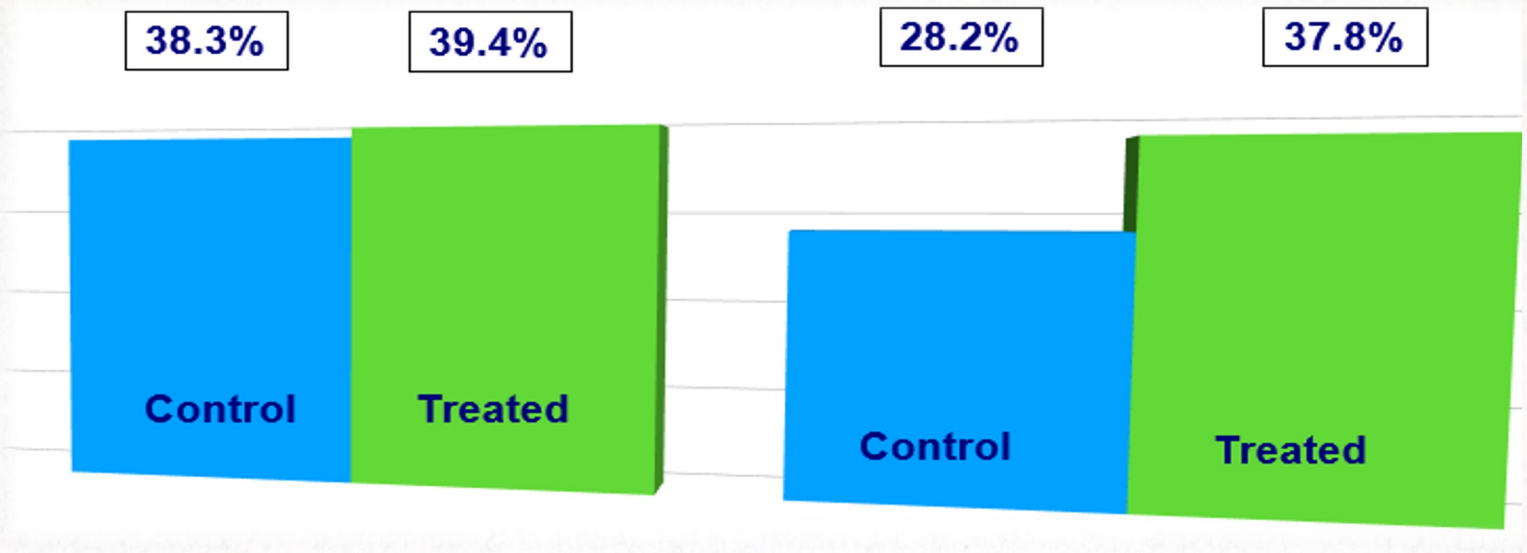
3. The way a consumer perceives or describes the flavor of a product does not predict if they like it.

CONSUMER PALATE/PREFERENCE PREDICTABLE USING CHEMISTRY



ANALYSIS OF OZONE TREATMENT
IMPACT ON CONSUMER PALATABILITY (85%+ PALATE MATCH SCORE)

2021- Napa Cabernet Sauvignon



Lot #1 - Control (2271) vs. Treated (2621)

TREATED:

+2.9% increase in Consumer Palatability
=
+7.1M consumers

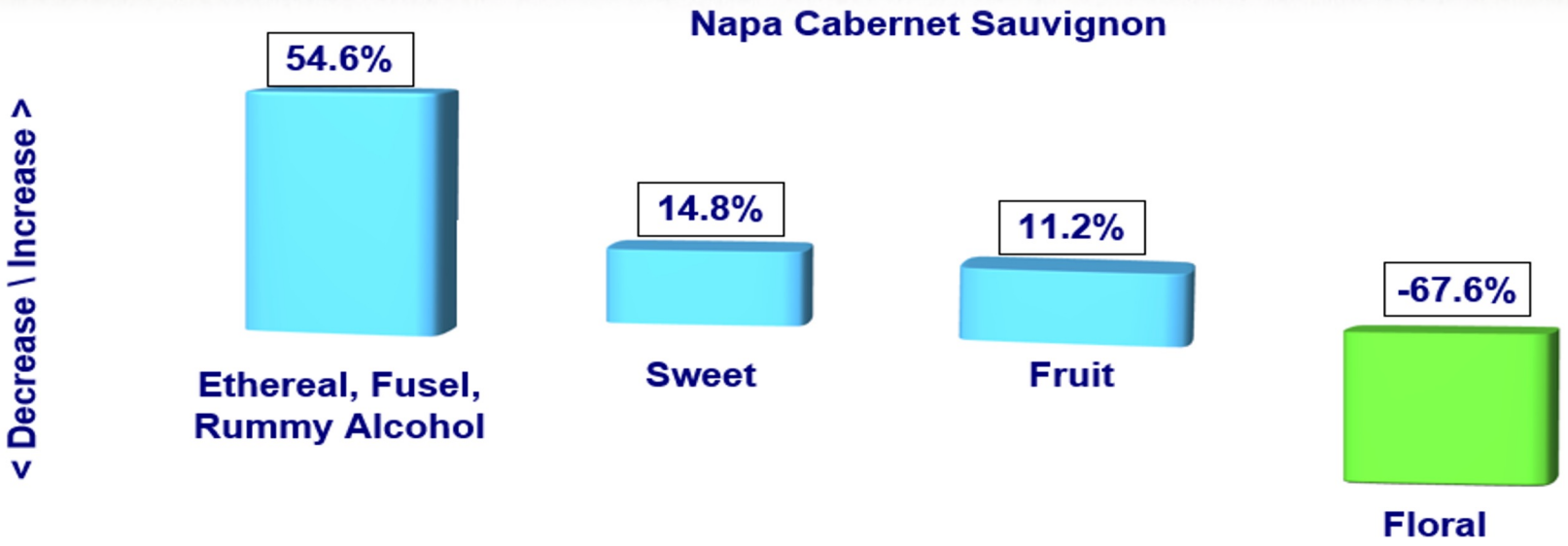
Lot #2 - Control (3321) vs. Treated (3221)

TREATED:

+34% increase in Consumer Palatability
=
+84M consumers

ANALYSIS OF OZONE TREATMENT

RESULTING IMPACTS ON FLAVOR CHARACTERISTICS & COMPOUNDS



Notable differences in 34 flavor characteristics, driven primarily by the matrix of 12 compounds

Most notable concentration INCREASES:

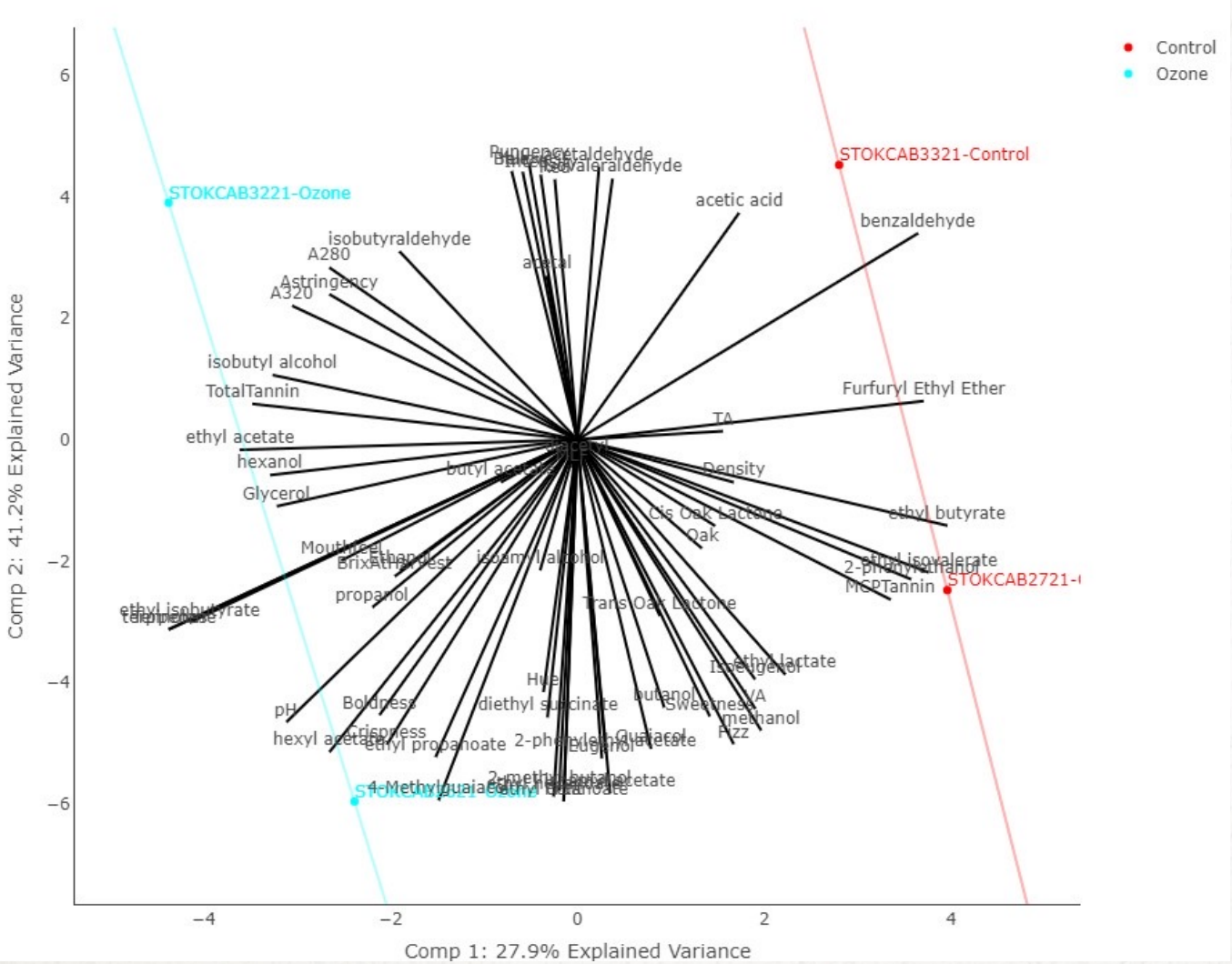
- Ethyl isobutyrate (avg. 26.86%)
- 2-ethyl acetate (avg. 16.68%)
- Isobutyl alcohol (avg. 6.44%)

Most notable concentration DECREASES:

- 2 Phenylethanol (avg. 31.69%)
- Ethyl butyrate (avg. 8.23%)

ANALYSIS OF OZONE TREATMENT

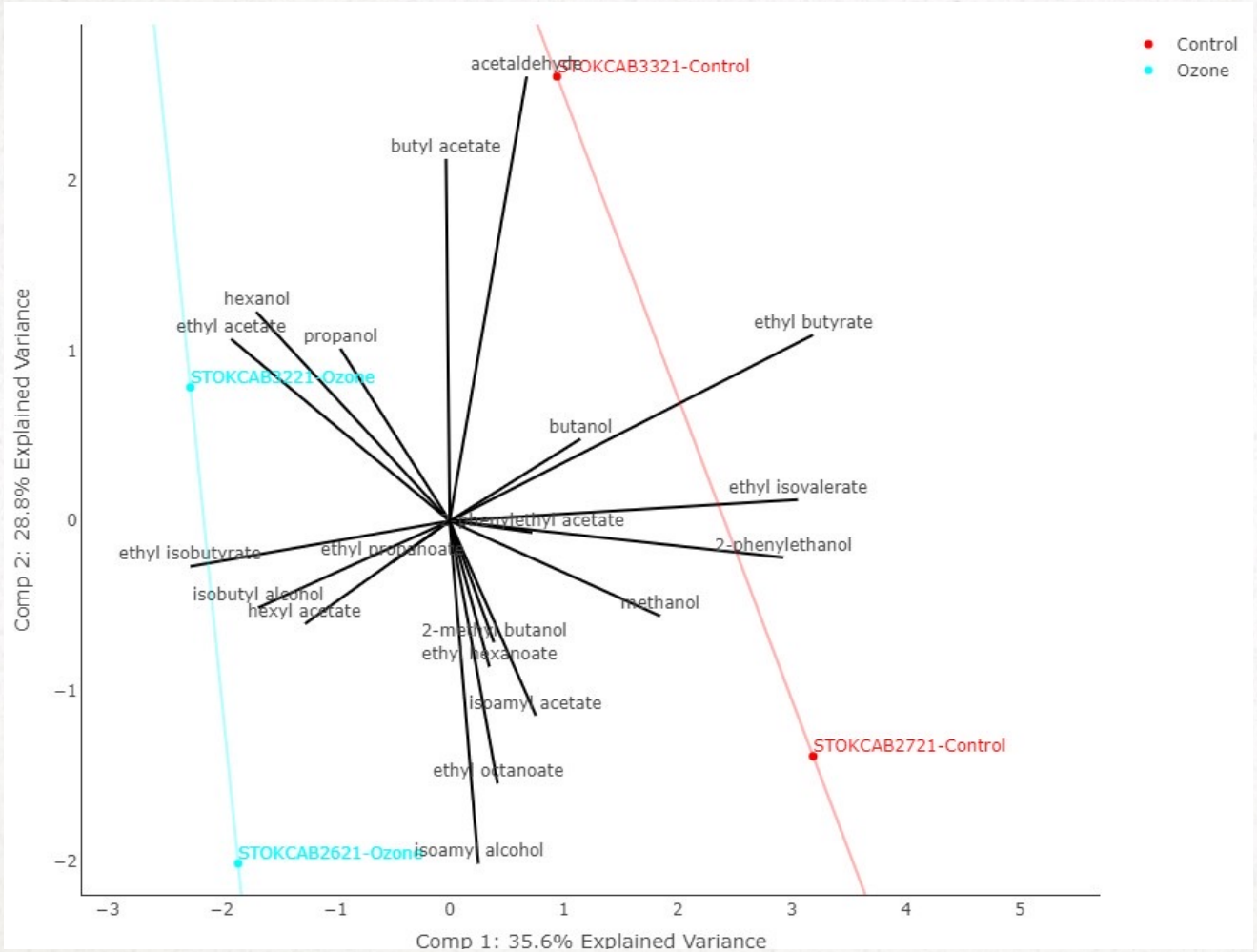
LOOKING AT THE CHEMISTRY VARIANCE



~28% of the chemistry variance between the Control and Ozone-treated samples can be explained by 63 compounds/characteristics

ANALYSIS OF OZONE TREATMENT

MOST IMPACTFUL COMPOUNDS APPEAR TO BELONG TO ESTERS AND ALCOHOLS

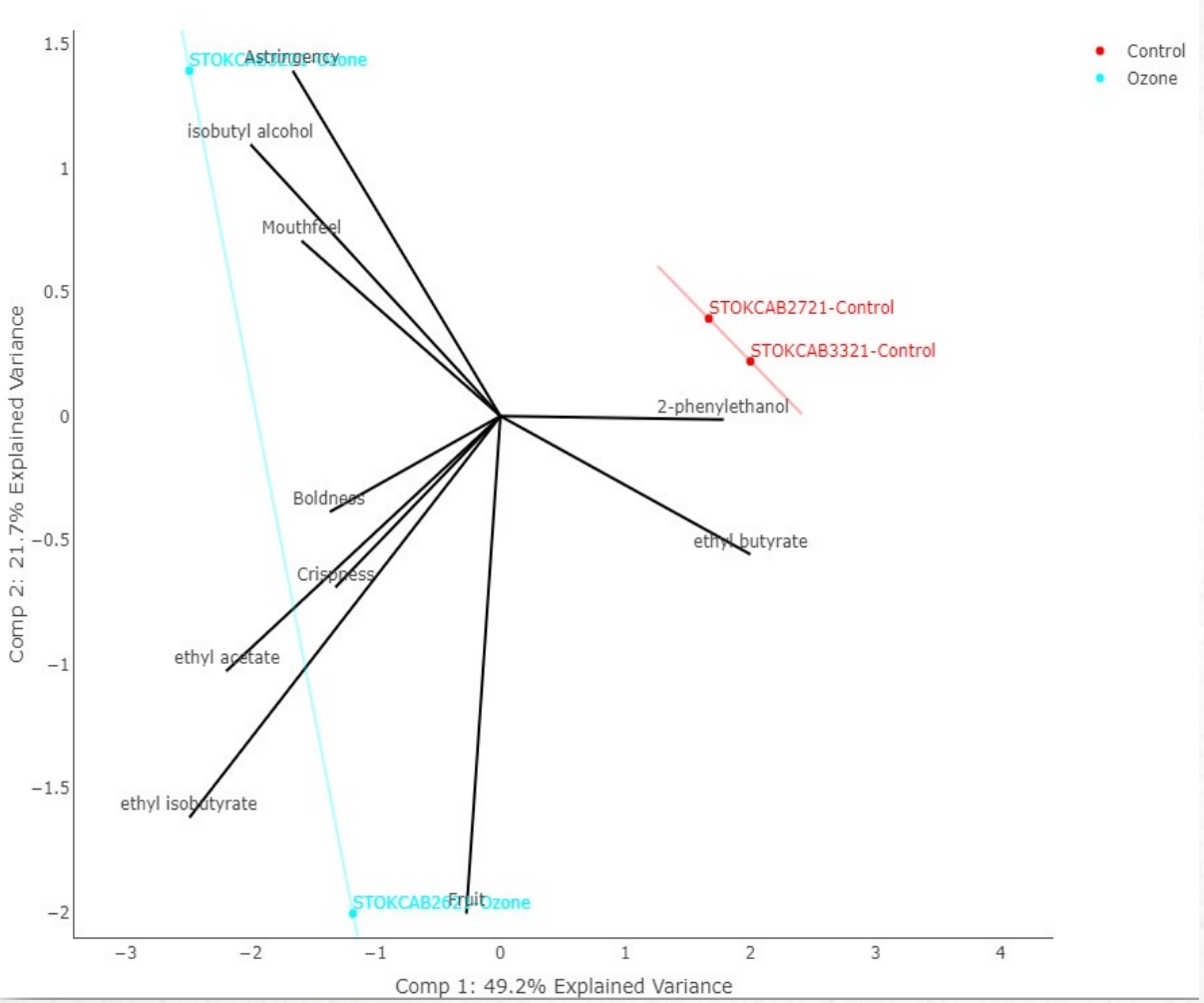


Tastry AI determined that the better performing wines, from the perspective of palatability had <u>INCREASED:</u>

- **Mouthfeel**
- **Astringency**
- **Boldness**
- **Crispness**
- **Fruitiness**

ANALYSIS OF OZONE TREATMENT

MOST IMPACTFUL COMPOUNDS APPEAR TO BELONG TO ESTERS AND ALCOHOLS



The 5 compounds primarily responsible for the increased palatability of the ozone treated vs. control samples were <u>INCREASES in</u>:

- **Ethyl isobutyrate (avg. 26.86%)**
- **Ethyl acetate (avg. 16.68%)**
- **Isobutyl alcohol (avg. 6.44%)**

And <u>DECREASES in</u>:

- **2-Phenylethanol (avg. 31.69%)**
- **Ethyl butyrate (avg. 8.23%)**

PRACTICAL WINEMAKING RESULTS & OBSERVATIONS FROM O3 USE

Ken Bernards

ken@ancienwines.com

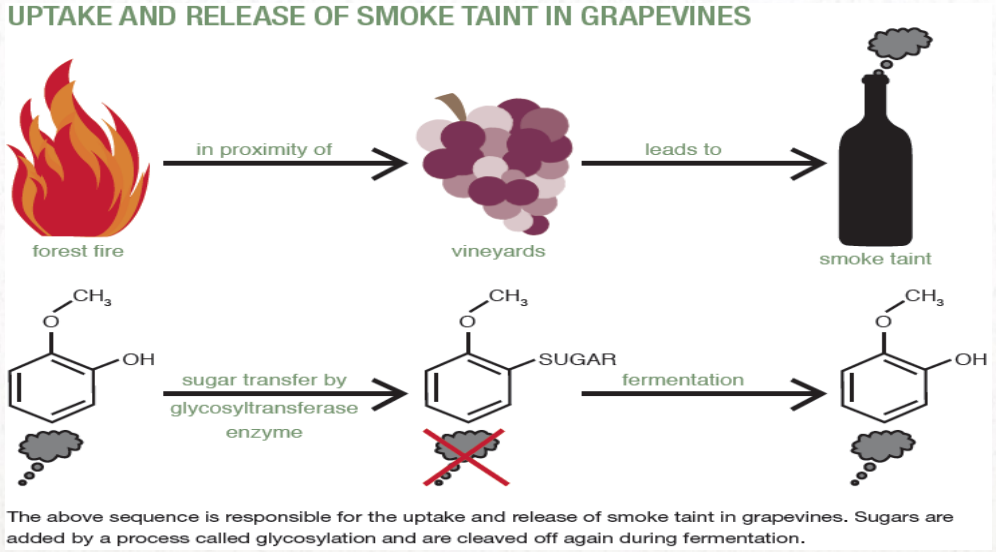
Ancien Wines - Napa California

NAPA WINEMAKING WITH O3 TREATMENT ON HARVESTED GRAPES INITIAL EXPERIMENT- 2017

- Decision to experiment with ozone after tasting trial results at neighboring winery
- Initial goal was to **soften tannins and emphasize fruit** in a challenging vineyard
- Days before a controlled experiment could be conducted, the 2017 fires broke out

PAST EXPERIENCES WITH SMOKE TAINT

- 2003 Chile – extreme taint in a Pinot Noir wine affected by adjacent fire was sold in bulk at a loss
- 2008 Northern Sonoma County – attempted remediation ultimately deemed unsuccessful



The above sequence is responsible for the uptake and release of smoke taint in grapevines. Sugars are added by a process called glycosylation and are cleaved off again during fermentation.

2017 STYLISTIC TRIAL TURNED SMOKE TAINT TRIAL

- 2017 became a race to harvest
- Single controlled experiment of ozone treated fruit vs. control resulted in favorable organoleptic improvement as well as reduction in taint markers. Is this reproduceable?
- What did we do?
- Enter 2020…

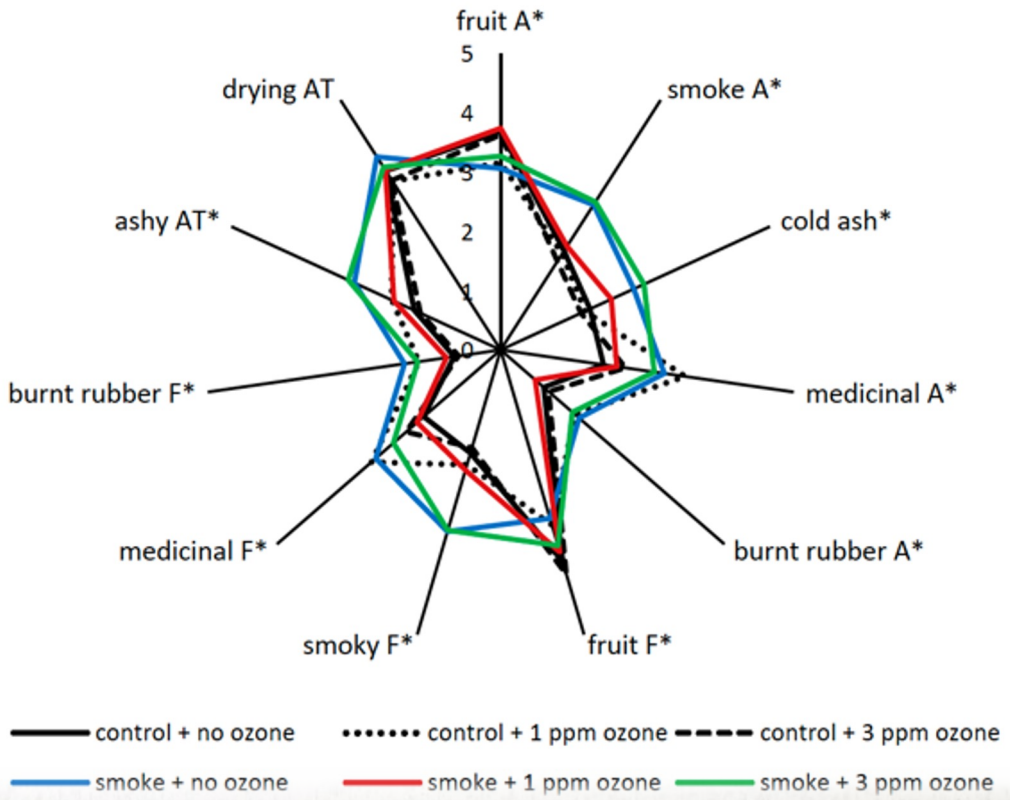
THE 2020 SMOKE TAINT TRIAL

Winemaking Trial Details

- Atlas Peak Cabernet Sauvignon, August fire encroached within 1/8 mile of the vineyard
- Emphasis on experimental design and controlled monitoring of treatment parameters
- Uniform block, adjacent rows
- Heat/Cooling control on tanks, inoculated with commercial yeast, identical protocols, 2-ton fermentation scale, no deviation from standard production techniques
- Both aged in 3-year-old barrels, identical cooper

SMOKE TAINT REMEDIATION

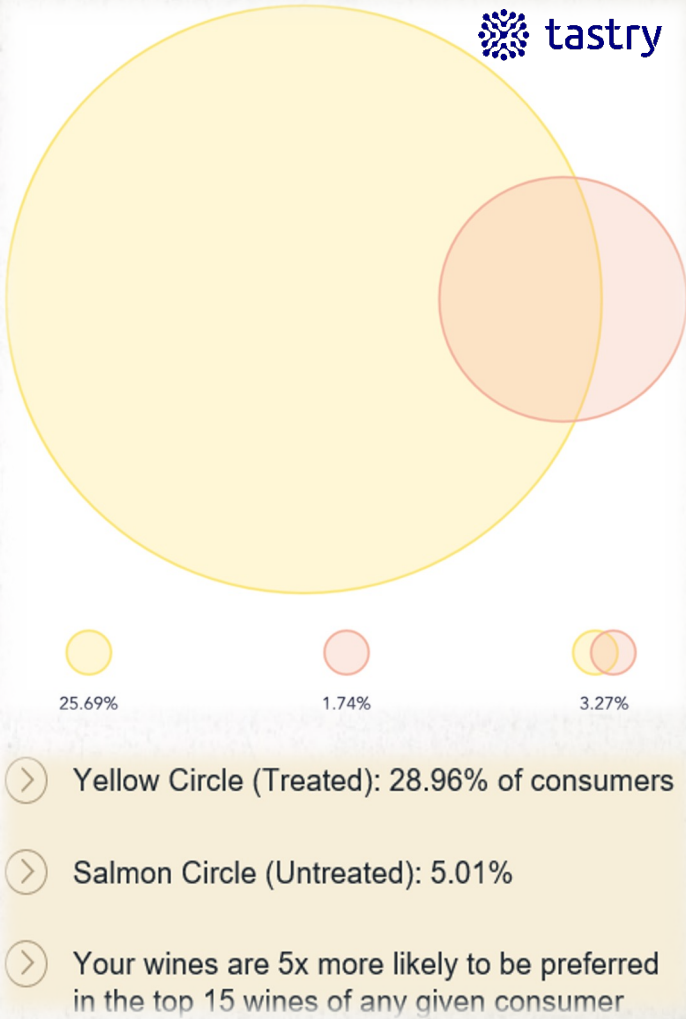
- During blind, in-house tastings, we have consistently observed a decrease in smoke taint perception on the ozone treated wine
- We have not observed an increase in observed smoke taint over time
- The wines from ozone treated grapes were ultimately **used for their intended program**
- The control wine was **declassified** to lower priced blend



Modesti Margherita, Szeto C., Ristic R, Jiang W, Culbert J, Catelli C, Mencarelli F, Tonutti P., Wilkinson K. Amelioration of Smoke Taint in Cabernet Sauvignon Wine via Post-Harvest Ozonation of Grapes. Beverages 2021, 7, 44.

A LARGER POTENTIAL FOR O3 TO EVOLVE STYLE AND SOLVE CHALLENGES

- Other effects perceived in the wines
  - **Softer, rounder tannins**
  - **More fruit driven, approachable**
- Winemaking Philosophy Questions
  - Can we be more extractive if some of the negatives of “over-extraction” seem to be lessened?
  - How are we affecting the longevity and evolution of the wines?
  - What vineyards/varieties/fruit characteristics is this treatment best suited for?
  - Do expected results mesh with your stylistic goals?



OTHER POTENTIAL ADVANTAGES

- Decrease in SO2 use
- Less microbial competition or potential inhibition of the primary fermentation
- A potential tool for compromised fruit eg Bird Damage, mold, etc
- More approachable wines ready for market sooner
- Under-ripe fruit applications

WHAT WINEMAKERS ARE SAYING

"Ozonation could provide benefits for non-smoke impacted grapes as a tool for fermentation to address VA issues and eliminate unwanted microflora for winemakers that want a more pure effect from inoculation with added yeast strains."
Towle Wine Company (Gundlach Bundschu)
Glen Ellen CA – Winemaker Joe Uhr

"There's still a lot more to figure out, but from what I am seeing so far the treated wines seem a bit fruitier."
Quintessa Estate Winery
St. Helena CA – Winemaker Rebekah Wineburg

"The treated wines were fresher and more fruit forward, I'm pleasantly surprised how the wines have responded to the treatments. I would personally use the technology again, I think it's a very promising technology."
Shea Wine Cellars
Newburg OR - Winemaker Dana Booth

Q&A
BEGIN WINE TASTING

PLEASE FILL OUT TASTING SURVEY FORM

EMS USA PRESENTS WINEXPO TRADE SHOW & CONFERENCE 2012 10th ANNIVERSARY 2022

purfresh® wine

UNIVERSITÀ DEGLI STUDI DELLA Tuscia

tastry

ANCIEN

TASTING PAIR - A

A1 – 2020 NAPA CAB
A2 – 2020 NAPA CAB

TASTING PAIR - B

B1 – 2021 WILLAMETTE PINOT NOIR
B2 – 2021 WILLAMETTE PINOT NOIR

TASTING - C

C1 – 2021 EL DORADO PETITE SIRAH

Thank You to Our Sponsors!

Presenting Sponsor

EMS USA
efficiency moves success

Silver Sponsors

CMPR
CARLE MACKIE POWER & ROSS
dh wine compliance
WWW.DHWINECOMPLIANCE.COM
MIRA COMMERCE DIGITAL AGENCY
TURRENTINE BROKERAGE

Additional Sponsors

365WINETRADE by Western Computer
American AgCredit
atpgroup
BPM
BSG
EUROSTAMPA
Fermentis by Lesaffre
GO fermentor
NORTHBAY biz
NAPA · MARIN · SONOMA
redchirp
Sonoma Sterling Limousines, Inc.
WECO
A DURAVANT COMPANY
WESTEC
TANK & EQUIPMENT CO.
cloverdale arts alliance
SANTA ROSA JUNIOR COLLEGE
SONOMA STATE UNIVERSITY
WINEAMERICA
WINE INDUSTRY JOBS