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IMPACT OF RED BLOTCH DISEASE ON GRAPE AND WINE COMPOSITION AND QUALITY

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Introduction

- Grapevine red blotch-associated virus (GRBaV)
  - First described in Cab Sauv, Zin and Cab Franc in Napa Valley (1)
  - Cornell researchers have shown that GRBaV is causal agent of red blotch diseases (2)
  - RB disease shows symptoms similar to leafroll disease
    - Unlike leafroll – RB show red veins on leaf undersides and no rolling

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(1) Al Rwahnih et al., (2013) Phytopath. 103: 1069-1076
(2) Fuchs (2013) http://lecture.ucanr.org/Mediasite/Play/7e6250539e5e4676ad4cd888051164c1d

Introduction

- **Red Blotch disease**
  - **Both young and mature vines – white and red cultivars – several states**
  - **Suggest transmission by grafting (1)**
  - **Increase incidence in young healthy vines adjacent to infected vineyards suggest vector (3)**
  - **Currently DNA-based PCR test available to assay for virus in plant material**

(1) Al Rwahnih et al., (2013) Phytopath. 103: 1069-1076
(3) Poojaric et al. (2013) PLosONE 8: e64194

Impact of RB disease on grape composition

- ↓ Sugar accumulation
  - As much 4-5 °Brix less
  - Delay in ripening
- ↓ Color development
- ↑ TA
  - Current research - show not always true
  - ↑ Malic acid

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Impact of RB disease on grape composition

- Anecdotal evidence – severe symptoms
  - Some see extreme color influence – pink grapes
  - Max sugar accumulation of 19°Brix
  - ↓ Total phenolics 5-30%
  - Some contracts want all infected fruit dropped or 50% dropped to help ripening??? – does it help?
  - Vineyard cultural practices?

Impact of RB disease on grape & wine composition

- Much not known
  - Influence of cultivar and rootstock?
  - Influence of stress?
  - Seasonal/climatic impact
  - No well documented influence on grape development
  - Effect on wine composition and quality?
    - Wine ageability?

Impact of RB disease on wine composition

- Prelimanary study on Cab Sauv, Napa Valley (n=3) 2013
  - RB pos fruit
    - 30%↓ Tot Anth
    - 24%↓ Tannin
    - 27%↓ Tot Phenols
  - Wines at end of fermentation – RB pos fruit
    - 5%↓ Tot Anth
    - 4%↑ Tannin
    - 9%↓ Tot Phenols

Study objectives

- To determine the effect of GRBaV on the composition of grapes at harvest and the resulting wines
- To investigate potential sensory and quality differences between wines made from GRBaV positive and negative grapes

Experimental layout

- Virus testing (GRBaV and Leafroll) of subset vines to determine GRBaV (+) and (-) sample plots
- Sample grapes at harvest
  - Chemical panels
  - Metabolomics analysis (primary and secondary metabolite profile)
  - Phenolic profile (AH-assay, RP-HPLC)
  - Tannin composition (SPE isolation, phloroglucinolysis, GPC analysis)

Experimental layout

- Winemaking from GRBaV (+) and (-) grapes
  - Chemical analyses similar to grapes (previous slide)
  - Descriptive sensory analysis
    - Correlate wine composition with sensory attributes
    - Impact of GRBaV on wine style/quality

Experimental layout

Variety (site #)	Source County	Grape Sampling	Winemaking
Chardonnay 1a	Sonoma	Yes	Yes
Chardonnay 1b	Sonoma	Yes	No
Chardonnay 2	Sonoma	Yes	No
Merlot 1	Napa	Yes	No
Merlot 2	Napa	Yes	Yes
Cab Sauv 1	Napa	Yes	Yes
Cab Sauv 2	Napa	Yes	Yes

- Important to determine seasonal impact: 5 of the 6 sites above can be studied in 2014-2015

Red Blotch symptoms – Site 1b Chardonnay

Red Blotch symptoms – Site 1 Cab Sauv

Results: Grape composition

Sample	GRBaV Status	Harvest Date	°Brix	pH	TA (g/L)
Chardonnay 1a	-	12-Sep-14	24.4	3.4	6.0
	+	12-Sep-14	23.0	3.5	6.7
Chardonnay 1b	-	11-Sep-14	23.0	3.4	6.6
	+	11-Sep-14	22.5	3.6	6.9
Chardonnay 2	-	16-Sep-14	24.1	3.3	7.8
	+	16-Sep-14	24.2	3.5	8.6

↓6 %

↓2 %

0 %

- ↓°Brix 0-6% GRBaV(+) CH grapes
- Small differences in pH
- ↑ TA in GRBaV(+) grapes

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Results: Grape composition

Sample	GRBaV Status	Harvest Date	°Brix	pH	TA (g/L)
Merlot 1	-	29-Aug-14	25.0	3.6	3.2
	+	29-Aug-14	21.1		3.6
Merlot 2	-	26-Sep-14	24.9		4.2
	+	26-Sep-14	23.5		4.7
Cab Sauv 1	-	18-Sep-14	25.7		7.8
	+	18-Sep-14	20.6		8.6
Cab Sauv 2	-	7-Oct-14	26.3		4.8
	+	7-Oct-14	25.2		4.9

↓16 %

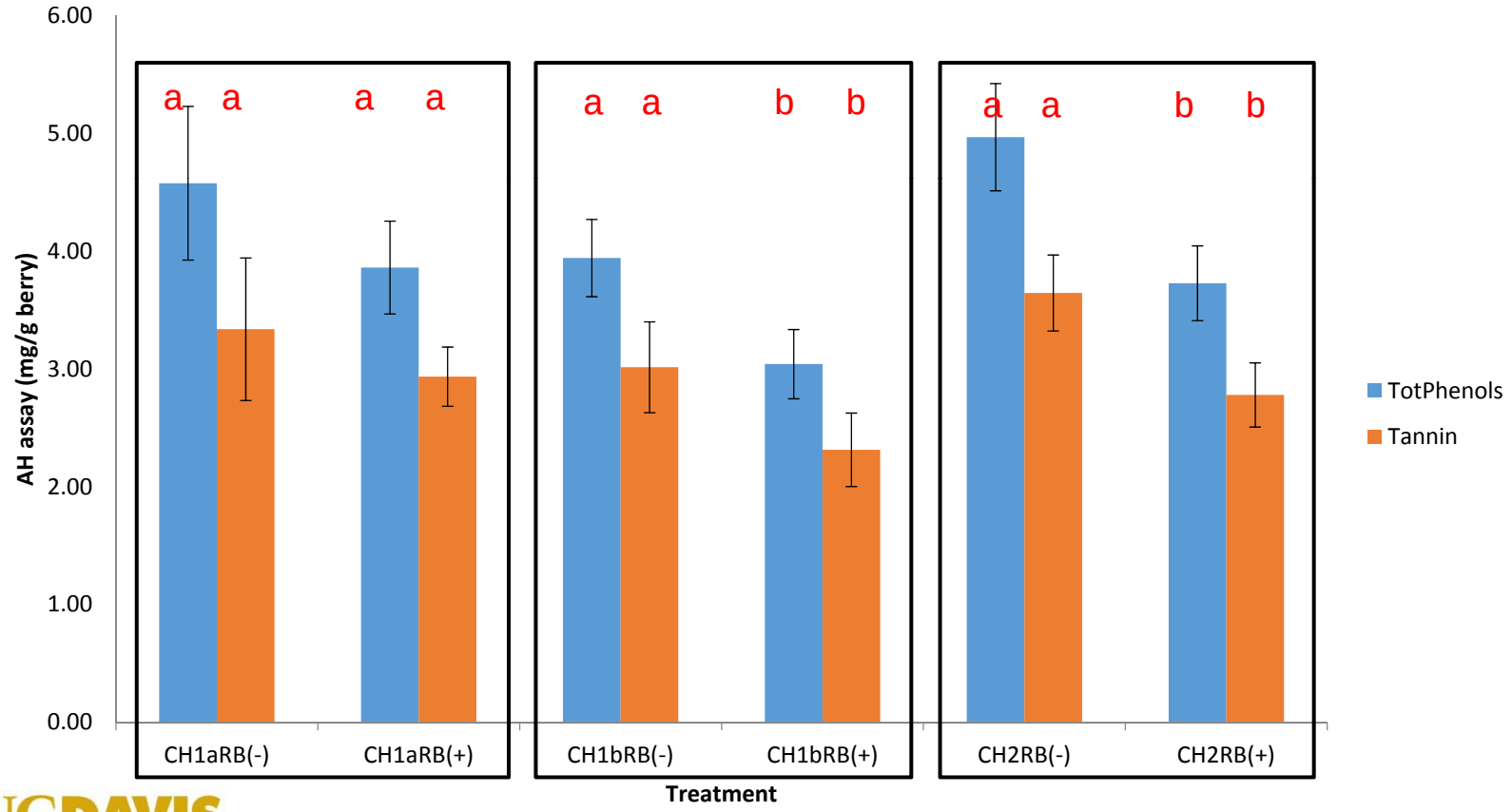
↓6 %

↓20 %

↓4 %

- ↓°Brix 6-16% GRBaV +) ME and 4-20% in CS grapes
- Small differences in pH
- ↑ TA in GRBaV(+) grapes

Preliminary results: Grape composition AH assay



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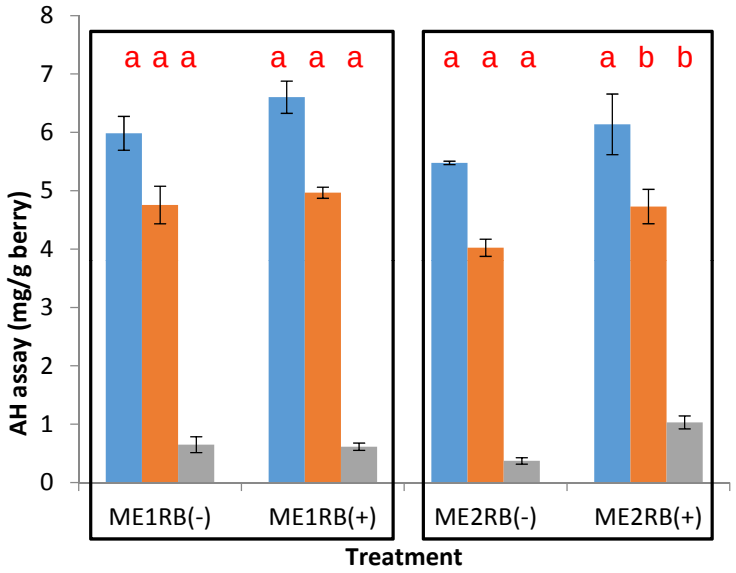
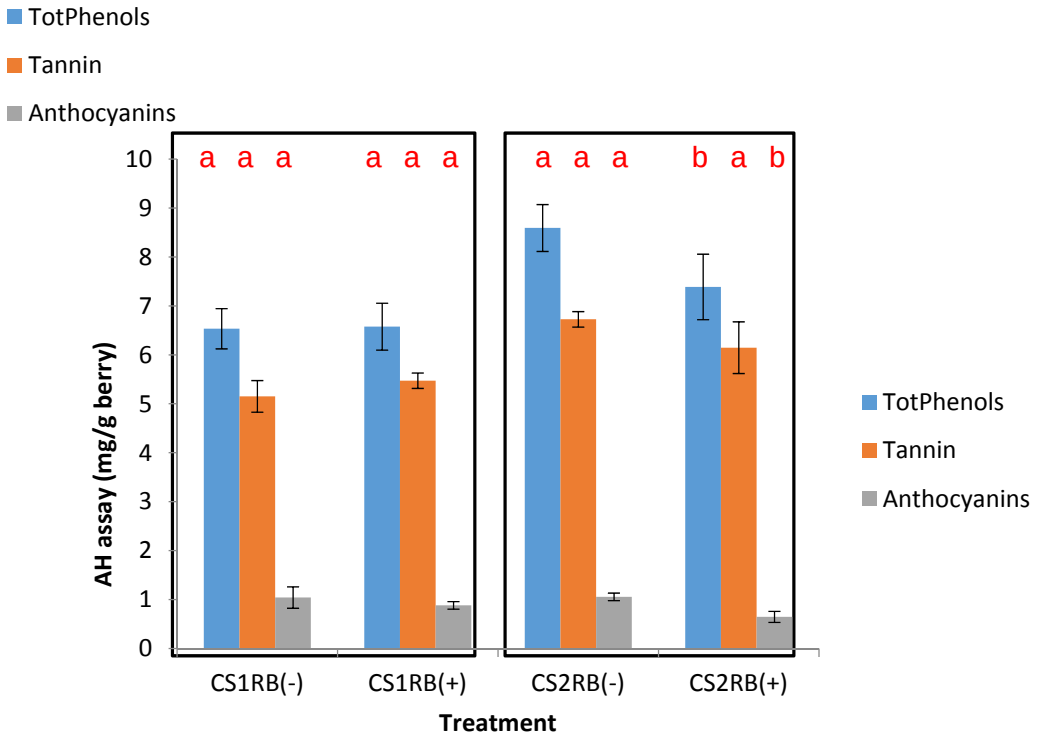
- Bars with the same letter indicate no significant difference within a site

Results: Grape composition AH assay





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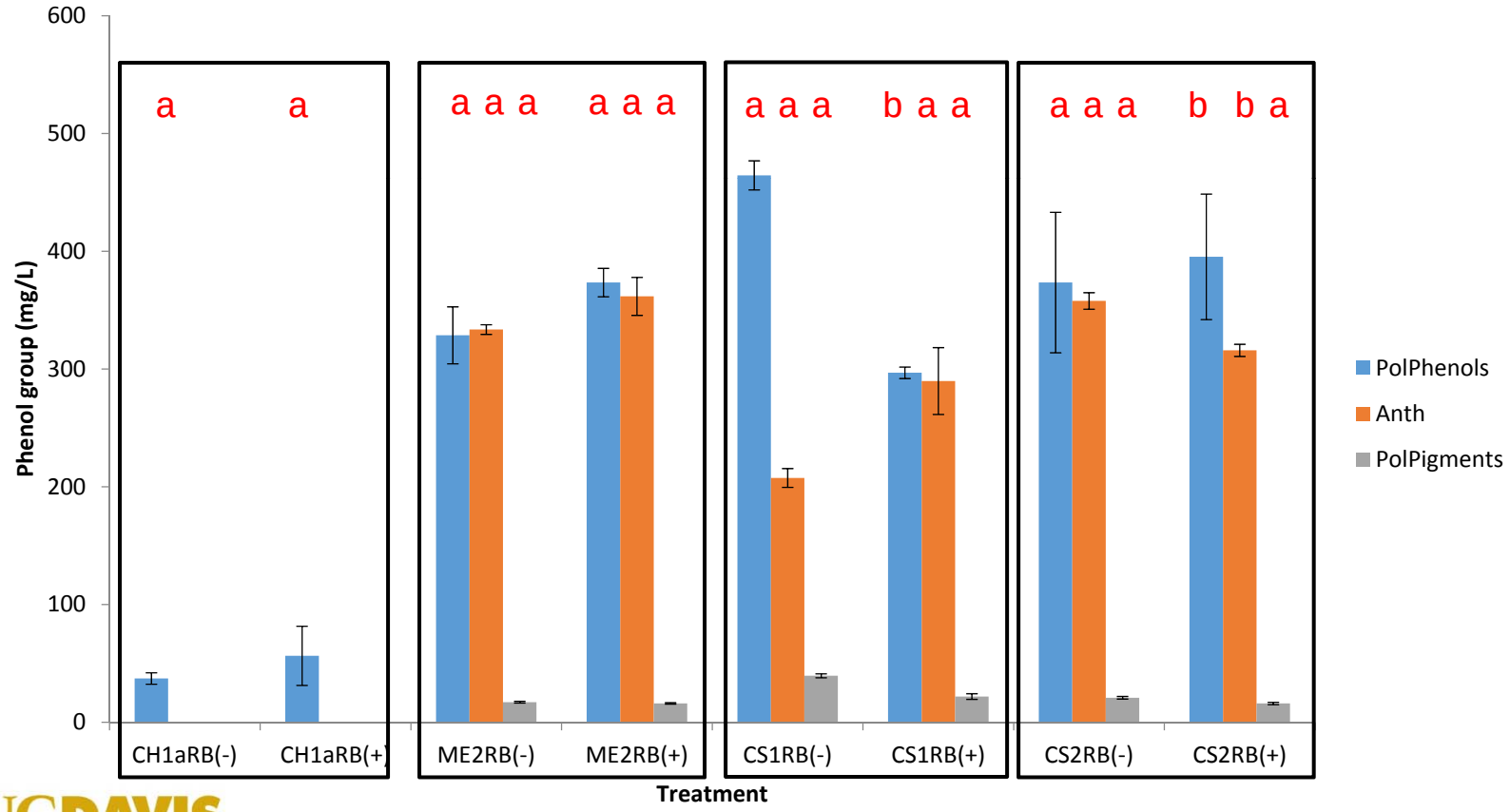
Bars with the same letter indicate no significant difference within a site

Grape & wine analyses…so far

- Grape samples
  - Metabolomics analysis underway
  - RP-HPLC and tannin analysis
- Wines samples
  - Cab Sauv site 1 just completed MLF
  - Bottling in 2 weeks
  - Sensory descriptive analysis 1 month after bottling
  - All chemical analyses scheduled to coincide with sensory analysis

Preliminary results: Wine composition RP-HPLC



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Bars with the same letter indicate no significant difference within a site

Informal tasting notes

- Common to all wines made from red blotch(+) fruit compared to control
  - Suppressed fruit
  - Less fresh, more artificial fruit
  - Mouthfeel thinner, tannins seem grainier and green, no length

Future Work

- Influence of season/climate on red blotch disease impact
- How to mitigate impact of GRBaV – if possible
  - Viticultural practices
  - Winemaking practices

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