



Oregon State University

Impact of Abscisic Acid Treatment on Composition of Wine Made from Grapevine Red Blotch Disease Infected Grapes

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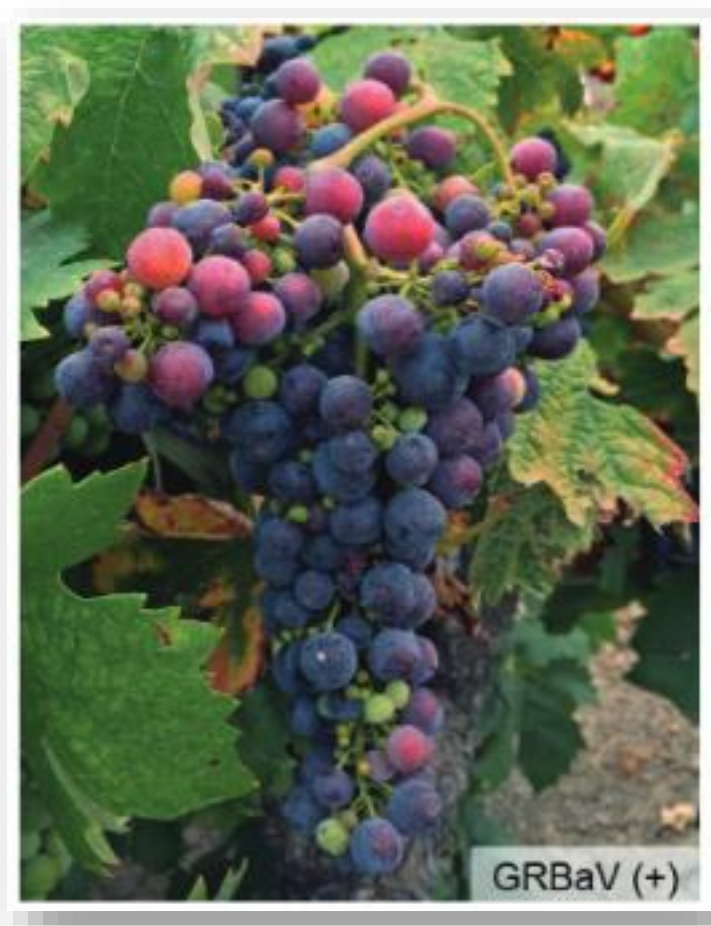
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Introduction

Grapevine Red Blotch Disease



OSU Plant Clinic Image, 2013



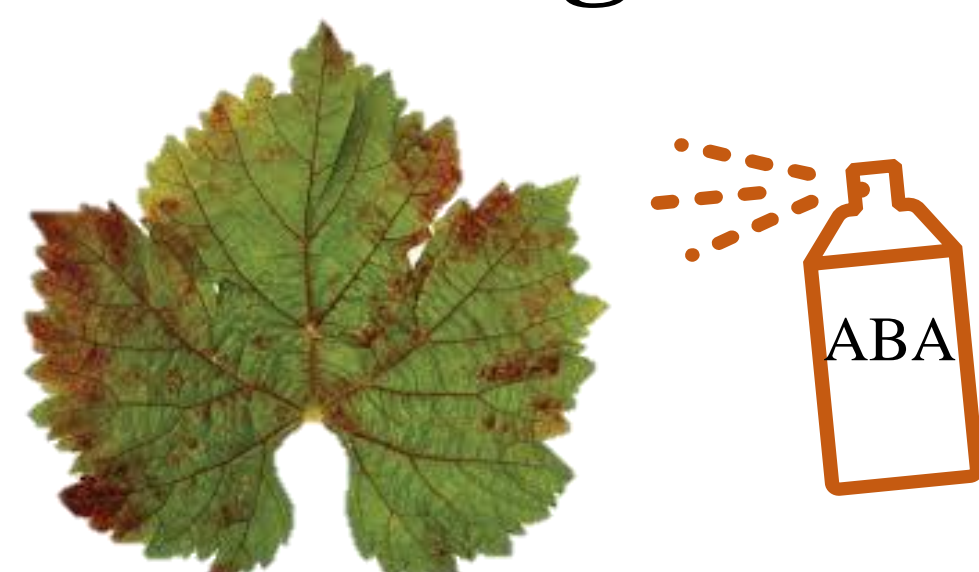
Blanco-Ulate, 2017

- Caused by Grapevine red blotch-virus (GRBV)
- Red discoloration of leaves that began at véraison in the basal leaves and progressed toward upper canopy leaves by late season.

Compared to healthy, non-GRBV vines

- Decrease sugar accumulation
- Delay berry ripening

Field management



ABA was applied by airblast sprayer to the cluster zone of the vineyard plots to dripping.

- Conducted over two field seasons: 2018 and 2019
- Commercial vineyard in the Dundee Hills AVA
- Pinot noir clone 777 grafted to 3309C rootstock
- Confirmed 100% positive GRBV by PCR
- Treatment groups: ABA applied and control (CON)
- ABA was applied as Protone SG at véraison and again two weeks later using label rates.

Methods

Volatile aroma compound analysis – GC SPME-GC-MS

for major compounds (isotope labeled internal standards)

HS-GC-FID

for high volatility compounds

SPME-GC-MS-SIM

Methoxypyrazines (isotope labeled internal standards)

Wine Color – UV/Vis Spectrophotometry

Monomeric Anthocyanin (mg/L, malvidin-3-glucoside equivalent)

$$= A \times MW \times DF \times 1000 / (\epsilon \times p)$$

A: $(ABS_{520nm} - ABS_{700nm})_{pH 1.0} - (ABS_{520nm} - ABS_{700nm})_{pH 4.5}$

MW: molecular weight of malvidin-3-glucoside

DF: dilution factor

p: pathlength in cm

ϵ : molar extinction coefficient for malvidin-3-glucoside

Total Phenolic content

Folin-Ciocalteu colorimetric method

UV-1800 spectrophotometer (absorbance at 740 nm)

Expressed as mg/L gallic acid equivalent.

Results

Table 1. Monomeric anthocyanin and total phenolic content in wine

Year / Treatment	Monomeric anthocyanin mean±SD (mg/L)	Total phenolic content mean±SD (mg/L)
2018	ABA/RB+ 175±23a	1345±15a
	CON/RB+ 204±2b	1550±6b
2019	ABA/RB+ 183±15A	1037±41A
	CON/RB+ 219±13B	1128±47B

Statistical differences between mean values (P < 0.05, n = 3) denoted by letters, comparisons made for each year separately.

Conclusions

- Both years showed ABA treatment reduced anthocyanin and phenolics content in final wines associated with Red Blotch Disease.
- ABA treatment affected certain wine aroma compounds, with the results differing in the two years.

Table 2. Wine aroma compounds in 2018 by GC-MS

Compounds (µg/L)	ABA/RB+ mean±SD	CON/RB+ mean±SD
Esters		
ethyl butanoate	74.7±3.3	65.8±2.8
ethyl hexanoate	184±5	163±7
Alcohols		
isobutyl alcohol	128±10	158±7
isoamyl alcohol	322±12	378±5
2-heptanol	6.7±0.1	5.3±0.4
Terpenes		
β-damascenone	5.8±0.0	5.6±0.1
Acids		
octanoic acid	929±23	852±29
decanoic acid	265±11	235±1
Bound form C13-norisoprenoids		
vitispirane	15.8±2.4	21.4±1.4
TDN	10.3±1.1	13.8±0.3

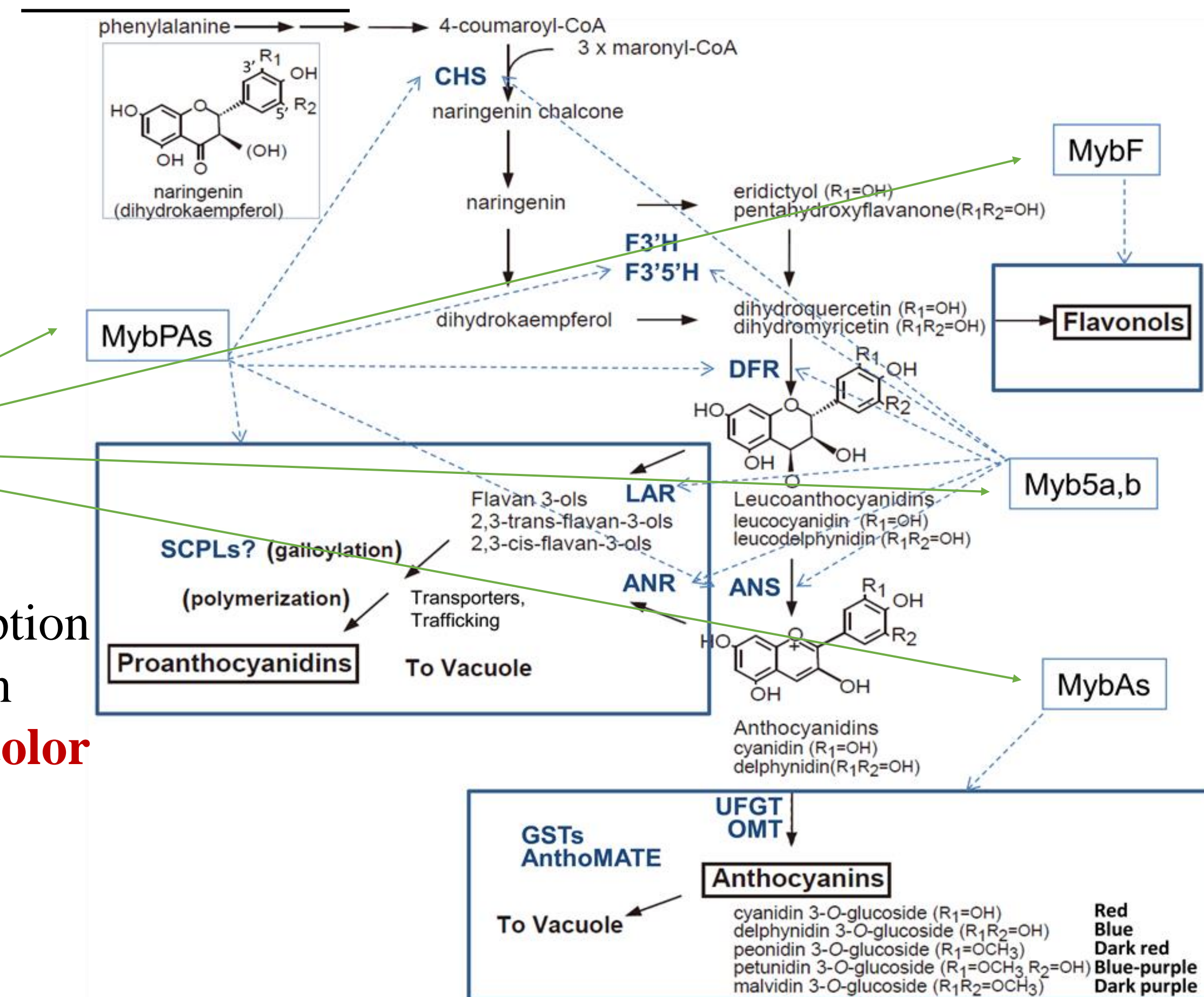
Only compounds with statistical significance are reported (P < 0.05, n = 3). Treatment group with significant higher concentration is highlighted in darker color.

Table 3. Wine aroma compounds in 2019 by GC-MS

Compounds (µg/L)	ABA/RB+ mean±SD	CON/RB+ mean±SD
Esters		
ethyl 2-methylbutyrate	4.3±0.3	5.4±0.1
ethyl 3-methylbutyrate	6.0±0.6	7.1±0.4
ethyl Octanoate	71±3	86±4
isoamyl acetate	391±5	529±66
Alcohols		
(E)-2-hexenol	57.5±8.6	40.7±5.8
phenethyl alcohol (mg/L)	27.6±15.1	34±52
Propanol	37.7±2	33.4±1.1
Acids		
3-methylbutanoic acid	1185±123	1462±83
hexanoic acid	1232±54	1422±61
octanoic acid	777±40	856±5
Free form C13-norisoprenoids		
β-damascenone	5.2±0.4	5.9±0.3
β-ionone	2.9±0.01	3.0±0.03
Methoxypyrazines (ng/L)		
IBMP (3-isobutyl-2-methoxypyrazine)	2.2±0.2	2.9±0.5
IPMP (2-isopropyl-3-methoxypyrazine)	1.8±0.2	2.8±0.3

Only compounds with statistical significance are reported (P < 0.05, n = 3). Treatment group with significant higher concentration is highlighted in darker color.

Abscisic Acid



ABA modulates Myb Transcription factors involved in anthocyanin biosynthesis to **increase skin color of grape berry.**

(Katayama-Ikegami, 2016)