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Cluster Loosening in Chardonnay Using Plant Growth Regulators (PGRs)

Hemant Gohil
Agricultural Agent, RCE of Gloucester County
Dan Ward
Rutgers/NJAES Extension Specialist – Pomology

Why cluster loosening?

- Bunch rot of wine grape, caused primarily by *Botrytis cinerea*, is a perennial problem limiting the productivity of eastern vineyards, especially on cultivars with compact clusters (Hed et al., 2009; Vail and Marois, 1991; Wilcox 2010).

- Longer rachis and more open clusters reduced the Botrytis Bunch Rot (BBR) symptoms (Hed et al., 2009).

Different ways of cluster loosening

- Early Leaf Removal (ELR) before fruit set results in cluster loosening in ‘Vignoles’ and ‘Pinot Gris’ (Hed et al., 2015).

- Applications of GA_3 increased cluster looseness and reduced the incidence and severity of bunch rots in Vignoles and, to a lesser extent, in Chardonnay over three consecutive years (Hed et al., 2009).

Major concern for using GA_3 in wine grape cultivars has been poor return bloom.

Role of Abscisic Acid (ABA) in cluster loosening

- Abscisic Acid plays an inhibitory roles in growth and development of plants.

- Padmavati et al. (2017) reported that exogenous application of *S*-ABA at 150 and 300 ppm during bloom resulted in significant increase in cluster looseness in ‘Early Sweet’ variety of table grape.

- No report of ABA application for cluster loosening in Wine Grape.

Objectives of the Study

To evaluate the effects of *S*-ABA and GA_3 on

(1) Overall cluster architecture.

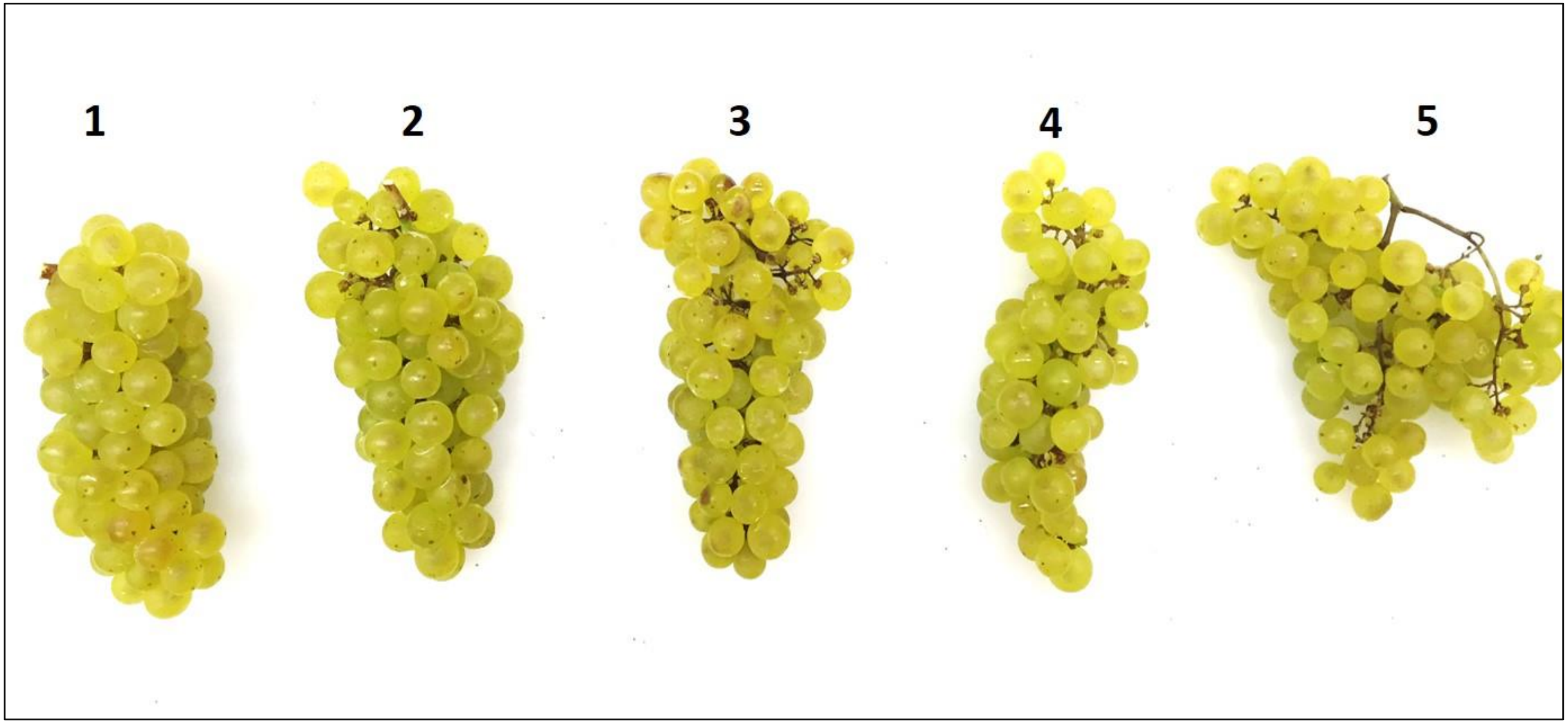
(2) Safety of the application (return bloom)

Experiment

Table 1. Description of plant growth regulator treatments, Abscisic Acid (*S*-ABA) and Gibberellic Acid (GA_3) and their application timing on 'Chardonnay' grapevines in southern New Jersey.

Treatment	Description	Dates of application	
		2015	2016
Control	No PGR applied		
100 ppm *S*-ABA applied once	80-90% bloom	5/28	5/31
100 ppm s-APB applied twice	80-90% bloom and 3 d later	5/28 & 5/31	5/31 & 6/3
200 ppm *S*-ABA applied once	80-90% bloom	5/28	5/31
200 ppm *S*-ABA applied twice	80-90% bloom and 3 d later	5/28 & 5/31	5/31 & 6/3
4% GA_3 applied once	80-90% bloom	5/28	5/31

Cluster looseness ratings



1 = almost all the berries are touching each other;
2 = more than half of the berries touching each other;
3 = very few berries touching each other and with minimal surface area;
4 = almost half of the berries are separate from each other with few gaps;
5 = most of the berries are separate from each other with visible rachis

Table 2. Means averaged over two years of cluster looseness rating[z], percentage shot berries, cluster weight, main rachis length, total rachis length, and berry weight per cm rachis length in response to different rates and timings of abscisic acid (*S*-ABA) and gibberellic acid (GA_3) applied at bloom to Chardonnay grapevines in New Jersey in 2015 and 2016.

Treatment	Cluster looseness	Shot berries (%)	Cluster wt. (g)	Main rachis length (mm)	Total rachis length (mm)	Berry wt. (g) per cm rachis length
Un-treated Control	2.07 d[y]	8.68 a	139.4	96.7	236.8	0.058
100 ppm *S*-ABA once	2.85 bc	4.00 bc	119.0	93.6	214.4	0.054
100 ppm *S*-ABA twice	2.73 c	2.95 cd	128.7	88.8	215.9	0.060
200 ppm *S*-ABA once	3.01 bac	3.46 bcd	115.4	89.1	211.6	0.055
200 ppm *S*-ABA twice	3.18 ba	1.59 d	105.1	89.2	204.3	0.051
4 g/l GA_3	3.41 a	6.75 ba	113.0	94.7	230.6	0.048
ANOVA *P*-value	<0.001	0.0033	0.2392	0.6113	0.5136	0.0952


Untreated Control
100 ppm ABA once
200 ppm ABA once
4% ProGibb 4 Fl Oz/Acre
100 ppm ABA twice
200 ppm ABA twice

Table 3. Means averaged over two years of return bloom, juice pH, juice total titratable acidity (TTA), and juice total soluble solids (TSS) in response to abscisic acid (*S*-ABA) and gibberellic acid (GA_3) applied at bloom to 'Chardonnay' grapevines in New Jersey in 2015 and 2016.

Treatment	Return bloom[z] (inflorescences/vine)	pH	TTA (mg/L)	TSS (°Brix)
Un-treated Control	46.4	3.61	7.3	20.8
100 ppm *S*-ABA Once	51.0	3.59	6.5	21.4
100 ppm *S*-ABA Twice	52.2	3.62	6.7	21.1
200 ppm *S*-ABA Once	50.8	3.63	7.0	21.0
200 ppm *S*-ABA Twice	48.2	3.57	6.7	21.5
4 gm/l GA_3	47.7	3.61	6.6	21.4
ANOVA *P*-Value	0.5301	0.8076	0.5584	0.1468
Minimum detectable difference[x]	7.19	0.099	1.02	0.63

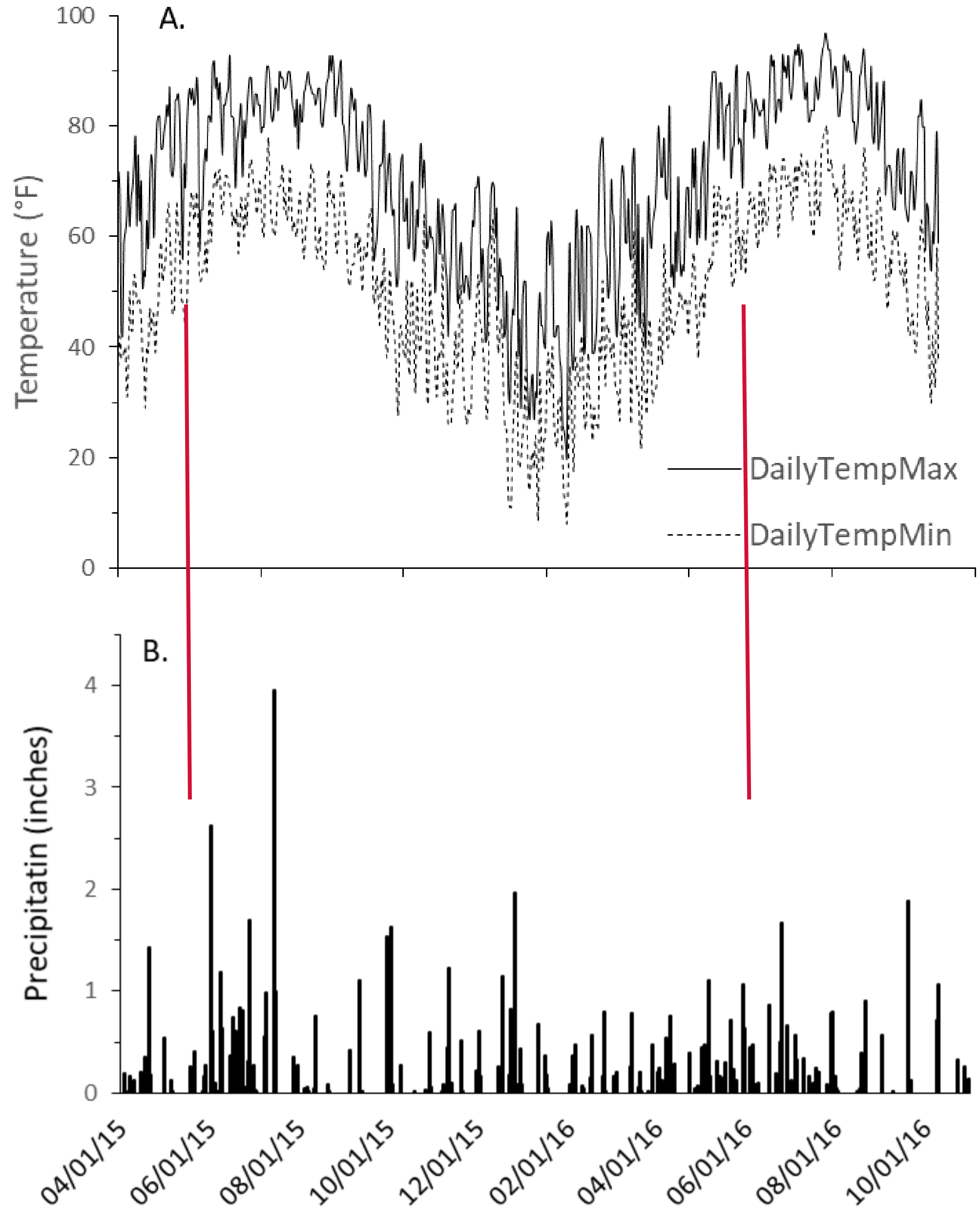


Figure 2. Ambient temperature and precipitation at Rutgers Agricultural Research and Extension Center in Upper Deerfield (39.4949°N; 75.2169°W), New Jersey during the conduct of the

Conclusions

- *S*-ABA and GA_3 increased cluster looseness, but not cluster elongation.
- *S*-ABA reduced shot berries and increased percentage normal berries.
- *S*-ABA and GA_3 did not affect return bloom in the following years.

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Thank you