Pub. TB12-98

Influence of Gibberellic Acid Berry Sizing Sprays on Crimson Seedless Table Grape

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Abstract

The influence of GA_3 sizing applications on the fruit quality and productivity of spur and cane pruned Crimson Seedless was evaluated. GA_3 applied at bloom increased fruit size, but also reduced berry color, increased berry shatter, and decreased return fruitfulness. Both spur and cane pruned vines responded similarly to the GA_3 treatments evaluated in this experiment.

Objectives

During the last several years we have developed cultural practices to optimize the quality of Crimson Seedless table grapes. This work showed that one gram of gibberellic acid (GA_3) per acre applied at bloom reduces the fruit set and improves the berry size of Crimson Seedless. The influence of GA_3 berry sizing applications this cultivar are not well documented. Early field observations suggested GA_3 should not be used for berry sizing due to the adverse effects on vine fruitfulness the following season.

However, preliminary work using spur pruned vines indicated that GA_3 sizing applications (20 to 40 grams per acre) had no detrimental effect on vine fruitfulness. The purpose of this study was to examine the interaction between pruning system (spur or cane) and GA_3 berry sizing applications on Crimson Seedless.

Procedures

The trial was initiated in 1995 in a commercial vineyard in Fresno County. The vineyard was planted on its own roots in 1990 in a sandy loam soil. Vines from both cane and spur pruning systems were located in adjacent rows. Cane pruned vines were head trained and trellised to a double cross-arm system. The top cross-arm is 36" wide and has four foliage support wires, while the bottom cross-arm is 24" wide and has two wires for tying canes. Eight canes were retained on each vine at pruning. The spur pruned vines were trained to quadrilateral cordons with 24" between the fruiting zones. Two foliage support wires are attached to a 36" wide cross-arm located approximately 18" above the cordons. Seven, 2-bud spurs were retained on each cordon arm (28 spurs per vine) at pruning.

The following treatments were evaluated in both pruning systems in 1995: Untreated control; GA_3 applied at bloom (1 g/ac); Bloom GA_3 + 20 g GA_3/ac at berry set (4-5 mm berry diameter); Bloom GA_3 + 40 g GA_3/ac at berry set; Bloom GA_3 + 2 x 20 g GA_3/ac at berry set (4-5 mm berry diameter + 8-9 mm berry diameter); Bloom GA_3 + 2 x 40 g GA_3/ac at berry set. Cluster counts in Table 1 reflect the effect of treatments applied in 1995 on return fruitfulness in 1996.

Based on this data, the 1996 experimental protocol was revised to include the following treatments: Untreated control; GA_3 applied at bloom (1 g/ac); Bloom GA_3 + 20 g GA_3/ac at berry set (4-5mm berry diameter); and Bloom GA_3 + 40 g GA_3/ac at berry set. GA_3 was applied to both clusters and foliage using a hand-held spray wand at the rate of 200 gallons of spray solution per acre. Each treatment was replicated nine times using three vine plots, with data collected from the middle vine. All data vines were girdled at berry set, and the crop load of each vine adjusted to 25 clusters following girdling. Bloom applications were performed at 80% bloom on 7 May. Sizing applications and trunk girdles were applied on 20 May at 4-5 mm berry diameter.

Prior to harvest, 100 randomly selected berries were collected from each vine for berry weight and diameter measurements. At harvest all clusters on data vines were assigned a quality grade (packable or cull). Clusters were graded cull if they lacked sufficient color for harvest. No other quality defects were observed in the trial. Clusters collected at harvest were used for postharvest shatter and capstem removal force measurements. Shatter potential was measured by dropping clusters from a standard height and recording the number of abscised berries. Capstem removal force was determined using the UC Pressure Tester.

Results

Influence of GA_3 applied in 1995 on vine fruitfulness in 1996

Control vines and vines treated with GA_3 at bloom had similar cluster numbers prior to bloom in 1996 (Table 1). However, the fruitfulness of vines from both pruning systems was significantly reduced when either 20 or 40 g GA_3 per acre was applied at set. Compared to the control, 40g GA_3/ac applied at set reduced the fruitfulness of spur and cane pruned vines 43% and 77%, respectively.

Influence of GA_3 on fruit quality and yield

The effects of pruning system and GA_3 treatment on the berry weight and diameter of Crimson Seedless are presented in Table 2. Spur pruned vines had larger berries than the cane pruned vines, but these differences were generally mitigated when GA_3 was applied for fruit sizing. The berry weight of control vines was 4.7 and 4.4 grams, respectively, for the spur and cane systems. Compared to the control, thinning sprays increased berry weight about 10% in both systems, while the berry weight of vines treated with 40 g GA_3/ac was approximately 15% greater than the control.

Packable clusters and berry color at harvest were reduced when GA_3 exceeded 40g/ac (Table 3). Approximately 68% of control fruit had adequate color for harvest. Vines treated with GA_3 at bloom had similar berry color and numbers of packable clusters as the control. However, color development was reduced, and the number of packable clusters decreased approximately 10% due to poor color, when vines received a single sizing application of 20 or 40 g GA_3/ac. GA_3 applied at bloom had no effect on berry shatter or capstem removal force (Table 2). However, shatter was increased and capstem removal force reduced when 20 or 40 g GA_3/ac was applied at berry set.

Conclusions

Little benefit for the use of GA_3 sizing applications on Crimson Seedless was found.

Compared to vines treated with GA_3 at bloom and girdled at fruit set, berry size was not greatly improved when GA_3 was applied for berry sizing. In addition, berry shatter was increased, and return fruitfulness and berry color were reduced. The effect of GA_3 treatment timing on these parameters will be evaluated in the upcoming season.

Acknowledgements

The authors gratefully acknowledge the cooperation of Raven Farms and the financial support of the California Table Grape Commission.

Table 1. Influence of GA_3berry sizing sprays on the return fruitfulness of spur and cane pruned Crimson Seedless grapevines. 1996.

Treatments applied in 1995	Clusters per vine in 1996	
	Spur[1]	Cane[2]
Untreated	51 a3	18 a
Bloom (1 g GA_3/ac)	48	21 a
Bloom + 20 g GA_3/ac	28 b	10 b
Bloom + 40 g GA_3/ac	29 b	4 c
Bloom + 2 x 20 g GA_3/ac	22 b	5 a
Bloom + 2 x 40 g GA_3/ac	21 b	4 c

[1] Thirty-two, 2-bud spurs retained per vine.
[2] Eight, 12-bud canes retained per vine.
[3] Numbers within columns followed by the same letter are not significantly different at the 5% level (DMRT).

Table 2. Influence of GA_3 berry sizing sprays on the berry weight and diameter of spur and cane pruned Crimson Seedless. 1996.

Treatment	Berry weight (g)		Berry diameter (mm)	
	Spur	Cane	Spur	Cane
Untreated	4.7 d1	4.4 c	18.1 b	17.4 c
Bloom (1 g GA_3/ac)	5.2 c	4.9 b	18.1 b	17.8 b
Bloom + 20 g GA_3/ac	5.3 bc	5.1 ab	18.6 a	17.9 b
Bloom + 40 g GA_3/ac	5.5 ab	5.3 a	18.5 a	18.2 a

[1]Numbers within columns followed by the same letter are not significantly different at the 5% level (DMRT).

Table 3. Influence of GA_3 berry sizing sprays on the harvestable yield, color

development, berry shatter, and capstem removal force of cane pruned Crimson Seedless. 1996.

Treatment	Harvestable clusters (%)	Color developments[2]	Berry shatter (%)	Capstem removal force (g)
Untreated	68 a[1]	4.1 a	22 b	840 a
Bloom (1 g GA_3/ac)	69 a	4.2 a	23 b	865 a
Bloom + 20 g GA_3/ac	59 b	3.8 a	36 a	740 b
Bloom + 40 g GA_3/ac	58 b	2.8 b	38 a	762 b

[1] Numbers within columns followed by the same letter are not significantly different at the 5% level (DMRT).
[2]Visual color rating (1-5): 1= little or no color; 3 = moderate color; 5 = full color.