Vitis 6, 303—308 (1967)

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Response of Thompson Seedless Grapes to Prebloom Thinning

by

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Introduction

Thinning of Thompson Seedless (Sultanina) grapes normally is done at shatter stage, after the fall of impotent flowers and berries (5). This practice is based on an observation by Winkler (4) that if grapes are thinned prior to flowering stage, a greater number of berries is obtained. Frequently such clusters are overly compact.

Thinning at shatter stage is laborious and expensive, since the clusters are often concealed by the abundant foliage. Thinning at prebloom stage, when clusters are smaller, more tender, and better exposed to view, is much easier and less expensive.

The primary purpose of the present experiment was to compare the effects of prebloom cluster thinning (removal of clusters) to those of prebloom cluster and prebloom berry thinning (removal of a portion of a cluster) relative to the quality of the cluster. Since compact clusters were anticipated from prebloom thinning, the effect of bloom-application of gibberellic acid (GA) on cluster loosening were also included in this study. It has recently been reported that bloom sprays of GA result in a striking loosening of clusters of Thompson Seedless grapes (2). A second purpose was to study the effect of prebloom thinning on shatter of flowers before and during bloom, a serious problem, especially in desert locations.

Materials and Methods

Mature Thompson Seedless vines in an irrigated University of California vineyard at Davis were used. The vines were pruned to four canes having 8 to 12 buds per cane. Cluster thinning was done by removing clusters from the head of the vine, leaving five clusters per cane or twenty clusters per vine. Only one cluster per shoot, normally the lower cluster, was retained. In flower and berry thinning, the apical half of the cluster was removed, leaving five to six basal laterals (5). Vines were trunk girdled, using a $^3/_{16}$-inch trunk-girdling knife (1).

The clusters were bagged with brown paper sacks prior to flower shatter, or immediately after GA was sprayed. About ten days later, the flowers and berries that had fallen into the sacks were counted.

The water-soluble potassium salt of GA containing 80 per cent active ingredient, was used throughout the experiments. Triton B-1956 was used as a wetting agent. Both clusters and foliage were sprayed to run off with 3-gallon hand sprayers. All concentrations are expressed as parts per million (ppm) on an acid equivalent basis. Berry weights were obtained by weighing all mature berries from the second and third laterals from the base. Degrees Balling of the juice from the crushed berries was measured with a hand refractometer. Total acidity was determined by diluting 10 ml of juice to 50 ml with distilled water, and titrating with 0.133 N NaOH, using

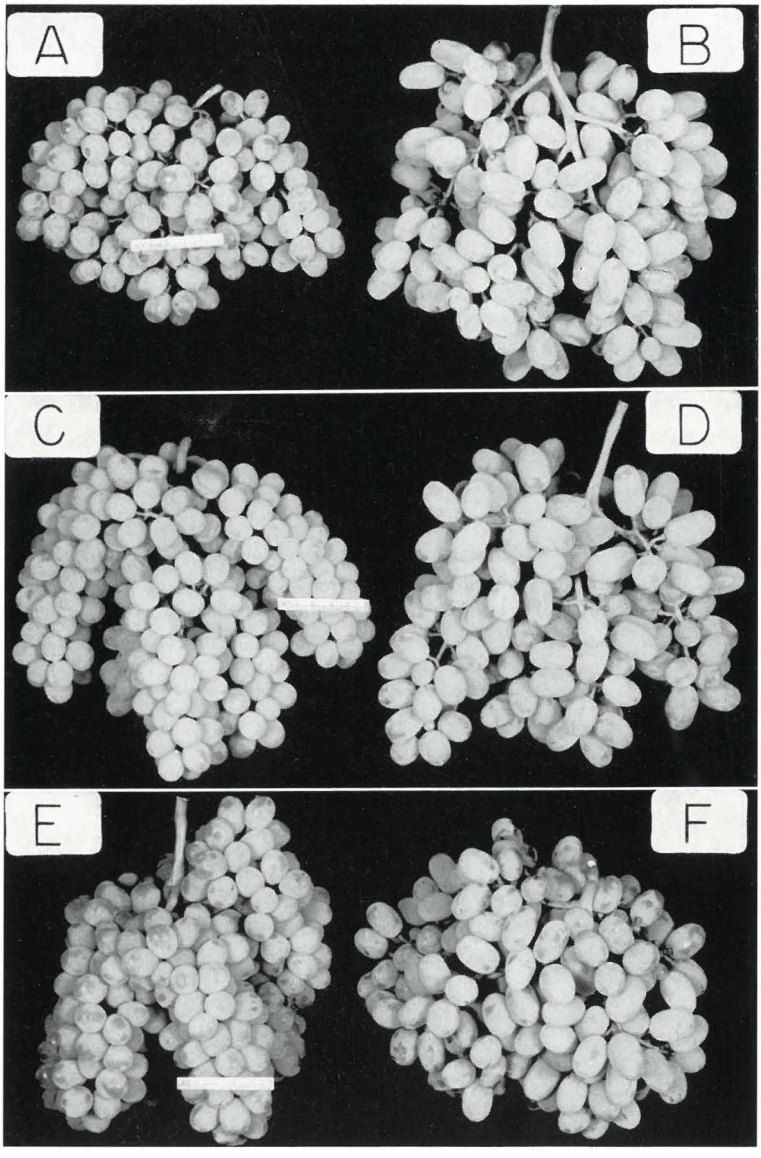

Fig. 1: Effects of time of thinning on Thomson Seedless grapes. Clusters on the right were sprayed with GA. A, B: Cluster-thinned and berry-thinned at shatter stage, C, D: Cluster-thinned at prebloom and berry-thinned at shatter, and E, F: Cluster-thinned and berry-thinned at prebloom. Cluster thinning and berry thinning at shatter following a bloom spray of GA produced large berries and a loose cluster (B). Prebloom cluster-thinning and berry-thinning at shatter also produced a suitable loose cluster (D). Note that a very compact cluster resulted from prebloom cluster and berry thinning (E), but that GA caused considerable loosening (F). In all instances, GA increased size of berry.

phenolphthalein as an indicator. Results are expressed as grams of tartaric acid per 100 ml of juice.

Clusters were classified visually into five classes on the basis of loosness. Clusters in class one were excessively loose while those in class five were very compact and could not be bent without crushing the berries. This latter class included clusters that normally would be trimmed before packing. Clusters in classes two, three and four were intermediate in compactness. Those in class four had some deformed berries as a result of pressure from neighboring berries. Clusters in class three had the most desirable degree of looseness, while those in class two were too loose.

The number of berries per centimeter on the second and third laterals from the base of the cluster also served as an indirect measure of looseness. The second and third laterals were chosen because of the uniformity in size of berry that occurs on these laterals, and because they comprise an important region of the cluster.

The number of shot berries (small berries that failed to enlarge normally) on the second and third laterals also was recorded.

Experimentation and Results

Effect of prebloom thinning on fruit quality

Prebloom cluster thinning was done on April 22, 1966, when the clusters were about 4 inches long (measured from the basal shoulder to the apex of the cluster) and the shoots about 16 inches. The following treatments were made:

1. Prebloom cluster thinning, berry thinning at shatter.
2. Prebloom cluster thinning, GA at 20 ppm at bloom, berry thinning at shatter.
3. Prebloom cluster thinning, prebloom flower thinning.
4. Prebloom cluster thinning, prebloom flower thinning, GA at 20 ppm at bloom.
5. Cluster thinning at shatter, berry thinning at shatter.
6. GA at 20 ppm at bloom, cluster thinning at shatter, berry thinning at shatter.

The gibberellin sprays were applied on May 14, when about 50% of the calyptras had fallen. The thinning at shatter stage and the trunk girdling were done May 31.

There were three vines per treatment with three replicate blocks. The fifth and sixth methods of thinning are standard thinning practices in California for table Thompson Seedless grapes.

At harvest time, August 18, three clusters were picked at random from each vine and analyzed. Looseness was significantly increased in all GA treatments as compared to the corresponding non-sprayed clusters (Table 1). The loosest sprayed clusters resulted when clusters and berries were thinned at shatter, while the most compact sprayed clusters resulted with prebloom cluster thinning and berry thinning. Prebloom cluster thinning with berry thinning at shatter gave intermediate results (Fig. 1).

The number of berries on laterals number 2 and 3 usually was strikingly reduced by application of gibberellin (Table 1). There were fewer berries on unsprayed clusters that were cluster- and berry-thinned at shatter than on those from vines that were cluster-thinned at prebloom and berry-thinned at shatter.

The laterals of bloom-sprayed clusters were not significantly elongated.

The average number of berries per cm on laterals 2 and 3 indicate that a reduction in set is obtained with GA applied at bloom.

The average number of shot berries on laterals 2 and 3 usually was significantly reduced by application of GA. Weight per berry was significantly increased by GA

Table 1

Effect of GA sprayed at bloom on 'Thompson Seedless' grapes that were cluster-or cluster-and berry-thinned at prebloom or postbloom stages.

Types of Treatments			Measurements							
Prebloom Thinning	Shatter Thinning	Sprayed GA at bloom	Average Looseness[1])	No. of berries on laterals # 2 & # 3	Total length laterals # 2 & # 3	No. of berries per cm	No. of shot berries on laterals # 2 & # 3	Weight per berry gm	Degrees Balling	Total Acid % tartaric
Cluster	Berry	No	4.0[a,b,c]	134[a]	19.3[a]	6.7[a]	8.6[a,b]	2.47[a]	20.4[a,b]	0.68[a]
Cluster	Berry	Yes	3.0[d,e]	82[c]	20.9[a]	3.9[b,c]	3.5[c]	3.62[b]	21.9[a]	0.64[a]
Cluster Berry	None	No	4.2[a,b]	131[a,b]	18.7[a]	6.9[a]	10.9[a]	2.25[a]	18.9[b]	0.68[a]
Cluster Berry	None	Yes	3.4[c,d]	91[c]	19.5[a]	4.7[b,d]	5.4[b,c]	3.12[b]	20.1[a,b]	0.65[a]
None	Cluster Berry	No	4.4[b]	101[b,c]	19.0[a]	5.4[d]	6.1[b,c]	2.64[a]	20.9[a,b]	0.68[a]
None	Cluster Berry	Yes	2.8[e]	72[c]	21.0[a]	3.4[c]	3.7[c]	3.34[b]	21.6[a]	0.66[a]

[1]) Class 1. Clusters excessively loose. Class 2. Clusters very loose. Class 3. Most desirable degree of looseness. Class 4. Clusters somewhat compact. Class 5. Clusters excessively compact.

a) Those values with different superscript letters are significantly different at the 5% level.

in all thinning treatments. There were no significant differences in degrees Balling or total acids among treatments.

Effect of prebloom thinning on flower shatter

Clusters thinned for the previous experiment were utilized. On May 9, prior to bloom, ten clusters from each thinning treatment (usually one cluster per vine) were bagged. The bags were removed on May 17, when 95 to 100% of the calyptras had fallen, but before normal shatter following flowering had begun. When the fallen flowers were counted it was found that there was a marked reduction in flower

shatter when vines were thinned at prebloom stage. The numbers of flowers per cluster that dropped before and during bloom from vines that were prebloom cluster-thinned and berry-thinned, prebloom cluster-thinned only, or not thinned were 132.4, 184.2 and 273.4, respectively. The numbers for the prebloom thinning treatments were significantly less than that of the non-thinned treatment.

Discussion

In agreement with the findings of WINKLER (4, 5) we found that clusters thinned at prebloom stage set a relatively large number of berries. WINKLER suggested the improvement in set probably was the result of improved flower parts resulting from better nutrition (3). We also found that the degree of looseness of all clusters that received GA at bloom was greater than that of the corresponding non-sprayed clusters (2). An additional advantage in using GA is the attainment of a uniform loosening throughout the cluster rather than the removal of whole laterals or secondary laterals or, more often, removal of the basal half or two-thirds of the cluster.

The reduction of prebloom and bloom flower shatter probably is a result of improved nutrition of the thinned clusters. In certain years prebloom shatter is insignificant and not detrimental. In such years, if prebloom hand thinning were done, a heavier set of fruit could be expected. Any excessive set could be reduced by bloom sprays of GA.

Summary

1. Paired treatments with and without application of GA at bloom were applied to Thompson Seedless vines that were (1) cluster-thinned at prebloom, and berry-thinned at shatter, (2) cluster-thinned and berry-thinned at prebloom, or (3) cluster-thinned and berry-thinned at shatter stage following bloom. Unsprayed clusters from vines that were cluster-thinned at prebloom or cluster- and berry-thinned at prebloom stage were very compact. All combinations of thinning that included applications of GA at bloom produced clusters that were looser than the corresponding unsprayed clusters. GA increased berry size, and clusters that received GA usually had fewer shot berries than did corresponding unsprayed clusters.
2. Prebloom thinning increased the number of berries per cm. of lateral, but applications of GA at bloom greatly decreased the amount of set.
3. A reduction of flower shatter occurred as a results of prebloom thinning.

Acknowledgements

This investigation was supported in part by Merck and Company and Abbott Laboratories.

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Eingegangen am 16. 2. 1967

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