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Response of Perlette clusters to gibberellic acid applied at different stages of bloom[1])

by

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Die Reaktion von Perlette-Trauben auf die Anwendung von Gibberellinsäure während verschiedener Blühphasen

Zusammenfassung. — Wurden Infloreszenzen der Rebensorte Perlette während verschiedener Blühphasen mit 10, 20 oder 40 ppm GS behandelt, so war die Anzahl der Beeren/cm der Traubenäste signifikant verringert; der stärkste Rückgang erfolgte bei Anwendung von 10 ppm GS, wenn 50% der Calyptren abgefallen waren. Hiermit war zugleich eine signifikante Zunahme der „Schrotbeeren" verbunden. Ein ähnlicher Ausdünnungseffekt wurde mit 40 ppm GS bei 75% abgefallener Calyptren erzielt, ohne daß dabei jedoch der Anteil der Schrotbeeren beeinflußt wurde. Die Qualitätskomponenten der Beeren wurden durch GS-Behandlung nicht signifikant beeinflußt.

Introduction

The effectiveness of GA in enhancing berry size and reducing berry set in seedless grape cultivars, particularly Thompson Seedless is well documented (Lynn and Jenson 1966, Christodoulou *et al.* 1968, Weaver and Pool 1971, Dass *et al.* 1977). However, information on the relation of GA to per cent berry set in Perlette is limited. Daris (1966) reported that 50 ppm GA applied at prebloom or bloom had no thinning effect in Perlette clusters, but resulted in a large number of smaller berries following bloom application. Kasimatis *et al.* (1971) reported that the application of GA during bloom to achieve thinning of Perlette was variable in effectiveness and the degree of thinning was minimal. On the contrary, Nijjar and Gill (1971) found that single full bloom application of GA at 125 ppm was most effective in thinning Perlette clusters. Singh (1976) reported that decrease in berry set following GA application at 40 % capfall was greater at 24.5 ppm than at higher concentrations. In view of the conflicting experimental evidence concerning response of Perlette to GA, the present experiment was initiated to obtain more information on the effectiveness of GA in reducing compactness of clusters, which is a serious problem in commercial production of this cultivar.

Materials and methods

The experiment was carried out with 12 mature Perlette vines growing in the vineyard of Government Gardens, Alam Bagh, Lucknow. The vines in 3 blocks were trained on a bilateral cordon system and were pruned to constant number of buds

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Table 1

Effect of GA applied at different stages of bloom on bunch length (cm) of Perlette grapes
Einfluß der GS-Behandlung in verschiedenen Blühphasen auf die Traubenlänge (cm) der Sorte Perlette

Concentration	Capfall (%)					Significant ranges	
	0	25	50	75	Mean	P	R_P
Control	—	—	—	—	12.00		
10 ppm	13.90	14.90	15.30	14.40	14.64		
20 ppm	14.60	15.90	16.50	16.00	15.77	(2)	0.42
40 ppm	15.60	17.60	16.90	17.00	16.78	(3)	0.44
Mean	14.71	16.14	16.27	15.80	15.73		
Significant ranges							
P		(2)	(3)	(4)			
R_P		0.48	0.51	0.52			

Significant ranges for interaction

P	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
R_P	0.85	0.89	0.91	0.93	0.95	0.96	0.97	0.98	0.98	0.99	0.99

LSD for control vs. any concentration = 2.24. LSD for control vs. treated = 2.41.

Table 2

Effect of GA applied at different stages of bloom on bunch weight (g) of Perlette grapes
Einfluß der GS-Behandlung in verschiedenen Blühphasen auf das Traubengewicht (g) der Sorte Perlette

Concentration	Capfall (%)					Significant ranges	
	0	25	50	75	Mean	P	R_P
Control	—	—	—	—	238		
10 ppm	191	198	192	202	196		
20 ppm	228	234	213	225	225	(2)	11.18
40 ppm	248	250	220	228	236	(3)	11.75
Mean	222	227	208	218	219		
Significant ranges							
P		(2)	(3)	(4)			
R_P		12.90	13.56	13.92			

Significant ranges for interaction

P	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
R_P	22.30	23.46	24.06	24.60	25.05	25.28	25.51	25.74	25.82	25.97	26.05

LSD for control vs. any concentration = 59.93. LSD for control vs. treated = 64.48.

in January, 1977. Uniform clusters with synchronous initiation of capfall were marked. 5 clusters on each experimental vine were selected randomly for each of 4 stages of inflorescence development i.e. 0 (initiation of capfall), 25, 50 and 75 % capfall and treated with 10, 20 and 40 ppm of GA. Triton was used as a wetting agent. The bunches were harvested at full maturity and were taken directly to the laboratory. They were weighed and rated for their looseness on an arbitrary scale

Table 3

Effect of GA applied at different stages of bloom on berry weight (g) of Perlette grapes
Einfluß der GS-Behandlung in verschiedenen Blühphasen auf das Beerengewicht (g) der Sorte Perlette

Concentration	Capfall (%)					Significant ranges	
	0	25	50	75	Mean	P	R_p
Control	—	—	—	—	1.18		
10 ppm	1.36	1.41	1.47	1.51	1.44		
20 ppm	1.30	1.38	1.34	1.42	1.36	(2)	0.021
40 ppm	1.23	1.28	1.32	1.40	1.31	(3)	0.022
Mean	1.30	1.36	1.38	1.44	1.37		
Significant ranges							
P		(2)	(3)	(4)			
R_p		0.024	0.025	0.026			

Significant ranges for interaction											
P	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
R_p	0.040	0.042	0.044	0.045	0.046	0.046	0.047	0.047	0.047	0.048	0.048

LSD for control vs. any concentration = 0.110. LSD for control vs. treated = 0.117.

from 1 to 20, in ascending order of compactness by a panel of 3 judges. Counts were made of the berries/cm length of the first 3 laterals from the base of the cluster. Average berry weight, total soluble solids, and acidity were determined of random samples of 100 berries from each treatment. The results were analysed using least squares method of analysis of variance followed by Duncan's Multiple range test for the differences of mean responses (DUNCAN 1955).

Results

Bunch length was significantly increased with the increase in concentration of GA (Table 1). Treatments made at initiation of capfall were less effective than the latter treatments. The greatest increase in cluster length resulted from the treat-

Table 4

Effect of GA applied at different stages of bloom on subjective ratings of looseness of Perlette grapes
Einfluß der GS-Behandlung in verschiedenen Blühphasen auf den subjektiv ermittelten Grad der Lockerbeerigkeit bei der Sorte Perlette

Concentration	Capfall (%)				
	0	25	50	75	
Control	—	—	—	—	20
10 ppm	16	14	13	16	
20 ppm	18	15	12	16	
40 ppm	17	13	10	10	

ment with 40 ppm at 25 % capfall stage. Berry weight increased progressively with the decrease in GA concentration and was significantly higher as a result of later bloom treatments at 25 to 75 % capfall (Table 3). Bunch weight was, however, not significantly affected by any treatments (Table 2).

All levels of GA significantly reduced the number of berries per centimeter length of lateral over that of control (Table 5). However, berry density was erratic

Table 5

Effect of GA applied at different stages of bloom on number of berries/cm length of laterals of Perlette grapes

Einfluß der GS-Behandlung in verschiedenen Blühphasen auf die Anzahl der Beeren/cm der Traubenäste bei der Sorte Perlette

Concentration	Capfall (%)					Significant ranges	
	0	25	50	75	Mean	P	R_p
Control	—	—	—	—	9.04		
10 ppm	6.41	5.90	5.27	6.40	5.99		
20 ppm	7.12	6.45	5.53	6.51	6.40	(2)	0.32
40 ppm	7.80	6.98	5.50	5.38	6.41	(3)	0.34
Mean	7.11	6.44	5.43	6.10	6.27		
Significant ranges							
P		(2)	(3)	(4)			
R_p		0.37	0.39	0.40			

Significant ranges for interaction											
P	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
R_p	0.64	0.67	0.69	0.71	0.72	0.73	0.73	0.73	0.74	0.75	0.75

LSD for control vs. any concentration = 1.73. LSD for control vs. treated = 1.85.

Table 6

Effect of GA applied at different stages of bloom on per cent shot berries of Perlette grapes

Einfluß der GS-Behandlung in verschiedenen Blühphasen auf den Anteil der „Schrotbeeren" (%) bei der Sorte Perlette

Concentration	Capfall (%)					Significant ranges	
	0	25	50	75	Mean	P	R_p
Control	—	—	—	—	11.80		
10 ppm	12.81	12.00	15.87	19.86	15.13		
20 ppm	15.00	16.78	13.99	11.50	14.31	(2)	.48
40 ppm	16.99	17.79	15.01	12.00	15.45	(3)	.51
Mean	14.93	15.52	14.96	14.45	14.96		
Significant ranges							
P		(2)	(3)	(4)			
R_p		0.56	0.59	0.60			

Significant ranges for interaction											
P	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
R_p	0.93	0.98	1.00	1.03	1.05	1.06	1.07	1.08	1.08	1.09	1.09

LSD for control vs. any concentration = 2.59. LSD for control vs. treated = 2.79.

among clusters in a given treatment. Clusters treated at 50 % capfall had significantly lower berry density and higher rating of looseness as determined by subjective rating (Table 4). Per cent shot berries was increased with lower concentration (10 ppm) applied at 50 and 75 % capfall and higher concentrations at 0 and 25 % capfall stages (Table 6). TSS and acidity were not significantly affected by GA treatment (Tables 7 and 8).

Table 7

Effect of GA applied at different stages of bloom on TSS (%) of Perlette grapes
Einfluß der GS-Behandlung in verschiedenen Blühphasen auf die gesamte lösliche Trokkensubstanz (%) bei der Sorte Perlette

Concentration	Capfall (%)					Significant ranges	
	0	25	50	75	Mean	P	R_p
Control	—	—	—	—	21.3		
10 ppm	20.9	21.0	21.4	21.6	21.2		
20 ppm	19.9	20.4	21.0	21.0	20.6	(2)	0.37
40 ppm	19.8	20.0	20.8	20.6	20.3	(3)	0.39
Mean	20.2	20.5	21.1	21.1	20.7		
Significant ranges							
P		(2)	(3)	(4)			
R_p		0.43	0.45	0.46			

Significant ranges for interaction											
P	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
R_p	0.73	0.77	0.79	0.80	0.82	0.83	0.83	0.84	0.84	0.85	0.85

LSD for control vs. any concentration = 1.99. LSD for control vs. treated = 2.14.

Table 8

Effect of GA applied at different stages of bloom on TSS/acidity ratio of Perlette grapes
Einfluß der GS-Behandlung in verschiedenen Blühphasen auf die Relation Gesamte lösliche Trockensubstanz/Säure bei der Sorte Perlette

Concentration	Capfall (%)					Significant ranges	
	0	25	50	75	Mean	P	R_p
Control	—	—	—	—	33.4		
10 ppm	32.1	32.9	35.2	35.4	33.9		
20 ppm	28.0	29.6	31.9	31.3	30.2	(2)	1.21
40 ppm	28.3	28.0	30.2	30.0	29.1	(3)	1.27
Mean	29.5	30.2	32.4	32.2	31.07		
Significant ranges							
P		(2)	(3)	(4)			
R_p		1.40	1.47	1.51			

Significant ranges for interaction											
P	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
R_p	2.42	2.55	2.61	2.67	2.72	2.75	2.77	2.80	2.80	2.82	2.83

LSD for control vs. any concentration = 6.40. LSD for control vs. treated = 6.98.

Discussion

It is evident from this experiment that the application of GA at various stages of bloom, though effective in thinning Perlette clusters, was accompanied by an increase in the number of shot berries. This has been reported by other workers too. An interesting result of our experiment was that higher concentrations, 20 and 40 ppm, when applied at 75 % capfall and a lower concentration, 10 ppm at 0 and 25 % capfall, did not significantly increase the percentage of shot berries as compared to untreated clusters. Although maximum decrease in berry density was observed with 10 ppm GA applied at 50 % capfall, this effect was negated by a higher percentage of shot berries. Compared with the treatment 40 ppm made at 75 % caps off, the berries in that treatment were larger and increase in rachis length was smaller; consequently the clusters were more compact despite the fact that they were as severely thinned as in the treatment with 40 ppm at 75 % caps off. As the most pronounced response of GA in increasing berry weight at 10 ppm was not followed by an increase in bunch weight, the treatment with 40 ppm GA at 75 % capfall would be more acceptable as a thinning procedure than the treatment with 10 ppm.

The results show the responsiveness of Perlette clusters to the thinning effect of GA at later stages of bloom. This contrasts with the findings of Kasimatis *et al.* (1971) who recorded no significant relationship between timing of application and thinning effect of GA, but agrees with those of Singh (1976). Christodoulou *et al.* (1968) also noted that application of GA at 25 to 75 % capfall usually resulted in loose clusters in Thompson Seedless grapes. The lack of response to GA with respect to quality constituents in the present experiment does not agree with the findings of Singh (1976) and Nijjar and Gill (1971). In view of these findings extensive trials on a commercial basis are warranted.

Summary

Treatment of Perlette clusters with GA at 10, 20 and 40 ppm concentrations applied at various stages of bloom significantly reduced the number of berries/cm length of lateral, the maximum reduction being with 10 ppm applied at 50 % capfall. This was accompanied by a significant increase in percentage of shot berries. Similar thinning response was obtained with 40 ppm GA applied at 75 % capfall stage without any effect on percentage of shot berries. Quality constituents of berries were not significantly affected by GA treatments.

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