Yield and Fruit Quality at Harvest or after Storage of Flame Seedless Grape as Affected by Frequent Sprayes of Gibberellic Acid

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ABSTRACT

The present study was carried out during 2000 and 2001 seasons to study the effect of frequency and timing of GA_3 application on yield, fruit maturity and quality of Flame seedless grape vines at harvest time and after storage at either 0°C or room temperature. Vines sprayed three times or more with GA_3 showed an increase in yield, color uniformity, anthocyanin content, reducing and total sugars and fruit total soluble solids. However, fruit acidity was decreased at harvest time during the first season only. Vines sprayed 2-5 times with GA_3 showed higher cluster and berries weight, berry length and diameter and fruit firmness at harvest time and after cold storage as compared with unsprayed control. All GA_3 treatments increased cluster length. Applying GA_3 4 or 5 times delayed the loss of firmness after 6 days of storage at room temperature. However, normal and shot berries, acidity and non-reducing sugars after storage were not significantly affected by any of GA_3 applications.

INTRODUCTION

Flame seedless is an early attractive red seedless table grape. It gives a naturally well filled to compact medium clusters with small bright red crispy seedless berries (Shehata and El-Barbary, 1996). There is a great opportunity for Egypt to increase the export of grapes, if ripening process is manipulated by a mean enables farmers to produce an early harvested grapes crop. Meanwhile, these grapes must meat the requirements in term of color and quality. Flame seedless grape cultivar needs improvement of berry size, color intensity and cluster uniformity. Gibberellic acid causes an increase in berry size, anthocyanin accumulation and ripening (Singh and Chundawat, 1979; Lee *et al.*, 1997 and El-Hammady *et al.*, 1998). Christodoulou (1968) recommended two applications of GA_3. The first one at a concentration of 5-20 ppm at bloom. This application increased berry size and led to have thin clusters by reducing berry set. Further increase in berry size was obtained by applying 20-40 ppm GA_3 in a second application on the same vines.

Prebloom gibberellin spray increased looseness and reduced compactness in several grapevine varieties (Jensen *et al.*, 1976; Kaps and Cahoon, 1989 and Reynolds *et al.*, 1994). The effect of GA_3 application on the storage of grapes was studied by Kumar and Gupta (1987), Kumar and Chharia (1990) and Sheng *et al.*(1996). They found that grapes treated with

GA_3 were longer stored than untreated control grapes. In addition, GA_3 application increased shelf life of grapes (Lee and Chol, 1977 and El-Hammady *et al.*, 1998).

This study, therefore, was undertaken over two years to determine the effects of frequency and timing of GA_3 application on yield, maturity and post-harvest fruit quality at harvest time and after storage either at 0°C or at room temperature of Flame seedless table grapes.

MATERIALS AND METHODS

The present study was carried out during two successive seasons 2000 and 2001 on Flame seedless (*Vitis vinifera*, L.) grapes. Vines were grown at Mariut district near Alexandria, Egypt. Vines were 7-year old, uniform, grown in calcareous soil under flooding irrigation method. They were planted at 1.5x4 m spacing and pruned by retaining a maximum of 40 nodes/vine. Vines were trained to the quadrilateral cordon system, trellised on two story cross arm system, pruned to approximate 2-3 node fruiting spur. The experimental design was a randomized complete block with six treatments and five replications. Each replication consisted of two adjacent vines, making a total of 10 vines per treatment. Spraying treatments and timing in both seasons were as follows:

T_1 : Water only pre-bloom, bunches 8-10 cm long (control).
T_2 : 15 ppm GA_3 pre-bloom, bunches 8-10 cm long (one spray).
T_3 : T_2 + 7 ppm GA_3 at full bloom (two GA_3 sprays).
T_4 : T_3 + 40 ppm GA_3 a week after fruit set, berry diameter = 0.3-0.4 cm (three GA_3 sprays).
T_5 : T_4 + 40 ppm GA_3 7 days later (four GA_3 sprays).
T_6 : T_5 + 40 ppm GA_3 7 days later (five GA_3 sprays).
All spray solutions were supplied with 0.25% non-ionic surfactant.

At harvest time (July 5-10) of both seasons, the total yield was recorded on basis of an individual vine and expressed as kg/vine. Moreover, fruits of the whole bunch were evaluated for their color uniformity according to an established color score (0-25%, >25 - <50%, >50 - <75%, >75 - <100% and 100%. Coloration was rated as 1, 2, 3, 4 and 5, respectively. The total number of normal and shot berries per bunch was counted. Cluster weight and length and berry diameter, length and weight were recorded in both seasons.

Sample of 4 clusters was randomly taken from each replicate. Berries were blended for 15 sec. and squeezed through a sheet cloth in order to obtain 100 ml of juice. Refractometric total soluble solids and titratable acidity using 0.1N NaOH were determined (A.O.A.C, 1984). Anthocyanin was measured colorimetrically in the separated berry skin extract at 530 nm (Rabino *et al.*, 1977). Sugar content was determined according to Malik and Singh (1980).

To investigate the effect of the treatments on the grapes shelf life and storability, 8 clusters (4 for each storage temperature) randomly taken from each replicate were put in open plastic boxes. Berries were examined upon removal from storage after 7 weeks at 0°C and 85-90% relative humidity and at the end of 6 days of shelf life at 20°C in order to determine fruit total soluble solids, acidity and firmness using a grapes pressure tester.

The data were statistically analyzed using the analysis of variance method (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Average fruit yield

The data in Tables 1 and 2 showed that the 3-5 applications of GA_3 caused a highly significant increase in the average fruit yield during both seasons. The yield in vines sprayed 4 and 5 times was higher than those sprayed one, two or three times. The differences between four and five sprays or between control, one GA_3 and two GA_3 sprays were not significant. These results are, generally, in line with those reported by Shehata and El-Barbary (1996) on Flame seedless grapevines and Omar and El-Morsy (2000) on Ruby seedless. In the meantime, Fallahi *et al.*(1995), on Thompson seedless, found that the yield of vines received 5 GA_3 sprays was higher than vines received no GA_3 or one GA_3 spray.

Average number of berries per cluster

Data in Tables 1 and 2 showed that there were no significant differences in number of normal or shot berries per cluster among treatments as compared with the control in both seasons, except for five GA_3 sprays in the first season. Shehata and El-Barbary (1996) found that vines sprayed with GA_3 at concentrations up to 15 ppm did not produce an average of shot berries and reduced the normal berries per cluster. However, Fallahi *et al.*(1995), on Thompson seedless, reported that spraying GA_3 at full bloom reduced the normal berries per cluster.

Table 1. Effect of frequent sprays of GA_3 on yield, berries/cluster, cluster weight and fruit quality of Flame seedless grapes in 2000 season.

Treatments	Yield (kg/vine)	Berries/cluster		100 berries weight (g)	Cluster weight (g)	Cluster length (cm)	Berry length (cm)	Berry diameter (cm)	Uniformity score of color	Anthocyanine content (mg/100 g)	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)	% increase in berry wt. than control	% increase in cluster wt. than control	% increase in yield wt. than control
		Shot	Normal													
Water spray (control)	8.56	0.85	190	236	468	16.5	1.51	1.50	1.7	5.68	10.52	1.50	12.02	100.00	100.00	100.00
One spray	8.89	1.00	182	246	479	27.6	1.62	1.59	2.6	6.75	10.67	1.56	12.23	104.24	102.35	103.86
Two sprays	9.36	2.26	190	251	508	30.4	1.65	1.62	3.0	7.21	11.05	1.37	12.42	108.47	108.55	109.35
Three sprays	10.31	2.12	180	290	558	29.8	1.69	1.67	4.2	9.86	11.90	1.66	13.56	122.88	119.23	118.22
Four sprays	11.68	3.12	178	317	602	27.8	1.78	1.75	4.6	10.32	12.37	1.83	14.20	134.32	128.63	135.86
Five sprays	11.82	4.36	175	324	611	29.7	1.77	1.75	4.8	12.30	12.58	1.38	13.96	137.29	130.56	138.08
$L.S.D_{0.05}$	1.36	3.20	NS	13	38	8.3	0.12	0.10	1.6	3.02	1.06	0.40	1.13			

Table 2. Effect of frequent sprays of GA_3 on yield, berries/cluster, cluster weight and fruit quality of Flame seedless grapes in 2001 season.

Treatments	Yield (kg/vine)	Berry cluster		100 berries weight (g)	Cluster weight (g)	Cluster length (cm)	Berry length (cm)	Berry diameter (cm)	Uniformity score of color	Anthocyanine content (mg/100 g)	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)	% increase in berry wt. than control	% increase in cluster wt. than control	% increase in yield wt. than control
		Shot	Normal													
Water spray (control)	8.46	1.13	180	231	440	17.8	1.55	1.54	2.1	6.07	10.38	1.27	11.65	100.00	100.00	100.00
One spray	8.62	1.02	176	252	473	29.5	1.62	1.61	2.9	7.18	10.06	1.76	11.82	109.09	107.50	101.89
Two sprays	8.89	1.17	180	261	502	30.7	1.66	1.65	3.2	7.78	10.23	1.83	12.06	112.99	114.09	105.08
Three sprays	9.92	2.78	172	307	562	28.9	1.70	1.68	4.4	10.93	11.35	1.28	12.63	132.90	127.73	117.26
Four sprays	11.28	3.21	174	327	609	29.7	1.78	1.75	4.8	12.86	12.16	1.32	13.48	141.56	138.41	133.33
Five sprays	11.60	3.81	183	321	628	30.3	1.75	1.72	4.8	11.87	12.88	1.18	14.06	138.96	142.72	137.12
$L.S.D_{0.05}$	1.23	NS	NS	22	37	7.8	0.11	0.08	2.2	2.60	0.82	0.76	0.78			

Weight of cluster and berries

The data presented in Tables 1 and 2 for both seasons indicated that the vines that received 3-5 GA_3 sprays had significantly heavier cluster and berries when compared with the untreated control. spraying GA_3 4 or 5 times gave significantly higher cluster weight than 2 and 3 sprays. Similar results for berries weight were obtained in the first season only. However, no significant differences between 4 and 5 sprays were recorded. These results are in line with those of Shehata and El-Barbary (1996) and El-Hammady *et al.*(1998) on Flame seedless, Hussein *et al.*(1998) on Thompson seedless and Omar and El-Morsy (2000) on Ruby seedless. They reported that the GA_3 sprays increased the weight of cluster and berries. Likewise, Fallahi *et al.*(1995), working on Flame seedless, found that the vines that received 3 sprays or more had significantly heavier cluster and berries than those with less number of sprays.

Cluster length

In both seasons, all treatments significantly increased cluster length when recorded at harvest time as compared with the control (Tables 1 and 2). However, no significant differences were obtained among all GA_3 treatments. The pre-bloom spraying of GA_3 is a very important factor in the production of seedless table grape varieties. It helps in preventing over compactness of cluster when berry size is increased by the use of plant growth regulators (Isshak *et al.*, 1974 and Winkler *et al.*, 1974). In addition, Shehata and El-Barbary (1996) and El-Hammady *et al.*(1998), working on Flame seedless, found that spraying cluster with GA3 before flower opening increased cluster length.

Berry length and diameter

In both seasons, all treatments, except for one time spray, significantly increased berry length and diameter as compared with the control. Data also showed that the control vines and those sprayed once with GA_3 did not differ significantly. Similarly, Fallahi *et al.*(1995) found that the berry diameter of vines with the 5 frequent GA_3 sprays was similar to those with 3 frequent GA_3 sprays and was larger than those with less than 3 GA_3 sprays. In the meanwhile, Omar and El-Morsy (2000) reported that the GA_3 treatments significantly increased berry length and diameter.

Color uniformity

All treatments attained a significantly higher color uniformity, except one and two sprays, as compared with the control in both seasons (Tables 1 and 2). These results are in line with those reported by Castacurta and Catalano (1988). They found that GA_3 sprays achieved more berry uniform color. Moreover, Prasad and Pathak (1975), Agavolu and Celik (1978) and Singh *et al.*(1994) reported that GA_3 sprays induced the early ripening of berries when treated with GA_3 before and/or after flowering. Application of GA_3 increased ethylene production (Singh and Chandawat, 1978 and Weaver and Singh, 1978). The ethylene increased color uniformity of Flame seedless berries (Farag *et al.*, 1998).

Anthocyanin

Data indicated that there was a significant increase in berries anthocyanin content as a result of three to five sprays when compared with control, one and two sprays (Tables 1 and 2). However, no differences between 3, 4 and 5 sprays were obtained. These results are, generally, in line with those reported by Reynold *et al.*(1992) and El-Hammady *et al.*(1998). They reported that the GA_3-treated berries were more red and less green than untreated ones. Lee *et al.*(1997) found that fruits treated with GA_3 had higher anthocyanin content.

Reducing, non-reducing and total sugars

Fruit reducing and total sugars were significantly increased by all treatments, except one and two sprays, as compared with the control in both seasons. On the other hand, the non-reducing sugars were not significantly affected by any of the GA_3 treatments. Lee *et al.*(1996) found that the glucose and fructose contents were higher in grapes treated with GA_3. In the meantime, Kondo and Kawai (1998), working on Pione grape berries, found that the sugars (glucose, fructose and sucrose) concentrations in the fruit skin were higher in vine treated with GA_3 than in the untreated one. Lee *et al.*(1986) reported that the GA_3 application increased sugar and reduced starch contents of berries.

Total soluble solids (TSS)

Data of the present investigation showed that total soluble solids were significantly increased by 3-5 GA_3 sprays as compared with the untreated control at harvest time in both experimental seasons (Table 3). However, no significant differences between the three treatments (3, 4 and 5 sprays) were obtained. These results are in agreement with those reported by Looney (1981), Colapietra *et al.*(1997) and El-Hammady *et al.*(1998). They reported that TSS were highest with cluster treated with GA_3. Moreover, total soluble

Table 3. Effect of frequent sprays of GA_3 on TSS, acidity and firmness at harvest time and after storage at either 0°C or room temperature of Flame seedless grapes in 2000 and 2001seasons.

Treatments	2000									2001								
	Total soluble solids (%)			Acidity (%)			Firmness (g/cm^2)			Total soluble solids (%)			Acidity (%)			Firmness (g/cm^2)		
	At harvest	After cold storage	After 7 days at R.T*	At harvest	After cold storage	After 7 days at R.T*	At harvest	After cold storage	After 7 days at R.T*	At harvest	After cold storage	After 7 days at R.T*	At harvest	After cold storage	After 7 days at R.T*	At harvest	After cold storage	After 7 days at R.T*
Water spray (control)	13.36	13.80	13.60	0.90	0.84	0.80	621	278	232	12.84	13.00	13.21	0.82	0.80	0.74	640	296	246
One spray	13.47	13.94	13.86	0.87	0.80	0.82	636	284	236	13.20	13.28	13.50	0.77	0.84	0.80	652	276	234
Two sprays	13.28	13.81	13.86	0.88	0.82	0.78	669	300	231	13.42	13.85	13.42	0.82	0.81	0.76	680	288	242
Three sprays	14.68	14.83	14.62	0.78	0.84	0.84	689	338	262	13.76	14.12	14.08	0.80	0.86	0.80	712	346	263
Four sprays	15.66	15.20	14.96	0.75	0.84	0.82	766	346	278	14.18	14.25	14.42	0.78	0.80	0.84	782	362	282
Five sprays	15.00	15.60	14.88	0.80	0.80	0.83	754	352	272	14.56	15.04	14.46	0.80	0.82	0.80	790	357	272
$L.S.D_{0.05}$	1.02	1.12	1.21	0.06	NS	NS	43	33	35	0.84	1.20	1.10	NS	NS	NS	38	42	26

R.T = Room temperature.

solids were significantly increased by the 4 and 5 GA_3 foliar applications after cold storage and after 6 days at storage at room temperature as compared with the control (Table 3). Hussein *et al.*(1998) and Kondo and Kawai (1998) found that when GA_3 was applied to grape berries before or during anthesis it extended the storage period. Hussein *et al.*(1998) found that the grapes treated with GA_3 at 5, 10 or 15 ppm before flower opening, followed by GA_3 at 40 ppm after fruit set increased shelf life of Flame seedless grapes.

Acidity

Data in Table 3 showed that, at harvesting time, acidity was significantly decreased by 3-5 sprays when compared with the control in the first season only. In the meantime, data also showed that no significant differences were found between GA_3-treated fruit acidity and those of water-sprayed (control) at the end of cold storage or after 6 days at room temperature. These results are in complete agreement with those reported by many investigators. Lee *et al.*(1996), working on Kyoho grapes, found that acidity did not significantly differ among different GA_3 treatments. Al-Dujaili *et al.*(1987) found that the acidity was not adversely affected by GA3 applications on Thompson seedless grapes.

Firmness

In both seasons, data in Table 3 showed that all treatments at harvest time significantly delayed the loss of berry firmness as compared with the control. However, no significant differences between 4 and 5 GA_3 sprays were found. Moreover, spraying GA_3 4 and 5 times had a significantly higher effect on the firmness than 2 and 3 sprays. In the meantime, data also showed that the fruit firmness after cold storage, during both seasons, was higher in vines treated with 3, 4 and 5 GA_3 sprays as compared with water, one and two GA_3 sprays. Meanwhile, after six days storage at room temperature, fruit firmness was only significantly affected by 4 and 5 GA_3 sprays when compared with the control (Table 3). These results are in agreement with those reported by Isshak *et al.*(1974), Mansour *et al.*(1977) and Singh *et al.*(1979) on Thompson seedless and Omar and El-Morsy (2000) on Ruby seedless. They all reported that the GA_3 application increased fruit firmness. Kondo and Kawai (1998) found that the GA_3 application before or during anthesis extended the storage period. Hussein *et al.*(1998) reported that the GA_3 sprays before flowering and after fruit set increased the shelf life of Flame seedless grapes.

REFERENCES

Agaoglu, Y.S. and H. Celik. 1978. The effect of GA_3 on seedlessness and some berry characteristics in a grapevine cultivar (Chaush). Ankara

Universitesi Ziraat Fakultesi Yilligi, 27 (3/4): 499-513. [Hort. Abst. 49 (5): 3330].

Al-Dujaili, J.A., M.A. Al-Khafaji, and K. Al-Juboory. 1987. The effect of localized GA3 application on the yield and quality of Thompson seedless grape (*Vitis vinifera*, L.). Iraqi J. Agric. Sci. [Hort. Abst. 58 (1): 171].

A.O.A.C. 1984. Association of Official Analytical Chemists. Edited by S. Williams. Association of Official Analytical Chemists.

Castacurta, A. and V. Catalano. 1988. Results of the use of certain agronomic methods to improve the morphological and commercial qualities of the very early table grape hybrid Conegliano 199. Rivista di Viiticoltura e di Enologia, 41 (4): 149-157. [Hort. Abst. 58 (11): 7438].

Christodoulou, A. 1968. Relation of gibberellin treatment to fruit set, berry development, and cluster compactness in *Vitis vinifera* grapes. Proc. Amer. Soc. Hort. Sci., 92: 301-310.

Colapietra, M., L.Tarricone, and G.Tagliente. 1995. Effect of gibberellic acid and cluster thinning on the qualitative characteristics of table grape Centennial seedless. Rivista di Frutticoltura e di Ortoforicoltura, 57 (5): 65-70. [Hort. Abst. 67 (9): 6923].

El-Hammady, A.M., A.D. Shaltout, N. Abdel-Hamed, and A.M.H. El-Kereamy. 1998. Effect of GA3 treatments on fruit quality of Flame seedless grape cv. Arab Universities Journal of Agricultural Science, 6 (2): 531-542.

Fallahi, E., H. Heydari, and M.W. Kilby. 1995. Maturity, quality and production of "Thompson seedless" grape as affected by frequency of gibberellic acid sprays with and without Naphthalene acetic acid. J. Small Fruit and Viticulture, 3 (1): 49-61. [Hort. Abst. 66 (3): 2102].

Farag, K.M., H.A. Kassem, and A. Hussein. 1998. Enhancing color formation of Flame seedless grapes using safe compounds or low dose of Ethephon. Emir. J. Agric. Sci., 10: 47-57.

Hussein, M.A., F.M.A. Mostafa, A.Y. Abo-Ellah, and S.M. Mohamed. 1998. Studies on physiological effect of gibberellic acid and kinetin application on Banaty (Thompson seedless). Assiut J. Agric. Sci., 29 (4): 31-42.

Isshak, Y.M., B.A. Fahmi, and R.I. Khalil. 1974. Effect of gibberellin on the quality of Banaty grapes as affected by concentration and growth stages. Agric. Res. Rev., 52 (3): 77-83.

Jensen, F.L. 1970. Effect of post bloom gibberellin applications on berry shrivel and berry weight on seeded *Vitis vinifera* table grapes. M.Sc. Thesis, Unif of Calif. Davis. [Cited after Fallahi *et al.*, 1995].

Jensen, F., F. Swanson, and G. Leavitt. 1976. Reducing set in Ruby seedless grapes with gibberellin. Calif. Agric., 30 (5): 13.

Kaps, M.L. and G.A. Cahoon. 1989. Berry thinning and cluster thinning influence vegetative growth, yield, fruit composition and net

photosynthesis of Seyval blanc grapes. J. Amer. Soc. Hort. Sci., 114 (1): 20-24.

Kondo, S. and M. Kawai. 1998. Relationship between free and conjugated ABA levels in seeded and gibberellin-treated seedless maturing "Pione" grape berries. J. Amer. Soc. Hort. Sci., 123 (5): 750-754.

Kumar, R. and O.P. Gupta. 1987. Effect of pre-harvest application of fungicide, growth regulators and calcium nitrate on the storage behaviour of Perlette grapes at low temperature. Haryana Agric. Univ. J. Res., 17 (1): 30-38. [Hort. Abst., 68 (11): 7440].

Kumar, S. and A.S. Chharia. 1990. Effect of different growth substances and pre-packaging on storage life of grapes cv. Perlette. Haryana Hort. Sci., 19 (1-2): 122-128. [Hort. Abst. 61 (5): 3610].

Lee, C.H., D.H. Han, and S.B. Kim . 1996. Effect of GA_3 and Fulmet (KT-30) on fruit set and quality in "Kyoh" grapes. J. Korean Soc. Hort. Sci., 37 (5): 686-690. [Hort. Abst. 67 (3): 2018].

Lee, C.H., S.B. Kim, and S.K. Kang. 1986. Studies on the promotion of berry set in Kyoho grape (*Vitis vinifera* L. x *V. labruscana* L.) by growth regulators. J. Korean Soc. Hort. Sci., 27 (4): 338-346. [Hort. Abst. 58 (8): 4813].

Lee, J.C. and Y.K. Chol. 1977. The effect of gibberellin and SADH [daminozide] on berry size and shelf life of grapes. J. Korean Soc. Hort. Sci., 17 (1): 12-16. [Hort. Abst. 47 (8): 7349].

Looney, N.E. 1981. Some growth regulators and thinning effects on berry set and size, berry cluster quality and annual productivity of de Chaunac grapes. Vitis, 20 (1): 22-35. Agric. Canada Res. Sta., Summerland, BC, Canada. [Hort. Abst. 52 (2): 719].

Looney, N.E. and D.F. Wood. 1977. Some cluster thinning and gibberellic acid effects on fruit set, berry size, vine size, vine growth and yield of "De Chaunac" grapes. Can. J. Plant Sci., 57: 563-659.

Mansour, K.M., E.A. Salem, and B.A. Fahmy. 1977. Effect of GA_3 spray on developing and mature clusters of Thompson seedless grapes. Agric. Res. Rev., 55 (3): 79-88.

Omar, A.H. and F.M. El-Morsy. 2000. Improving quality and marketing of Ruby seedless table grapes. J. Agric. Sci. Mansoura Univ., 25 (7): 4425-4436.

Prasad, A. and R.A. Pathak. 1975. Effect of gibberellic acid on thinning, size and quality of grapes. Agric. Agro. Ind. J., 8 (1): 25-27. [Hort. Abst. 47 (5): 4460].

Rabino, I., L. Alberto, and M.K. Konrad. 1977. Photocontrol of anthocyanin synthesis. J. Plant Physiol., 59: 569-573.

Reynolds, A.G., G.G. Edwards, D.A. Wardle, D.R. Webster, and D. Dever. 1994. Shoot density effects "Riesling" grape vines. 1. Vine performance. J. Amer. Soc. Hort. Sci., 119 (5): 874-880.

Reynolds, A.G., D.A. Wardle, C. Zurowski, and N.E. Looney. 1992. Phenylurea CPPV and Thidiazuron effect on yield components, fruit composition and storage potential of four seedless grape selections. J. Amer. Soc. Hort. Sci., 117 (1): 85-89.

Shehata, M.M. and O.M. El-Barbary. 1996. Effect of prebloom gibberellic acid application and after shattering cluster tipping on the quantity and quality of Flame seedless table grapers. Alex. J. Agric. Res., 41 (3): 247-256.

Sheng, W.C., F. Jin; Z. Meng, E.L. Xia, and L. Jianhau. 1996. Studies on the effect of plant growth regulators on the storage of Kyoho grape. China Fruits, 4: 28-29. [Hort. Abst. 67 (9): 8399].

Singh, I.S. and B.S. Chundawat. 1978. Effect of growth regulators on ethylene production by "Thompson seedless" grape berries. Indian J. Agric. Sci., 48 (12): 755-757. [Hort. Abst. 49 (7): 4928].

Singh, S., I.S. Singh, and D.N. Singh. 1994. Effect of GA_3 on ripening and quality of grape (*Vitis vinifera*, L.). Orissa J. Hort., 22 (1/2): 66-70. [Hort. Abst. 66 (10): 8487].

Steel, R.G. and T.H. Torrie. 1980. Principles and procedures of statistics. N.Y. 2nd Ed., McGraw-Hill, N.Y., U.S.A.

Weaver, R.J. 1972. Fruit set and development. In: Plant Growth Substances in Agriculture. pp. 222-290. W.H. Freeman and Company, San Francisco, California.

Weaver, R.J. and I.S. Singh. 1978. Occurrence of endogenous ethylene and effect of plant regulators on ethylene production in the grapevine. Amer. J. Enol. Viticulture, 29 (4): 282-285. [Hort. Abst. 49 (8): 5762].

Winkler, A.J., J.A. Cook, W.M. Kliewer, and L.A. Lider. 1974. General Viticulture Univ., Calif. Press, Perkeley, USA.

الملخص العربي

تأثير الرش المتكرر بحامض الجبريلليك على محصول وجودة ثمار عنب الفلام سيدلس أثناء الجمع وبعد التخزين

هند على مرزوق ، حسن على قاسم

قسم الفاكهة – كلية الزراعة (الشاطبى) – جامعة الإسكندرية

أجريت هذه الدراسة خلال عامى ٢٠٠٠ و ٢٠٠١ لدراسة تأثير عدد مرات رش شجيرات العنب صنف فليم سيدليس بحامض الجبريليك على المحصول وجودة الثمار عند الجمع وبعد التخزين المبرد على صفر درجة مئوية ودرجة حرارة الغرفة. ويمكن تلخيص النتائج فيما يلى:

١) أدى رش حامض الجبريلليك ٣–٥ مرات إلى زيادة المحصول وتلوين الثمار ومحتوى الثمار من الأنثوسيانين والسكريات المختزلة والكلية ونسبة المواد الصلبة الذائبة الكلية. بينما إنخفضت حموضة الثمار عند الجمع خلال الموسم الأول فقط.

٢) كان وزن العناقيد والحبات وطول وقطر الحبة وصلابة الثمار أعلى عند الجمع وبعد التخزين المبرد فى حالة الرش ٢–٥ مرات بحمض الجبريلليك عن الكنترول.

٣) أدى رش حامض الجبريلليك ٤ و ٥ مرات إلى التأخير من حدوث طراوة للثمار وذلك بعد ٦ أيام من التخزين على درجة حرارة الغرفة.

٤) لم تتأثر نسبة السكريات غير المختزلة والحموضة بأى من المعاملات بعد التخزين.