Assiut J. of Agric. Sci. 40 Special Issue (3 nd Conference Of Young Scienti
Fac. of Agric. Assiut Univ. April.,28, 2009.)(73-96)

IMPROVEMENT OF FLAME SEEDLESS GRAPES QUALITY FOR EXPORTATION

Maha M.Abdel-Salam, Kamelia I.A. Amin and A.M. El-Salhy

Department of Horticulture, Faculty of Agriculture, Assiut University

Abstract: This investigation was conducted during the two successive seasons of 2006 and 2007 in order to study the effects of applying Dormex at 3% after winter pruning as well as the combined application of Dormex at 3% with 40 ppm GA_3 plus 5 ppm CPPU when the berry diameter was about 5 mm together with using different potassium sources on growth and fruiting of Flame Seedless grapevines.

The results obtained could be summarized under the following main points.

- All combinations of used vinasse whether by spraying or soil application on the Dormex treated vines resulted in a significant increase in the leaf area, the percentage of N, P and K and pruning wood weight as compared to potassium sulphate on unsprayed Dormex vines.

- Using vinasse for Dormex plus GA_3 and CPPU treated vines gave the highest values of yield/vine, clust weight, cluster length and ber weight and size with a reduc compactness coefficient as compar to potassium sulphate on unspray dormex vines.

- Dormex spraying improv T.S.S, reducing sugars a anthocyanin contents and decreas the total acidity relative to contr Contrarily, Dormex followed by G plus CPPU spraying increased t juice titratable acidity and reduc T.S.S. The use of vinasse either foliar spray or soil dressing improv the chemical properties of berries a overcome the adverse effects of usi GA_3 and CPPU in grape productic namely the of berry ripening a reduced full coloration. Su advantages will eventually enat growers to produce early and hea clusters of Flame Seedle grapes,which are highly marketat in surrounding and overseas markets

Key words: Flame seedless, export quality, CPPU, GA_3, vinasse.

Introduction

Grape is the first fruit crop in the world, for being of an excellent flavour, nice taste and high nutritional value. In Egypt, the area dedicated to vineyards is increasing by about 2% per year. It ranks the second fruit crop aft Citrus. The total planted area grapes in Egypt reached abo 165,786 feddan. (According annual statistical of the Ministry Agriculture in 2006).

Received on: 31/3/2009 **Accepted for publication on**: 13/4/20(
Referees: Prof.Dr. Ahmed M.A.Al-Sesi Prof.Dr. Talat K. El-Mahdi

During the last two decades, many new grape cultivars have been introduced to Egypt. Some of which are early and others are late in ripening and some of which are seeded and others are seedless.

The merit of enhancing ripening of early grapevine cultivars are clear for increasing the opportunity of exportation by using chemicals responsible for early breaking of dormancy. Dormex (hydrogen Cyanamide) is a dormancy breaking agent, which leads to earliness in bud break and earlier harvest of grapes (Poni *et al.*, 1990; Behnk *et al.*, 1992; Abdel-Aal, 1996; El-Sabrout, 1998; El-Salhy, 2002 and El-Akkad, 2004). The early cropping is very important either for local consumption or for exportation to external markets which are void of grapes during such time.

Seedless grape is prone to quality defects such as small and uneven berry size and berry abscission which can cause major loss in production comparing to seeded grape. There is a potential to solve this problems by using CPPU [N-(2-chloro-4-pyridyl)-N-phenyl urea).

CPPU since it exhibits cytokine like properties when applied to plants. CPPU increased berry size, delayed fruit maturation, retarded the accumulation of sugar and color while reduced the respiration of organic acids. Moreover, CPPU was able to stimulate periclinal cell division in the berry leading to more round or oral shaped berries and improved both berry firmness and cap stem removal force at harvest.

CPPU increase cluster stem or rachis size and dry weight. Combined applications of CPPU and GA have synergistic effects on berry growth (Nickell, 1985; Reynolds *et al.*, 1992; Dokoozlian *et al.*, 1994; Lion *et al.*, 1999; Carvajal-Millan *et al.*, 2001 and Abdel-Aal *et al.*, 2005).

Fertilization is one of the important tools for increasing crop yield. Potassium has a considerable role in improving production and quality of fruit. It has a pertinent role in many metabolic processes, such as carbohydrate synthesis and development of meristematic tissue, as well as encouragements of lignifications and regulation of water absorption and transpiration (Mengel and Arneke, 1982). It also activities at least 60 different enzymes involved in plant growth and improves qualitative aspects of production such as colour, taste, consistency and preservation of many fruits as well as supports the plant's resistance to pathogens (Arafat, 1996; Dhillon *et al.*, 1999 and Tamim *et al.*, 2000).

Vinasse provides the possibility of using Egyptian slop from beet and sugar cane industries for the production of potassium sulfate, for utilization as fertilizer (Ahmed *et al.*, 2005). Vinasse contains high levels of organic matter potassium,

calcium and moderate amounts of nitrogen and phosphorus (Gomez and Rodriguez, 2000). It is a good source of potassium and may substitute potassium fertilizer for K requirements in plant (Gameh *et al.*, 2006). It increased yield, shoot length and leaf area (Algur and Kadioglu, 1992)and its addition led to an increase in shoot length, leaf area, yield and total soluble solids and K contents in fruits (Algur and Kadioglu, 1992 and Paula *et al.* 1999).

The objective of this investigation is to study the effects of combined treatment of Dormex, CPPU and GA_3 on the production of earlier and improved berry quality of Flame Seedless grapes for exportation as well as to examine the possibility of using vinasse as an alternative to potassium fertilizer.

Materials and Methods

This study was carried out during two consecutive seasons of 2006/2007 and 2007/2008 on Flame Seedless grapevines grown at the Experimental vineyard, Plant Pathology Department, Faculty of Agriculture, Assiut University.

The vines were trained in traditional double cordon with three wires; the used vines were healthy, uniform in vigor and were divided for achieving this study. All vines received the standard agricultural practices that are used in the vineyard including soil fertilization, irrigation and pest control, except for the tested different treatments through the two studied seasons. Each vine was pruned to four arms of four fruiting spurs (each with 3 buds length), a total of 48 buds/vine at the end of December. Crop load at all vines was adjusted to 30 clusters/vine after berry set. The experiment included two factors. The first factor (A) comprised the following three treatments:

1- Dormex at 3% (v/v) spraying.

2- Dormex at 3% and CPPU at 5 ppm plus GA_3 at 40 ppm.

3- Control (water spraying).

Mean while, the second factor (B) consisted of the following four potassium treatments

1- Vinasse (2.02% K_2O) spraying (150 ml/L/vine)

2- Vinasse application (2000 ml/vine) (as soil dressing).

3- Potassien (30% K_2O) spraying (10 cm/L/vine).

4- Potassium sulphate (48% K_2O). 200 g/vine (as soil dressing).

Therefore, the experiment involved twelve treatments; each treatment was replicated three times, one vine per each. All solutions of Dormex, CPPU and GA_3 were water based. Dormex was sprayed after winter pruning (end of Dec.) by using a hand sprayer to the runoff.

CPPU (sitofex) was sprayed at 5 ppm on the cluster when the

berry diameter reached about 5 mm, followed by GA_3 (40 ppm) in the same day. In addition, treated cluster received earlier two GA_3 sprays at 15 and 7 ppm when the cluster length was about 10-12 cm and at bloom-opening, respectively. The check vines were sprayed with water. Whereas, potassium sulphate and vinasse application were divided into two equal batches after berry set and the second at one month later. In addition, potassien and vinasse spraying were used three times, first was executed after berry set and the second was applied three weeks later, followed by the third application two weeks later.

The present experiment was set in split plot arrangement of completely randomized block design with three replicates for each treatments and each replicate was represented by one vine. Dormex and CPPU plus GA_3 treatments represented the main plots and potassium treatments stood up for the sub-plots, therefore this experiment included thirty six vines.

The tested treatments were evaluated through the following measurements:

1–Vegetative growth parameters:

- The average leaf area (cm^2)as estimated by weighing ten mature leaves/vine and the weighing 40 sections of 1 cm^2 (4 sec. of 1 cm^2/leaf), then the leaf area (cm^2)was determined as

$$= \frac{\text{Leaves weight (g) x Sections area (cm}^2\text{)}}{\text{Sections weight (g)}}$$

- Weight of pruning wood was recorded immediately after pruning (kg/vine).

2 – Leaf nutritional status:

In order to determine the leaf nutrient content, samples of 30 leaves for each replication were collected from the first full mature leaves of the top of growing shoots in mid on July in the two seasons and leaf petioles were separated from the blades. The petioles were washed with tap water, distilled water, air-dried, oven-dried at 70°C to constant weight, then ground in a stainless steel mill and kept for chemical analysis (Nijjar, 1985).

Part of each ground sample was analyzed for total nitrogen by the semi-microkjeldahl technique (Bremmer and Mulvaney, 1982). Other part of each ground sample was wet-digested using a 2:1 nitric to perchloric acid mixture. Phosphorus and potassium in the digests were determined by colorimetric and flame photometry methods respectively (Jackson, 1958).

3 – Yield, cluster and berry characteristic:

At harvesting date (when TSS % attained 15-16%) and colour covered all bunche berries,the yield per vine (kg) was recorded.Two clusters were taken at random from the yield of each

vine and the following characters were determined.

- Cluster weight (g).
- Cluster compactness coefficient according to Winkler *et al.* (1974).
- Average weight of berry (g).
- Percentage of total soluble solids in the juice by using the hand refractometer.
- Percentage of reducing sugars in the juice according to Lane and Eynon procedure as outlined in A.O.A.C. (1985).
- Percentage of total acidity (expressed as g. of tartaric acid per 100 ml of juice) by titration with 0.1 N NaOH using phenol-phthaline as an indicator.
- Total anthocyanin.The anthocyanin pigments were extracted by ethanolic HCl, a mixture of 95% ethanol and 1.5 N HCl acids (85:15 v/v). A sample of 0.5 gram from berry skin was ground and kept overnight with about 20 ml of the solvent. The samples were then washed by aliquots of the ethanolic HCl several times until the berry skin samples were colourless. The mixture was filtrated through a centered glass funnel G-3 and extract was transferred to 25 ml volumetric flask and completed to volume with the acidified alcohol then measured on spectrophotometer at wave length 530. The anthocyanin content was determined from the standard calibration curve as pointed out by Markham (1982).

All obtained data was tabulated and statistically analysed according to Gomez and Gomez (1984) and Snedecor and Cochran (1990) using the L.S.D. test at 5% for determining the significance of differences between various treatment means.

Results and Discussion

1- Effect on vegetative growth and leaf content of N,P and K.

Results in Tables (1-5) showed that Dormex spray either singly or followed by CPPU significantly increased the pruning wood weight, leaf area ($cm^{2)}$ and the percentage of N, P, K in leaves as compared with unsprayed control.No significant differences were found between spraying either dormex alone or followed by CPPU application. These results were in agreement with those achieved by Reddy and Shikhamany (1989), Abdel-Aal (1996), El-Sabrout. (1998)) and El-Shazly (1999)and revealed that vegetative growth was significantly increased in Dormex treated vines.

These findings might be attributed to the role of Dormex on activating the process of bud burst and inducing a significant early bud development as well as its role as nitrogen source in producing new tissues.

Table(1): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on pruning wood weight (kg/vine) of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	1.54	1.27	1.08	1.24	1.28	1.54	1.33	1.14	1.33	1.33
Dormex + GA_3 + 5 ppm CPPU	1.48	1.26	1.11	1.19	1.26	1.50	1.33	1.18	1.27	1.32
Control	1.29	1.25	1.08	1.06	1.17	1.37	1.33	1.16	1.15	1.25
Mean (B)	1.44	1.26	1.09	1.16		1.47	1.33	1.16	1.25	
L.S.D. 5%	A= 0.029		B= 0.036		AB= 0.063	A= 0.029		B= 0.030		AB= 0.051

Table(2): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on leaf area (cm^2) of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	222.8	219.9	188.8	186.9	204.6	204.0	218.0	179.1	182.1	195.8
Dormex + GA_3+5 ppm CPPU	224.0	220.0	190.4	188.4	205.9	200.9	218.8	178.7	183.0	195.4
Control	200.3	200.4	171.7	171.8	186.1	192.7	198.9	166.5	166.3	181.1
Mean (B)	215.7	213.6	183.7	182.4		199.2	211.9	174.8	177.1	
L.S.D. 5%	A= 5.4		B= 4.6		AB= 8.0	A= 1.6		B= 5.4		AB= 9.4

Table(3): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the percentage of nitrogen in leaves of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→	2006					2007				
A↓ B→	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	2.38	2.27	1.79	1.72	2.04	2.52	2.38	1.88	1.73	2.13
Dormex + GA_3+ 5 ppm CPPU	2.32	2.23	1.75	1.66	1.99	2.48	2.41	1.90	1.65	2.11
Control	2.12	2.05	1.63	1.56	1.84	2.23	2.15	1.63	1.52	1.88
Mean (B)	2.27	2.18	1.72	1.65		2.41	2.31	1.80	1.63	
L.S.D. 5%	A= 0.08	B= 0.06	AB= 0.11			A= 0.07	B= 0.09	AB= 0.18		

Table(4): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the percentage of phosphorus in leaves of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→	2006					2007				
A↓ B→	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	0.256	0.241	0.236	0.180	0.228	0.248	0.224	0.221	0.172	0.216
Dormex + GA_3+ 5 ppm CPPU	0.250	0.238	0.233	0.181	0.226	0.246	0.225	0.222	0.168	0.215
Control	0.233	0.222	0.216	0.164	0.209	0.223	0.208	0.202	0.156	0.197
Mean (B)	0.246	0.234	0.228	0.175		0.239	0.219	0.215	0.165	
L.S.D. 5%	A= 0.011	B= 0.007	AB= 0.014			A= 0.010	B= 0.09	AB= 0.017		

Table(5): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the percentage of potassium in the leaves of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	2.40	1.92	1.41	2.08	1.95	2.44	1.87	1.54	2.13	1.99
Dormex + GA_3 + 5 ppm CPPU	2.30	1.88	1.38	2.06	1.93	2.42	1.85	1.51	2.12	1.98
Control	2.21	1.67	1.30	1.92	1.77	2.33	1.72	1.41	1.98	1.86
Mean (B)	2.33	1.82	1.36	2.02		2.40	1.81	1.49	2.08	
L.S.D. 5%	A= 0.08	B= 0.06	AB= 0.11			A= 0.09	B= 0.08	AB= 0.15		

Table(6): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the yield (kg/vine) of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	13.98	14.28	13.47	13.32	13.76	15.09	15.39	14.70	14.46	14.91
Dormex + GA_3+ 5 ppm CPPU	17.16	17.52	16.47	16.26	16.85	19.11	19.26	18.30	17.97	18.66
Control	10.86	11.13	10.44	10.44	10.72	11.79	12.09	11.55	11.35	11.69
Mean (B)	14.00	14.31	13.46	13.34		15.33	15.58	14.85	14.59	
L.S.D. 5%	A= 1.10	B= 0.55	AB= 1.29			A= 1.04	B= 0.68	AB= 1.15		

Also, using vinasse either as vine-foliage spraying or soil dressing led to a significant increase in the pruning wood weight, percentage of N, P, K in leaves compared to fertilize by potassium sulphate (control). Contrarily, potassien spray had no significant effects on such traits as compared to control.

These findings emphasized the utility of using vinasse as a potassium source for enhanced growth since potassium has a main role in lots of physiological processes occurring in the plant and activating many enzyme systems relevant to protein synthesis and formation of carbohydrates. In addition, the utility of vinasse in enhancing growth might be attributed to its important role in uptake and translocation of most nutrients and movement which aids in cell division and the development of meristematic tissues. The present results are in harmony with those of Morris and Cawthan (1982), Shikhamany *et al.* (1990), Rabeh *et al.* (1994), Dhillon *et al.* (1999), Mohamed and Abdel-Aal (2000) and Shoaieb (2002)who found that soil or foliar application of potassium significantly raised shoot length, leaf area and weight of pruning wood per vine, as well as improving vine nutritional status. In addition, Tano *et al.* (2005) stated that "vinasses supply improved vine physiological status, in terms of leaf photosynthetic efficiency and root activity".

The increase in the nutrient contents in leaves resulting from using vinasse could be related to its high content of organic matter, potassium, calcium and moderate amounts of nitrogen and phosphorus (Gomez and Rodriguez, 2000). Application of vinasse was reported to cause a significant increases in soil pH, K, Ca and Mg contents in soil as well as increasing the availability of certain nutrients and improving soil structure moisture retentions and biological properties (Ferrira and Monteriro, 1987). In addition, Arafat *et al.* (2000) and Subash *et al.* (2002)stated that "vinasse application improved the physical properties of the soil and decreased pH of soil, hence increased the availability of certain nutrients."

So from these results ,all combinations of using vinasse either by spraying or as soil application on the Dormex treated vines were significantly effective in increasing the leaf area , pruning wood weight and percentage of N, P and K in leaves as compared to using potassium sulphate on unsprayed Dormex vines. The obtained pruning wood weight attained was 1.54, 1.48 and 1.29 kg/vine and 1.54, 1.50 and 1.37 kg/vine, due to vinasse spraying and Dormex spraying followed by CPPU and unsprayed (control) during two studied seasons, respectively. Moreover, the

maximum leaf area was attaind on Dormex treated vine either sprayed by vinasse(222.8 cm^2 in the first season) or vinasse application (218.0 cm^2 in the second season). On the other hand, the minimum values of leaf area were 171.8 and 166.3 cm^2 for the untreated (control) during the two studied seasons, respectively.

Hence, the maximum percentage of N, P and K was recorded in leaves of Dormex treated vines followed by vinasse spray. The obtained values were 2.38 and 2.52% for N%, 0.256 and 0.248% for P% and 2.40 and 2.44% for K% during the two studied seasons respectively. Whereas, the minimum values of N and P% were found in the leaves of untreated vines and fertilized with potassium sulphate (control). The recorded percentage of N and P were 1.56 and 1.52 N % and 0.164 and 0.150 P % during the two studied seasons, respectively. And, the minimum percentage of K was recorded on untreated vines and spraying with potassien. Such values of K % were 1.30 and 1.41% during the two studied seasons, respectively.

It could be concluded that foliar spraying of vinasse would induce a beneficial improvement to the vine vigour and nutritional status and reduce the need for mineral fertilizers thus reduce the cost of production as well as environmental pollution problems.

2- Yield (kg/vine):

Results in Table (6) showed that the yield/vine was significantly increased by using Dormex followed by CPPU spray as compared to unsprayed (control). The highest yield was recorded in vines treated by Dormex after winter pruning, then GA_3 spray three times plus CPPU once spray.

These findings might be explaind as due to the positive action of Dormex in improving the vine vigour.The improvement of vine growth and vigour was surely reflected on increasing the yield of the treated vine s. In addition, the increase in yield/vine due to application of GA_3 and CPPU might be due to their great role in activating the biosynthesis of proteins, RNA and DNA which was reflected on increasing the berry weight and consequently increasing the cluster weight (Thomas, 1979).

These results were in line with Abdel-Aal (1996), El-Sabrout (1998), El-Shazly (1999), Abdel-Ghany *et al.* (2001), El-Mogy *et al.* (2002), El-Salhy (2002). They concluded that spraying Dormex on grapevines led to increases in the yield/ vine. The beneficial effect of GA_3 and CPPU application on increasing the yield/vine was emphasized by Retamales *et al.* (1993), Omar and El-Morsy (2000), Ranpise *et al.* (2000) and Abdel-Aal *et al.* (2005). They concluded from their

investigation on different grape cultivars that CPPU (sitofex) either alone or with GA_3 spraying significantly increased the yield/vine.

Therefore, using vinasse either a foliar spray or soil dressing significantly increased the yield/vine more than potassium sulphate fertilization (control). Meanwhile, potassien spray had no significant effect on yield/vine relative to control.

The improvement of yield/vine due to using vinasse either as a foliar spray or soil application might be due to the improvement in vigour and nutrient status of vines and cluster weight.

In addition, all combinations with of vinasse either as a spray or soil application significantly increased the yield/vine. Using vinasse for Dormex plus GA_3 and CPPU gave the highest yield/vine whereas potassium fertilization in the form of potassium sulphate for untreated vine recorded the least yield/vine. The maximum yield/vine was obtained with Dormex plus GA_3 and CPPU and vinasse soil application (17.52 and 19.26 kg) during the two seasons. These finding could be attributed to dormex spraying as well as GA_3 and CPPU spraying in improving the berry weight and size. In addition the positive effect of vinasse on the nutrient status and vigour of vine.

3- Cluster weight and compactness coefficients:

Results presented in Table (7 and 8) indicated that the cluster weight was significantly increased by using Dormex followed by CPPU spraying as compared to unsprayed (control). The heaviest cluster was recorded in vines treated by Dormex and then GA_3 spray (for elongation, reduction berry set and plus CPPU for sizing). The increment percentage of cluster weight due to Dormex singly or plus both GA_3 and CPPU as compared to unsprayed(control) were estimated to 28.44 and 57.28% and 27.53 and 59.55% during the two studied seasons, respectively. These findings might be due to the increase in berry set, berry weight in response to Dormex spraying and berry weight due to GA3and CPPU application.

Contrarily, the compactness coefficient was significantly decreased as compared to control.

The decrement percentage of compactness coefficient of cluster were 5.03 and 31.01% and 4.03 and 25.36% due to Dormex and Dormex followed by GA_3 plus CPPU compared to control, during two studied seasons, respectively.

Such results could be due to the increase in cluster length and the reduction in the berries number per cluster in response to GA_3 application. Thus, it could be concluded that GA_3 sprayed twice at pre-bloom opening and at bloom

Table(7): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the cluster weight (g) of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	466.1	476.6	449.8	444.2	459.2	503.6	513.3	490.6	482.3	497.5
Dormex + GA_3+ 5 ppm CPPU	572.0	584.9	549.9	542.4	562.3	637.4	642.4	610.3	599.5	622.4
Control	362.4	370.7	348.4	348.5	357.5	392.9	403.6	385.5	378.5	390.1
Mean (B)	466.9	477.4	449.4	445.0		511.3	519.8	495.5	486.8	
L.S.D. 5%	A= 18.9		B= 19.4		AB= 33.6	A= 22.1		B= 12.2		AB= 21 .1

Table(8): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the compactness coefficient of "Flame" Seedless grapevines during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	6.77	6.65	6.86	6.92	6.80	6.77	6.73	6.72	6.43	6 .66
Dormex + GA_3+ 5 ppm CPPU	5.07	4.96	4.77	4.94	4.94	5.04	5.19	5.31	5.19	5 .18
Control	6.93	7.00	7.18	7.52	7.16	6.97	7.07	6.82	6.88	6 .94
Mean (B)	6.25	6.21	6.27	6.46		6.26	6.33	6.28	6.17	
L.S.D. 5%	A= 0.45		B= N.S		AB= 0.48	A= 0.34		B= N.S		AB= 0.39

opening caused an increase in cluster length and a reduction in the berries number per cluster which was reflected on pronounced reduction in compactness coefficient, hence produced loose clusters.

Similarly, using vinasse either as a foliar spray or soil dressing caused a significant increase in cluster weight more than the fertilization by potassium sulphate (control). Moreover, potassien spray had insignificant promotion of cluster weight as compared to control. Whereas, using vinasse and potassien had insignificant effect on compactness coefficient as compared to control.

All combinations of vinasse either by spraying or soil application caused significant increases in cluster weight. Using vinasse for Dormex plus GA_3 and CPPU treated vine gave the highest cluster weight.Mean while, potassium sulphate fertilization for untreated vine recorded the least cluster weight. The maximum cluster weight was found by Dormex plus GA_3 and CPPU treated vine and vinasse soil application(584.9 and 642.4 g in the two studied seasons, respectively). Moreover, all Dormex spraying followed by GA_3 and CPPU treated vines supplemented with different potassium sources produced the least compactness coefficient, which was reflected on loose clusters as compared to the analogous ones resulted from the combination of Dormex treated and untreated vines.

These finding could be attributed to the effect Dormex as well as GA_3 and CPPU spray in improving the berry weight and size as well as the positive effect of vinasse on the nutrient status and vigour of vine as mentioned above.

4- Physical properties of berries:

Results in Table (9) showed that berry weight significantly increased in response to Dormex singly or Dormex plus GA_3 and CPPU application as compared to control. Greater increase on berry weight was associated with using Dormex plus GA_3 and CPPU.

The increment percentage in berry weight as induced by Dormex and Dormex plus GA_3 and CPPU over control were 24.76 and 75.14% and 22.66 and 67.78% during the two studied seasons, respectively.

These results could be attributed to the activating effect of Dormex on the synthesis of total carbohydrates and proteins which could have been reflected on enhancing cell division and enlargement which led increasing the weight and size of berries. In addition, it could be attributed to the positive effect of GA_3 and CPPU in increasing cell division and cell elongation as well as their great role in activating the biosynthesis of proteins, RNA and DNA (Thomas, 1979).

Spraying Dormex followed by GA_3 and CPPU was significantly effective in improving weight and size of berry when compared with spraying dormex alone. The increased in berry weight was targeted by grape producers to increase in packable yield. Using vinasse either as a foliar spray or soil application significantly increased the berry weight as compared to fertilizing by potassium sulphate (control). Meanwhile, potassien as a foliar spray did not significantly increase such trait over the control.

Berry weight improvement due to using vinasse could be attributed to improving the vigour and nutrient status of vine as well as to the physiological effect of potassium in increasing the osmotic potential of the berry cells and that according to the view of Coombe (1960) might promote the water movement into the berries, consequently might increase the berry weight and volume.

Moreover, all combinations of potassium sources along with spraying Dormex alone or Dormex plus GA_3 and CPPU significantly increased the berry weight as compared to the control. The heaviest berry were found on Dormex followed by GA_3 and CPPU treated vines that were fertilized with vinasse either by foliage spraying or soil application.

So, it could be concluded that the best results regarding berry weight of Flame Seedless grapevines were obtained with Dormex spraying followed by GA_3 spraying three times at pre-bloom and at full bloom followed after berry set by 5 ppm CPPU accompanied using vinasse as potassium source either foliage spraying or soil application. Such treatment was more effective in increasing the weight of the berry than other treatments. Moreover, such treatment is very important in grapes production since the increase in berry weight and its size is the most important target than total yield due to the increase in berry weight and size induce an increase in pack able yield.

5-Chemical and constituents of juice:

Dormex spraying significantly improved total soluble solids, reducing sugars and anthocyanin contents as well as significantly decreased the total acidity (as tartaric acid) compared to control. Mean while, Dormex followed by GA_3 plus CPPU spraying significantly increased in the juice titratable acidity and reduced total soluble solids, reducing sugars and anthocyanin content compared to control(Tables10-13).

These results might be attributed to the effect of Dormex in advancing but burst and appearance of clusters which may advance the berries maturation. Moreover, increasing the leaf surface and nutrient status of vines would enhance photosynthesis activity and production of more

Table(9): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on 25 berries weight (g) of "Flame" Seedless grapes during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse Spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	64.40	65.27	63.50	63.23	64.10	69.17	70.20	68.67	68.67	69.18
Dormex + GA_3+ 5 ppm CPPU	91.40	91.23	90.27	87.07	89.99	98.62	96.37	91.82	91.70	94.63
Control	52.83	53.53	50.63	48.53	51.38	58.57	56.77	55.83	54.45	56.40
Mean (B)	69.54	70.01	68.13	66.28		75.45	74.44	72.11	71.61	
L.S.D. 5%	A= 1.40		B= 2.05	AB= 3.51		A= 2.35		B= 1.85	AB= 3.16	

Table(10): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the total soluble solids percentage of "Flame" Seedless grapes during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse Spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	17.77	17.60	17.03	16.97	17.34	16.57	16.77	16.47	16.47	16.57
Dormex + GA_3+ 5 ppm CPPU	15.97	15.77	15.33	15.03	15.53	14.97	14.83	14.97	15.00	14.94
Control	16.30	16.33	15.80	15.93	16.09	16.03	15.83	15.63	15.47	15.74
Mean (B)	16.68	16.57	16.06	15.98		15.86	15.81	15.69	15.64	
L.S.D. 5%	A= 0.25		B= 0.34	AB= 0.58		A= 0.40		B= 0.15	AB= 0.26	

Table(11): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the titratable acidity percentage of "Flame" Seedless grapes during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse Spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	0.440	0.452	0.455	0.450	0.449	0.468	0.448	0.477	0.464	0.464
Dormex + GA_3+ 5 ppm CPPU	0.555	0.578	0.567	0.590	0.573	0.588	0.574	0.580	0.587	0.582
Control	0.453	0.483	0.492	0.505	0.483	0.508	0.508	0.510	0.563	0.522
Mean (B)	0.483	0.504	0.504	0.515		0.522	0.510	0.522	0.538	
L.S.D. 5%	A= 0.008		B= 0.009	AB= 0.016		A= 0.017		B= 0.011	AB= 0.019	

Table(12): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the reducing sugars percentage of "Flame" Seedless grapes during 2006 and 2007 seasons.

Season→ A↓ B→	2006					2007				
	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse Spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	14.73	14.49	14.55	14.38	14.54	14.11	14.22	13.76	13.92	14.00
Dormex + GA_3+ 5 ppm CPPU	13.12	12.80	12.74	12.69	12.84	12.58	12.32	12.66	12.74	12.57
Control	13.22	13.38	12.89	12.71	13.05	13.49	13.47	13.26	13.17	13.35
Mean (B)	13.69	13.56	13.39	13.26		13.39	13.34	13.23	13.28	
L.S.D. 5%	A= 0.35		B= 0.27	AB= 0.46		A= 0.51		B= 0.10	AB= 0.18	

Table(13): Effect of Dormex, CPPU along with GA_3 spray and different potassium fertilization sources on the anthocyanin content (mg/g fresh weight) of "Flame" Seedless grapes during 2006 and 2007 seasons.

Season→	2006					2007				
A↓ B→	Vinasse spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)	Vinasse Spraying	Vinasse application	Potassien	K_2SO_4 application	Mean (A)
Dormex	0.79	0.83	0.72	0.71	0.76	0.82	0.80	0.73	0.72	0.76
Dormex + GA_3+ 5 ppm CPPU	0.64	0.66	0.60	0.57	0.62	0.59	0.61	0.53	0.51	0.56
Control	0.73	0.70	0.70	0.67	0.70	0.76	0.80	0.68	0.65	0.72
Mean (B)	0.72	0.73	0.67	0.65		0.72	0.74	0.65	0.63	
L.S.D. 5%	A= 0.03		B= 0.03	AB= 0.05		A= 0.03		B= 0.04	AB= 0.07	

sugars translocated to berries. The early maturation of Falme Seedless berries is most important for increasing the exportation chance and its price and ner income.

These results are in line with those obtained by Abdel-Aal (1996), El-Sabrout (1998), El-Shazly (1999), El-Salhy (2002), and El-Akkad (2004)who concluded that spraying Dormex significantly improved the berry chemical properties in terms of total soluble solids, reducing sugars and TSS/acid ratio and decreasing the total acidity.

Moreover, Dokoozlian *et al.* (1994), Retamales *et al.* (1995), Carvajal-Milan *et al.* (2001), Ishikawa *et al.* (2003),and Abdel-Aal *et al.* (2005) found that CPPU alone or in combination with GA_3 decreased TSS, TSS/acidity and anthocyanin and delayed berry ripening by 5 to 21 days.

In addition, Bikash-Das *et al.* (2001) found that vines treated with Dormex exhibited earlier berry ripening by 7 days than control, whereas CPPU alone or combined with GA_3 delayed the berry ripening.

Using vinasse either as foliage spraying or soil application improved the berry chemical properties in terms of higher total soluble solids, reducing sugars, and anthocyani in their skin and reducing titratable acidity compared to fertilize by potassium sulphate (control).Whereas, using potassien spraying had no significant improved effect on these traits. These results are in harmony with those of El-Akkad (2004) and Tano *et al.* (2005)

All combinations of Dormex spraying significantly improved the berry chemical traits in terms of increasing the total soluble solids, reducing sugars and anthocyanin contents of berry skin and decreasing total acidity compared to combination of untreated ones. Moreover, all combinations of Dormex with using vinasse gave the highest values of such traits.

Such advantages will eventually enable growers to produce early and heavy clusters of Flame Seedless grapes, consequently the growers will obtain highly marketable yield in surrounding and overseas markets.

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تحسين خصائص ثمارعنب الفليم اللابذرى للتصدير

مها محمد عبد السلام ، كاميليا إبراهيم أحمد ، عبد الفتاح مصطفي الصالحي

قسم البساتين (فاكهة) – كلية الزراعة – جامعة اسيوط

أجريت هذه الدراسة خلال موسمى 2006 ، 2007 على شجيرات العنب الفليم عديم البذور المنزرعة بالمزرعة البحثية لقسم أمراض النبات بكلية الزراعة جامعة أسيوط ويهدف هذا البحث إلي دراسة تأثير رش الدورميكس 3% بعد تقليم الشجيرات بمفرده أو مصحوبا برش العناقيد بحمض الجبريليك 40 جزء فى المليون والسيتوفيكس 5 جزء بالمليون عند وصول قطر الحبات إلى 5 مم بالأضافة لأستخدام مصادر مختلفة من التسميد البوتاسى على المحصول وخصائص الثمار .

ويمكن تلخيص أهم النتائج على النحو التالى :

- أظهرت نتائج التداخل بين المعاملات أن استخدام الفيناس سواء رشاً أو إضافة للتربة ورش الدورميكس سببت زيادة جوهرية فى كل من وزن خشب التقليم ومساحة الأوراق وتحسين الحالة الغذائية لشجيرات مقارنة باستخدام سلفات البوتاسيوم وعدم رش الدورميكس .

- سبب رش الدورميكس فردياً بعد التقليم الشتوى أثناء السكون أو بالإضافة إلى حمض الجبريليك والسيتوفكس واستخدام الفيناس سواء رشاً أو إضافة للتربة زيادة جوهرية فى كل من(وزن المحصول/ شجيرة ــ وزن العنقود ــ وزن وحجم الحبات) و تأثيراً سلبياً على معامل تزاحم العناقيد حيث نتج عناقيد ذو درجة تزاحم جيدة مقارنة باستخدام سلفات البوتاسيوم وعدم رش الدورميكس .

- أدى رش الدورميكس إلى زيادة جوهرية فى المواد الصلبة الذائبة ومحتوى السكريات ونسبة المواد الصلبة الكلية إلى الحموضة وكذلك محتوى قشرة الثمار من الانثوسيانين بينما أدى رش حمض الجبريليك والسيتوفكس إلى نقص هذه القياسات وزيادة نسبة الحموضة مقارنة بمعاملة عدم الرش .

- سبب استخدام الفيناس رشاً أو إضافة للتربة للشجيرات إلى تحسين الصفات الكيميائية للحبات حيث أن الفيناس يعالج بعض عيوب استخدام السيتوفكس وحمض الجبريليك مثل تأخير النضج ورداءة التلوين.

من هذه الدراسة يمكن التوصية برش شجيرات العنب الفليم بعد التقليم بالدورميكس 3% ثم رش النورات برشتى حمض الجبريليك للاستطالة وخف الحبات وكذلك رش العناقيد بحمض الجبريليك والسيتوفكس عند وصول قطر الحبات إلى 5 مم بالإضافة إلى رش الشجيرات بالفيناس كمصدر للبوتاسيوم وذلك لإنتاج عناقيد عنب مبكرة ذات مواصفات تسويقية جيدة للتصدير .