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Impact of Dormex Concentration and Spraying Date on the Fruitful Flame Seedless Grapevines

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Abstract

This study was conducted on fruitful flame seedless grape vines grown in Esna district, Luxor Governorate, Egypt to study the effect of five Dormex (hydrogen cyanamide) concentrations *i.e.*, (0.5, 1.0, 2.0 and 4.0%) and four spraying dates (last Dec. week, 1st, 2nd, and 3rd jan.week), as well as the interaction effect of their 20.0 possible combinations during both 2017/2018 and 2018/2019 seasons. So, the complete randomized blocks design with four replications was employed to conduct such factorial experimental.

The obtained data revealed that, most evaluated parameters responded specifically to two investigated factors (Dormex conc. and spraying date). However, the trend and rate of variances differed not only from one measurement to another, but also differences due to Dormex concentration were more pronounced than spraying date. Anyhow, some parameters like as: 1- bud burst %, 2- shoot length, 3- leaf area, 4- cane thickness, 5- pruning wood weight, 6- fruit set %, 7&8- yield either as number or weight of clusters/vine, 9- cluster weight, 10- 100 berries weight, 11- berry dimensions (length and diameter), 12- TSS% and 13- total sugars % were in positive relationships to Dormex concentration from one hand and the 3rd spraying date (2nd week of January) was the most suitable.

From this study, data show clear significant with the aforesaid parameters except those of can thickness, pruning wood weight, fruit set % and (weight and dimensions) of berry, where variance was relatively moderate or too few to reach level of significance. On the contrary, the trend of response took the other way around either with the shoot berries % or leaf N, P and K% particularly as the specific effect of Dormex concentration was the concerned whereas the control (water sprayed vines) exceeded different Dormex spray treatments. In addition, other leaf nutrient contents *i.e.*, Ca, Mg and Fe did not significantly influence.

As for the interaction effect the specific effect of each investigated factor was directly reflected on their combinations, so the 4.0% Dormex concentration which sprayed through the 2nd week of January was the superior for most parameters and it could be recommended to be applied for flame seedless vineyards under the same environmental condition of such experimental region as an advisable rest breakage agent.

Key words: Flame seedless – Dormex spraying date – Growth, Yield, Fruit quality – Leaf nutritional status.

Introduction

Grapes is considered one of the first major fruit crop allover world. Grape is currently grown in all major countries of the world for fresh fruit and processed products **Chapman, (1990).** Grapes suggested to be one of the most important fruit crops for either local consumption or export, **Winkler *et al.*, (1974)**. The world total fruiting area and production reached 10.0 million Hectares and 90-million-ton fruits **(FAO, 2016)**.

The old-world grape species Vitis vinifera L. "European grape" is the most spreading in the world, where several thousand varieties of grapes have been derived from such species. Vinifera is also a parent of many grape hybrids. So, more than 90% of cultivated grape cultivars are belonging to such species and their berries having higher nutritional status and could be consumed fresh as table grapes, dried to be used as raisins, while juice may be used as fresh pasteurized form or be fermented to make vine types **Creasy and Creasy (2009).**

In Egypt grapes ranked second fruit crop after citrus since the total vineyard reached 196.993 feddans. The fruiting vineyards area reached about 178.323 feddans with a production of 1.686.706 tons, according to **Ministry of Agricultural and Land Reclamation, Egypt (2016)**.

Some growing grape cultivars belonging to *Vitis vinifera* in warm winter regions still poses agronomic challenges. Bud dormancy breaking agents is closely related to commercial attempts to grow grapevines in mild winter locations, where chilling requirements are not necessarily met, and absence of chemical bud breaking agents leads to some problems in growth season which certainly resulting in reducing yield **Erez (1987)**, uneven maturity and delayed harvesting **Shulman *et al.*, (1986)**.

So, many investigations have been conducted to artificially interrupt dormancy in grapevines with synthetic chemicals **Shulman *et al.*, (1986)**. Among such compounds, hydrogen cyanamide (H_2CN_2) *i.e.*, dormex proved to be the most effective bud rest breakage agent for field using **Zelleke and Kliewer (1989)**.

Consequently, this study aimed to elucidate the effect of the dormex at different concentrationds and its spraying dates as bud dormancy breaking agent for improving growth yield quantitatively and

qualitatively, nutritional status and berries characteristics of Flame Seedless grape vines grown under Luxor Governorate condition (Upper Egypt).

Materials and Methods

This investigation was conducted during two consecutive seasons of 2017/2018 and 2018/2019 seasons on ten 10 years old Flame Seedless grapevines grown in clay loam soil at 2x3 m apart *i.e.* (700 vines per Feddan) in a private vineyard under surface irrigation system at Esna district, Luxor Governorate, Egypt.

This study aimed to investigate the effect of Dormex as a partial supplementary agent of chilling hours needed to avoid irregularity of chilling requirements through winter season. It was also suggested that Dormex spray help bud burst to take place early with regular flowering, well fruit setting and earlier higher yield of good fruit qualities which will be certainly reflected positively on both grape's growers and local consumer.

The experimental vineyard was subjected to the cane training with T shape supporting system and the long pruning units (fruiting canes) each with 10.0 eyes, whereas six fruiting canes plus six renewal spurs (2.0 eyes/each) were left per every vine. So, total vine load after winter (fruiting) pruning was 72.0 eyes per each. Pruning was done at fourth week of December 2017 and 2018 years during 1st and 2nd experimental seasons, respectively. Soil physical and chemical properties of the vineyard were analyzed after **Wilde *et al.*, (1985)**. Data of sampled soil in January 2018 year are presented in **Table (1)**.

Table 1. Analysis of the soil at trial location:

Deeps of the soil (cm.).		30 cm.	60 cm.	90 cm.
Soil texture			Clay loam	
Chemical analysis	pH value	7.90	7.90	7.80
	Total solids %	0.07	0.12	0.12
	Calcium carbonate %	3.30	4.10	4.50
	Macro elements (ppm)			
	Concentration of N (ppm)	6.00	6.00	7.00
	Conc. of P (ppm)	17.00	20.00	15.00
	Conc. of K (ppm)	213.00	279.00	372.00
	Micro elements (ppm)			
	Conc. of Fe (ppm)	7.00	5.00	3.80
	Conc. of Cu (ppm)	1.14	0.52	0.10
	Conc. of Mn (ppm)	1.40	1.00	2.00
	Conc. of Zn (ppm)	0.70	0.48	1.16
	Anions meq/100 g			
	Cl^- (Meq/L)	0.60	0.80	1.40
	$So_4^=$ (Meq/L)	0.42	1.32	0.83
	HCo_3 (Meq/L)	1.20	1.60	1.60
	Co_3 (Meq/L)	0.11	0.11	0.11
	Cations meq/100 g			
	Na^+ (Meq/L)	0.80	2.50	2.70
	Ca^{++} (Meq/L)	0.72	0.48	0.48
	Mg^{++} (Meq/L)	0.61	0.66	0.66

In this experiment the effect of the Dormex compound (49% Hydrogen cyanamide) spray at different dates on some growth, yield, fruit quality (physical and chemical properties) and nutritional status (leaf nutrient elements content) measurements of Flame seedless grapevines were investigated during both (2017/2018 and 2018/2019).

Experimental layout:

In this experiment two factors were studied during each experimental season. The first factor was representative of the Dormex concentration, whereas five concentrations *i.e.*, 0.05, 0.1, 0.2 and 0.4%, besides water only (control) were included. However, the second factor was dealing with four Dormex spraying dates at one week interval *i.e.*, through either the last week of December (2017 and

2018), or (1st, 2nd and 3rd week of January (2018 & 2019 years), during first & second experimental seasons, respectively.

So, the differential investigated Dormex spray treatments were representative of the different possible combinations between two studied factors (5 conc. at 0.05, 0.1, 0.2, 0.4%, in addition to control) and four spraying dates at one-week interval through (last week of December and 1st, 2nd as well as 3rd weeks of January). The complete randomized block design with four replications (one vine per every replicate) was employed for arranging the 20 investigated treatments. Consequently, 80 vines representative of (5 conc. x 4 spraying dates x 4 replications) were carefully selected as being nearly uniform in their vigor and all were pest and diseases free. Hence, the investigated Dormex spray treatments were as shown in **Table (2)**.

Table 2. The effect of date of Dormex

Spraying date / Dormex conc.	Through last week of Dec. 2017/2018	Through January 2018/2019		
		1st week	2nd week	3rd week
1- water spray as control	**Dec. last week**	**Jan. 1st week**	**Jan. 2nd week**	**Jan. 3rd week**
2- 5.0 ml/l (0.5%)	**Dec. last week**	**Jan. 1st week**	**Jan. 2nd week**	**Jan. 3rd week**
3- 10.0 ml/l (1.0%)	**Dec. last week**	**Jan. 1st week**	**Jan. 2nd week**	**Jan. 3rd week**
4- 20.0 ml/l (2.0%)	**Dec. last week**	**Jan. 1st week**	**Jan. 2nd week**	**Jan. 3rd week**
5- 40.0 ml/l (4.0%)	**Dec. last week**	**Jan. 1st week**	**Jan. 2nd week**	**Jan. 3rd week**

Taking into considerations that such selected Flame seedless vines selected for such factorial experiment received regularly the same agricultural and horticultural practices adopted in the region particularly those dealing with hoeing, pest and disease control managements, irrigation and fertilization with 20 m^3 farmyard manure (0.3 % N, 0.4% P_2O_5 and 1.5% K_2O mixed with 500 kg calcium mono-superphosphate (15.5% P_2O_5) applied together once at the 1st week of January, 400.0 kg ammonium sulphate (20.6% N) divided into three unequal portions (50% after bud burst, 25% after berry setting and 25% at one month later, as well as 300 kg potassium sulphate (48.0% K_2O) applied twice at two equal doses *i.e.*, just before blooming and after berry setting by . placing 10.0 cm^3 under soil surface at 40.0 cm from both sides of each vine trunk.

The surfactant agent (Triton B at 0.05%) was added to the different Dormex solutions even control (water spray), whereas one liter/vine was sufficient to be applied till running off.

The effect of different investigated Dormex conc. and spraying dates regarding the specific effect of each investigated factor and their combinations (interaction effect) was evaluated through the response of the following measurements:

1- Date of Buds' burst

Observations on bud behavior were carried out at weekly intervals during the period from one week after 1st date of spraying Dormex and ended at the last week of April in the two seasons. The number of bursted buds, were recorded for each interval, then the additive number along the observation period was recorded to calculate the percentages of bud burst in relation to the total number of buds left per vine (72 buds).

Percentage of bud burst

It was calculated by dividing the number of bursted buds by total number of buds left per vines after winter pruning and multiplying the product by 100.

2. Vegetative growth measurements:

In this regard average shoot length, number of leaves per each and average leaf area were recorded as the increase in shoot length was ceased approximately July late of 2018 and 2019 years. Since, twenty full expanded (mature) leaves were picked from the opposite side to their basal clusters for calculating the leaf area using the following equation outlined by **Ahmed and Morsy (1999).**

Leaf area (cm^2) = 0.45 (0.79 x W^2) + 17.77

Where W = the maximum diameter of leaf (cm).

Moreover, ten shoots/vine were randomly selected and labeled, then their length was recorded, and their average length was estimated, as well as the number of leaves per each was also calculated.

Meanwhile, just before winter pruning had been carried out, cane thickness (cm) at the 5th basal internodes of each of the previously labeled mature shoots (canes) per every vine were recorded (using a vernier caliper) and finally their average value was estimated. However, pruning wood weight (kg) per vine *i.e.*, weight of the removed one year old wood (canes) at winter pruning through the last week of December (2017 and 2018) years during 1st and 2nd seasons, respectively, was recorded.

3. Nutritional status (leaf nutrient elements composition):

The same twenty leaves opposite to the basal clusters which previously used for determining leaf area were picked from each vine at late July 2018 and 2019 years, after **Balo *et al.*, (1988)**, then washed by tap water followed by distilled water to remove dust and any other residues. Afterwards, leaves were dried in an electric oven at 70ºC till constant weight. The dried leaves were finely ground using an

electrical stainless-steel knife mill, then stored in small paper bags for determining the N, P, K, Ca, Mg and Fe content after wetting digested by using H_2SO_4 + H_2O_2.

Total nitrogen (N) was determined in dried leaves material by semi-micro Kjeldahl methods as recommended by **Bremner (1965)**. Phosphorus (P) was calorimetrically determined by using ascorbic acid according to the method described by **John (1970).** Potassium (K) was determined by flame-photometer according to **Brown and Lilliland (1946)**. Calcium, magnesium, and iron contents were determined using the atomic absorption spectrophotometer according to the procedures outlined by **Carter (1993)**.

The different determined nutrient elements were estimated on the dry weight leaves either as percentage or ppm for the five macro-elements (N, P, K, Ca, Mg) or iron, respectively.

4. Productivity measurements:

In this respect both fruit set % as an earlier indicator of productivity and harvested clusters per vine (estimated as number or weight in Kg of clusters/vine) as final yield were determined.

4. a. Fruit set %:

Fruit set % was recorded by selecting five clusters/vine and bagging them each in perforated white paper bags when became suitable (just before blooming). Bags were carefully removed at mid April, after setting had been taken place completely. Then number of attached fruitlets per each cluster and numbers of dropped (flowers and fruitlets) in the bag were recorded. The percentage of berry set of the five bagged clusters on every vine was individually calculated for each cluster according to the following equation:

$$\text{Fruit set \%} = \frac{\text{No. of attached fruitlets per cluster}}{\text{No. of attached fruitlet + dropped (flowers and fruitlets)}} \times 100$$

Then an average value of the five clusters / vine was estimated.

4.b. Yield:

At harvesting date, when the T.S.S/acid ratio in the berries juice reached 18-20 % the yield per vine in terms of either weight or number of harvested clusters per vine was registered.

5. Berry quality:

From each vine 3-5 clusters were taken at random for determining the following fruit physical and chemical characteristics:

5.a. Physical characteristics:

Average cluster weight (kg), 100 berries weight (g.), berry length (mm), berry diameter (mm) and shot berries % were estimated.

5.b. Chemical properties:

Berries juice TSS %, in berry juice were determined using hand refractometer.

Total sugars were determined in the juice by using **Lane and Eynon (1965)** volumetric methods. All obtained data during both seasons were subjected to the analysis of variance according to **Snedecor and Cochran (1972)** and differences between means were distinguishing by using capital and small letters for specific and interaction effects, after **Gomez and Gomez (1984) and Mead *et al*. (1993)** and carried out with Computer using (MSTATC Program software, 1980).

Results and Discussions

Specific effect of two studied factors (5 Dormex concentrations and 4 spraying dates) and interaction effect of their 20 possible combinations on fruitful flame seedless vines were investigated. The response was evaluated through the changes exhibited in various measurements dealing with the following aspects:

1- Bud behavior (bud burst %) and some vegetative growth measurements.

Data obtained during both 2017-18 and 2018-19 experimental seasons are presented in **Tables (3 and 4)**.

Bud burst %:

A- Specific effect:

Concerning the specific effect of Dormex conc. it is quite evident as shown from **Table (3)** that all investigated conc. solutions *i.e.*, C_2 (0.5%), C_3 (1.0%), C_4 (2.0%) and C_5 (4.0%) significantly increased the bud burst % over the sprayed vines (control water 0.0 Dormex conc.) from one hand. Such increase was in positive significant relationship with Dormex concentration. Hence, the highest bud % was usually in concomitant to the 4.0% Dormex concentration, descend followed by 2.0, 1.0 and 0.5%. Such trend was true during both experimental seasons.

As for the specific effect of Dormex spraying date, **Table (3)** displays that bud burst % was also responded to such investigated factor. Herein, third spraying date *i.e.*, through the second week of January was the superior followed statistically in a descending order by spraying in 3rd week of January 1st week of January and last week of December. However, such trend was time during both seasons from one hand, but it could be safely said that the rate of response was obviously lower than that previously discussed with concentration, especially during 2nd seasons, whereas both 3rd and 4th spraying dates were equally of the same effectiveness from the statistical point of view.

B- Interaction effect:

It is quite clear that specific effect of each investigated factor (Dormex concentration and spraying date) was directly reflected on their combinations. Since, the 4.0% Dormex sprayed Flame seedless vines through the second week of January was exhibited the highest significant bud burst rate *i.e.*, 83.93 and 84.48% during 1st and 2nd experimental seasons, respectively. On the contrary, the four conc. of water sprayed vines (0.0% Dormex

/control) were statistically the inferior with bud sprouting rates ranged (62.25-62.68) and (63.53-64.13) % during 1st and 2nd seasons, respectively, irrespective of spraying date. In addition, other combinations were statistically in between the aforesaid two extremes. However, those combinations of either 4.0% Dormex sprayed vines through (1st, 2nd and 4th dates) or (4.0, 2.0 and 1.0% Dormex conc.) sprayed vines through third date (2nd week of January, exceeded significantly other combinations of such intermediate category, during 1st and 2nd seasons, respectively. Such modification rate of response to Dormex concentration rather that of spraying date.

Some vegetative growth measurements:

In this regard shoot length, No. of leaves/shoot, average leaf area, cane thickness and winter pruning wood weight were the five investigated growth parameters.

A- Specific effect:

Tables (3 and 4) display that all five growth measurements were affected specifically to both investigated factors and each parameter showed a variable degree of response and followed to some extent the same trend previously discussed with bud burst. Anyhow, rate of response was not equally the same with such growth parameters.

Nevertheless, the specific effect of Dormex conc., it is quite clear that average shoot length and leaf area both followed typically the same trend previously detected with bud sprouting % during two seasons of study. However, in three other growth measurements *i.e.*, number of leaves/shoot, cane thickness and winter pruning wood weight, differences between investigated Dormex conc. were relatively lower than that previously discussed with average shoot length and leaf area. In other words, two higher conc. (C_4 and C_5) in most cases surpassed statistically the two other Dormex conc. (C_3 and C_2), in spite of all (C_5, C_4, C_3, C_2), increased significantly these three parameters than control (C_1/water spray) during both seasons. Moreover, the least differences were obviously noticed with the number of leaves per shoot, whereas the control and the light Dormex conc. *i.e.*, (C_2 and C_3) or (C_2) didn't significant differ than control during 1st and 2nd seasons, respectively. As for the specific effect of spraying date, it is so clear that Dormex spraying date was also effective, however the rate of response was less pronounced than that previously discussed with the specific effect of Dormex concentration. Anyhow, it could be generally said that the 3rd spraying date (through 2nd week of January) was the superior with the five investigated growth parameters. The increase resulted by the Dormex spray through second week of January was significant with both shoot length and winter pruning wood weight, while it didn't reach level of significance with the three other growth parameters, especially as compared to the second spraying date (1st week of January).

On the other hand, the least values of the investigated five parameters were always in concentrate to these sprayed vines at the last week of December (1st date). However, the inferiority of spraying Dormex through the last week of December below other dates was significant with shoot length, leaf area and winter pruning wood weight, while with two other parameters (No. of leaves/shoot and cane thickness) both 1st and 4th dates were equally the same from the statistical point of view.

In addition, both 2nd and 4th spraying dates were in between the aforementioned superior (D_3) and inferior (D_1) from one hand and they didn't significantly differ as compared each other except with shoot length during 2nd season from the other.

B- Interaction effect:

Tables (3 and 4) display obviously that specific effect of each investigated factor reflected directly on their combinations. Hence the 4.0% Dormex sprayed vines through second week of January induced generally the highest values for the five investigated growth measurements. However, the superiority of such combination over other ones was significant with both shoot length and leaf area only. Meanwhile, with three other parameters *i.e.*, No. of leaves per shoot, cane thickness and winter pruning wood weight significance were absent. On the contrary water sprayed vines (regardless of application date) was the inferior. In addition, other combinations were in between, however an interesting relative tendency declared that some combinations, especially these three of 4.0% Dormex spray at either 1st or 3rd week of January, as well as spraying 2.0% Dormex through 3rd date in most cases exceeded other combinations of such intermediate category.

These results are in general agreement with the findings of several investigations on some important grape cultivars, **Kubota *et al.*, (2000)** on Thompson seedless, **El-Halaby (2006)** on Superior, **Mekawy (2008)** on Red Roomy. **Corrales-Maldonado *et al.* (2010)** on superior, **Hussein (2009)** on superior and **El-Sawy (2009)** on superior. All mentioned that Dormex was very effective for advancing and inducing uniform bud break, as well as improved bud burst %. Besides, they also added that an announced stimulation effect on the various growth measurements *i.e.*, shoot length, number of leaves/shoot, leaf area, winter pruning wood weight and cane thickness were resulted by Dormex application. Besides our results go partially with findings of **Kubota *et al.* (2000)** and **Abdalla (2007)** pertaining the specific effect of Dormex concentration. However, finding of **Mekawy (2008)** on Roomy Red grape cv. gave partial support to the present result.

Table 3. Specific and interaction effects of Dormex concentration and spraying dates on some growth parameters of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons

Dormex conc.	Bud burst (%)					Shoot length (cm)					No. leaves/shoot				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
								1st (2017/2018) season							
C1	62.25 n	62.38 n	62.50 n	62.68 n	62.45 E	93.53 o	94.70 o	95.48 o	95.58 o	94.82 E	13.20 a	13.48 a	14.11 a	13.39 a	13.54 B
C2	67.78m	69.15 l	71.03 j	69.73 k	69.42 D	97.08 n	98.33 m	101.58 l	98.15 m	98.78 D	13.18 a	13.46 a	14.09 a	13.37 a	13.53 B
C3	71.28 j	72.33 i	75.78 e	72.55 i	72.98 C	105.25 k	107.33 i	113.00 f	106.08 j	107.91 C	13.37 a	13.65 a	14.28 a	13.56 a	13.71AB
C4	73.78 h	74.48 g	77.93 d	74.90 f	75.27 B	109.73 h	112.78 e	117.43 b	111.97 g	112.97 B	13.70 a	13.98 a	14.61 a	13.89 a	14.04 A
C5	79.75 c	80.35 b	83.93 a	80.35 b	81.09 A	112.15 f	114.28 c	120.98 a	113.23 d	115.16 A	13.82 a	14.10 a	14.73 a	14.01 a	14.17 A
Mean**	70.97D	71.74C	74.23A	72.04 B	---------	103.55 C	105.48 B	109.69 A	105.00 B	----------	13.46C	13.73AB	14.36A	13.64BC	-------
								2nd (2018/2019) season							
C1	63.53 o	63.80 o	64.13 o	63.58 o	63.76 E	96.03 m	97.28 m	99.08 m	96.93 m	97.08 E	13.61 a	13.89 a	14.34 a	13.79 a	13.91 B
C2	68.75 n	70.55 m	73.65 k	71.13 l	71.02 D	100.90 l	105.83 j	115.03 h	104.63 k	106.59 D	13.82 a	14.10 a	14.56 a	14.01	14.12 AB
C3	74.70 j	75.50 i	79.58 c	75.00 j	76.19C	114.00 i	119.98 f	125.00 d	119.23 g	119.55 C	14.05 a	14.33 a	14.78 a	14.23 a	14.35 A
C4	75.63 i	76.68 g	82.35 b	76.40 h	77.76 B	122.65 e	124.75 d	132.25 b	122.75 e	125.60 B	14.07 a	14.35 a	14.80 a	14.25 a	14.37 A
C5	77.38 f	78.35 d	84.48 a	77.83 e	79.51 A	130.20 c	132.25 b	137.75 a	130.50 c	132.68 A	14.20 a	14.48 a	14.93 a	14.38 a	14.50 A
Mean**	72.00C	72.98 B	76.84A	72.79 B	--------	112.56 D	116.02 B	121.82 A	114.81 C	--------	13.95C	14.23AB	14.68A	14.13BC	--------

***&** refer to specific effect of 2 investigated factors *i.e.*, Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.**

D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

Table 4. Specific and interaction effects of Dormex concentration and spraying dates on some growth parameters of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons …… continue

Dormex conc.	Leaf area (cm^2)					Pruning wood weight (kg)					Cane thickness (mm)				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
								1st (2017/2018) season							
C1	106.28 p	109.85 n	110.04 n	108.12 o	108.57 E	1.97 f	2.00 f	2.05 f	1.99 f	2.00 D	15.47 i	15.71 i	16.03 i	15.63 i	15.71 D
C2	109.11 n	111.85 m	112.81 k	110.93 n	111.18 D	2.21 e	2.24 e	2.28de	2.23 e	2.24 C	16.88 h	17.13gh	17.48 g	17.05gh	17.13 C
C3	112.25 l	115.02 i	115.99 h	114.10 j	114.34 C	2.26cde	2.30cde	2.33cd	2.32cd	2.30 BC	18.07 f	18.34 ef	18.71de	18.25 ef	18.35 B
C4	115.10 i	117.90 f	118.88 e	116.96 g	117.21 B	2.47 b	2.51 b	2.51 b	2.40 b	2.50 AB	19.27cd	19.55bc	19.94ab	19.46bc	19.55 A
C5	119.46 d	122.32 b	123.32 a	121.36 c	121.62 A	2.61 a	2.61 a	2.70 a	2.63 a	2.64 A	19.85ab	20.14 a	20.52 a	20.04 a	20.14 A
Mean**	112.44 C	115.39AB	116.21 A	114.30 B	---------	2.30 C	2.33 B	2.37 A	2.33 B	-----	17.91 C	18.17 AB	18.54 A	18.09BC	------
								2nd (2018/2019) season							
C1	108.57 q	112.21 no	112.42no	110.45 p	110.91 E	1.99 f	2.03 f	2.07 ef	2.01 f	2.03 D	15.77 f	16.01 f	16.26 f	15.93 f	16.00 D
C2	111.44op	114.25 m	115.24 k	113.3 n	113.56 D	2.23 e	2.27 e	2.32de	2.25 e	2.27 C	17.21 e	17.47 e	17.73de	17.38 e	17.45 C
C3	114.63 l	117.47 i	118.47 h	116.52 j	116.77 C	2.30 de	2.36 cd	2.37cd	2.36cd	2.35 BC	18.43cd	18.71 c	18.98 c	18.61 c	18.68 B
C4	117.53 i	120.40 f	121.41 e	119.44 g	119.70 B	2.50 bc	2.55 bc	2.54bc	2.52bc	2.53 AB	19.55 b	19.84 b	20.12ab	19.74 b	19.81 A
C5	121.99 d	124.93 b	125.95 a	123.94 c	124.21 A	2.65 ab	2.66 ab	2.75 a	2.67ab	2.68 A	20.14ab	20.43 a	20.72 a	20.33 a	20.40 A
Mean**	114.83 C	117.85AB	118.70 A	116.73 B	--------	2.33 D	2.38 B	2.41 A	2.36BC	----	18.22 B	18.49AB	18.76 A	18.40 B	-------

***&** refer to specific effect of 2 investigated factors *i.e.*, Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.**

D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

These results are in general agreement with the findings of several investigations on some important grape cultivars, **Kubota *et al*., (2000)** on Thompson seedless, **El-Halaby (2006)** on Superior, **Mekawy (2008)** on Red Roomy. **Corrales-Maldonado *et al*. (2010)** on superior, **Hussein (2009)** on superior and **El-Sawy (2009)** on superior. All mentioned that Dormex was very effective for advancing and inducing uniform bud break, as well as improved bud burst %. Besides, they also added that an announced stimulation effect on the various growth measurements *i.e*., shoot length, number of leaves/shoot, leaf area, winter pruning wood weight and cane thickness were resulted by Dormex application. Besides our results go partially with findings of **Kubota *et al*. (2000)** and **Abdalla (2007)** pertaining the specific effect of Dormex concentration. However, finding of **Mekawy (2008)** on Roomy Red grape cv. gave partial support to the present result.

2- Vine productivity:

In this regard fruit set % as an earlier cropping indicator and the exact yield estimated either as number or weight of harvested clusters per an individual vine were the three productivity measurements pertaining their response to specific and interaction effects of 5 Dormex conc. combined with 4 spraying dates.

A- Specific effect:

Table (5) reveals that the three productivity measurements responded specifically to each investigated factor (concentration and spraying date). However, the rate of response varied not only from one measurement to another, but also specific effect of each investigated factor reflected its own degree of effectiveness in this concern, even within the same cropping parameter. Anyhow, differences due to specific effect of Dormex concentration were more pronounced than the analogous ones of spraying date. Such trend was true with three cropping measurements, especially yield expressed as weight of harvested clusters per vine. Herein, the four investigated Dormex conc. increased significantly yield expressed as weight of clusters/vine. Besides, the same trend was detected with the number of clusters/vine except with comparing the 4.0% and 2.0% conc. during 1st season, whereas both didn't significantly differ.

Meanwhile, specific effect of Dormex conc. fruit set % was the lightest. Since, higher Dormex conc. *i.e*., (4.0 and 2.0) and 4.0, 2.0 and 1.0) % didn't significantly differ as compared each other during 1st and 2nd seasons, respectively. Besides the lower Dormex conc. *i.e.*, (0.5) and (0.5 and 1.0) % didn't significantly vary than control (water spray) during 1st and 2nd seasons, respectively.

As for the specific effect of spraying date, it was so clear that the third date (through 2nd week of January) was generally the most favorable. The increases over three other dates (last week of December 1st and 3rd weeks of January) were significant with both yield measurements (weight and number of harvested clusters/vine). Meanwhile, with fruit set %, superiority of 3rd spraying date was significant with comparison to the 1st one only (last week of December).

B- Interaction effect:

It is quite evident as shown in **Table (5)** that, the specific effect of two investigated factors and their variable levels of effectiveness within a given productivity measurement were directly reflected on their possible combinations. Hence, for both yield measurement (number and weight of harvested clusters/vine), the 4.0% Dormex sprayed vines through 2nd week of January was statistically the most effective, whereas the highest values *i.e*., (39.35 and 43.73 clusters) and (17.32 and 20.18 kg) per vines were resulted during 1st and 2nd seasons, respectively. The reverse was true with the water, sprayed vines where the least yield values were induced, regardless of spraying dates. In addition, other combinations were in between.

On the other hand, interaction effect on fruit set % was less pronounced, whereas four combinations of two higher Dormex conc. (4.0%) during two seasons and (2.0%).

Particularly 1st season in most cases were the superior. On the contrary, eight combinations of water spray and the least Dormex conc. (0.5%) were the inferior and induced the same values of fruit set % from the statistical standpoint. In addition, four combinations of 1.0% Dormex conc. were in between the aforesaid two extremes.

Obtained results concerning the simulative effect of Dormex application on various productivity aspects could be logically explained upon its beneficial effect on increasing buds burst and promoting an earlier uniform buds sprouting. Which certainly would be reflected positively, quantitatively, and qualitatively on cropping. Moreover, findings of **Serag El-Deen (2002)** and **El-Halably (2006)** gave support to our results.

3. Fruit quality:

3.1. Fruit physical properties:

Cluster weight, 100 berries weight, shot berries % and berry dimensions (length and diameter) were the five concerned physical characteristics.

A- Specific effect:

Data obtained during both seasons as shown in **Tables (6 and 7)** displayed that the response of such five evaluated fruit physical characteristics considerably varied from one measurement to another. Anyhow, specific effect of Dormex conc. followed two conflicted trends. Herein the trend was positively related to Dormex conc. and showed either clear or moderate changes with cluster weight and (100 berries weight & berry dimensions),

Table 5. Specific and interaction effects of Dormex concentration and spraying dates on some productivity measurements of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons

Dormex conc.	Fruit set (%)					Yield as No. clusters/vine					Yield as kg/vine				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
						1st (2017/2018) season									
C1	8.71d	8.93d	8.98d	8.85d	8.87C	27.25m	27.70m	27.55m	27.35 m	27.46 D	8.61 k	8.75 k	8.77 k	8.67 k	8.70 E
C2	8.79 d	9.01 d	9.06 d	8.93 d	8.95 C	30.80 l	31.73 k	32.90 j	31.60 k	31.76 C	10.52 j	11.19 i	12.11 h	10.99 ij	11.20 D
C3	9.45 c	9.67 c	9.72 bc	9.59 c	9.61 B	33.98 i	35.15 g	35.80 f	34.63 h	34.89 B	12.49 h	13.59 g	14.27 f	13.30 g	13.41 C
C4	9.87 b	10.09 ab	10.13 a	10.01 ab	10.02 A	36.80 e	37.15 d	38.08 bc	36.90 e	37.23 A	14.69 ef	15.14 e	16.49 b	14.77 ef	15.28 B
C5	10.06 a	10.28 a	10.33 a	10.20 a	10.22 A	37.90 c	38.30 b	39.35 a	37.98 c	38.38 A	15.27 de	15.97 bc	17.32 a	15.78 cd	16.09 A
Mean**	9.38 B	9.59 AB	9.64 A	9.52 AB	----------	33.35 B	34.01 AB	34.74 A	33.69 B	---------	12.32 C	12.93 B	13.79 A	12.70 BC	---------
						2nd (2018/2019) season									
C1	7.20 e	7.31 e	7.59 cd	7.28 e	7.35 B	28.85 m	29.10 m	31.10 l	28.75 m	29.45 E	9.22 l	9.48 kl	10.15 k	9.40 kl	9.56 E
C2	7.28 e	7.50 de	7.66 cd	7.35 e	7.45 B	32.08 k	33.13 j	34.40 i	32.43 k	33.01 D	11.40 j	11.91 j	12.88 i	11.58 j	11.94 D
C3	7.44 de	7.66 cd	7.82 bc	7.51 cde	7.61 AB	38.50 h	39.50 g	41.08 e	38.68 h	39.44 C	14.45 h	15.22 g	16.30 f	14.69 gh	15.17 C
C4	7.62 cd	7.84 bc	8.00 ab	7.69 c	7.79 A	39.33 g	40.10 f	41.83 d	39.70 fg	40.24 B	16.20 f	17.04 e	18.67 c	16.68 ef	17.15 B
C5	7.79 bc	8.01 a	8.17 a	7.86 ab	7.96 A	41.65 cd	42.23 bc	43.33 a	43.73 a	42.73 A	17.82 d	19.01 bc	20.18 a	19.30 b	19.08 A
Mean**	7.46 B	7.67 AB	7.85 A	7.54 AB	-------	36.08 B	36.81 B	38.35 A	36.66 B	--------	13.82 C	14.53 B	15.64 A	14.33 BC	------

***&** refer to specific effect of 2 investigated factors *i.e.*, Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.**

D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

Table 6. Specific and interaction effects of Dormex concentration and spraying dates on some fruit physical properties of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons

Dormex conc.	Fruit physical properties (cluster & 100 berries wt.) and shot berries %														
	Average cluster weight (g)					Weight of 100 berries					Shot berries (%)				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
						1st (2017/2018) season									
C1	315.75 i	315.75 i	318.25 i	317.00 i	316.69 D	390.60 a	399.82 a	401.93 a	396.59 a	397.23 C	7.52 a	7.49 a	7.33 a	7.43 a	7.44 A
C2	341.25 h	352.50 gh	368.00 fg	347.50 h	352.31 C	395.17 a	404.39 a	406.50 a	401.16 a	401.80 C	7.40 a	7.36 a	7.21 a	7.31 a	7.32 A
C3	367.25 fg	386.50 ef	398.63 de	384.00 ef	384.09 B	401.43 a	410.65 a	412.76 a	407.42 a	408.06BC	7.31 a	7.28 a	7.12 a	7.22 a	7.23 AB
C4	399.25 de	407.50 cd	433.00 a	400.25 de	410.00 A	406.27 a	415.50 a	417.60 a	412.26 a	412.91AB	7.24 a	7.20 a	7.04 a	7.15 a	7.16 B
C5	402.75 cd	417.00 bc	440.00 a	415.50 c	418.81 A	415.16 a	424.38 a	426.49 a	421.15 a	421.80 A	6.97 a	6.93 a	6.77 a	6.88 a	6.89 C
Mean**	365.25 B	375.85 B	391.58 A	372.85 B	--------	401.73 B	410.95 A	413.06 A	407.71AB	-----	7.29 A	7.25 A	7.09 A	7.20 A	-------
						2nd (2018/2019) season									
C1	319.50 i	325.50 i	326.25 i	326.75 i	324.50 E	402.14 a	411.72 a	413.91 a	408.36 a	409.03 C	7.15 a	7.11 a	6.95 a	7.06 a	7.07 A
C2	355.25 h	359.25 h	374.25 gh	356.75 h	361.38 D	410.57 a	420.15 a	422.34 a	416.78 a	417.46 C	7.22 a	7.18 a	7.03 a	7.13 a	7.14 A
C3	375.25 g	385.25 fg	396.75 ef	379.75 fg	384.25 C	417.07 a	426.65 a	428.84 a	423.29 a	423.96 B	7.34 a	7.30 a	7.15 a	7.25 a	7.26 A
C4	411.75 de	425.00 cd	446.25 b	420.00 d	425.75 B	422.10 a	431.68 a	433.87 a	428.32 a	429.00AB	7.11 a	7.08 a	6.92 a	7.02 a	7.03 A
C5	427.50 cd	450.25 ab	465.75 a	441.25 bc	446.19 A	431.34 a	440.92 a	443.11 a	437.56 a	438.23 A	5.99 a	5.95 a	5.79 a	5.90 a	5.91 B
Mean**	377.85 B	389.05AB	401.85 A	384.90 B	-----	416.64 B	426.22 B	428.41 A	422.86AB	--------	6.96 A	6.93 A	6.77 A	6.87 A	------

***&** refer to specific effect of 2 investigated factors *i.e.*, Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.**

D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

Table 7. Specific and interaction effects of Dormex concentration and spraying dates on berry dimensions of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons

Dormex conc.	Fruit physical properties									
	Berry length (mm)					Berry width (mm)				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
	1st (2017/2018) season									
C1	19.52a	19.98 a	20.09 a	19.85 a	19.82 C	18.30 a	18.73 a	18.83 a	18.58 a	18.61 E
C2	19.71a	20.17 a	20.27 a	20.04 a	20.01 BC	18.48 a	18.91 a	19.01 a	18.76 a	18.79 D
C3	20.02a	20.48 a	20.58 a	20.35 a	20.32 B	18.77 a	19.20 a	19.30 a	19.05 a	19.08 C
C4	20.53a	20.99 a	21.10 a	20.86 a	20.83 AB	19.06 a	19.49 a	19.59 a	19.34 a	19.37 B
C5	21.19a	21.65 a	21.75 a	21.52 a	21.49 A	19.67 a	20.10 a	20.20 a	19.95 a	19.98 A
Mean**	20.19B	20.65A	20.76A	20.52AB	---------	18.85B	19.29A	19.38A	19.13AB	-------
	2nd (2018/2019) season									
C1	20.06a	20.53 a	20.64 a	20.40 a	20.37 B	18.48 a	18.91 a	19.01 a	18.76 a	18.79 E
C2	20.32a	20.80 a	20.91 a	20.66 a	20.63 B	18.68 a	19.12 a	19.22 a	18.96 a	18.99 D
C3	20.64a	21.12 a	21.23 a	20.99 a	20.95 B	18.98 a	19.41 a	19.51 a	19.26 a	19.29 C
C4	20.89a	21.37 a	21.48 a	21.24 a	21.20 AB	19.21 a	19.64 a	19.74 a	19.49 a	19.52 B
C5	21.35a	21.83 a	21.93 a	21.69 a	21.66 A	19.63 a	20.06 a	20.16 a	19.91 a	19.94 A
Mean**	20.65B	21.13A	21.24A	21.00AB	--------	18.99B	19.43A	19.53	19.28AB	-------

*&** refer to specific effect of 2 investigated factors *i.e.*, Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.

D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

respectively. Meanwhile, the trend took the other way around with the shot berries %. In other words, the highest Dormex conc. (4.0%) resulted in the highest cluster weight, 100 berries weight and both berry dimensions, while the reverse was true with the shot berries %. Differences between 5 Dormex conc. were pronounced and significant with cluster weight and berry diameter. However, with 100 berries weight and berry length as well as shot berries % differences were relatively slighter and not significant except with comparing the 4.0% concentration with either (2.0, 1.0 and 0.0 %) or all other concentrations, respectively.

As for the specific effect of spraying date, however the response was less pronounced than that previously discussed with concentration. On the other hand, it could be noticed generally that the 2nd of January week was more suitable, despite such superiority was significant. Over other spraying dates with the average cluster weight only, while with 100 berries weight both berry dimensions such date exceeded only the last week of December spray. In addition, with the shot berries % differences were completely absent with comparing four spraying dates each other from the statistical point of view during both seasons.

B- Interaction effect:

The specific effect of both investigated factors on different evaluated 5 fruit physical characteristics were directly reflected on their possible combinations. Herein, the highest values of these five parameters were resulted by the 4.0% Dormex sprayed vine through the 2nd week of January, except shot berries the opposite was true. The differences were significant with average cluster weight only, while with four other fruit physical properties the significance was completely absent.

3.2. Fruit chemical properties:

The berries juice total soluble solids and total sugars percentages were the two fruit chemical properties investigated regarding the response to specific and interaction effects of Dormex spray concentration and application date.

A- Specific effect:

Table (8) declares that, both berries juice TSS and total sugars % responded specifically to the investigated factors (Dormex conc. and spraying date) and both properties followed to great extent the same trend. However, the rate of changes due to Dormex conc. was obviously higher than that of spraying date. Nevertheless, simulative effect of Dormex spray to increase both TSS% and total sugars % was in positive relationship with Dormex conc., whereas the 4.0% Dormex concentration was statistically the superior and exceeded other investigated conc. *i.e.*, (2.0, 1.0 and 0.5%).

As for, the specific effect of spraying date differences were relatively lighter, whereas two spraying dates through either 1st or 2nd week of January were generally more suitable from one hand and did not significantly differ as compared each other even with that sprayed through 3rd week of January particularly for the total sugars % during both seasons.

Table 8. Specific and interaction effects of Dormex concentration and spraying dates on some fruit juice chemical properties of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons

Dormex conc.	Fruit juice chemical properties									
	T.S.S. (%)					Total sugar (%)				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
	1st (2017/2018) season									
C1	18.36i	18.77ghi	18.94efg	18.63ghi	18.67 C	16.04h	16.45 fg	16.51fg	16.29gh	16.32 D
C2	18.55hi	18.96efg	19.13efg	18.82fgh	18.86 C	16.22gh	16.63 ef	16.68def	16.46 fg	16.50CD
C3	18.88fgh	19.29def	19.45cde	19.14 efg	19.19 BC	16.54 f	16.95cde	17.01 cd	16.79 def	16.82BC
C4	19.35de	19.76cd	19.93bc	19.62 cd	19.66 B	16.74def	17.15 c	17.20 bc	16.99 cde	17.02 B
C5	19.94bc	20.35a	20.51a	20.21 ab	20.25 A	17.27 bc	17.68 a	17.73 a	17.52 ab	17.55 A
Mean**	19.02C	19.43A	19.59 B	19.28 BC	-------	16.56 B	16.97 A	17.03 A	16.81 A	--------
	2nd (2018/2019) season									
C1	18.49e	18.91e	19.00 de	18.76 e	18.79 E	16.20 g	16.58 ef	16.67 ef	16.44 fg	16.47 D
C2	18.76d	19.17d	19.27d	19.03 d	19.06DE	16.42 fg	16.81ef	16.89 de	16.67 ef	16.70CD
C3	19.04d	19.45cd	19.55bcd	19.31 cd	19.34 CD	16.68 cd	17.07cd	17.15bcd	16.93 df	16.96BC
C4	19.26d	19.67abc	19.77abc	19.52bcd	19.55 BC	16.88 bc	17.27 bc	17.35 abc	17.13bcd	17.16AB
C5	19.66abc	20.07a	20.16a	19.92 ab	19.95 A	17.25 a	17.64 a	17.72 a	17.50 ab	17.53 A
Mean**	19.04 C	19.45 AB	19.55A	19.31 BC	------	16.69 B	17.07 A	17.16 A	16.94AB	--------

***&** refer to specific effect of 2 investigated factors i.e., Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.**

D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

On the contrary spraying Dormex through the last week of December was significantly the inferior for both juice chemical parameters with very scarce exceptions especially with comparison to the last spraying date (3rd week of January) during two seasons and 1st season as TSS and total sugars percentages were concerned, respectively.

B- Interaction effect:

It is quite evident as shown in **Table (8)** that the 4.0% Dormex sprayed Flame seedless vines through either 1st, 2nd or 3rd weeks of January were the superior and showed significantly the highest TSS and total sugars values. In spite of the 4.0% Dormex spray through 2nd week of January tended relatively to be more effective than two other superior combinations from one hand and differences between such three superior (effective) combinations were completely absent as compared each other from the statistical standpoint. On the contrary, and combinations of both 0.0 (water spray) and 0.5% Dormex conc. were the inferior. Such trends of superiority and inferiority of different Dormex combinations were true during both seasons for berries TSS% and total sugars %.

The beneficial effect of Dormex spray (conc. and application date) on Flame seedless fruit quality (physical and chemical) could be logically explained on the stimulative effect of Dormex application on increasing bud sprouting and improving variable growth measurements which guarantee a sufficient leaf area (photosynthesize means) through earlier uniform bud rest breaking. Moreover, findings of several investigators gave support to such results, **Mekawy (2008), El-Sawy (2009)** and **Hussein (2009)** regarding the different fruit quality characteristics.

4. Nutritional status (leaf N, P, K, Ca, Mg and Fe contents):

Data obtained during both (2017-18) and (2018-19) experimental seasons regarding the response to Dormex spray treatments at various 5 conc. and 4 application dates are presented in **Tables (9 and 10)**.

A- Specific effect:

Regarding the specific effect of Dormex conc., the response was not too pronounced and didn't follow specific firm trend with such 6 evaluated nutrient elements, where two trends were detected. Herein the 1st trend pointed out that Dormex application decreased leaf N, P and K content below control. Such reduction was significant for both leaf N and P% irrespective of Dormex concentration from one hand and the four 0.0, 1.0, 2.0 and 4.0% conc. did not statistically differ as compared each other during two seasons. Meanwhile, the decrease in leaf K% in most cases was insignificant. The second trend was dealing with the leaf Ca, Mg and Fe contents, whereas the different Dormex conc. were approximately the same and in general did not significantly differ either compared each other or with water spray (control) during both seasons.

Referring the specific effect of Dormex spraying date, it was quite clear that no significant difference could be noticed with comparison four dates each other during both seasons for the 6 evaluated leaf N, P, K, Ca, Mg and Fe contents..

Table 9. Specific and interaction effects of Dormex concentration and spraying dates on leaf N, P and K content of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons

Dormex conc.	Leaf nutrient elements contents														
	N (%)					P (%)					K (%)				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
								1st (2017/2018) season							
C1	1.38 ab	1.40 a	1.45 a	1.40 a	1.41 A	0.23abc	0.23 abc	0.25 a	0.23 abc	0.24 A	1.35 a	1.38 a	1.41 a	1.37 a	1.38 A
C2	1.26 bc	1.28 c	1.32 b	1.27c	1.28 B	0.22bcd	0.23 abc	0.25 a	0.22 bcd	0.23 AB	1.31 a	1.34 a	1.37 a	1.33 a	1.37 AB
C3	1.22 c	1.24 c	1.28 c	1.24 c	1.25 B	0.21 cd	0.22 bcd	0.24 ab	0.21 cd	0.22 BB	1.27 a	1.30 a	1.34 a	1.29 a	1.34 B
C4	1.23 c	1.25 c	1.28 c	1.24c	1.25 B	0.20 d	0.20 d	0.22bcd	0.20 d	0.20 C	1.31 a	1.34 a	1.37 a	1.33 a	1.33 AB
C5	1.24 c	1.26 c	1.30 b	1.25 c	1.26 B	0.20 d	0.20 d	0.22bcd	0.20d	0.20 C	1.34 a	1.37 a	1.40 a	1.36 a	1.30 AB
Mean**	1.27A	1.29 A	1.33 A	1.28 A	------	0.21 A	0.22 A	0.23 A	0.21 A	------	1.32 A	1.35 A	1.38 A	1.34 A	-----
								2nd (2018/2019) season							
C1	1.41 ab	1.45 a	1.48 a	1.42 ab	1.44 A	0.23abc	0.23 abc	0.25 a	0.23 abc	0.23 A	1.37 a	1.43 a	1.47 a	1.39 a	1.43 A
C2	1.28 c	1.32 bc	1.35 bc	1.29 c	1.31 B	0.22abc	0.22 abc	0.24 ab	0.22 abc	0.23 A	1.35 a	1.41 a	1.45 a	1.37 a	1.42 A
C3	1.26 c	1.30 bc	1.33 bc	1.27 c	1.29 B	0.21bcd	0.21 bcd	0.23abc	0.21 bcd	0.22 AB	1.34 a	1.40 a	1.43 a	1.36 a	1.40 AB
C4	1.26 c	1.29 c	1.32 bc	1.27 c	1.28 B	0.19 d	0.20 cd	0.21bcd	0.19 d	0.20 B	1.36 a	1.41 a	1.45 a	1.38 a	1.40 AB
C5	1.27 c	1.31 b	1.33 b	1.28 c	1.30 B	0.19 d	0.20 cd	0.22abc	0.19 d	0.20 B	1.39 a	1.45 a	1.48 a	1.41 a	1.38B
Mean**	1.29 A	1.33 A	1.36 A	1.31 A	-------	0.21 A	0.21 A	0.23 A	0.21 A	------	1.36 B	1.42 AB	1.45 A	1.38 B	------

***&** refer to specific effect of 2 investigated factors *i.e.*, Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.**
D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

Table 10. Specific and interaction effects of Dormex concentration and spraying dates on leaf Ca, Mg and Fe content of Flame seedless grape vines during (2017/2018) and (2018/2019) seasons

Dormex conc.	Leaf nutrient elements contents														
	Ca (%)					Mg (%)					Fe (ppm)				
	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*	D1	D2	D3	D4	Mean*
								1st (2017/2018) season							
C1	1.04 a	1.06 a	1.07 a	1.05 a	1.05 B	0.30 a	0.31 a	0.33 a	0.30 a	0.31 A	103.66 a	105.24 a	106.66 a	104.71 a	105.07 A
C2	1.05 a	1.07 a	1.08 a	1.06 a	1.07 B	0.31 a	0.32 a	0.34 a	0.31 a	0.32 A	104.69 a	106.27 a	107.70 a	105.75 a	106.10 A
C3	1.06 a	1.08 a	1.09 a	1.07 a	1.08 AB	0.29 a	0.30 a	0.32 a	0.29 a	0.30 A	106.35 a	107.93 a	109.35 a	107.40 a	107.76 A
C4	1.08 a	1.10 a	1.11 a	1.09 a	1.09 A	0.30 a	0.31 a	0.33 a	0.30 a	0.31A	107.64 a	109.22 a	110.64 a	108.69 a	109.04 A
C5	1.10 a	1.12 a	1.13 a	1.11 a	1.12 A	0.31a	0.32 a	0.34 a	0.31 a	0.32 A	109.99 a	111.57 a	112.99 a	111.04 a	111.40 A
Mean**	1.07A	1.08A	1.09A	1.08A	--------	0.30A	0.31A	0.33A	0.30A	-------	106.47 A	108.05 A	109.47 A	107.52 A	---------
								2nd (2018/2019) season							
C1	1.06 a	1.08 a	1.10 a	1.07 a	1.08 E	0.31 a	0.32 a	0.34 a	0.31 a	0.32A	105.69 a	108.18 a	108.75 a	107.31 a	107.48 A
C2	1.07 a	1.09 a	1.11 a	1.08 a	1.09 D	0.32 a	0.32 a	0.35 a	0.32 a	0.33A	106.75 a	109.24 a	109.81 a	108.36 a	108.54 A
C3	1.08 a	1.10 a	1.12 a	1.09 a	1.10 C	0.30 a	0.31 a	0.33 a	0.30 a	0.31A	108.44 a	110.93 a	111.50 a	110.05 a	110.23 A
C4	1.11 a	1.13 a	1.15 a	1.12 a	1.13 B	0.29 a	0.30 a	0.32 a	0.30 a	0.30A	109.75 a	112.24 a	112.81 a	111.36 a	111.54 A
C5	1.13 a	1.15 a	1.17 a	1.15 a	1.15 A	0.32 a	0.32 a	0.34 a	0.32 a	0.33A	112.15 a	114.64 a	115.21 a	113.77a	113.94 A
Mean**	1.09A	1.11A	1.13A	1.10A	-------	0.31A	0.31A	0.33A	0.31A	-------	108.55 A	111.04 A	111.61 A	110.17 A	---------

***&** refer to specific effect of 2 investigated factors *i.e.*, Dormex conc. & spraying date, respect. Means of either two factors (each solely) or their combinations followed by the same capital or small letter/s for each parameter within the same season were not significant at 5% level.**
D1: Dec. last week D2: Jan. 1st week D3: Jan. 2nd week D4: Jan. 3rd week

B- Interaction effects:

No interaction effect was resulted pertaining the leaf N, P, K, Ca, Mg and Fe contents during two seasons of study. The response of the nutritional status (leaf N, P, K, Ca, Mg and Fe contents) to Dormex application may be attributed to the dilution effect resulted by one or both the two following seasons.

1- Increasing the accumulation rate of dry matter (mainly carbohydrates) resulted by stimulation the photosynthesize area which paralleled to the stable absorption rate of these 6 nutrient elements.

2- The mobility nature of such 6 elements *i.e.*, the highly mobile group (N, P, K) and the immobile (Ca, Mg, Fe). Since, the highly mobile N, P, K elements translocate easily from the older organs to younger ones, while with Ca, Mg and Fe translocation is too hard or very slow.

So, such results disagree with **Omar and Girgis (2004)** and **El-Sawy (2009)**. It could be safely recommended that, under the environmental condition of Luxor Governorate it is so necessary to spray Flame seedless vineyards with 4.0% Dormex solution through the 2nd week of January to improve bud burst growth productivity and fruit quality of such grape cv.

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تأثير التركيز وموعد الرش بالدورمكس على كرمات عنب الفليم سيدلس المثمرة

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أجريت هذه الدراسة على كرمات عنب فليم سيدلس مثمرة نامية بمركز أسنا – محافظة الأقصر خلال موسمى 2017–2018 و 2018–2019 لدراسة التأثير النوعى لكل من تركيز الدورمكس (أربعة تركيزات 0.5، 1.0، 2.0 و 4.0% بالإضافة للماء كمقارنة) وموعد الرش (أربعة مواعيد خلال الأسبوع الأخير من ديسمبر، الأول، الثانى والثالث من يناير) وتأثير التفاعل للتراكيب العشرين الممكنة بين عاملى الاختبار. وقد قيمت النتائج بناءا على مدى الاستجابة لبعض القياسات التالية:

1- نسبة تفتح البراعم وأهم القياسات الخضرية (طول الفرخ وعدد الأوراق للفرخ، مساحة الورقة ، سمك القصبات ووزن خشب التقليم الشتوى للكرمة).
2- بعض قياسات الانتاجية (نسبة العقد والمحصول) إما كعدد أو وزن لعناقيد الكرمة الواحدة.
3- صفات الجودة سواء طبيعية (وزن العنقود ، وزن الـ 100 حبة ، أبعاد الحبة ونسبة الحبات الصغيرة) أو كيميائية (نسبة المواد الصلبة الذائبة والسكريات الكلية).
4- الحالة الغذائية(محتوى الأوراق من العناصر النيتروجين،الفوسفور،البوتاسيوم،الكالسيوم ، الماغنسيوم والحديد) .

قد أظهرت الدراسة أن معظم هذه القياسات قد استجابت نوعيا لعاملى الاختبار، حيث كان التركيز 4.0% هو الأكثر كفاءة وأن الرش خلال الأسبوع الثانى من يناير هو الأنسب. هذا وقد تباينت معدلات الاستجابة فكانت أكثر وضوحا لتأثير التركيز عنه لموعد الرش مما انعكس ذلك بدوره على تأثير التفاعل ، كما أن القياسات المختلفة قد تفاوتت فى معدل الاستجابة فكان معدل الاستجابة أوضح مع كل من نسب تفتح البراعم وطول الفرخ ومساحة الورقة ونسبة العقد والمحصول (عدد أو وزن) وإلى حد كبير وزن العنقود والحبات ونسبة الحبيبات الصغيرة كذلك المواد الصلبة الذائبة (TSS) والسكريات الكلية وعموما فإن التأثير النوعى للتركيز فى علاقة طردية مع تلك القياسات ماعدا نسبة الحبيبات فكانت العلاقة عكسية.

وعليه فإن الرش بتركيز 4.0% فى الأسبوع الثانى من يناير كان يمثل أكثر التراكيب فعالية. أما عن باقي القياسات فكانت درجة الاستجابة أقل مثل عدد الأوراق وأبعاد الحبة . كذلك فإن الحالة الغذائية (محتوى الأوراق من العناصر) فأظهرت النتائج أن كل النيتروجين والفوسفور وإلى حد ما البوتاسيوم اتجاها عكسيا لما سبق ذكره بينما محتوى الأوراق من كل من الكالسيوم ، الماغنسيوم والحديد لم تظهر استجابة تذكر فى هذا الصدد.

وعليه يمكن أن يوصى برش مزارع العنب صنف فليم سيدلس النامية تحت نفس ظروف التجربة برش الدورمكس بتركيز 4.0% فى الأسبوع الثانى من يناير.