EFFECT OF MEPIQUAT CHLORIDE AND SOME ANTI-TRANSPIRATION AGENTS ON GROWTH AND PRODUCTIVITY OF FLAME SEEDLESS GRAPEVINE UNDER HEAT STRESS CONDITIONS

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A A field trial was conducted throughout the 2021 and 2022 seasons on "Flame seedless" grapevine cultivated in sandy soil. Grapevines were irrigated from a well with a drip irrigation system at an orchard in El-Farafrah Oasis in the New Valley Governorate, Egypt. The aim of this study is to investigate the effects of foliar spray with three rates of mepiquat chloride (0, 200, and 300 ppm) and five different concentrations of anti-transpiration (0, 10 cm/l glycerol, 15 cm/l glycerol, 2 and 4 cm/l Green Miracle) and their combinations on vegetative characteristics, yield and fruit quality of Flame seedless grapevine. Obtained results showed that untreated plants with mepiquat chloride combined with Green Miracle at 4 cm/l decreased shoot length, number of leaves/shoot and leaf area. Meanwhile, mepiquat chloride at 300 ppm combined with Green Miracle at 4 cm/l had statistically the highest productivity measurements and improving cluster and berry quality of Flame seedless grapevines under the circumstances of this study.

Keywords: Flame seedless, mepiquat chloride, Green Miracle, glycerol, growth, productivity, heat stress

INTRODUCTION

Grapes (*Vitis vinifera* L.), the first major fruit crop globally, are renowned for their excellent flavor, taste, and nutritional value and ranking third in Egypt. The possible impact of upcoming climate change includes annual temperature increases and an accumulation of extreme weather occurrences, like regular, intense heat waves, which the global warming to occur (El-Salhy et al., 2021). Another major obstacles to expanding grape vineyard growth on recently reclaimed lands is high temperatures. Extreme temperatures can be highly harmful to the grapevine. Abiotic stressors, especially heat have become more harmful to

viticulture slowing down maturity by 50%, delaying harvest, reducing photosynthesis by 35%, and increasing transpiration as well as increasing sunburn and wilting berries (Myers et al., 2017 and Venios et al. 2020). The most important plant function that is either directly or indirectly impacted by temperature is photosynthesis. Stomata conductance and water-use efficiency may be considerably reduced by heat stress, which is frequently accompanied by drought (Biasi et al., 2019). Several attempts have been made to limit plant growth, which limits the exposed surface of the plant and may reduce water loss, to mitigate the negative effects of heat stress on the yield and berries quality of grapevines growing under heat stress circumstances. Mepiquat chloride (MC), one of their substance's growth retardants, can be applied to achieve this. During blooming and berries growth of grapevine, high temperatures can reduce berry growth, berry sugar accumulation, and yield as well as delayed fruit harvest (Greer and Weston, 2010). MC was first registered by BASF under the name Pix (Casteel, 2004). It was discovered that MC inhibits internode elongation by decreasing gibberellic acid (GA) levels in the plant, which regulates vegetative and reproductive growth (Halmann, 1990). Cahoon et al. (1991) found that vines treated with MC increased berry sets and yield. Lim et al. (2004) mentioned that Kyoho grapes treated with MC alone and/or in conjunction with GA decreased shoot growth, enhanced cluster weight, berry size, and one week's early fruit maturity. Abdel-Mohsen (2015) suggested that MC treatments at 150 or 200 ppm improved the number of clusters/vine, average berry or brunch weight, and yield of vines as well as intensified the internal light rays of the vine canopy. Hanaa and Samia (2014) indicated that MC spraying at 150 and 250 ppm increased leaf chlorophyll content and enhanced fruit quality of five-year-old 'Le Conte' pear trees. Zaen El-Daen (2019) reported that MC foliar spray at 150 ppm improved fruit weight, flesh weight, and fruit total sugars of peach trees. On the other hand, MC foliar sprays at 300 ppm increment fruit total soluble solids (TSS) and it reduced shoot length, leaf dimension, leaf area, and total fruit juice acidity.

Also, to alleviate the heat stress and maintain acceptable yield, different substances treatments and cultivation practices have been examined. Glycerol, a low-cost byproduct of biodiesel production, is a safe, edible, biodegradable sugar alcohol and eco-friendly agrochemical. Despite its limited presence in higher plants, exogenous application of glycerol can significantly affect plant growth (Baba et al., 2013 and Tisserat and Stuff, 2011). Prakash and Ramachandran (2000) classified glycerol as an anti-transpiration agent into three groups. The first group includes film-forming kinds, such as glycerol. Secondly, stomatal closure types such as $MgCO_3$ and Na_2CO_3, which have an impact on the metabolic processes in leaf tissues, and thirdly, reflecting materials that reflect the radiation falling on the upper surface of the leaves. Abdel Gawad (2015) found that the

growth parameter, bunch weight and bunch characteristics of Grand Nain banana significantly varied in response to spraying some anti-transpirant (potassium silicate - aluminum silicate - Green Miracle - glycerol) as compared with untreated control.

Green Miracle agent is a reflecting new-generation anti-transpirant. It is made from vegetable oil (long-chain fatty alcohol) and it is not edible (El-Gioushy et al., 2017). When plant foliar is sprayed with Green Miracle, it makes a thin glassy film coat on leaves which reflects the sun's rays' "visible light" to avoid the thermic effect of light on plant tissue. El-Gioushy et al. (2017) found that foliar spray with Green Miracle at 3 cm/l increased the number of fruits, fruit weight, yield, and vitamin C content as well as reduced sunburnt fruits/trees of "Keitt" mango trees.

Thus, the goal of this study was to investigate the effect of three MC foliar sprays (0, 100, and 200 ppm) and five concentrations of anti-transpiration agents and their interaction on vegetative growth, yield, and fruit quality of Flame seedless grapevine under heat stress of El-Farafrah Oasis of the New Valley Governorate, Egypt.

MATERIALS AND METHODS

The current investigation was conducted during the two successive seasons 2021 and 2022 in a private grapevine orchard, at the El-Farafrah oasis in the New Valley Governorate of Egypt. Seven years old Flame seedless grapevine grown in sandy soil, and spaced 1.5 x 3 m apart under a drip irrigation system from a well was devoted to this study. Physical and chemical analyses of the experimental soil are shown in Table (1). Moreover, the chemical analysis of the used water for irrigation is shown in Table (2), whereas Table (3) displays average monthly air temperature and relative humidity data for the two seasons under study. Vines were trained to cane pruning under the "double cordon technique" system and pruned on the 15th December with sixteen fruiting spurs with three buds each and four replacement spurs, with two buds each were left per vine beside sprayed dromix in the first week of January. In this experiment, ninety healthy vines were chosen with care. These vines were subjected to the same annual regular horticulture management. The current study used a factorial design with two factors: three rates of MC spraying (0, 200, and 300 ppm) formed the first factor as a growth retardant, and five levels of glycerol and Green Miracle spray (0, 10 and 15 cm/l glycerol, 2 cm/l and 4 cm/l Green Miracle) formed the second factor as anti-transpiration. Three replicates of each treatment were used in the randomized complete block design system, and each replication was represented by two vines.

MC foliar spray was carried out at one time before full blooming. Additionally, foliar spraying with glycerol and Green Miracle treatments was done twice: the first time during the fruit set and the second time, four weeks later. In the meantime, tap water was sprayed on the control vines at the aforementioned times.

Table (1). Analysis of experimental soil.

Soil depth (cm)	Texture class	pH soil past	EC (ppm)	$CaCO_3$ %	Soluble cations (meq/l)				Soluble anions (meq/l)		
					Ca^{++}	K^{+}	Na^{+}	Mg^{++}	Cl^{-}	$SO_4^{=}$	CO_3+ HCO_3
0-30	Sand	7.86	1910	8.05	7.9	1.0	18.0	3.1	20	9.8	0.2
30-60	Sand	7.89	1960	7.15	8.2	1.2	18.5	3.1	20.8	10.0	0.2

Table (2). Chemical analysis of water used for irrigation.

pH	E.C. (dSm^{-1})	Soluble cations (meq/l)				Soluble anions (meq/l)		
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Cl^{-}	CO_3^{-}	HCO_3
7.06	0.33	0.58	0.92	1.06	0.60	1.70	*	1.18

Table (3). Monthly air temperature and relative humidity during the two seasons under study.

Year	2021				2022			
	Temperature (^{0}C)			Average Relative Humidity	Temperature (^{0}C)			Average Relative Humidity
Month	Minimum Air Temperature	Maximum Air Temperature	Mean		Minimum Air Temperature	Maximum Air Temperature	Mean	
April	13.28	30.54	21.86	29.68	15.57	33.20	24.38	28.12
May	20.30	37.81	29.05	21.07	18.53	33.85	26.19	24.25
Jun	21.92	37.01	29.46	26.90	22.47	37.23	29.58	26.19
July	24.05	38.56	31.30	25.95	22.73	37.62	30.17	27.42
August	23.89	38.75	31.32	27.06	23.65	37.97	30.81	29.72

After New Valley weather station.

The following parameters were measured to evaluate the tested treatments.

1. Vegetative Growth Characteristics

Ten new emerging shoots were selected and labeled per vine, just after the growth commencement of each season, and shoot length (gained growth), number of leaves/shoot, and the average leaf area of the 5th, 6^{th,} and 7th basal leaves were measured using a planimeter. Total chlorophyll was quantitatively

determined in leaf samples in mid-July; the study collected 10 fresh mature leaves from the middle of spring shoots and their total chlorophyll contents were determined using a Minolta meter SPAD- 502.

2. Yield Components

At harvest time (when TSS of berry juice in the control treatment reached 14-15% brix), cluster numbers per vine were counted and weighted (g) to determine the total yield/vine (kg).

3. Cluster and Berry Characteristic

Representative random samples of two clusters per replication were taken to the laboratory to determine cluster dimensions (length and width), berry length (cm), and berry width (cm). A random sample of 100 berries per replication was taken to determine the weight of 100 berries (g), volume of 100 berries (cm^3), and juice weight of 100 berries (g). Berry quality is measured by TSS %, vitamin C, total acidity %, and TSS/ acid ratio that calculated by dividing TSS % over acidity %. Total sugars were measured in fresh weight using colorimetric reaction between phenol and sulphuric acid, and total anthocyanin content was determined using a pH differential method with two buffer systems.

4. Leaf Blades and Petioles Nutrients Content

To determine the following nutrients, ten fully mature expanded leaves (the third one) were taken from the base of spring and non-fruiting shoots, cleaned with a damp cloth to remove any leftovers, and oven-dried at 70°C until a constant weight was reached. The leaves were then ground in a porcelain mortar and pestle and stored in small light bags.

Pregl's (1945) modified micro-Kjeldahl method was used to determine the total nitrogen content. Using a spectrophotometer set at 882 UV, the total phosphorus level was ascertained using Murphy and Riely (1962) method. Furthermore, an atomic absorption spectrophotometer (Perkin-Elmer Model 3300) was used to determine K, Fe, Zn, and Mn contents of the leaf.

5. Statistical Analysis

The measured data were statistically analyzed by MSTAT-C software and means were differentiated using Rang test at the 0.05 level (Duncan, 1955).

RESULTS AND DISCUSSION

1. Vegetative Growth Characteristics

1.1. Shoot length and average no. leaves/new shoots

Data presented in Table (4) reveal that untreated vines (control) with MC foliar spray produced the longest shoot length and average number of leaves/new

shoots. While treated vines with MC foliar spray at 300 ppm achieved the smallest values of shoot length and average number of leaves/new shoots during both of study seasons.

Regarding specific consequences of some anti-transpiration agents (glycerol and Green Miracle) foliar spray, it was clear that the higher rate of Green Miracle foliar spray at 4 cm/l gave the highest shoot length and average number of leaves/new shoots as compared with the control treatment.

Concerning the interactions between foliar MC spraying and anti-transpiration agents foliar spray (glycerol and Green Miracle) on shoot length and average number of leaves/new shoots, data indicated that the maximum shoot length and average number of leaves/new shoots were detected with the combination of untreated vines with MC foliar application and Green Miracle foliar application at 4 cm/l in both seasons.

Table (4). Effect of foliar spray of mepiquat chloride, anti-transpiration agents, and their interaction on shoot length and number of leaves/new shoots of Flame seedless grapevines during 2021 and 2022.

Parameters	**Shoot length (cm)**				**No. leaves/new shoots**			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
First season; 2021								
Control	102.9j	95.5k	94.2k	98.5E	20.05ef	15.85i	11.60j	15.83D
Glycerol 10 cm/l	142.5d	115.8h	104.8j	121.0D	25.20d	19.70fg	16.85h	20.58C
Glycerol 15 cm/l	148.2c	133.2e	109.6i	130.3C	27.57c	21.20e	18.27gh	22.35B
Green Miracle 2 cm/l	152.5b	135.3e	106.6ij	131.5B	29.30b	21.95e	19.15g	23.47B
Green Miracle 4 cm/l	159.5a	120.5g	127.7f	135.9A	30.70a	24.40d	20.80e	25.30A
Mean	141.1A	120.7B	108.6C		26.56A	20.62B	17.33C	
Second season; 2022								
Control	103.5i	100.2i	95.1j	99.6D	20.5e	15.50i	12.53j	16.29E
Glycerol 10 cm/l	146.2c	167.7f	107.5h	125.5C	23.63d	18.47fg	16.25h	19.45D
Glycerol 15 cm/l	150.3b	140.5d	116.3g	135.7B	25.75c	21.15e	18.75fg	21.88C
Green Miracle 2 cm/l	153.1b	142.7cd	113.2g	136.3B	27.60b	23.20d	19.35f	23.38B
Green Miracle 4 cm/l	160.7a	124.7cd	134.1e	139.8A	31.25a	23.95d	21.45e	25.55A
Mean	142.8A	126.2B	113.2C		25.82A	20.45B	17.67C	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

1.2. Leaf area and total chlorophyll

Data in Table (5) show that, in both seasons of the study, there were significant variations between the three utilizing levels for leaf area (cm^2) and leaf

total chlorophyll contents caused by MC foliar spray. The least leaf area (125.7 and 127.4 cm^2) was produced by MC foliar spray at 300 ppm, whereas the largest leaf area (139.8 and 140.6 cm^2) was obtained from 2021 and 2022 seasons without MC foliar spray (control). Another trend in total chlorophyll contents was observed; in 2021 and 2022 seasons, respectively, MC foliar spray at 300 ppm produced the highest total chlorophyll contents (3.64 and 3.72 SPAD values) compared to the control group that did not receive MC foliar spray.

Table (5). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on leaf area and total chlorophyll of Flame seedless grapevines during 2021 and 2022.

Parameters	**Leaf area (cm^2)**				**Total chlorophyll**			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
First season; 2021								
Control	129.8f	122.9hi	119.5i	124.1E	1.45f	1.56f	1.92e	1.64E
Glycerol 10 cm/l	137.2d	130.4ef	123.6h	130.4D	2.05de	3.15c	3.81b	3.00D
Glycerol 15 cm/l	141.3c	131.7E	125.4h	132.8C	2.15de	3.29c	4.05ab	3.16C
Green Miracle 2 cm/l	143.2b	135.2d	128.7fg	135.7B	2.27d	3.79b	4.19a	3.42B
Green Miracle 4 cm/l	147.4a	135.9d	131.4e	138.2A	3.05c	3.78b	4.23a	3.69A
Mean	139.8A	131.2B	125.7C		2.19C	3.11B	3.64A	
Second season; 2022								
Control	131.5f	123.3i	120.6j	125.1E	1.51g	1.62g	1.97f	1.70D
Glycerol 10 cm/l	138.0d	131.6f	125.7h	131.8D	2.12ef	3.28d	3.92bc	3.11C
Glycerol 15 cm/l	141.8c	132.2e	127.8h	133.9C	2.22ef	3.37d	4.17ab	3.25C
Green Miracle 2 cm/l	144.0b	136.5de	129.6g	136.7B	2.31e	3.82c	4.21a	3.45B
Green Miracle 4 cm/l	147.6a	137.4d	133.2e	139.4A	3.17d	3.87c	4.33a	3.79A
Mean	140.6A	132.2B	127.4C		2.27C	3.19B	3.72A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

Concerning the specific effect of anti-transpiration agents (glycerol and Green Miracle) foliar spray on leaf area and total chlorophyll showed that the higher concentration of 4 cm/l of Green Miracle recorded the highest leaf area (138.2 and 139.4 cm^2) compared with the lowest leaf area (124.1 and 125.1 cm^2) obtained from the control treatment. The total chlorophyll content showed the same pattern, with Green Miracle foliar spray at 4 cm/l producing the highest total chlorophyll content (3.69 and 3.79 SPAD values) in 2021 and 2022 seasons, respectively, compared with the lowest total chlorophyll contents (1.64 and 1.70 SPAD values) obtained from the control treatment.

For the interaction between MC foliar spray and anti-transpiration agents (glycerol and Green Miracle) foliar spray on the leaf area, data indicated that the maximum leaf area was detected with the combination of high concentration of Green Miracle of 4 cm/l and without MC (control). While the higher dose of MC 300 ppm combined with 4 cm/l and/or 2 cm/l Green Miracle achieved the highest total chlorophyll in this respect.

The reducing effect of MC foliar spray on vegetative growth characteristics of Flame seedless grapevines (shoot length, number of leaves/shoot, and leaf area) may be attributed to the fact that MC reduces gibberellic acid concentrations in the plant, which controls both vegetative and reproductive growth, hence inhibiting internode elongation (Zaen El-Daen, 2019). Meanwhile, the improving effect of MC foliar spray on leaf total chlorophyll content could be attributed to the increase of macronutrients uptake, especially K and N element, moreover, N nutrient are necessary for chlorophyll synthesis (Mengel and Kirkby, 1978).

The obtained results regarding the effect of MC foliar spray on vegetative growth characteristics go in line with the findings of Abdel-Mohsen (2015). He mentioned that MC treatments at 100, 200, or 300 ppm decreased the shoot length of vine. Zaen El-Daen (2019) found that foliar spray with MC at 300 ppm decreased the shoot length, leaf dimension, and leaf area of peach trees.

The enhanced impact of anti-transpiration agents like glycerol and Green Miracle on vegetative growth can be attributed to their mechanism of action, which can be categorized into stomatal closing types, film-forming types, and reflecting materials, which affect leaf metabolic processes, impervious to water vapor, and reflect back radiation (Prakash and Rama chandran, 2000). Glycerol's positive effect may be due to its film formation, which protects plants from damage from high transpiration and evaporation, increasing water use and improving vegetative growth and yield, as reported by Sanbagavalli et al. (2017). The improvement by Green Miracle may be attributed to improving the water content on the plant tissues by organizing status of stomata and increasing photosynthetic activities thus reflecting on vegetative growth (Abd El-Hady and Doklega, 2017 and El-Gioushy et al., 2017) . The obtained results regarding the effect of anti-transpiration on vegetative growth go in line with the findings of Abdel Gawad (2015), who mentioned that anti-transpiration agents (potassium silicate- aluminum silicate - Green Miracle – glycerol) had a positive effect on the growth parameter, bunch weight and bunch characteristics of Grand Nain banana.

2. Yield and Cluster Characteristics

2.1. Number of clusters/vin and cluster weight

The total amount and weight of clusters were significantly increased by MC foliar spray treatments, according to the findings shown in Table (6). When compared to the control treatment, MC foliar spray at 300 ppm recorded the highest values in both seasons, followed by MC foliar spray at 200 ppm. Furthermore, in both study seasons, the large amount of Green Miracle foliar spray increased the quantity and weight of clusters in comparison to the control treatment. In this regard, 4 cm/l Green Miracle foliar spray treatment was generally rated as the most successful treatment.

Regarding the interaction between the two factors under investigation and the number and weight of clusters, it is evident that the greatest values were obtained when MC was applied directly at a dose of 300 ppm coupled with Green Miracle at a rate of 4 cm/l.

2.2. Yield

It is clear from the results in Table (6) that, in the study of both seasons, the yield was considerably impacted by each of the various foliar spray treatments of MC. The highest yield (11.52 and 12.36 kg) can be achieved with a foliar spray of MC at a rate of 300 ppm in both seasons. While the control treatment had the lowest yield (7.15 and 7.91 kg). Furthermore, in both study seasons, anti-transpiration chemical treatments had a considerably greater impact on Flame seedless grapevine production as compared to the control treatment. In short, as compared to the control treatment, the Green Miracle foliar spray at 4 cm/l produced the maximum yield.

The results of the interaction between the foliar spray of MC and the anti-transpiration agents (glycerol and Green Miracle) showed that the maximum yield values were obtained when MC was applied at a concentration of 300 ppm and the Green Miracle was applied at a rate of 4 cm/l.

2.3. Cluster length and width

It is clear from the data in Table (7) that, throughout both study seasons, all treatments had a significant impact on cluster length and cluster width. Shortly, foliar spraying of MC at 300 ppm greatly expanded the length and diameter of a cluster. In contrast, check treatment (control) produced the smallest cluster dimensions in both seasons. In comparison to the control treatment, foliar spray of a Green Miracle at a rate of 4 cm/l resulted in the greatest significant cluster in both length and width in both seasons. The maximum length and width of a cluster were observed with MC foliar spray at 300 ppm combined with Green Miracle foliar spray at 4 cm/l in both seasons. This was made evident by the interaction between the foliar spray of MC and anti-transpiration agents (glycerol and Green Miracle).

Table (6). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on cluster number, cluster weight, and yield of Flame seedless grapevines during 2021 and 2022.

Parameters	Cluster number/vine				Cluster weight (g)				Yield (kg)/vine			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
						First season; 2021						
Control	20.00j	22.00h	26.00de	22.67D	301.0h	300.0h	390.0c	330.3E	6.02i	6.60h	10.14d	7.59E
Glycerol 10 cm/l	21.00i	24.00f	27.00cd	24.00C	305.0g	331.0	392.0c	342.7D	6.41h	7.94f	10.58c	8.31D
Glycerol 15 cm/l	22.00h	25.00e	29.00b	25.33B	320.0f	360.0e	395.0c	358.3C	7.04fg	9.00e	11.46bc	9.17C
Green Miracle 2 cm/l	23.00fg	26.00de	30.00b	26.33B	320.0f	370.0d	406.0b	365.3B	7.36f	9.62de	12.18b	9.72B
Green Miracle 4 cm/l	25.00e	28.00c	32.00a	28.33A	356.0e	370.0d	413.0a	379.7A	8.90e	10.36d	13.22a	10.83A
Mean	22.20C	25.00B	28.80A		320.4C	346.2B	399.2A		7.15C	8.70B	11.52A	
						Second season; 2022						
Control	21.00h	24.00fg	28.00de	24.33E	305.0jk	310.0ij	383.0d	332.7E	6.41g	7.44f	10.72c	8.19E
Glycerol 10 cm/l	23.00g	26.00ef	29.00cd	26.00D	315.0i	325.0h	405.0c	348.3D	7.25f	8.45	11.75b	9.15D
Glycerol 15 cm/l	24.00fg	27.00e	31.00a-c	27.33C	315.0i	365.0ef	40.00b	360.0C	7.56f	9.86d	12.40ab	9.94C
Green Miracle 2 cm/l	25.00f	29.00cd	32.00ab	28.67B	340.0g	370.0e	415.0a	375.0B	8.50e	10.73c	13.28a	10.84B
Green Miracle 4 cm/l	27.00e	31.00a-c	33.00a	30.33A	365.0ef	380.0d	414.0a	386.3A	9.86d	11.78b	13.66a	11.77A
Mean	24.00C	27.40B	30.60A		328.0C	350.0B	403.4A		7.91C	9.65B	12.36A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

Table (7). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on cluster length and width of Flame seedless grapevines during 2021 and 2022.

Parameters	**Cluster length (cm)**				**Cluster width (cm)**			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
First season; 2021								
Control	17.00k	18.50j	19.40h	18.30E	11.40h	12.60e	13.10c	12.37D
Glycerol 10 cm/l	19.00i	20.40f	20.90e	20.10D	11.90g	12.70d	13.40bc	12.67C
Glycerol 15 cm/l	20.00g	21.10d	21.80b	20.97C	12.50f	12.90d	13.60b	13.00B
Green Miracle 2 cm/l	21.00d	21.70c	22.10b	21.60B	12.60e	13.25c	13.75b	13.20B
Green Miracle 4 cm/l	21.90b	22.30b	22.90a	22.37A	12.85d	13.55b	14.45a	13.62A
Mean	19.78C	20.80B	21.42A		12.25C	13.00B	13.66A	
Second season; 2022								
Control	17.20l	18.60k	19.85hi	18.55E	11.60h	12.80de	13.30c	12.57C
Glycerol 10 cm/l	19.15j	20.55fg	21.25f	20.32D	12.20g	13.00d	13.70b	12.97B
Glycerol 15 cm/l	20.30gh	21.45e	22.00c	21.25C	12.75f	13.15d	13.85b	13.25B
Green Miracle 2 cm/l	21.25f	21.93d	22.30c	21.83B	12.90de	13.55c	14.05b	13.50A
Green Miracle 4 cm/l	22.15c	22.70b	23.10a	22.65A	12.89de	13.59c	14.49a	13.65A
Mean	20.01C	21.05B	21.70A		12.47C	13.22B	13.88A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

3. Berry quality

3.1. Berry length and width

MC foliar spray treatments in two seasons had a substantial impact on berry length and width, according to data for both seasons in Table (8). Nevertheless, in both seasons, the maximum berry length (1.72 and 1.75 cm) and berry breadth (1.64 and 1.66 cm) were obtained with MC foliar spray at a rate of 300 ppm. Furthermore, in both seasons, the use of distinct anti-transpiration agents (glycerol and Green Miracle) had a major effect on the length and width of the berries. When compared to the control treatment, the Green Miracle foliar spray at 4 cm/l produced the longest berries in both seasons. However, in both seasons, the greatest berry width was recorded with a 4 cm/l Green Miracle foliar spray.

According to Table (8) data on the interaction between the two factors in the investigation, MC foliar spray at 300 ppm and Green Miracle foliar spray at 4 cm/l significantly increased berry length and width in both seasons.

Table (8). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on berry length and width of Flame seedless grapevines during 2021 and 2022.

Parameters	Berry length (cm)				Berry width (cm)			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
First season; 2021								
Control	1.22i	1.33h	1.51f	1.35E	1.19h	1.29g	1.49e	1.32D
Glycerol 10 cm/l	1.42g	1.51f	1.63d	1.52D	1.37f	1.49e	1.55d	1.47C
Glycerol 15 cm/l	1.54de	1.59de	1.73c	1.62C	1.45e	1.53d	1.61c	1.53C
Green Miracle 2 cm/l	1.65d	1.71c	1.82b	1.73B	1.53d	1.64c	1.74ab	1.64B
Green Miracle 4 cm/l	1.76c	1.85ab	1.89a	1.83A	1.69b	1.78a	1.81a	1.76A
Mean	1.52C	1.60B	1.72A		1.45C	1.55B	1.64A	
Second season; 2022								
Control	1.31h	1.45f	1.55e	1.44E	1.23h	1.34g	1.50e	1.36D
Glycerol 10 cm/l	1.39g	1.63d	1.67d	1.56D	1.30g	1.52d	1.57d	1.46C
Glycerol 15 cm/l	1.46f	1.68d	1.75c	1.63D	1.42f	1.63c	1.65bc	1.57B
Green Miracle 2 cm/l	1.58e	1.75c	1.84b	1.72B	1.53d	1.66bc	1.74b	1.64A
Green Miracle 4 cm/l	1.61d	1.86b	1.92a	1.80A	1.52d	1.71b	1.82a	1.68A
Mean	1.47C	1.67B	1.75A		1.40C	1.57B	1.66A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

3.2. Weight, volume, and juice weight of 100 berries

Table (9) clearly shows that all treatments had a significant impact on the weight, volume, and juice weight of 100 berries. The higher weight of 100 berries (218 and 222 g), volume of 100 berries (264 and 274 m^3), and juice weight of 100 berries (181 and 201 g) were recorded in both seasons when vines were foliar applied with MC at 300 ppm. In contrast, the smallest weight of 100 berries (191 and 185 g), volume of 100 berries (226 and 236 m^3), and juice weight of 100 berries (162.8 and 163.8 g) were scored with control treatment. In all seasons, foliar spray of a Green Miracle at a rate of 4 cm/l produced the highest values of berry weight, volume, and juice as compared to the check treatment (control).

About the interaction between foliar spray of MC and anti-transpiration agents (glycerol and Green Miracle), the data indicate that during both study seasons, the greatest values for weight, volume, and juice of 100 berries was obtained when a higher concentration of MC foliar spray at 300 ppm was combined with foliar spray of Green Miracle at 4 cm/l.

Table (9). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on weight, volume, and juice weight of 100 berries of Flame seedless grapevines during 2021 and 2022.

Parameters	Weight of 100 berries (g)				Volume of 100 berries (m^3)				Juice weight (g) of 100 berries			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
First season; 2021												
Control	139.00m	154.0l	165.0j	152.7E	117.0m	125.0l	175.0k	139.0E	105.0m	127.0l	138.0j	123.3E
Glycerol 10 cm/l	162.0k	178.0i	195.0g	178.3D	195.0j	210.0i	226.0h	210.3D	133.0k	138.0j	156.0h	142.3D
Glycerol 15 cm/l	166.0j	190.0h	205.0f	187.0C	205.0j	248.0g	251.0g	234.7C	145.0i	156.0h	168.0g	156.3C
Green Miracle 2 cm/l	238.0e	245.0d	257.0c	246.7B	285.0f	305.0e	315.0d	301.7B	204.0f	210.0e	213.0d	209.0B
Green Miracle 4 cm/l	250.0c	260.0b	270.0a	260.0A	330.0c	343.0b	356.0a	343.0A	227.0c	231.0b	234.0a	230.7A
Mean	191.0C	205.4B	218.4A		226.0C	246.2B	264.6A		162.8C	172.4B	181.8A	
Second season; 2022												
Control	145.0m	159.0l	171.0j	158.3E	125.0m	133.0l	183.0k	147.0E	107.0m	142.0k	151.0i	133.3E
Glycerol 10 cm/l	165.0k	182.0i	198.0g	181.7D	207.0j	222.0i	238.0h	222.3D	130.0l	159.0h	168.0g	152.3D
Glycerol 15 cm/l	173.0j	194.0h	209.0f	192.0C	212.5i	255.5g	258.5g	242.2C	147.0j	173.0f	197.0e	172.3C
Green Miracle 2 cm/l	242.0e	249.0d	261.0b	250.7B	294.5f	314.5e	324.5d	311.2B	212.0e	219.0d	231.0b	220.7B
Green Miracle 4 cm/l	253.0c	263.0b	275.0a	263.7A	341.3c	354.3b	367.3a	354.3A	223.0c	232.0b	258.0a	237.7A
Mean	185.6C	209.4B	222.8A		236.1C	255.9B	274.3A		163.8C	185.0B	201.0A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

3.3. Total soluble solids percentage (TSS) and TSS/acid ratio

Table (10) presents some of the chemical characteristics of Flame seedless grapevine berries, such as the percentages of TSS and TSS/acid ratio as affected by the foliar spray of MC and anti-transpiration agents (glycerol and Green Miracle), as well as the interaction between these agents. Table (10) demonstrates that the vines' foliar spray treatment of MC at 300 ppm in both seasons produced the greatest TSS (21.68 and 21.40%) and the highest TSS/acid ratio (16.93 and 17.22).

Regarding the impact of foliar spray of anti-transpiration chemicals (glycerol and Green Miracle) on TSS and the TSS/acid ratio of Flame seedless grapevine, significant variations among the four concentrations used in both seasons were observed. In the first and second seasons, respectively, the largest TSS/acid ratio (20.65 and 18.77%) and maximum TSS (23.73 and 22.65%) were reported with Green Miracle foliar spray at a rate of 4 cm/l. In both seasons under study, the control treatment, however, produced the lowest TSS (17.50 and 17.47%) and the lowest TSS/acid ratio (10.21 and 10.39).

Concerning the interaction between the two factors that were investigated, it was determined that the highest values of TSS and TSS/acid ratio (24.80 and 23.95% in TSS and 21.57 and 21.27 in TSS/acid ratio) were obtained from the foliar spray of vines in both seasons with Green Miracle at 4 cm/l and MC at 300 ppm.

3.4. Total acidity percentage

The data presented in Table (10) show that the three rates of MC foliar spray had a significant impact on the total acidity percentage, but that there was no significant difference in acidity between 200 ppm MC foliar spray and the control treatment in either of the two seasons. Conversely, the lowest percentage of acidity (1.31 and 1.27%) was obtained from the vine's foliar spray of MC at 300 ppm in the first and second seasons.

The anti-transpiration chemicals (glycerol and Green Miracle) that were applied topically to the Flame seedless grapevine in both seasons at a concentration had a major effect on its overall acidity. In both seasons, the total acidity values for Green Miracle foliar spray at a rate of 4 cm/l were the lowest (1.15 and 1.22%), whereas the total acidity values for the control treatment (1.73 and 1.70 %) were the highest.

The results of the interaction between MC foliar spray and anti-transpiration agents (glycerol and Green Miracle) demonstrated that MC foliar spray at 300 ppm combined with Green Miracle foliar spray at 4 cm/l recorded the lowest total acidity (1.15 and 1.10%) in comparison to control treatment, which produced the highest total acidity during both seasons (1.90 and 1.85%).

Table (10). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on TSS %, acidity %, and TSS/ acid ratio of Flame seedless grapevines during 2021 and 2022.

Parameters	TSS %				Acidity (%)				TSS/acid ratio			
Treatments	Control	Mepiqute (200 ppm)	Mepiqute (300 ppm)	Mean	Control	Mepiqute (200 ppm)	Mepiqute (300 ppm)	Mean	Control	Mepiqute (200 ppm)	Mepiqute (300 ppm)	Mean
						First season; 2021						
Control	15.60i	17.50h	19.40g	17.50E	1.90a	1.70a	1.60ab	1.73A	8.21m	10.29l	12.13k	10.21E
Glycerol 10 cm/l	19.60g	21.40de	19.60f	20.00D	1.50c	1.40cd	1.35cd	1.42B	12.67j	15.29g	14.52hi	14.16D
Glycerol 15 cm/l	20.90f	21.50de	21.70d	21.37C	1.40cd	1.30d	1.25e	1.32C	14.93gh	16.54ef	17.36de	16.28C
Green Miracle 2 cm/L	21.80d	22.10d	22.90c	22.27B	1.30d	1.25e	1.20ef	1.25C	16.77ef	17.68d	19.08c	17.84B
Green Miracle 4 cm/L	22.50d	23.90b	24.80a	23.73A	1.10g	1.20ef	1.15g	1.15D	20.45b	19.92	21.57a	20.65A
Mean	19.96C	21.28B	21.68A		1.44A	1.37A	1.31B		14.61C	15.94B	16.93A	
						Second season; 2022						
Control	15.70k	17.60j	19.10h	17.47E	1.85a	1.70b	1.55c	1.70A	8.49k	10.35j	12.32i	10.39E
Glycerol 10 cm/l	18.20i	21.30e	19.80g	19.77D	1.50c	1.45cd	1.30e	1.42B	12.13i	14.69g	15.23f	14.02D
Glycerol 15 cm/l	18.25i	21.70d	21.40d	20.45C	1.40d	1.37de	1.20	1.32BC	13.04h	15.84e	17.83c	15.27C
Green Miracle 2 cm/L	20.40f	21.90d	22.75b	21.68B	1.35de	1.30e	1.20f	1.28C	15.11f	16.85d	18.96b	16.97B
Green Miracle 4 cm/L	21.80d	22.20c	23.95a	22.65A	1.30e	1.25f	1.10g	1.22CD	16.77d	17.76c	21.27a	18.77A
Mean	18.87C	20.94B	21.40A		1.48A	1.41A	1.27B		13.11C	15.10B	17.22A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

3.5. Vitamin C, total sugar percentage, and total anthocyanin

All of the treatments under investigation had substantial effects on the vitamin C, total sugars, and total anthocyanin of Flame seedless grape berries. Regarding, both seasons, foliar spray of 300 ppm MC showed the highest meaningful value (Table 11). In the first and second seasons, respectively, the maximum levels of berry vitamin C, total sugars, and total anthocyanin were seen while applying Green Miracle foliar at a rate of 4 cm/l. In contrast, the control therapy received the lowest ratings in this regard for both seasons.

Pointing to the interaction between the two factors under investigation, it was found that the highest levels of berry vitamin C, total sugars, and total anthocyanin were obtained in both seasons from the foliar spray of vines treated with MC at 300 ppm in combination with Green Miracle at 4 cm/l. The reducing effect of MC on vegetative growth characteristics may be attributed to the fact that MC increases the quantity of light reaching the middle of the vine and increases the overall amount of carbohydrates deposited in the shoot tissues (Abdel-Mohsen, 2015). All of these reflected more carbohydrate production that led to enhancement in yield vines.

The obtained results regarding the effect of MC on yield and berry quality go in line with the findings of Cahoon et al. (1991), who demonstrated that MC had a positive effect on the average bunch weight, yield and and berry quality of grapevine. Lim et al. (2004) also reported that MC-treated vines produced more fruit sets from clusters, which increased the yield of "Kyoho" grapes. Furthermore, Kim et al. (2008) observed that the rate of berry setting was improved by 3 to 11% by using MC as a foliar spray during the 5, 7, and 10 leaf stages, respectively. Hanaa and Samia (2014) investigated the effects of 150 and 250 ppm MC on five-year-old 'Le Conte' pear plants and the results demonstrated that MC improved fruit quality. Also, Zaen El-Daen (2019) found that MC foliar spray at 150 ppm on peach trees increased fruit weight, flesh weight, and fruit TSS, moreover, it had the lowest total fruit acidity of mango fruits.

The obtained results regarding the effect of Green Miracle anti-transpiration on yield and quality go in line with the findings of El-Gioushy et al. (2017). They mentioned that Green Miracle at 3 cm/l foliar spray twice in mid-June and mid-July improved the productivity and enhanced the quality of Keitt mango fruits. Furthermore, Abdel Gawad (2015) found that spraying anti-transpiration (potassium silicate- aluminium silicate - Green Miracle - glycerol) had a positive effect on bunch characteristics of Grand Nain banana.

4. Leaf blades and petioles nutrients content

4.1. Macromineral content (N, P, and k %)

Table (12) shows the effects of foliar treatment of MC and foliar spray of

anti-transpiration agents (glycerol and Green Miracle) on the Flame seedless grapevine's macromineral content (N, P, and K %). About the macromineral content (N, P, and k %) as impacted by the foliar spray of MC, significant variances among the three treatments over both seasons were observed. Applying 300 ppm of MC topically to the foliage produced the highest levels of macrominerals (N, P, and K %) in both of seasons under study when compared to the control treatment. The foliar spray of two different anti-transpiration chemicals (glycerol and Green Miracle) was considerably impacted by the macromineral content (N, P, and K %) in both seasons. Additionally, in both seasons, Green Miracle at 4 cm/l provided the highest macromineral content (N, P, and K %) in comparison to the control, which provided the lowest values.

The combination of MC foliar spray at 300 ppm and Green Miracle foliar spray at 4 cm/l with anti-transportation agents (glycerol and Green Miracle) revealed that the highest macromineral content (N, P, and K %) was achieved. However, in both seasons, the control treatment had the lowest macromineral content (N, P, and K %).

4.2. Micromineral content (Fe, Zn, and Mn ppm)

According to the results in Table (13), MC topically applied had a significant effect on micromineral content (Fe, Zn, and Mn %) in both seasons. Also, in the first and second seasons, respectively, the highest micromineral content (Fe, Zn, and Mn %) was obtained from Flame seedless grapevines foliar application with MC at 300 ppm, while the lowest micromineral content (Fe, Zn, and Mn %) was obtained from vines without MC foliar application.

The five using levels in both seasons differed significantly in the mineral content (Fe, Zn, and Mn %) as influenced by the foliar spray of anti-transpiration agents (glycerol and Green Miracle). The greatest amount of micromineral content (Fe, Zn, and Mn %) was recorded with Green Miracle foliar spray at a rate of 4 cm/l, while the smallest micromineral content (Fe, Zn, and Mn %) was detected with the control treatment in both seasons. However, during the first and second seasons, vine foliar spray with MC at 300 ppm mixed with Green Miracle foliar spray at 4 cm/l produced the greatest amounts of mineral content (Fe, Zn, and Mn %).

The results regarding the effect of MC on leaf nutritional status go in line with the findings of Albuquerque et al. (2000). They investigated that MC treatments increase the amount of P and K micronutrients in shoots of Thompson seedless and Italia grapes. Also, Abdel-Mohsen (2015) reported that MC treatments enhance shoot content of P and K micronutrients on superior grapes.

Table (11). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on vitamin C, total sugar content %, and total anthocyanin of Flame seedless grapevines during 2021 and 2022.

Parameters	Vitamin C				Total sugars %				Total anthocyanin (mg/100g F.W.)			
Treatments	Control	Mepiqute (200 ppm)	Mepiqute (300 ppm)	Mean	Control	Mepiqute (200 ppm)	Mepiqute (300 ppm)	Mean	Control	Mepiqute (200 ppm)	Mepiqute (300 ppm)	Mean
First season; 2021												
Control	0.90e	1.30d	1.55c	1.25D	15.59g	15.86f	15.87f	15.77E	30.45i	30.95h	31.65f	31.02E
Glycerol 10 cm/l	1.50c	1.60b	1.60b	1.57C	16.33e	16.22e	16.43e	16.33D	31.20g	31.35g	32.45e	31.67D
Glycerol 15 cm/l	1.70b	1.70b	1.70b	1.70B	16.55d	16.83c	16.91c	16.76C	31.60f	32.55e	33.10c	32.42C
Green Miracle 2 cm/l	1.60b	1.75a	1.85a	1.73B	16.68d	17.07b	17.30b	17.02B	32.30e	32.80d	33.90b	33.00B
Green Miracle 4 cm/l	1.65b	1.90a	1.95a	1.83A	16.61d	17.63a	17.74a	17.33A	33.70b	34.15a	34.35a	34.07A
Mean	1.47B	1.65A	1.73A		16.35B	16.72AB	16.85A		31.85C	32.36B	33.09A	
Second season; 2022												
Control	0.85e	1.40d	1.61c	1.29D	15.63h	15.96g	16.02f	15.87D	31.15j	31.30i	32.25g	31.57E
Glycerol 10 cm/l	1.60c	1.65c	1.70c	1.65C	16.42e	16.39e	16.57e	16.46C	31.75h	32.35f	32.55f	32.22D
Glycerol 15 cm/l	1.75b	1.72b	1.78b	1.75B	16.68d	16.90c	16.96bc	16.85B	32.05	33.15d	33.60c	32.93C
Green Miracle 2 cm/l	1.78B	1.90a	1.95a	1.88A	16.73D	17.15B	17.38a	17.09B	32.80d	33.30b	33.90a	33.33B
Green Miracle 4 cm/l	1.82b	1.95a	2.05a	1.94A	16.76d	17.71a	17.81a	17.43A	33.80b	33.90b	34.65a	34.12A
Mean	1.56C	1.72B	1.82A		16.44B	16.82A	16.95A		32.31C	32.80B	33.39A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

Table (12). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on nitrogen %, phosphorus % and potassium % of Flame seedless grapevines during 2021 and 2022.

Parameters	N (%)				P (%)				K (%)			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
						First season; 2021						
Control	1.01j	1.06j	1.16i	1.08E	0.210l	0.240k	0.310j	0.253E	2.19h	2.24gh	2.34fg	2.26C
Glycerol 10 cm/l	1.14i	1.39fg	1.71d	1.41D	0.290g	0.540g	0.860d	0.563D	2.32f-h	2.57d	2.90bc	2.60B
Glycerol 15 cm/l	1.22h	1.44f	1.77c	1.48C	0.370i	0.590f	0.920c	0.627C	2.40ef	2.62d	2.95bc	2.66B
Green Miracle 2 cm/l	1.24h	1.69de	1.85b	1.59B	0.390i	0.840d	1.000b	0.743B	2.42ef	2.87c	3.03ab	2.77A
Green Miracle 4 cm/l	1.35g	1.65e	1.93a	1.64A	0.500h	0.800e	1.080a	0.793A	2.53de	2.83c	3.11a	2.82A
Mean	1.19C	1.45B	1.68A		0.352C	0.602B	0.834A		2.37C	2.63B	2.87A	
						Second season; 2022						
Control	1.11h	1.17g	1.21g	1.16D	0.260n	0.320m	0.360l	0.313E	2.29g	2.35fg	2.39fg	2.34D
Glycerol 10 cm/l	1.18g	1.42de	1.74c	1.45C	0.330m	0.570h	0.890e	0.597D	2.36fg	2.60de	2.92bc	2.63C
Glycerol 15 cm/l	1.28f	1.47d	1.87b	1.54B	0.430k	0.620g	1.020c	0.690C	2.46ef	2.65d	3.05ab	2.72B
Green Miracle 2 cm/l	1.30f	1.76c	1.91ab	1.66A	0.450j	0.910d	1.060b	0.807B	2.48ef	2.94bc	3.09a	2.84A
Green Miracle 4 cm/l	1.37e	1.72c	1.96a	1.68A	0.520i	0.870f	1.110a	0.833A	2.55de	2.90bc	3.14a	2.86A
Mean	1.25C	1.51B	1.74A		0.398C	0.658B	0.888A		2.43C	2.69B	2.92A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

Table (13). Effect of foliar spray of mepiquat chloride, anti-transpiration agents and their interaction on iron ppm, zinc % and manganese % of Flame seedless grapevines during 2021 and 2022.

Parameters	Fe (ppm)				Zn (ppm)				Mn (ppm)			
Treatments	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**	**Control**	**Mepiqute (200 ppm)**	**Mepiqute (300 ppm)**	**Mean**
						First season; 2021						
Control	33.40h	33.60gh	33.90g	33.63E	15.90h	16.10gh	16.40g	16.13E	24.65e	24.85e	25.15e	24.88D
Glycerol 10 cm/l	36.50f	38.80e	41.90c	39.07D	19.00f	21.30e	24.40b	21.57D	27.75d	30.05c	33.15b	30.32C
Glycerol 15 cm/l	36.70f	39.20e	43.40b	39.77C	19.20f	21.70e	25.90b	22.27C	27.95d	30.45c	34.65a	31.02C
Green Miracle 2 cm/l	36.90f	41.20d	43.70b	40.60B	19.40f	23.70d	26.20b	23.10B	28.15d	32.45b	34.95a	31.85B
Green Miracle 4 cm/l	38.90e	41.70c	44.20a	41.60A	21.40e	24.20c	26.70a	24.10A	30.15c	32.95b	35.45a	32.85A
Mean	36.48C	38.90B	41.42A		18.98C	21.40B	23.92A		27.72C	30.15B	32.67A	
						Second season; 2022						
Control	34.15h	34.35gh	34.65g	34.38E	16.65h	16.85gh	17.15g	16.88E	25.40e	25.60e	25.90e	25.63D
Glycerol 10 cm/l	37.25f	39.55e	42.65c	39.82D	19.75f	22.05e	25.15c	22.32D	28.50d	30.80c	33.90b	31.07C
Glycerol 15 cm/l	37.45f	39.95e	44.15b	40.52C	19.95f	22.45e	26.65b	23.02C	28.70d	31.20c	35.40a	31.77C
Green Miracle 2 cm/l	37.65f	41.95d	44.45b	41.35B	20.15f	24.45d	26.95b	23.85B	28.90d	33.20b	35.70a	32.60B
Green Miracle 4 cm/l	39.65e	42.45c	44.95a	42.35A	22.15e	24.95c	27.45a	24.85A	30.90c	33.70b	36.20a	33.60A
Mean	37.23C	39.65B	42.17A		19.73C	22.15B	24.67A		28.48C	30.90B	33.42A	

Means having the same letter (s) in each column, row or interaction are not significantly different at a 5% level.

CONCLUSION

Briefly, it can be recommended from the results of the present study that using MC at 300 ppm compined with Green Miracle at 4 cm/L had a positive influence in improving productively and quality of Flame seedless grapevine berry under New Valley Governorate.

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تأثير كلورايد الميبكوات وبعض مضادات النتح على نمو وإنتاجية العنب الفليم سيدلس تحت ظروف الإجهاد الحراري

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أجريت هذه التجربة خلال موسمي ٢٠٢١ و٢٠٢٢ على كرمات العنب الفليم سيدلس المنزرعة في تربة رملية تحت نظام الري بالتنقيط بواحة الفرافرة بمحافظة الوادي الجديد بمصر. والهدف الرئيسي من هذه التجربة هو دراسة تأثير ثلاثة تركيزات من كلوريد الميبكوات (٠.٠، ٢٠٠ و٣٠٠ جزء في المليون) وخمسة تركيزات من مضادات النتح (٠.٠، ١٠ سم/ لتر جلسرين، ١٥ سم/ لتر جلسرين، ٢ سم/ لتر جرين ميراكل، ٤ سم/ لتر جرين ميراكل) على صفات النمو الخضري والمحصول وصفات الجودة لعناقيد العنب فليم سيدلس تحت ظروف الإجهاد الحراري بالوادي الجديد. أظهرت النتائج التي تم الحصول عليها أن الرش الورقي بكلوريد الميبكوات بتركيز ٣٠٠ جزء في المليون + الرش بمادة جرين ميركل بتركيز ٤ سم/لتر أدى إلى زيادة المحصول وصفات جودة العنب الفليم سيدلس تحت ظروف التجربة.