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EFFECT OF GIRDLING ALONE OR COMBINED WITH FLOWER CLUSTER THINNING AND ETHEPHON APPLICATION ON FRUIT SET, YIELD AND FRUIT QUALITY OF BLACK MONUKKA GRAPES

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ABSTRACT

This study was carried out during 2000 and 2001 seasons on nine year old Black Monukka grape, to reveal the effect of girdling alone or combined with, flower cluster thinning and ethephon application on fruit set, yield and fruit quality. The results showed that vine girdling of Black Monukka alone or combined with flower cluster thinning before flowering significantly increased the fruit set percent than the untreated vines. All treatments except flower-cluster thinning produced a higher significant increment in yield/vine than the control. The highest figures in fresh yield was gained as a results of girdling before flowering. Girdling or ethephon treatment at veraison stage gave no clear effect on yield. Girdling application either alone or combined with flower cluster thinning before flowering significantly increased the average cluster weight, cluster length and width, berries number/cluster, rachis weight, berry weight, size and berry dimensions. Ethephon application (150-200ppm) alone or combined with girdling at veraison stage due to fruits ripe earlier 9 days, and significantly increased total soluble solids, reduced total acidity and increased T.S.S/acid ratio. All treatments increased cluster compactness than the control.

Key words: Grape, Girdling, Flower cluster thinning, Ethephon application, Vines, Veraison stage, Fruit quality

INTRODUCTION

Grape *(Vitis vinifera L.)* is considered one of the most important fruits in the world and Egypt. Black Monukka grape is one of many cultivars which were introduced to Egypt and characterized by production of small and loose clusters. Improving the size of cluster, number of berries per cluster and size of berries are often of much commercial importance. According to **Winkler (1930); Jacob (1931) and Novello *et al* (1999)**, girdling and thinning have influenced the rate of maturity, degree of coloration and size of berry of several varieties of grapes. Girdling has been used commercially to increase accumulation of carbohydrates in

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the parts above the wounds, including flower or fruit clusters and to influence their development (**Coombe, 1973 and Singh & Weaver 1976**). Girdling also increased average yield/vine, cluster weight and Total soluble solids (**El-Hamady & Abd El-Hamid 1995; Kalil *et al* (1999) and Kim & Chung (2000).**

Thinning at fruit set gave the highest cluster and fruit weight, longest pedicels, best colour, fastest ripening, highest total soluble solids and sugar and lowest percentage of acidity and produced the best yield in Perlette and Beauty seedless grapes (**Sanjay 1995, Gao & Cahoon 1999 and Palliotti & Cartechini, 2000).** Concerning, the effect of ethephon on fruit ripening at harvest, most investigators such as **El-Banna & Weaver, (1979); Mehta & Chundawat (1980); Saad *et al* (1980) and Jindal & Sharma (1990)** indicate that ethephon applications advanced grapes ripening. The objective of the present study was to improve fruit set, yield and fruit quality of Black Monukka grape by girdling, flower cluster thinning and ethephon application under the conditions of a private vineyard near Alexandria.

MATERIAL AND METHODS

The present work was carried out during 2000 and 2001 season on nine year-old vigorous fruitful Black Monukka cv. grapevines grown at a private vineyard near Alexandria, Behaira Governoniate Egypt. Seventy – two Vines were chosen and subjected to the studied treatments each vine had average number of 30 cluster.

The chosen vines were nearly similar in growth, planted in sandy soil at 2×3 meters and the cane system of training was applied. All vines were irrigated through trickle irrigation system and subjected to the normal cultural practices applied at Behaira Governorate.

The experiment comprised 12 treatments, in 3 replicates where each replicate was represented by 2 vines. The considered treatments were :

1. Control. (Untreated vines).
2. Girdling before flowering.
3. Flower-cluster thinning to ¼ the number of cluster/vine before flowering .
4. Flower-cluster thinning to ½ the number of cluster/vine before flowering.
5. Girdling + flower-cluster thinning to ¼ the number of cluster / vine before flowering.
6. Girdling + flower-cluster thinning to ½ the number of cluster/vine before flowering.
7. Girdling after fruit set.
8. Girdling at veraison stage.
9. Ethephon (2-chloroethyl" phosphonic acid") at 150 ppm at veraison stage.
10. Ethephon at 200 ppm at veraison stage.
11. Girdling + ethephon at 150 ppm at veraison stage.
12. Girdling + ethephon at 200 ppm at veraison stage .

Girdling was done below the second bud from the cane base using girdling scissors where 5mm ring was completely removed.

Wounds caused from girdling were immediately covered with bandag containing zinc oxide to avoid any fungus or bacteria attack.

Girdling was done on three dates : the first date was before flowering (Treat. 2),

the second was after fruit set (Treat. 7) and the third was at veraison stage (Treat.8).

Before flowering, flower cluster thinned to quarter or half the number of cluster/vine.

Time of fruit setting in grapevine was determined when about 80% of the flowering cluster had set its fruit (El-Sese, personal communication). In black Monukka cv. Fruit setting occurred during the first week of August in 2000 and in the second week of August in 2001 season.

Length of cluster was measured from the base of the cluster to the apex, then compactness co-efficient was calculated by dividing the number of berries per cluster by its length, according to **Weaver *et al* (1962).**

At harvest time, the following parameters where determined :

1) Physical properties

1- Average yield per vine (kg.)
2- Average cluster weight (gm.)
3- Average cluster length (cm.).
4- Average cluster width (cm.)
5- Average number of berries/cluster.
6- Average weight of berry.
7- Average berry size: this parameter was determined by immersing the berries sample in water in a graduated cylinder and the size of the displaced water was measured.
8- Average weight of rachis (gm.)
9- The juice volume was determined by blending 100 gram of berries per replicated and filtering through a fine muslin cloth. Juice volume was measured by graduated cylinder and average of three samples was calculated .
10- Coefficient of cluster compactness. It was determined as follows: Number of berries/cluster / length of cluster in cm.

2) Chemical properties

a- Total soluble solids (T.S.S%) was determined using a hand refractometer.
b- Titratable acidity TA% by direct titration using 0.1 NaoH and calculated as grams of tartaric acid per 100 grams fruit juice **(A.O.A.C.) (1984).**
c- T.S.S/ acid ratio was calculated.

Statistical analysis

The statistical analysis of the present data was carried out using the complete randomized design according to **Snedecor and Cochran (1972).** Averages were compared using new L.S.D values at 5% level.

RESULTS AND DISCUSSION

Effect of girdling, flower-cluster thinning and ethephon application on fruit set, yield and fruit quality:

Harvesting date

Data presented in Table (1) indicated that treatments ethephon alone or combined with girdling at veraison enhanced harvest date by peiod ranged from 7-9 days earlier compared with control in both seasons . These results are in harmony with those obtained by **El-Banna & Weaver (1979) and Saad *et al* (1980).**

On the other hand, girdling at veraison advanced grope ripening of Black

Table 1. Effect of girdling, flower-cluster thinning and ethephon application on harvesting date of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Harvesting date	
		2000	2001
1	Control	9 / 8	3 / 8
2	Girdling before flowering	5 / 8	1 / 8
3	* F.C thinning to ½ No. of cluster/vine before flowering.	3 / 8	31 / 7
4	F.C thinning to ¼ No. of cluster/vine before flowering.	3 / 8	31 / 7
5	Girdling + (Treat. 3).	1 / 8	30 / 7
6	Girdling + (treat. 4).	1 / 8	30 / 7
7	Girdling after fruit set.	11 / 8	6 / 8
8	Girdling at veraison.	31 / 7	28 / 7
9	Ethephon 150 p.p.m at veraison.	2 / 8	26 / 7
10	Ethephon 200 p.p.m at veraison.	2 / 8	26 / 7
11	(Treat. 8) + (Treat.9)	30 / 7	24 / 7
12	(Treat.8) + (Treat.10)	30 / 7	24 / 7

* F.C = Flower cluster.

Monukka grapevines about 5 days than the control . on the contrary girdling after fruit set had a retarding effect .

Whereas, treatments flower – cluster thinning alone on combined with girdling before flowering enhanced harvest date by period ranged from 5-6 days earlier compared with control.

A- Fruit set

Data presented in Table (2) clearly show that girdling before flowering increased the fruit set percentage than the untreated vines. **Coombe (1973)** mentioned that the increase in fruit set attributed to girdling may be due to the accumulation of nutritive substance in parts above girdling zone. Similar results were reported by **Jindal *et al* (1982).**

Treatments from 7 to 12 were excluted since they were carried out after fruit set . The largest and the best filled clusters were produced when girdling was accompanied by flower-cluster thinning. Similar results were obtained by **Kitat (1964) and Rizk (1993).**

Table 2. Effect of girdling, flower-cluster thinning and ethephon application on fruit set of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Fruit set %			
		2000	2001	Mean	% of increase than the control
1	Control	11.23	13.89	12.06	--
2	Girdling before flowering	16.33	17.31	16.82	39.46
3	* F.C thinning to ½ No. of cluster/vine before flowering.	13.11	15.81	14.46	19.90
4	F.C thinning to ¼ No. of cluster/vine before flowering.	12.53	14.11	14.17	17.49
5	Girdling + (Treat. 3).	19.30	21.33	20.32	68.49
6	Girdling + (treat. 4).	17.88	19.32	18.60	54.23
7	Girdling after fruit set.	--	--	--	--
8	Girdling at veraison.	--	--	--	--
9	Ethephon 150 ppm at veraison.	--	--	--	--
10	Ethephon 200 ppm at veraison.	--	--	--	--
11	(Treat. 8) + (Treat.9)	--	--	--	--
12	(Treat.8) + (Treat.10)	--	--	--	--
	New L.S.D. at 5%	1.33	1.23	--	--

Treatments from 7 to 12 were excluded since they were carried out after fruit set

B-Yield

It is clear from Table (3) that all treatments except flower cluster thinning to ½ the number of cluster per vine before flowering increased the yield than the control. These results are in agreement with those found by **Gao & Cahoon (1999) and Kim & Chung (2000).** Who reported that fruit cluster thinning decreased vine yield significantly.

In addition, girdling alone before flowering or combined with flower cluster thinning gave a more pronounced effect in this respect. The increment in yield per vine due to girdling application before flowering could be attributed to the increase in fruit set and berry size,

Table 3. Effect of girdling, flower cluster thinning and ethephon application on yield/vine of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Yield/vine (kg)			
		2000	2001	Mean	% than control
1	Control	5.25	5.37	5.31	---
2	Girdling before flowering	8.88	8.70	8.79	+65.53
3	F.C thinning to ½ No. of cluster/vine before flowering.	4.18	4.28	4.23	-20.33
4	F.C thinning to ¼ No. of cluster/vine before flowering.	5.27	5.31	5.29	-0.37
5	Girdling + (Treat. 3).	6.24	6.75	6.49	+22.22
6	Girdling + (treat. 4).	8.86	8.99	8.92	+67.98
7	Girdling after fruit set.	7.95	8.04	7.99	+50.47
8	Girdling at veraison.	5.64	5.49	5.56	+ 4.71
9	Ethephon 150 p.p.m at veraison.	5.64	5.52	8.58	+ 5.08
10	Ethephon 200 p.p.m at veraison.	5.55	5.34	5.45	+ 2.63
11	(Treat. 8) + (Treat.9)	6.45	6.30	6.38	+20.15
12	(Treat.8) + (Treat.10)	6.24	6.33	6.28	+18.26
	New L.S.D at %5	0.76	0.68	---	---

these findings are in agreement with those obtained by **Abdel-Kawi *et al* (1984) and Amen (1987).**

Data also reveal that girdling or ethephon treatments at veraison stage gave a slight increment in this respect. It may be attributed to the date of application since, it was carried out at pre-maturation stage. These results go in line with those found by **Samra (1982) and El-Sayed (1995)** who mentioned that ethephon application at 250 ppm at veraison gave little effect on yield.

Physical chracteristics of clusters

1-Cluster weight

Data in Table (4) indicated that all treatments increased cluster weight than the untreated ones. Moreover, the combined application of girdling and flower cluster thinning before flowering gave a more pronounced effect in this connection. As a result of girdling vines before flowering the cluster weight was also increased. These results are in harmony with those found by **Kalil *et al* (1999) and Gao & Cahoon (1999)** who reported that large increase in weight and size of cluster occurred as a result of girdling.

Data also revealed that ethephon treatment either alone or combined with girdling at veraison stage gave a slight increment in this respect. This may be due to the date of application, since, it was carried out of at pre-maturation stage. **Samra (1982)** found no effect on cluster weight of Thompson seedless grape vines when treated with ethephon

Table 4. Effect of girdling, flower-cluster thinning and ethephon application on cluster weight, cluster length and cluster width of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Cluster weight (gm)			Cluster length (cm)			Cluster width (cm)		
		2000	2001	Mean	2000	2001	Mean	2000	2001	Mean
1	Control	175	179	177.00	28.00	27.88	27.94	14.38	14.00	14.19
2	Girdling before flowering	296	290	293.00	29.19	28.16	28.65	16.10	15.89	15.99
3	F.C thinning to ½ No. of cluster/vine before flowering.	279	285	28.20	28.60	28.14	28.37	15.06	15.33	15.19
4	F.C thinned to ¼ No. of cluster/vine before flowering.	229	231	230.00	28.35	28.00	28.18	15.50	15.38	15.44
5	Girdling + (Treat.3).	416	450	433.00	29.91	30.11	30.01	17.23	16.88	17.06
6	Girdling + (Treat.4).	385	391	388.00	29.12	28.81	28.96	16.58	16.50	16.54
7	Girdling after fruit set.	265	268	266.50	28.30	28.16	28.23	15.63	15.91	15.77
8	Girdling at veraison.	188	183	185.50	28.31	28.06	28.19	15.01	15.00	13.01
9	Ethephon 150 p.p.m at veraison.	188	184	187.00	28.33	28.14	28.23	16.04	16.30	16.17
10	Ethephon 200 p.p.m at veraison.	185	178	181.50	28.32	29.00	28.66	15.91	15.73	15.82
11	(Treat.8) + (Treat.9)	215	210	212.50	28.01	28.33	28.22	15.13	15.30	15.22
12	(Treat.8) + (Treat.10)	208	211	209.50	27.93	28.03	28.11	16.01	16.28	16.15
	New L.S.D at %5	65.00	66.00	-	1.53	1.61	-	0.54	0.36	-

at 250 ppm at veraison stage. Similar results were obtained by **Hawang *et al* (1986) and Larious *et al* (1990).**

2- Cluster length

From Table (4) it is revealed that, the longest clusters were produced when girdling was combined by flower-cluster thinning. Flower cluster thinning increased the cluster length but less than girdling.

On the other hand, girdling alone or combined with ethephon at veraison increased the cluster length as compared with the control. These results agree with those reported by **Sidhu and Dhalimal (1984)** who found that spraying perlette grape with ethephon (100-500ppm) alone or plus girdling increased cluster size. Similar results were obtained by **Rizk (1993) and Orth *et al* (1990).**

3- Cluster width

It is obvious from Table (4) that the effect of the different used treatments on cluster width were almost similar to that of cluster length.

4- Number of berries / cluster

It is clear from Table (5) that all treatments increased the number of berries per cluster than the control. Moreover, the combined application of girdling with flower-cluster thinning significantly increased the number of berries/cluster than the control.

Clusters on girdled vines were found to have more berries than those on the control ones. The increment may be due to the remarkable influence on fruit set and to the accumulation of organic food materials above the girdle until after healing.

The results in this respect are in harmony with the findings of **Rizk (1993) and Kitat (1964)** who reported that girdling the vines of Black Corinth grape during the blooming period greatly increased the number of berries per cluster.

5- Weight of berries/cluster

Data of Table (5) disclosed that all treatments increased weight of berries per cluster than the control. Yet, girdling alone before flowering gave the highest weight of berries per cluster than other treatments and the control. The results are in harmony with the findings of **Kitat (1964)**.

6- Weight of rachis

From Table (5) it can be detected that girdling application before flowering alone or combined with flower-cluster thinning significantly increased weight of rachis than the control. These results are in agreement with those found by **Rezk Allah (2000) and Kalil *et al* (1999).**

Physical and chemical characteristics of berries

1) Berry weight and size

Data presented in Table (6) indicated that girdling before flowering alone or combined with flower-cluster thinning tended to increase the berry weight and size significantly more than other treatments and the control.

Table 5. Effect of girdling, flower-cluster thinning and ethephon application on number of berries/cluster, weight of berries/cluster and weight of rachis of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Av. No. of berries/Cluster			Av. Weight of berries/cluster (gm)			Av. Weight of rachis (gm)		
		2000	2001	Mean	2000	2001	Mean	2000	2001	Mean
1	Control	103.34	98.91	101.13	165.50	168.18	166.83	9.50	10.84	10.17
2	Girdling before flowering	113.08	115.21	114.15	282.69	276.50	279.59	13.31	13.50	13.50
3	F.C thinning to ½ No. of cluster/vine before flowering.	121.13	118.55	119.84	266.48	272.67	269.58	12.52	12.33	12.42
4	F.C thinned to ¼ No. of cluster/vine before flowering.	114.56	100.01	107.29	217.67	220.02	218.85	11.33	10.98	11.56
5	Girdling + (Treat.3).	143.17	150.05	146.61	400.87	435.15	418.01	15.13	14.85	14.99
6	Girdling + (Treat.4).	142.33	139.44	140.89	370.07	376.50	373.28	14.93	14.50	14.72
7	Girdling after fruit set.	115.85	102.66	109.26	254.87	256.67	255.77	10.13	11.33	10.73
8	Girdling at veraison.	111.24	107.93	109.58	177.98	172.68	175.33	10.02	10.32	10.17
9	Ethephon 150 p.p.m at veraison.	104.62	102.35	103.49	177.86	173.99	175.75	10.14	10.01	10.08
10	Ethephon 200 p.p.m at veraison.	108.23	104.06	106.15	173.17	166.50	169.83	11.83	11.50	11.67
11	(Treat.8) + (Treat.9)	107.11	110.43	108.72	203.50	198.77	201.13	11.50	11.23	11.37
12	(Treat.8) + (Treat.10)	103.51	117.46	110.46	196.67	199.58	198.13	11.33	11.42	
	New L.S.D at %5	8.00	6.00	-	10.00	9.00	-	1.13	0.91	-

Table 6. Effect of girdling, flower-cluster thinning and Ethephon application on berry weight and berry size of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Av. Berry weight (gm)			Av. Berry size (ml)		
		2000	2001	Mean	2000	2001	Mean
1	Control	1.6	1.7	1.65	1.3	1.2	1.25
2	Girdling before flowering	2.5	2.4	2.45	2.1	2.2	2.15
3	F.C thinning to ½ No. of cluster/vine before flowering.	2.2	2.3	2.75	1.9	2.0	1.95
4	F.C thinned to ¼ No. of cluster/vine before flowering.	1.9	2.2	2.05	1.6	1.8	1.75
5	Girdling + (Treat.3).	2.8	2.9	2.85	2.5	2.4	2.45
6	Girdling + (Treat.4).	2.6	2.7	2.65	2.3	2.4	2.35
7	Girdling after fruit set.	2.2	2.5	2.35	1.8	2.2	2.00
8	Girdling at veraison.	1.6	1.6	1.60	1.3	1.2	1.25
9	Ethephon 150 p.p.m at veraison.	1.7	1.7	1.70	1.5	1.3	1.40
10	Ethephon 200 p.p.m at veraison.	1.6	1.6	1.60	1.3	1.4	1.35
11	(Treat.8) + (Treat.9)	1.9	1.8	1.85	1.6	1.5	1.55
12	(Treat.8) + (Treat.10)	1.8	1.7	1.75	1.5	1.3	1.41
	New L.S.D at %5	0.4	0.5	---	0.4	0.3	---

Furthermore, girdling at veraison gave a slight increment in this respect. These findings are in harmony with those found by **Kitat (1964) and Rizk (1993) and Kalil *et al* (1999)** who reported that girdling before flowering tended to increase the berry weight and size.

With regard to the effect of ethephon application on berry weight and size, ethephon alone or combined with girdling at veraison gave a slight increase in berry weight and size than the control. These results could be due to the effect of ethephon on cell enlargement of berries. These results are confirmed by the work of **El-Banna and Weaver (1979).**

2) Berry dimensions

It is clear from Table (7) that all treatments increased berry length and diameter than the control.

On the other hand, girdling alone wheather before flowering, or after fruit set or at verasion or combined with ethephon gave a slight increment than the control.

Meanwhile, girdling combined with flower cluster thinning to ½ the number of cluster / vine or to ¼ the number of cluster / vine before flowering gave a more pronounced effect in this respect. These results are in agreement with those **Kitat (1964) and Rizk (1993).**

3) Total soluble solids percentage

It is clear from Table (8) that all treatments significantly increased total soluble solids than the untreated ones. Yet, ethephon alone or combined with girdling at veraison stage gave more pronounced effect than all the other treatments. These results are in agreement with those found by **Hamey (1983) and Rizk (1993).**

With regard to the effect of girdling on increasing T.S.S%. in berry Juice, **Kim and Chung (2000)** found that girdling resulted in higher soluble solids content and earlier harvesting.

Flower cluster thinning increased the total soluble solids % in berry juice of Black Monukka cv., but it was generally less than the girdling did. These findings are in harmony with those found by **Kitat (1964) and Palliotti & Cartechini (2000)** who mentioned that, cluster thinning increased the T.S.S and it can be used to improve grape quality.

4) Total acidity percentage

Data presented in Table (8) clearly show that all treatments decreased total acidity (TA%) than the control. Moreover, ethephon alone or combined with girdling at veraison stage gave more reductions than the control.

These results agree with those reported by **Tourky (1983); Shulman *et al* (1985) and Al-Dujaili (1989)** who mentioned that spraying with ethephon at 100 ppm alone or in combination with girdling reduced the total acidity in berry juice. Similar results were obtained by **Rizk (1993) and Kim & Chung (2000).**

5) T.S.S / Acid ratio

Data tabulated in Table (8) show that all treatments increased T.S.S/Acid ratio in berry juice than the untreated vines. Moreover, ethephon applications either alone or combined with girdling at

Table 7. Effect of girdling, flower cluster thinning and ethephon application on berry dimensions of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Av. Berry length (cm)			Av. Berry diameter (cm)		
		2000	2001	Mean	2000	2001	Mean
1	Control	1.53	1.64	1.59	1.43	1.46	1.45
2	Girdling before flowering	1.59	1.65	1.62	1.45	1.44	1.45
3	F.C thinning to ½ No. of cluster/vine before flowering.	1.68	1.66	1.67	1.57	1.55	1.56
4	F.C thinned to ¼ No. of cluster/vine before flowering.	1.65	1.61	1.63	1.53	1.50	1.52
5	Girdling + (Treat.3).	1.73	1.69	1.71	1.61	1.65	1.63
6	Girdling + (Treat.4).	1.70	1.71	1.71	1.69	1.65	1.67
7	Girdling after fruit set.	1.63	1.66	1.65	1.62	1.63	1.63
8	Girdling at veraison.	1.56	1.61	1.58	1.46	1.49	1.48
9	Ethephon 150 p.p.m at veraison.	1.55	1.59	1.57	1.44	1.48	1.46
10	Ethephon 200 p.p.m at veraison.	1.56	1.54	1.55	1.43	1.44	1.44
11	(Treat.8) + (Treat.9)	1.66	1.63	1.64	1.57	1.54	1.56
12	(Treat.8) + (Treat.10)	1.68	1.66	1.67	1.59	1.56	1.58
	New L.S.D at %5	0.06	0.08	--	0.07	0.07	

Table 8. Effect of girdling, flower-cluster thinning and ethephon application on T.S.S (%), total acidity (%) and T.S.S/acid ratio of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	T.S.S (%)			Total acidity (%)			T.S.S/acid ratio		
		2000	2001	Mean	2000	2001	Mean	2000	2001	Mean
1	Control	18.23	18.00	18.12	0.66	0.65	0.66	27.62	27.69	27.45
2	Girdling before flowering	19.03	18.99	19.01	0.63	0.63	0.63	30.20	30.14	30.17
3	F.C thinning to ½ No. of cluster/vine before flowering.	19.32	19.30	19.31	0.62	0.61	0.62	31.16	31.67	31.15
4	F.C thinned to ¼ No. of cluster/vine before flowering.	19.01	19.14	19.16	0.63	0.63	0.63	30.17	30.38	30.41
5	Girdling + (Treat.3).	19.51	19.58	19.33	0.62	0.61	0.62	31.47	32.09	31.18
6	Girdling + (Treat.4).	19.33	19.31	19.32	0.64	0.62	0.63	30.20	31.15	30.66
7	Girdling after fruit set.	20.03	20.33	20.18	0.64	0.62	0.63	31.29	32.79	32.03
8	Girdling at veraison.	19.80	19.91	19.86	0.65	0.63	0.64	30.46	31.60	31.03
9	Ethephon150p.p.mat veraison.	21.13	21.50	21.32	0.60	0.61	0.61	35.22	35.25	34.95
10	Ethephon200p.p.mat veraison.	21.00	21.31	21.16	0.61	0.61	0.61	34.43	34.93	34.69
11	(Treat.8) + (Treat.9)	21.58	21.63	21.61	0.59	0.58	0.58	36.58	37.29	37.26
12	(Treat.8) + (Treat.10)	21.30	21.55	21.43	0.60	0.59	0.59	35.50	36.53	36.32
New	L.S.D at %5	1.43	1.31	-	0.03	0.03	-	0.6	0.5	-

veraison significantly increased this ratio than other treatments and the control.

The increament due to ethephon application may be attributed to that ethylene was gradually released in plants previously treated with ethephon **Yang (1969) and El-Sayed (1995).**

6) Cluster (bunch) compactness

Data presented in Table (9) indicated that all treatments increased bunch compactness than the control. Yet, girdling application alone or combined with flower cluster thinning before flowering gave the most compactness than other considered treatments.

Table 9. Effect of girdling, flower-cluster thinning and ethephon application on the coefficient of cluster compactness of Black Monukka cv. grape during seasons of 2000 and 2001.

No.	Treatments	Coefficient of cluster compactness			
		2000	2001	Mean	% of increase than the control
1	Control	3.69	3.54	3.61	-
2	Girdling before flowering	3.88	5.51	4.69	29.92
3	F.C thinning to ½ No. of cluster/vine before flowering.	4.24	4.21	4.23	17.17
4	F.C thinned to ¼ No. of cluster/vine before flowering.	4.04	3.57	3.81	5.54
5	Girdling + (Treat.3).	4.79	4.98	4.89	35.45
6	Girdling + (Treat.4).	4.89	4.83	4.86	34.63
7	Girdling after fruit set.	4.09	3.64	3.87	7.20
8	Girdling at veraison.	3.92	3.85	3.89	7.76
9	Ethephon 150 p.p.m at veraison.	3.69	3.63	3.66	1.38
10	Ethephon 200 p.p.m at veraison.	3.82	3.58	3.70	2.49
11	(Treat.8) + (Treat.9)	3.82	3.89	3.86	6.93
12	(Treat.8) + (Treat.10)	3.70	4.19	3.95	9.42
	New L.S.D at %5	0.6	0.6	-	-

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مجلة اتحاد الجامعات العربية للدراسات والبحوث الزراعية، جامعة عين شمس، القاهرة ، ١١(٢)، ٧٣٣-٧٥٠، ٢٠٠٣

دراسة تأثير التحليق منفردا أو مع خف العناقيد الزهرية والرش بالإيثيفون على عقد الثمار والمحصول وصفات الجودة لثمار عنب بلاك مونوكا

[٥٣]

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أجريت هذه الدراسة خلال موسمي ٢٠٠٠ و٢٠٠١ على كرمات عنب بلاك مونوكا عمر ٩ سنوات. وذلك لدراسة تأثير التحليق سواء منفردا أو مع خف العناقيد الزهرية والرش بالإيثيفون على عقد الثمار والمحصول وصفات الجودة للثمار الناتجة. وقد اختير لهذه الدراسة ٧٢ كرمة متماثلة في الحجم تقريبًا. وقد أتضح من النتائج أن إجراء عملية التحليق لكرمات عنب البلاك مونوكا منفردًا أو بالإضافة إلى خف العناقيد الزهرية قبل التزهير أدى إلى زيادة معنوية في نسبة عقد الثمار عن الكرمات غير المعاملة ، أدت المعاملات المستخدمة ماعدا معاملة خف العناقيد الزهرية إلى زيادة المحصول زيادة معنوية وكان أعلى محصول ناتج من معاملة التحليق قبل التزهير، ولم يكن هناك تأثير واضح على المحصول نتيجة لرش الكرمات بالإيثيفون وتحليق الأفراع الثمرية في مرحلة بداية تلوين الثمار.

أشارت النتائج إلى أن إجراء عملية التحليق سواء بمفردها أو بالإضافة لخف العناقيد الزهرية قبل التزهير أدى إلى زيادة معنوية عالية في متوسط وزن ، وطول وعرض ، عدد الحبات بالعنقود، وزن الشمراخ ، وزن وحجم الحبة وأبعاد الحبة.

وقد أدى الرش بالإثيفون بتركيز (١٥٠ أو ٢٠٠ جزء/ مليون) سواء منفردًا أو مع

التحلـــيق في مرحلة بداية تلوين الثمار إلى التبكير في ميعاد نضج الثمار بمدة حوالـــي ٧-٩ أيـــام عن المعاملة المحايدة ، كما أدت معـــاملات الاثـــيفون الي زيادة معنوية في المواد الصلبة الذائبة وتقليل محتوى الحبات مـــن الحموضـــة الكلـــية وزيـــادة نسبـــة المـــــواد الصـــلبة الذائـــبة إلى الحموضة الكليـــة.

وقـــد أدت جميع المعاملات المستخدمة إلى الحصول على عناقيد أكثر اندماجًا عن الكـــرمات الغير معاملة وكان تأثير التحليق بمفـــردة أو مـــع خف العناقيد الزهرية أكثر وضوحًا في هذا المجال. وبصفة عامة يمكن القول أن كافة المعاملات المستخدمة في هذه الدراســـة قد أدت لتحسين جودة العنب بلاك مونوكا.

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