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EFFECT OF PRUNING SEVERITY ON BUD BEHAVIOUR, VEGETATIVE GROWTH, YIELD AND SOME BUNCH CHARACTERISTICS OF SUPERIOR SEEDLESS GRAPE

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ABSTRACT

This investigation was conducted during the seasons of 2002 and 2003 in a private vineyard of Superior seedless grape at EL-Khatatba district, EL-Monofia governorate. The vines were grown in a sandy soil under drip irrigation system. The vines were pruned to 6 or 8 canes with 10 or 12 or 14eyes per each cane.

The results showed that the percentage of bud burst was increased by leaving 6 canes with 12 or 14 eyes. Leaving 8 canes with 14 eyes per each cane gave a lower value than leaving both 10 or 12 eyes under the same number of canes. Pruning Superior seedless grape by leaving 6 canes with 10 , 12 and 14 eyes increased the values of bud fertility than leaving the same number of eyes on 8 canes/vine.

Vines pruned to 8 canes/vine with 10,12 or 14 eyes produced the highest values of number of clusters, yield per vine& per feddan, berry firmness and leaf area in comparison with leaving 6 canes under the same number of eyes Whereas, leaving 6 canes with 10 eyes per cane gave the highest values of berry weight ,diameter and berry adherence strength during the two seasons .Percentage of soluble solids content in berry juice was higher when vines were pruned to 6 canes than leaving 8 canes with 10, 12 or 14 eyes/cane. Yet, the other pruning levels resulted in an unpronounced effect in this respect.

The percent of nitrogen and potassium was increased by increasing the number of eyes/cane during the two seasons of the study. This percent was decreased by increasing bud load/vine from 72 (6 canes x 12 eyes) to 96 (8 canes x 12 eyes) per vine. No obvious effect was observed concerning the effect of pruning severity on leaf P content during the two seasons of study .

INTRODUCTION

The Sugraone table grape variety is trademarked as "Superior seedless" by the United States Governments Patent and Trademark office and over fifteen other significant table grape trading nations including numerous member states of the European Union. Sugraone grapes are large, shatter-resistant, sweet, firm, crisp and crunchy. They ripen early in the season and when ripe have a slight Muscat flavor which is more easily distinguished by their low acid content.

Superior seedless grape is one of the newly introduced cultivars in Egypt, since it ripens early at the beginning of the harvest season. This cultivar is one of the most important cultivars which meet the needs of the local as well as foreign market (some Arab and European countries). Its cultivated area reached about 13060 feddans in the newlreclaimeds land according to the recent statistics of the Ministry of Agriculture (2003). Additional areas of this cultivar is expected in a few years, specially due to its excellent bunch characteristics and good flavor which are more suitable for both marketing and exportation.

Pruning is the most important operation that the grower performs on the grapevines. It consists of removing from each vine almost all the canes leaving only an adequate number of canes, that according to vine vigour . This number of eyes is usually named as vine load. It is widely accepted that the fruit yield and fruit quality of the grapevine is related to the number of eyes retained after the dormant pruning (AL-Said & AL-Wan, 1990; Hussain & EL-Dujaili, 1990 and Murisier & Ziegler, 1991). However, the length of bearing units is determined by the fruiting habit of the cultivar, fruitfulness of the basal buds on the cane and the size of cluster produced (Weaver, 1976). Spur pruning is used on cultivars having large cluster and fruitful basal buds i.e. Flame seedless, King Ruby and Romi Ahmar. On the other hand, cane pruning is used on cultivars in which the basal buds are less fruitful i.e. Thompson seedless, Superior seedless and Crimson seedless grapes. In addition, the number of eyes/cane and suitable bud load per vine vary according to different factors i.e., grape cultivar, vine vigour, proper horticultural practices....etc.

Pruning is considered as the most important technique developed to regulate the balance between fruit production and vegetative growth of the grapevines, (Possingham, 1993). Since, it directly influences yield, fruit quality and vine vigour, (Howell and Striegler, 1998). Little attention had been paid on pruning of Superior seedless grapevines under local conditions.

This investigation was carried out to determine the suitable level of pruning severity as number of canes and number of eyes per vine and its effect on bud behaviour, yield and berry quality of Superior seedless grapes. The vegetative growth and the content of NPK in the leaf petioles during the seasons of study were also included

MATERIALS AND METHODS

This study was carried out during the two successive seasons of 2002 and 2003 in a private vineyard of Superior seedless grape at EL-Khatatba district, EL-Monofia governorate. The vines were five years old, grown in a sandy soil using drip irrigation system. Vines were spaced at 2 x 2.5 meters cane pruned and supported to (Y) trellis system. Vines were vigorous and were subjected to the ordinary horticultural practices. The selected vines were similar in growth and vigor as far as possible and treated alike except for pruning treatments.

The main objective was to evaluate the effect of different levels of pruning severity on bud behavior, vegetative growth, yield, berry quality and NPK content of the leaf petioles of this grape cultivar. Each treatment was represented by four replicates, three vines each. Thus the experiment included (72 vines).

Three vines from each replicate were pruned at the beginning of January to six or eight canes per vine with 10, 12 or 14 eye per cane. Four or five renewal spurs (2 eyes/each) were also retained per vine.

The experiment included six treatments as follows :

6 canes X 10 eyes = 60 eye / vine.

6 canes X 12 eyes = 72 eye / vine.

6 canes X 14 eyes = 84 eye / vine.
8 canes X 10 eyes = 80 eye / vine.
8 canes X 12 eyes = 96 eye / vine.
8 canes X 14 eyes = 112 eye / vine.

Bud behaviour :

Number of bursted out buds and clusters per each vine were counted one month after bud burst. The percentage of bud burst and fertility were calculated as follows according to (Bessis, 1960) and (Samra, 2001)

Bud burst% = No. of bursted out buds / Total No. of buds × 100

Bud fertility coefficient = No. of clusters vine / Total No. of buds

Vegetative growth :

1-Leaf area : at full bloom stage, samples of matured leaves were collected from the sixth leaf from the top of the shoots to determine leaf area (cm2) using Planimeter.

NPK percentages in leaf petioles :

Samples of mature leaves (opposite to clusters) were taken at full bloom stage from the each treatment replicate wise. Leaf petioles were separated, cleaned and dried at 70 oC to constant weight and finally grind. Samples were digested by using perchloric and sulphuric acids according to (Chapman and Pratt, 1978) for the following determinations :

1. Nitrogen (N%) according to (Nelson and Sommers, 1980).
2. Phosphorus (P%) according to (Jakson, 1967).
3. Potassium (K%) using flame photometer according to (Brown and Lilliand, 1946)

Yield and berry quality :

When the clusters attained their full-colour (creamy, greenish-yellow) and soluble solids percentage in berry juice reached about 14-15.5 %, with TSS/acid ratio 18-20:1 according to Food and Agriculture Organization of the united Nations (2003), the clusters were harvested.

At harvest time (first of June), the following aspects were estimated :

1. Number of clusters per vine.
2. Average bunch weight(gm)).
3. Yield per vine (kg)
4. Yield per feddan (ton).

Samples of 100 berries from each replicate were collected at random to determine the average of :

1-Berry weight (gm). 2- Berry diameter (mm).

3-Berry firmness and adherence strength (g/f) using Push-Pull (Dynanometer Model DT 101).

The juice was pressed from the berries and filtered through two layers of cheesecloth to determine :

1. Soluble solids percentage using Carlzeiss hand refractometer.
2. Titratable acidity by titration of 10 ml juice sample against (0.1N) Na OH. Acidity was expressed as gms tartaric acid /100 ml juice according to A.O.A.C., (1980).
3. Soluble solids / acid ratio in berry juice was calculated.

Statistical analysis :

Data of both seasons of the study were statistically analyzed according to (Snedecor and Cochran, 1980). Treatment means were compared using L.S.D values at 5 % level of probability.

RESULTS AND DISCUSSION

1) Effect of pruning severity on bud behaviour

a) Bud burst :

Data from Table (1) show that leaving six canes with 12 or 14 eyes per each cane significantly increased the percent of bud burst than 6 canes with 10 eyes/cane. However, the variation between the two treatments was in significant. Furthermore, bud burst was reduced by increasing the number of eyes per each cane. So, leaving 8 canes with 14 eyes per each cane gave a lower values than that of 10 or 12 eyes/cane under the same number of canes. Percent of bud burst was not markedly affected with leaving 10 or 12 eyes with 8 canes/vine.

In this respect, Ali et al. (2000) mentioned that bud burst percentage increased significantly as cane length was increased. Since, leaving 4 canes with 18 eyes gave a higher bud burst value than leaving 6 canes with 12 eyes. Also, Omar and Abdel-Kawi (2000) found that bud burst was increased from the basal to the distal part of the cane of Thompson seedless grape. They showed that increasing the number of eyes from 60 to 120 eyes/vine significantly decreased bud burst percentage. They attributed that to the fact that eyes are dependant on parent vines for stored nutrients to burst out. The increase of bud load decreases bud burst as a result of minimizing the amount of nutrients for each bud to burst out, (Phillips, 1969).

b) Bud fertility :

It is clear from Table (1) that bud fertility percentage was reduced by increasing the number of eyes per each cane. So, pruning Superior seedless grape by leaving 8 canes of 12 or 14 eyes each, significantly decreased the percent of bud fertility than the other pruning severity levels in both seasons. Furthermore, pruning Superior seedless grape by leaving 6 canes with 10, 12 and 14 eyes increased the values of bud fertility than leaving the same number of eyes on 8 canes/vine. Yet, leaving 6 canes with 10 or 12 eyes per each cane gave a higher percent of bud fertility than the other pruning severity under (Y) trellis system.

Our data go in line with Rizk et al(2006) who studied the effect of pruning severity on bud behaviour of Thompson seedless grapevines. They found that Leaving 6, 8 or 10 canes with 14 eyes gave a lower bud fertility than leaving 6, 8 or 10 canes with 12 eyes per cane. Leaving 6 canes with 12 eyes produced higher bud fertility than other treatments. Also, Samra (2001) reported that Crimson seedless vines pruned to 8 or 10 canes with 12 eyes each gave a higher bud fertility percentage than leaving 16 eyes/cane under the two levels of pruning.

Table (1) : Effect of pruning severity on bud burst, bud fertility and leaf area of Superior seedless grape during 2002 and 2003 seasons .

Treatments	Bud Burst %				Bud fertility				Leaf area (cm)2			
	2002				2002				2002			
No.of eyes / No.of canes	10	12	14	mean	10	12	14	mean	10	12	14	Mean
6 canes	75.9	80.2	80.1	78.7	31.7	32.0	32.0	32.0	150.1	145.2	159.6	151.6
8 canes	78.6	77.8	75.3	77.2	30.3	27.6	25.6	27.5	152.0	150.3	157.0	153.1
mean	77.3	79.0	77.7	---	31.0	29.8	28.8	---	151.0	147.7	158.3	---
L.S.D at 5% for : No of cane				1.55		1.26				2.81		
No of eyes				1.90		1.54				3.44		
interaction				2.68		2.18				4.87		
	2003				2003				2003			
6 canes	75.3	78.1	77.4	77.0	34.1	30.6	28.6	31.1	152.7	147.8	156.1	152.2
8 canes	76.9	76.2	68.7	74.0	31.6	26.8	25.2	27.7	155.3	149.0	159.2	154.5
Mean	76.1	77.2	73.1	---	32.8	28.7	26.9	---	154.0	148.4	157.6	---
L.S.D at 5% for : No of cane				2.03		1.38				276		
No of eyes				2.48		1.69				3.38		
interaction				3.51		2.39				4.78		

2) Effect of pruning severity on vegetative growth :

Leaf area :

Data presented in Table (1) reveal that leaf area was increased by increasing the number of canes per vine. Since, vines pruned to 8 canes/vine10,12 or 14 eyes resulted in higher values of leaf area than the other levels of pruning (6 canes/vine). Vines pruned to 6 canes with 10,12 or 14 eyes were found to have the lowest average of leaf area in this respect. The obtained data are in accordance with those found by Zamboni et al. (1998) who studied the effect of two different eye numbers (30 and 50 per vine) on vine physiology of Pinot Gris, Pinot Noir and Sauvignon grape cultivars. They found that the vines with high eyes number developed a large total leaf area than the vines with the low eyes number. Also, Abdel-Wahab (1997) mentioned that vines pruned to 10 canes x 6 eyes gave the highest percentage of leaf area. Moreover, Nuzzo et al. (1999) demonstrated that cane pruning of Superior seedless grape by leaving five to six canes and 10 eyes/vine showed that the single shoot and leaf area increased rapidly from bud-break to veraison.

3) Effect of pruning severity on yield and number of clusters / vine :

a) Yield per vine and per feddan :

From Table (2) of yield per vine and per feddan was increased by increasing bud load per vine. Thus, leaving 8 canes with 12 or 14 eyes per cane produced a higher significant yield/vine than that with 10 eyes/cane during the two seasons of this study. Furthermore, vines pruned to 8 canes with 14 eyes resulted in a higher yield per vine and per feddan than leaving 10 or 12 eyes/cane. Leaving 6 canes with 10,12 or 14 eyes per cane

produced lower yield per vine and per feddan than leaving the same number of eyes with 8 canes. Yet, leaving 6 canes with 10 eyes per vine gave the lowest yield per vine and per feddan during both seasons of study. The reduction in the yield may be due to the decrease in the number of clusters per each vine, Table (2). Our data go in line with Omar and Abdel-Kawi (2000) who found that the yield/vine of Thompson seedless grape was increased significantly by increasing bud load. Also, Marandi (2000) working on the response of seedless grape to different levels of pruning (20-200 eyes/vine), found that, yield increased by increasing the number of eyes left on the vine. Also, Samra (2001) clarified that the yield/vine or per feddan was increased by increasing bud load of Crimson seedless grape. Also, Rizk at al(2006) found that yield per vine and per feddan was increased by increasing the number of eyes/vine.

Table (2) : Effect of pruning severity on Yield/vine , Yield/feddan of Superior seedless grape during 2002 and 2003 seasons

Treatments	Yield/vine(kg)				Yield/feddan (ton)			
	2002				2002			
No.of eyes / No.of canes	10	12	14	Mean	10	12	14	Mean
6 canes	12.7	13.6	13.7	13.3	10.6	11.4	11.5	11.2
8 canes	13.6	14.3	14.8	14.2	11.4	12.0	12.4	12.0
mean	13.1	14.0	14.2	---	11.0	11.7	12.0	---
L.S.D at 5% for : No. of canes			0.58			0.49		
No of eyes			0.71			0.60		
interaction			1.00			0.85		
	2003				2003			
6 canes	12.0	12.2	12.7	12.3	10.1	10.3	10.6	10.3
8 canes	14.2	14.4	14.9	14.5	12.0	12.1	12.5	12.2
mean	13.1	13.3	13.8	---	11.1	11.2	11.6	---
L.S.D at 5% for : No. of canes			0.75			0.62		
No of eyes			0.92			0.76		
interaction			1.68			1.08		

b) Number of bunches:

It is obvious from Table (3) that number of bunches per vine was significantly increased by increasing both number of canes and number of eyes per each cane. In this respect, the data also reveal that increasing the number of eyes on the cane increased the number of bunches per vine. So, the mean number of bunches was 23.0-22.2 for leaving 6 canes/vine, but reached about 26.5-26.4 by leaving 8 canes/vine in the two seasons respectively. Leaving 6 canes with 10 eyes per each cane gave a lower significant number of bunches per vine than the other pruning severitylevels. Thus, pruning vine by leaving 8 canes with 14 eyes per each cane gave the highest values of this estimate.

Our data are in agreement with those obtained by Singh and Kumar (1980) who reported that Anab-e-Shahi grapevines pruned to 20, 24, 30 or

40 canes and 3 eyes/cane were found to produce the highest number of bunches/vine. Also, Hegazi et al. (1984) mentioned that fruitful shoots of Thompson seedless vines were increased by increasing the number of eyes per vine. Moreover, Salem et al. (1997) showed that leaving 96 eyes/vine resulted in the greatest growth and percentage of fruiting buds of Thompson seedless than leaving 72, 84 or 108 eyes/vine.

Table(3) : Effect of pruning severity on No. of bunches/vine and bunch weight of Superior seedless grape during 2002 and 2003 seasons .

Treatments	No. of bunches/vine				Bunch weight (gm)			
	2002				2002			
No.of eyes / No.of canes	10	12	14	Mean	10	12	14	mean
6 canes	19.0	23.0	26.8	23.0	666.8	591.0	513.2	590.3
8 canes	24.2	26.5	28.7	26.5	561.5	540.7	518.0	540.1
mean	21.6	24.8	27.7	--	614.1	565.8	515.6	---
L.S.D at 5% for : No of canes			1.02				19.36	
No of eyes			1.24				23.71	
interaction			1.76				33.51	
	2003				2003			
6 canes	20.5	22.0	24.0	22.2	586.8	555.5	528.8	557.0
8 canes	25.3	25.8	28.2	26.4	562.0	559.2	527.5	549.5
mean	22.9	23.9	26.1	---	574.4	557.3	528.1	---
L.S.D at 5% for : No. of canes			1.19				15.89	
No of eyes			1.45				19.47	
interaction			2.06				27.52	

4) Effect of pruning severity on cluster characteristics :

a) bunch weight :

Data in Table (3) show that the bunch weight was reduced by increasing bud load. Vines pruned to six canes with 10 or 12 eyes/cane gave the highest bunch weight in the combination with the other pruning severity. Leaving 8 canes under different numbers of eyes/cane reduced the average bunch weight as compared with the other tested treatments. The differences between the highest load and the lowest one were significant than leaving six canes with 10,12 or 14 eyes/cane during the two seasons of this study. Data in the same table indicated that mean bunch weight was decreased by increasing the number of canes per vine.

Our data go in line with, Abdel-Wahab (1997) who reported that vines which were pruned to 10 canes with 6 eyes gave the highest cluster weight. Also, Samra (2001) found that increasing the bud load produced a lower cluster weight. Moreover, Rizk at al(2006) mentioned that average cluster weight was reduced by increasing the number of eyes of Thompson seedless grapes.

b) Berry weight and diameter :

Data in Table (4) revealed that berry weight and diameter were decreased by increasing the number of eyes to 6 or 8 canes/vine.Thus, vines pruned to 6 or 8 canes with 14 eyes each resulted ina significant reduction in

average berry weight and diameter than the other pruning severity levels. On the other hand, leaving 6 canes with 10 eyes/cane gave the highest values of berry weight and diameter during the two seasons of this study. This seems to be not astonishing since this treatment produced lower number of clusters per vine but the highest values of cluster weight than the other pruning severity levels. These results are in agreement with those reported by Rizk et al. (1994) who found that berry weight decreased as cane length was increased 16 eyes/cane. Also, Miller and Howell (1997) mentioned that berry weight decreased with increasing pruning level from 20, 40 to 120 or 160 eyes/vine.

Table (4) : Effect of pruning severity on berry weight and diameter of Superior seedless grape during 2002 and 2003 seasons

Treatments	Berry weight (gm				Berry diameter (mm			
	2002				2002			
No.of eyes / No.of canes	10	12	14	mean	10	12	14	mean
6 canes	4.8	4.5	3.4	4.2	18.9	18.7	18.0	18.5
8 canes	4.3	4.0	3.6	4.0	18.4	18.3	18.2	18.3
mean	4.5	4.2	3.4	---	18.6	18.5	18.1	---
L.S.D at 5% for : No. of canes			0.22				0.26	
No of eyes			0.26				0.32	
Interaction			0.37				0.46	
	2003				2003			
6 canes	4.5	4.1	3.6	4.1	18.6	18.5	18.2	18.4
8 canes	4.3	4.2	3.5	4.0	18.4	18.3	18.0	18.2
mean	4.4	4.1	3.5	---	18.5	18.4	18.1	---
L.S.D at 5% for : No. of canes			0.12				0.23	
No of eyes			0.14				0.29	
interaction			0.20				0.40	

c) Berry firmness and adherence strength :

It is clear from Table (5) that berry firmness of Superior seedless grape was more higher than that of the other different pruning severity. Thus, leaving 6 or 8 canes/vine with 14 eyes/cane gave the higher values of berry firmness during the two seasons of the study, whereas, these treatments gave the lowest values of berry adherence strength. Moreover, leaving 6 canes/vine with 10 eyes per cane produced berries with a higher adherence strength than the other pruning severity levels . However, the differences between treatments were not significant for both the number of canes or the buds load concerning berry firmness. In this respect, Fawzi et al. (1984b) showed that berry firmness decreased by increasing the number of eyes from 12 to 14 eyes per cane. Also, Ibrahim et al. (1996) mentioned that cane length led to an increase in berry firmness.

Table (5) : Effect of pruning severity on berry firmness and adherence strength of Superior seedless grape during 2002 and 2003 seasons .

Treatments	Berry firmness (g/f)				Berry adherence strength (g/f)			
	2002				2002			
No.of eyes / No.of canes	10	12	14	mean	10	12	14	mean
6 canes	1018.7	970.0	1063.7	1017.5	870.0	801.2	720.0	797.1
8 canes	1010.0	968.7	1030.0	1002.9	692.5	715.0	723.7	710.4
Mean	1014.3	969.4	1046.9	---	781.2	758.1	721.8	---
L.S.D at 5% for : No. of canes			56.28		48.96			
No of eyes			68.93		59.79			
interaction			97.44		84.77			
	2003				2003			
6 canes	1153.3	1131.7	1185.7	1156.9	956.2	875.0	860.0	897.1
8 canes	1140.0	1122.3	1160.0	1140.7	810.0	735.0	730.0	758.3
Mean	1146.7	1127.0	1172.9	---	883.1	805.0	795.0	---
L.S.D at 5% for : No. of canes			69.13		28.28			
No of eyes			84.66		34.64			
interaction			119.68		48.96			

d) Soluble solids content :

The effect of pruning severity on the content of soluble solids in the berry juice of Superior seedless grape is shown in Table (6) . It is clear that soluble solids content in berry juice was affected by different pruning severity levels. In this respect, leaving 6 canes/vine produced a higher SSC than leaving 8 canes per vine under 10, 12 or 14 eyes/cane. Yet, leaving 6 canes with 10 eyes per each vine produced a higher content of soluble solids in berry juice than the other pruning severity levels during both seasons. These results are in harmony with those reported by Rizk (1996) who mentioned that in Thompson seedless grape pruned to different number of canes (4,5 or 6 canes/vine) and to different number of eyes (18,15 or 12 eyes/cane), SSC was increased at the short cane than the other treatments. Also, Ibrahim et al. (1996) found that increasing cane length led to a decrease in soluble solids (TSS) content. Furthermore, Avenant (1998) working on Festival seedless grapevines which were pruned to 5 levels; 4,6,8,10 and 12 canes with 14 eyes/cane, found that Sugar concentration decreased as bud load was increased.

e) Titratable acidity :

Table (6) indicated that total acidity nearly gave an opposite trend to that noticed with SSC. Since, leaving 6 canes/vine with 10 eyes per cane showed a lower acidity percent in berry juice in comparison with other levels of pruning. Yet, the effect of other pruning severity on total acidity were not pronouncing during both seasons of the study, but it varied from one season to another.

It could be noticed that there was no definite trend in this respect. In the case of leaving 8 canes per vines, number of eyes per cane seemed to have a very slight effect without definite trend whereas in the case of leaving 6 canes/vine, the lowest acidity content was associated with the lower number of eyes (10 eyes/cane) followed in an increasing order by that of the highest one (14 eyes/cane) then the moderate number (12 eyes/cane) respectively. This was true for the two experimental seasons.

In this respect, Tomer and Brar (1983) mentioned that the total acidity was increased by increasing the number of eyes/cane. Also, Bozinovik and petroveski (1985) who pruned Ribier grapevines to 6, 8 or 10 eyes/cane, found that acidity increased with increasing bud load.

Table 6) : Effect of pruning severity on SSC content, Titratable acidity and SSC/acid ratio of Superior seedless grape during 2002 and 2003 seasons .

Treatments	SSC content				Titratable acidity (%)				SSC/acid ratio			
	2002				2002				2002			
No.of eyes / No.of canes	10	12	14	mean	10	12	14	mean	10	12	14	Mean
6 canes	16.5	16.0	16.2	16.2	0.35	0.43	0.40	0.39	47.0	37.0	40.4	41.5
8 canes	15.8	15.6	15.5	15.6	0.40	0.38	0.39	0.39	39.7	40.5	39.3	39.8
mean	16.1	15.8	15.8	---	0.37	0.40	0.40	---	43.3	38.7	39.8	---
L.S.D at 5% for : No. of canes				0.64			0.03				3.13	
No of eyes interaction.				0.78			0.03				3.83	
				1.11			0.04				5.41	
	2003				2003				20003			
6 canes	17.0	16.4	16.4	16.6	0.36	0.42	0.40	0.39	46.6	38.8	41.1	42.2
8 canes	16.3	15.7	15.9	16.0	0.41	0.39	0.41	0.40	40.1	40.2	38.8	39.7
mean	16.6	16.0	16.1	---	0.38	0.40	0.41	---	43.3	39.5	40.0	---
L.S.D at 5% for : No. of canes				0.44			0.02				3.78	
No of eyes interaction				0.54			0.03				4.22	
				0.77			0.04				6.13	

f) SSC/acid ratio :

It is clear from Table (6) that percentage of SSC/acid ratio gave a similar trend to that noticed with the soluble solids content. Moreover, leaving 6 canes with 10 or 14 eyes/cane gave a higher SSC/acid ratio than the other pruning severity levels. Vines pruned to 8 canes with 10,12 or 14 eyes produced a lower level of SSC/acid ratio than the other levels of pruning . The reduction observed in these treatments may be ascribed to their effect in reducing the percent of SSC with increasing the values of total acidity in berry juice. Furthermore, leaving 6 canes per each vine with 10 eyes per each cane produced a higher value of SSC/acid ratio in berry juice than the other treatments used. Yet, vines pruned to 8 canes with 14 eyes resulted in lower values than the other pruning severity levels. The obtained data are in accordance with those found by Dvornin and Ipatil (1984) who found that

pruning vines as to leave 3-4 to 10-11 eyes using long fruiting canes with total number of eyes/vine from 30-35 to 75-80 was found to give the highest sugar/acid ratio. Also, AL-Saidi and AL-Wan (1990) stated that the lowest values of TSS/acid ratio were obtained from vines pruned to 16 eyes/cane followed by canes pruned to 8, 10, 12, 14 eyes/cane. Also, Samra (2001) found that increasing the number of eyes on the canes reduced the percent of soluble solids in berry juice. However, leaving 8 canes with 12 eyes on the cane gave higher values of SS/acid ratio than leaving 10 canes with 12 or 14 eyes per each vine.

Table (7) : Effect of pruning severity on N,P, P and K% dry weight base of Superior seedless grape during 2002 and 2003 seasons .

Treatments	N % dry weight base				P % dry weight base				K % dry weight base			
	2002				2002				2002			
No.of eyes / No.of canes	10	12	14	mean	10	12	14	mean	10	12	14	Mean
6 canes	1.27	1.32	1.59	1.40	0.115	0.128	0.126	0.123	3.72	3.65	2.44	3.27
8 canes	1.19	1.28	1.60	1.36	0.124	0.119	0.123	0.122	2.83	2.49	2.10	2.47
mean	1.23	1.30	1.60	---	0.119	0.123	0.124	---	3.27	3.07	2.27	---
L.S.D at 5% for : No. of canes				0.21			0.007				0.31	
No of eyes				0.26			0.008				0.38	
interaction.				0.30			0.010				0.45	
	2003				2003				20003			
6 canes	1.75	2.14	2.26	2.05	0.150	0.132	0.136	0.140	3.90	3.86	3.83	3.86
8 canes	1.75	2.10	2.22	2.02	0.140	0.153	0.132	0.141	3.64	3.52	3.35	3.50
mean	1.75	2.12	2.24	---	0.145	0.142	0.134	---	3.77	3.70	3.60	---
L.S.D at 5% for : No. of canes				0.27			0.012				0.08	
No of eyes				0.32			0.015				0.10	
interaction				0.37			0.015				0.12	

5) Effect of pruning severity on N, P and K percentages in leaf petioles :

Concerning the effect of pruning severity on NPK percentages in leaf petioles of Superior seedless grape data in Table (7) indicated that the percent of nitrogen and potassium increased by increasing the number of eyes/cane during the two seasons of study, whereas, this percent was decreased with increasing bud load/vine from 72 (6 canes x 12 eyes) to 96 (8 canes x 12 eyes) per vine. however, no clear effect was observed concerning the effect on leaf P content during the two seasons. The obtained data agree with those of Abd EL-Fatah et al. (1993) who showed that pruning Roumi Ahmar grapevines to leave 30,45,60 or 75 eyes/vine. The obtained results reveal that NPK percentages in 1 year old wood were significantly decreased as a result of increasing bud-load/vine from 30 to 75 eyes per vine. Also, (Fardossi et al. 1993) found that nutrient content of the grapevines leaves was affected by cultivar, method of cultivation and age of the vines. Furthermore, Abdel-Wahab (1997) showed that the treatment of 15 eyes/cane produced the highest average (0.5 % and 0.57 % in both seasons, respectively) of total nitrogen of King Ruby grapevine, while the lowest average was obtained from load of 6 eyes/cane (0.41 % and 0.48 % in both

seasons, respectively). Also, Ali et al. (2000) pruned Thompson seedless grapevines to different numbers of canes (4,5,6 and 9 canes/vine) and to different number of eyes (18,14,12 and 8 eyes/cane). Increasing cane length was found to decrease total nitrogen in one year old canes. Also, Waqar Ahmad et al. (2004) reported that leaf N, P and K contents were significantly affected by the pruning levels. They also mentioned that pruning severity did not affected the leaf P content, however, different pruning levels significantly affected K content.

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تأثير شدة التقليم على سلوك البراعم والمحصول وبعض الصفات البيوكيميائية لعناقيد العنب صنف " سوبيريور".

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أجريت هذة الدراسة خلال موسمي ٢٠٠٢ و ٢٠٠٣ على كرمات عنب سوبر يور منزرعة في مزرعة خاصة بناحية الخطاطبة بمحافظة المنوفية في أرض رملية تروى بنظام الرى بالتنقيط و مربـاه بالطريقة القصيبة تحت نظام التدعيم (Y) .وتهدف هذه الدراسة إلى تقييم مدى تأثير مستويات للتقليم المختلفة من حيث عدد القصبات وعدد العيون على سلوك البراعم والنمو الخضري والمحصول وجودة الثمار بالإضافة إلى محتوى أعناق الأوراق من النيتروجين والفوسفور والبوتاسيوم أثناء موسم النمو .

وقد أوضحت النتائج أن نسبة التفتح تأثرت بزيادة عدد القصبات للكرمة وعدد العيون ، حيث أعطت الأشجار المقلمة بترك ٦ قصبات وعلى كل قصبة ١٢ أو ١٤ عين زيادة فى النسبة المئوية للبراعم المتفتحة بينما أعطت الأشجار المقلمة إلى ٨ قصبات بطول ١٤ عين أقل نسبة تفتح عن مثيلاتها بطول ١٠ أو ١٢ عين كما زادت النسبة المئوية لخصوبة البراعم عندما ترك على الشجرة ٦ قصبات على كل منها ١٠ أو ١٢ أو ١٤ عين في حين أدى تقليم الكرمات الى٨ قصبات بكل منها ١٠ أو١٢ أو ١٤ عينا إلى زيادة المساحة الورقية وعدد عناقيد الكرمة ومحصولها عن مثيلاتها المقلمة إلي ٦ قصبات تحت نفس العدد من العيون

كما أظهرت الدراسة أن صلابة الحبات للعنب السوبر يوركانت بصفة عامة أعلي من قوة انفصال الحبات تحت ظروف التقليم المختلفة . فقد نتج عن ترك ٦ أو ٨ قصبات لكل شجرة على كل منها ١٤ عين أعلىالقيم في صلابة الحبات وأقلها في قوة انفصال الحبات . أما ترك ٦ قصبات للشجرة مع ١٠ عيون لكل قصبة فقد نتج عنه أعلى قوة انفصال للحبات عن باقي مستويات التقليم المستخدمة كما أعطى تقليم الأشجار إلي ٦ قصبات على كل منها ١٠ أو ١٢ عينا أعلى القيم في وزن الحبة وقطرهاو محتواها من المواد الصلبة الذائبة في عصير الحبات عن ترك ٨ قصبات بكل منها ١٠ أو ١٢ أو ١٤ عين . كما أدت زيادة عدد العيون على القصبة إلى زيادة نسبة النيتروجين والبوتاسيوم خلال موسمي الدراسة . بينما قلت تلك النسبة بزيادة عدد العيون على الكرمة من ٧٢ (٦ قصبات 12 x عين) إلى ٩٦ (٨ قصبات 12 x عين) للكرمة و لم يكن هناك أي تأثير واضح على محتوى أعناق الأوراق من الفوسفور خلال موسمي الدراسة

من النتائج المتحصل عليها خلال هذه الدراسة يمكن التوصية بإجراء التقليم للعنب صنف السوبريور النامي تحت ظروف التجربة بترك ٨ قصبات لكل شجرة بأطوال ١٠ و ١٢ و ١٤ عين تحت نظام التدعيم Y والري بالتنقيط حيث كان ذلك مناسبا للحصول على أعلى إنتاجية للكرمة والفدان وأعلي زيادة في عدد العناقيد و صلابة الحبات والمساحة الورقية وقطر الجذع ومحتوى قشور الحبات من الكاروتينات بالإضافة لما سبق فإن ترك ٨ قصبات وعلى كل قصبة ١٢ عين (٩٦ عين) قد أعطى نتائج أفضل عن باقي مستويات التقليم المختلفة . لذا يمكن التوصية بها في حالة تقليم صنف العنب السوبريور تحت نظام التدعيم (Y) ..