

RESPONSE OF RED ROOMY GRAPEVINES TO SUMMER PRUNING

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ABSTRACT

This study was designed to select the best summer pruning practice for Red Roomy grapevines that achieve an economical yield and berries with good quality. Four techniques namely head suckering, pinching the main shoots and maintaining laterals, pinching the main shoots and topping the laterals as well as pinching the main shoots and removing the laterals were carried out. In addition, the experiment involved the vines that were left without summer pruning (as control).

The results showed that all summer pruning treatments substantially seemed to be very effective in improving growth aspects, cane total carbohydrates %, coefficient of wood ripening, berry set %, yield as well as physical and chemical properties of the berries compared with leaving the vines without summer pruning. Head suckering followed by pinching of the main shoots and maintaining laterals resulted in great stimulation on all the studied parameters. No pruning during summer on the other hand recorded the minimum values of these characters.

For inducing vigorous vines and improving both yield and fruit quality of Red Roomy vines it is necessary for carrying out summer pruning practice by head suckering or pinching the main shoots and maintaining laterals. This study confirmed the beneficial of carrying out summer pruning for such grape cv.

INTRODUCTION

Among the important horticultural practices already carried out in all vineyards, summer pruning is considered very beneficial. It is a complementary practice for the preceding winter pruning and a preparatory for the subsequent one. It is carried out by many techniques. Out of those are head suckering, pinching or topping the main shoots or the main laterals and removal of laterals. Neglecting or carrying out summer pruning incorrectly is accompanied with undesirable influence on the yield and fruit quality of the current year besides the following one. Therefore, it is of at most importance, testing the numerous techniques for summer pruning to find out the appropriate method.

The effect of different methods of summer pruning on growth and fruiting of various grape cvs was reviewed by many workers. All of them emphasized the necessity of summer pruning for enhancing growth and production of grapes (Winkler, 1965; Selim *et al.*, 1977; El-Hamady *et al.*, 1981; Huang, 1981; Vergnes, 1981; Passos, 1983; Vergas, 1984; Ahmed, 1985; Mann and Kushal, 1985; Reynolds, 1989; Wolf *et al.*, 1990 and Said-Rafaat, 1995).

The target of this study is to find out the optimum pruning techniques that responsible for obtaining an economical yield and berries with fairly good quality of Red Roomy grapevines.

MATERIALS AND METHODS

This study was carried out during 1999 and 2000 seasons on eighty 20-years old almost uniform head trained Red Roomy grapevines. They were planted at 2.0 x 2.0 meters apart and grown in sandy loam soil. The private vineyard located in Sindbeas, Kalyobia Governorate. The vines irrigated with flood system. Winter pruning was carried out in the mid of Jan. leaving bud load 60 buds (12 fruiting spurs x 4 buds plus six replacement spurs x 2 buds).

The study included the following five summer pruning treatments:-

- 1- Head suckering
- 2- Pinching of the main shoots and maintaining laterals
- 3- Pinching the main shoots and topping laterals
- 4- Pinching the main shoots and removing laterals
- 5- Control (with out summer pruning)

Each treatment was replicated four times, four vines per each. Completely randomized blocks design was followed in this experiment. Usually, head suckering is followed when shoot length reached 20 cm by removing unwanted shoots inside the vine head (Lilov and Michailova, 1965). Pinching of the main shoots was established 10 days before blooming start by removing 1-2 cm. of the shoot tip. Topping laterals was done by cutting off shoots leaving only 4-5 leaves per shoots.

All vines were subjected to the same cultural practices usually applied in the vineyard except summer pruning.

At growth cessation of each season, shoot length (cm.), number of leaves per shoot and leaf area (according to Ahmed and Morsy, 1999) of the basal 7th and 8th leaves were measured.

Total carbohydrate % in the ripened shoots of the current season was determined colorimetrically at 490 m μ wave length, using the phenol sulphoric acid method described by Smith *et al.* (1956).

Total length of the ripened shoots as well as the length of brownish colour in October were measured. Then, coefficient of wood ripening was calculated by dividing length of the ripened part by the total length of the shoots according to Bouard (1966).

Berry set percentage was estimated by caging five flower clusters on each vine in perforated white paper bags before bloom and after berry set , these bags were removed and berry set percentage was calculated . At harvesting, yield expressed in weight (kg.) and number of clusters per vine was recorded. Representative random samples consisted of three clusters per vine were used for determining the following parameters:

- 1- Cluster weight (g.)
- 2- Dimensions of clusters (length and width, cm.)
- 3- Berry weight (g.) and size (cm³)
- 4- Berry dimensions (longitudinal and equatorial, cm.)
- 5- Compactness coefficient calculated by dividing number of berries /cluster by length of the bunch according to Weaver *et al.* (1962).
- 6- Percentage of total soluble solids

7- Percentage of total acidity (expressed as g tartaric acid /100 ml juice) (A.O.A.C, 1985)

8- The ratio between total soluble solids and total acidity

The statistical analysis of the present data was carried out according to Snedecor and Cochran (1967) using New L.S.D test for comparison between the studied summer pruning treatment means.

RESULTS AND DISCUSSION

1- Effect of summer pruning on some growth aspects:-

Data in Table (1) clearly show that all summer pruning treatments namely head suckering, pinching the main shoots and maintaining laterals, pinching the main shoots and topping laterals and pinching the main shoots and removing laterals were significantly effective in improving the three growth aspects i.e shoot length, number of leaves /shoot and leaf area compared with no pruning. The positive action of these methods was arranged as follows in descending order, head suckering, pinching the main shoots and maintaining laterals, pinching the main shoots and topping laterals and pinching the main shoots and removing laterals. Accompanying with pinching the main shoots, results showed that maintaining laterals and topping them was favourable than removing them in stimulating growth traits. The maximum and minimum values of these aspects were recorded due to carrying out summer pruning through head suckering and no pruning respectively. These results were true in both seasons.

These results are in agreement with those obtained by Ahmed (1985), Mann and Kushal (1985) and Said-Rafaat (1995), who found that all summer pruning treatments increased the growth rate of the shoots and the leaf area of Thompson seedless grapevine.

2- Effect of summer pruning on the percentage of total carbohydrates in the canes:-

It is evident from the data in Table (1) that significant differences were detected between all pruning treatments under study and control in respect to total carbohydrates content of canes during the first and second seasons. The maximum values were detected on head suckering, pinching the main shoots and maintaining laterals, pinching the main shoots and topping laterals as well as pinching the main shoots and removing laterals, in descending order. No pruning during summer was responsible for producing the minimum values in the second season.

The relative increase in total carbohydrates content of canes observed in summer pruning treatments may be attributed to the high rate of shoot growth and wood ripening, since there was a highly positive correlation between carbohydrates accumulation in the canes and the degree of wood ripening, in addition to the increasing in the intensity of photosynthesis in leaves as well as the great accumulation of organic and mineral nutrients in favor of the rest tissues of the vines (Winkler, 1965).

These results are in agreement with those obtained by Said- Rafaat (1995).

3- Effect of summer pruning on wood ripening coefficient:-

It is clear from the data in Table (1) that coefficient of wood ripening was always higher in all summer pruning treatments in comparison with unpruning. No significant differences on coefficient of wood ripening were detected between the four studied summer pruning treatments. Values ranged from 0.75 - 0.76 in 1999 season and from 0.77 to 0.80 in 2000 season. Coefficient of wood ripening in unpruned vines reached 0.53 and 0.57 in both seasons, respectively. These results were true in both seasons.

The increase in coefficient of wood ripening may be attributed to the served organic foods especially carbohydrates stored in the canes.

Similar results were obtained by Reynolds (1989), Wolf *et al.* (1990) and Said- Rafaat (1995).

4- Effect of summer pruning on berry set and yield:-

Data in Tables (1 & 2) clearly show that all summer pruning treatments were significantly effective in improving both berry set % and the yield compared to unpruning. Percentage of berry set did not change significantly on the studied four summer pruning treatments. The maximum values were recorded on vines subjected to head suckering followed by those received pinching the main shoots and maintaining the laterals.

Significant differences on the yield were observed between most of the studied summer pruning treatments. The beneficial of the summer pruning treatments on the yield can be arranged as follows in ascending order, pinching the main shoots and removing the laterals, pinching the main shoots and topping the laterals, pinching the main shoots and maintaining the laterals and head suckering. The maximum values were recorded on vines head suckering. Under such promising treatment, yield reached 12.21 and 12.26 kg in both seasons, respectively. The minimum values i.e 9.45 and 7.84 kg in both seasons were registered in the vines left without summer pruning. These results were true in 1999 and 2000 seasons.

The positive action of summer pruning on berry set % and number of clusters could explain the present results. Such increase can be ascribed to the increase in fruitful buds %, fertility coefficient of buds and the higher content of the reserved materials especially carbohydrates besides the temporary cessation of the growth of the main shoots which aids in the redistribution of assimilates (Ahmed, 1985). In addition, the favourable effect of laterals was to promote the development of embryonic shoot growth and increasing the number of clusters (Winkler, 1965).

These results are in harmony with those obtained by Ahmed (1985), Wolf *et al.* (1990) and Said-Rafaat (1995).

5- Effect of summer pruning on cluster weight and dimensions:-

Data in Table (2) clearly shows that carrying out summer pruning was significantly more favourable in improving cluster weight and dimensions (length and width) than unpruning. Length and width of cluster did not alter significantly with pinching either with topping or removing the laterals. However, in most cases there was significant differences on cluster weight and dimensions owing to summer pruning treatments.

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These results emphasized the beneficial of leaving the laterals completely accompanied with pinching the main shoots on cluster weight and dimensions. Head suckering produced the heaviest and largest clusters while the minimum values were recorded on unpruned vines. These results were true in both seasons. The increase in bunch weight and dimensions observed in summer pruning can be attributed primarily to the berry set % ,then the increase in the weight of berries .

These results are in accordance with those obtained by El-Hamady *et al.* (1981), Passos (1983), Ahmed (1985) and Said-Rafaat (1995).

6- Effect of summer pruning on some physical characters of the berries:-

Data in Tables (2 & 3) clearly shows that weight, size and dimensions of berries were positively affected by summer pruning treatments compared to unpruning. In addition, summer pruning treatments were responsible for increasing compactness coefficient compared to unpruning. The positive action of summer pruning treatments on weight, size and dimensions of the berry could be arranged as follows in descending order, head suckering, pinching the main shoots and maintaining the laterals, pinching the main shoots and topping the laterals as well as pinching the main shoots and removing laterals. The best results were obtained on clusters of head suckering vines. However, unpruning the vines was responsible for producing clusters with the minimum weight, size and dimensions of the berry. These results were true in both seasons.

The increase in berry weight and dimensions observed in summer pruning treatments can be interpreted in view of the fact that these treatments lead to the increase in photosynthetic activity of leaves. As a consequence of that, immigration of assimilates from leaves towards berries is enhanced (Winkler, 1965).

These results are in agreement with those obtained by Mann and Kushal (1985), Reynolds (1989) and Said-Rafaat (1995).

7- Effect of summer pruning on some chemical characters of the berries:-

Data in Table (3) obviously reveals that summer pruning treatments were significantly effective in improving quality of the berries in terms of increasing the total soluble solids and the ratio between it and total acidity and in decreasing the total acidity than unpruning. There was a great variation on such chemical traits due to differing summer pruning treatments. Unpruning resulted in the minimum values of total soluble solids and the ratio between it and total acidity and the maximum values of total acidity. The best results with regard to chemical fruit quality was detected on vines received head suckering or pinching the main shoots and maintaining the laterals. Similar results were recorded in both seasons.

Table (3): Effect of some summer pruning treatments on physical and chemical properties of Red Roomy grapevines.

Summer pruning treatment	Berry longitudinal (cm)		Berry equatorial (cm)		Compactness coefficient		TSS %		Total acidity %		TSS/acidity	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
Head suckering	2.4	2.5	1.9	2.1	2.3	3.0	16.0	15.0	0.522	0.440	30.65	34.09
Pin. Mainshoots+ Maint. Laterals	2.3	2.3	1.9	2.1	2.2	2.8	15.5	15.0	0.537	0.462	28.86	32.47
Pin. Main shoots +Top. Laterals	2.1	2.1	1.8	2.0	2.2	2.8	14.8	14.5	0.540	0.480	27.41	30.21
Pin. Main shoots+ Rem. Laterals	2.1	2.0	1.8	1.9	2.2	2.8	14.0	14.0	0.540	0.482	25.92	29.05
Control(without summer pruning)	1.9	1.8	1.7	1.8	2.0	2.4	13.8	13.6	0.560	0.501	24.64	27.15
New-LSD at 5%	0.2	0.2	0.2	0.2	0.2	0.4	0.2	0.3	0.015	0.012	1.02	1.11

Pin. = Pinching by cutting off 1-2 cm from tips

Top. = Topping laterals to 4-5 leaves

Rem. = Removing

Maint. = Maintaining

The favorable influence of suckering on fruit quality may be explained by promoting vine vigor which aids in supplying the clusters with assimilates.

These results are in coincidence with those obtained by Vergas (1984) Ahmed (1985), Wolf *et al.* (1990) and Said-Rafaat (1995).

As a conclusion, for enhancing growth, yield and fruit quality of Red Roomy vines, it is necessary for establishing summer pruning by head suckering or by pinching the main shoots and maintaining the laterals.

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أجريت هذه الدراسة لتحديد أفضل طريقة للتقليم الصيفي للعنب الرومي الأحمر والتي تكون مصحوبة بتحقيق محصول اقتصادي وحببات ذات جودة عالية . وقد تم استخدام أربعة طرق للتقليم الصيفي هي السرطنة التاجية , تطويش الأفرع الرئيسية مع الإبقاء على الأفرع الجانبية , تطويش الأفرع الرئيسية مع قصف الأفرع الجانبية وتطويش الأفرع الرئيسية مع إزالة الأفرع الجانبية كما اشتملت التجربة على كرمات تركت بدون إجراء التقليم للمقارنة.

ولقد أشارت نتائج الدراسة أن كل معاملات التقليم الصيفي تبدو فعالة جدا في تحسين صفات النمو ومحتوى القصبات من الكربوهيدرات , معامل نضج الخشب , نسبة عقد الحبات , المحصول وكذلك الخصائص الطبيعية والكيميائية للحبات وذلك بالمقارنة بعدم إجراء التقليم الصيفي وقد أعطت السرطنة التاجية يليها تطويش الأفرع الرئيسية مع الإبقاء على الأفرع الجانبية أكبر تحسين في كل الصفات تحت الدراسة وكان عدم إجراء التقليم من ناحية أخرى قد سجل أقل القيم لهذه الصفات.

ولأجل الحصول على كرمات قوية النمو و تحسين المحصول وخصائص الجودة للثمار في العنب الرومي الأحمر فإن من الضروري إجراء عملية التقليم الصيفي عن طريق السرطنة التاجية أو من خلال تطويش الأفرع الرئيسية مع الإبقاء على الأفرع الجانبية وتؤكد نتائج هذه الدراسة على أهمية إجراء التقليم الصيفي لهذا الصنف من العنب.

Table (1): Effect of some summer pruning treatments on growth characters, canes reserved total carbohydrate %, coefficient of wood ripening and berry set % of Red Roomy grapevines.

Summer pruning treatment	Shoot length (cm)		No. of leaves/shoot		Leaf area (cm ²)		Total carbohydrate %		Coefficient of wood ripening		Berry set %	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
Head suckering	210.0	252.5	46.5	49.0	141.0	148.5	19.5	20.5	0.75	0.77	9.3	8.5
Pin. Main shoots + Maint. laterals	197.5	235.0	33.0	40.0	130.0	137.0	19.5	19.5	0.75	0.79	8.9	8.2
Pin. Main shoots + Top. laterals	186.0	218.0	27.5	33.0	120.0	125.5	19.0	18.8	0.76	0.78	8.6	8.0
Pin. Main shoots + Rem. laterals	175.0	202.5	21.0	28.0	110.5	114.0	18.5	18.0	0.75	0.80	8.6	7.9
Control (without summer pruning)	159.0	187.0	17.5	25.0	101.0	100.5	18.0	17.3	0.53	0.57	7.5	7.0
New-LSD at 5%	10.3	12.2	3.2	2.1	8.5	9.0	0.4	0.5	0.11	0.08	0.8	0.9

Table (2): Effect of some summer pruning treatments on yield, cluster weight, cluster dimensions as well as berry weight and size of Red Roomy grapevines.

Summer pruning treatment	Yield/vine (kg)		Cluster weight (g)		Cluster length (cm)		Cluster width (cm)		Av. Berry weight (g)		Av. Berry size (cm ³)	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
Head suckering	12.21	12.26	488.5	438.0	33.0	31.0	17.8	17.5	5.1	6.1	4.5	5.5
Pin. Main shoots + Maint. laterals	11.75	10.27	470.0	395.0	31.0	30.0	17.0	17.0	5.0	5.7	4.4	5.2
Pin. Main shoots + Top. Laterals	11.38	9.50	455.0	380.0	29.0	29.0	16.0	16.8	5.0	5.2	4.1	5.0
Pin. Main shoots + Rem. laterals	10.25	8.78	410.0	366.0	29.0	29.0	16.0	16.8	5.0	5.0	4.1	4.8
Control (without summer pruning)	9.45	7.84	377.0	341.0	22.0	23.0	15.0	14.0	4.4	4.5	3.7	4.2
New-LSD at 5%	0.72	0.81	10.2	11.0	0.9	0.8	0.7	0.5	0.4	0.4	0.3	0.4

Pin. = Pinching by cutting off 1-2 cm from tips

Top. = Topping laterals to 4-5 leaves

Rem. = Removing

Maint. = Maintaining

