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EFFECT OF TRAINING SYSTEM AND FRUITING UNIT LENGTH ON BUD BEHAVIOUR, GROWTH AND PRODUCTIVITY OF FLAME SEEDLESS GRAPEVINES

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ABSTRACT

This investigation was conducted for two successive seasons (2006& 2007) to study the effect of training system and fruiting unit length on bud behaviour, growth and productivity of Flame Seedless grapevines. The chosen vines were ten-year-old, grown in a clay loamy soil and irrigated by the drip irrigation system. The vineyard was located at Meniet Samannoud, Dakahlia governorate. Vines were spaced at 2.5 X 3 meters apart, pruned during the second week of February with a load of (40-42 buds/vine) and trellised according to the telephone system. Seventy two uniform vines were chosen. Each four vines acted as a replicate and each three replicates were treated by one of the following treatments: Two training systems were evaluated; the first was cordon training system with three levels of spur length: two, three or four buds per spur, while the second was cane training system with three levels of cane length: six, eight or ten buds per cane.

The results showed that cordon training system gave the best results as compared to cane training system. The spur pruning (2-3 buds/spur) resulted in the highest percentages of bud burst and fruitful buds and coefficient of bud fertility as compared to the cane pruning (6 buds/cane) which recorded the lowest values. In addition, the cordon training system with fruiting unit lengths of 2-3 buds/spur gave the best yield/vine and its components as well as the best physical properties of bunches, improved the physical and chemical characteristics of berries and ensured the best vegetative growth parameters, dynamics of wood ripening, weight of prunings/vine and size of old wood. Total chlorophyll of the leaves and total carbohydrates of the canes were also increased as compared to the cane training system with fruiting unit length of ten buds/cane which gave the lowest values of these parameters.

The economical study indicated that cordon training system with spur pruning for Flame Seedless grapevines gave the highest net income as compared to cane training system with cane pruning.

INTRODUCTION

To provide grapevines with the most favourable conditions for their growth and productivity, one should consider two factors: biological characteristics of the cultivar and its surrounding environment. These factors are responsible for the determination of the most favourable cultural practices required for achieving this purpose. In this connection, pruning and training rank first among other practices since they are mainly responsible for regulating grape growth and production. According to the fact that no training system is the best for all cultivars under all circumstances, the proper choice of a certain training system seems to have a determinant role among the other factors. The haphazard application of some training systems has actually been the main reason for the undesired and unreliable obtained

results. Using the optimum training system as well as adjusting the proper length of the fruiting units will undoubtedly affect the yield and bunch quality of the vines. In this respect, some researchers emphasized the importance of the role of pruning and training for raising bud fertility and hence vine yield (Fawzi *et al.*, 1984; Higazi 1985, Marwad *et al.*, 1993; Abd El-Fattah *et al.*, 1993 a and b, Pavlov 1995, Rizk, 1996, Abd El-Wahab 1997, Sayed 1998, Sourial *et al.*, 1999, Ali *et al.*, 2000, Palma *et al.*, 2000, Garic 2001, Terry and Rick 2003, Dawn *et al.*, 2004, El-Mogy 2006 a and b and Abd El-Ghany 2006).

Some grape growers apply the cane system in training Flame Seedless grapevines, while others prefer the cordon training system for this cultivar. Therefore, this research was conducted to study the effect of both training systems and length of fruiting units on bud behaviour, growth and productivity of Flame Seedless grapevines.

The ultimate target of this investigation is to determine the preference of one training system to the other on a scientific basis taking into account some important economical considerations which could be useful in this connection.

MATERIALS AND METHODS

This investigation was performed for two successive seasons (2006& 2007) in a private vineyard located at Meniet Samannoud, Dakahlia Governorate, on mature Flame Seedless grapevines. The chosen vines were ten-year-old, spaced at 2.5 X 3 meters apart, grown in a clay loamy soil and irrigated by the drip irrigation system. The vines were pruned during the second week of February with a load of (40-42 buds/vine). The vines were trellised according to the telephone system. Seventy two uniform vines were chosen. Each four vines acted as a replicate and each three replicates were treated by one of the following treatments.

Two training systems were evaluated; the first was cordon training system with three levels of spur length: two, three or four buds per spur, while the second was cane training system with three levels of cane length: six, eight or ten buds per cane.

The following parameters were adopted to evaluate the tested treatments:-

1. Bud behaviour

Number of opened buds/vine was recorded, and the percentage of bud burst was calculated by dividing number of opened buds per vine by the total number of buds per vine left at pruning. The percentage of the fruitful buds was also calculated. Moreover, coefficient of bud fertility was calculated by dividing average number of bunches per vine by the total number of buds/vine according to Huglin (1958) and Bessis (1960).

2. Yield and its components

A representative random sample of six bunches/vine were taken at maturity when TSS reached about 16-17% according to Tourky *et al.*, (1995). The following characteristics were determined:

Yield/vine (kg) expressed as number of bunches/vine X average bunch weight (g).

3. Physical characteristics of berries

Average berry weight (g), Average berry size (cm^3) and Average berry dimensions (length and diameter) (cm).

4. Chemical characteristics of berries

Total soluble solids in berry juice (T.S.S.) (%) by hand refractometer and total titratable acidity as tartaric acid (%) (A.O.A.C. 1985), then TSS /acid ratio was calculated. Total anthocyanin content of berry skin (mg/100g fresh weight) according to Husia *et al.*, (1965).

5-Morphological and chemical characteristics of vegetative growth

At growth cessation, the following morphological and chemical determinations were carried out on 4 shoots / the considered vine:

1- Average shoot length (cm).
2- Average number of leaves/shoot.
3- Average leaf area (cm^2) of the apical 5^{th} and 6^{th} leaves using a CI-203-Laser Area-meter made by CID, Inc., Vancouver, USA.
4- Total leaf area/vine (m^2) calculated by multiplying average number of leaves/shoot by average leaf area then by the number of shoots per vine.
5- Coefficient of wood ripening calculated by dividing length of the ripened part by the total length of the shoot according to Bouard (1966).
6- Weight of prunings/vine (Kg) at dormancy as in indirect estimate for vine growth in the preceding year.
7- Size of old wood (cm^3) estimated for all above ground parts of the vine including trunk and all units of more than one year old. Circumference and length of these units were measured and divided into (n) sections. To compute the total size of old wood, the following formula was used:

$$S = \Sigma n\,(di/2)^2 .\ n.\ Li$$

Where:

di : is the diameter of the measured parts.
n : is a constant number which equals 3.14.
Li : is the length of the measured parts.

8- Leaf content of total chlorophyll was measured by using nondestructive Minolta chlorophyll meter SPAD 502 of the apical 5^{th} and the 6^{th} leaves (Wood *et al.*, 1992).
9- Cane content of total carbohydrates (%) (Smith *et al.*, 1956).

- **Statistical analysis:**

The completely randomized design was carried out for this experiment. The statistical analysis of the present data was made according to Snedecor and Chocran (1972). Averages were compared using the new L.S.D. values at 5% level. Percentages were transformed by a certain equation prior to the statistical analysis and thereafter percentages were presented with statistical letters.

RESULTS AND DISCUSSION

1. Bud behaviour

Percentage of bud burst, percentage of fruitful buds and coefficient of bud fertility are shown in Table (1).

Table (1) : Effect of training system and fruiting unit length on bud behaviour of Flame Seedless grapevines in seasons 2006 and 2007

Treatments		Bud burst (%)		Fruitful buds (%)		Coefficient of bud fertility	
Training system	Fruiting unit length	2006	2007	2006	2007	2006	2007
Cordon	2 buds	88.83	83.49	78.23	74.55	0.69	0.62
	3 buds	88.37	82.86	79.17	75.21	0.70	0.62
	4 buds	87.94	82.65	77.21	72.58	0.68	0.60
Cane	6 buds	83.06	79.21	74.13	69.90	0.62	0.55
	8 buds	84.81	80.74	75.89	70.96	0.64	0.57
	10 buds	85.45	81.63	76.58	71.99	0.65	0.59
new L.S.D. at 0.05 =		0.83	0.79	0.95	1.01	0.02	0.01

*** Percentage of bud burst:-**

Cordon training system with all lengths of fruiting units (2, 3 or 4 buds/spur) was found to increase the percentage of bud burst as compared to cane training system with all lengths of fruiting units (6, 8 or 10 buds/cane) in both seasons. The most remarkable increment was obtained by cordon training system with fruiting unit lengths of (2 or 3 buds/spur). On the other hand, cane training system with short cane length (6 buds/cane) was found to record the minimum percentages in this respect.

These results are in agreement with those mentioned by Fawzi *et al.*, (1984), Abd El-Fattah *et al.*, (1993a), Sourial *et al.*, (1999), El-Mogy (2006 a and b) and Abd El-Ghany (2006) who found that the percentage of sprouted buds increased with more severe pruning. Moreover, Abd El-Wahab (1997) reported that with the short cane, the sprouting of basal buds was suppressed, this decrease may be ascribed to that the short cane could be hardly oriented horizontally so as to limit the occurrence of polarity phenomenon and this resulted in the lowest percentage of bud burst.

*** Percentage of fruitful buds:-**

Concerning the effect of training system with different lengths of fruiting units on percentage of fruitful buds, it was found that this parameter followed the same trend shown with bud burst (%) which was appreciably increased as a result of the increase of bud burst (%). Cordon training system with fruiting unit lengths (2 or 3 buds/spur) recorded the highest percentage of fruitful buds, while, cane training system with fruiting unit length of (6 buds/cane) gave the lowest percentage in both seasons.

***Coefficient of bud fertility-:**

With regard to the effect of training system with different lengths of fruiting units on coefficient of bud fertility, data showed that this estimate went parallel with bud burst (%) which was remarkably increased due to the increase of bud burst (%) in both seasons.

The results in this respect are in harmony with those of Fawzi *et al.*, (1984), Abd El-Fattah *et al.*, (1993a), Sourial *et al.*, (1999), El-Mogy (2006 a and b) and Abd El-Ghany (2006) who found that vines with short pruning resulted in a higher percentage of fruitful buds and coefficient of bud fertility in comparison with long pruning.

2. Yield and its components:

Data presented in Table (2) show that training system as well as fruiting unit lengths was accompanied with a pronounced effect on yield structure expressed in yield/vine, bunch weight and number of bunches per vine. Yield/vine and bunch weight were increased in cordon training system when spur length was (2 or 3 buds/spur) as compared with cane training system with cane length of 10 buds/cane in both seasons. However, the difference between fruiting unit lengths (2 or 3 buds/spur) was insignificant in this respect. It is evident from the data that the increase observed in the yield/vine can be attributed to the higher number of bunches per vine (as a result of the increase in bud fertility) and the increase in bunch weight observed at cordon training system with fruiting unit lengths of 2 or 3 buds/spur.

Table (2) : Effect of training system and fruiting unit length on yield and its components of Flame Seedless grapevines in seasons 2006 and 2007

Treatments		Yield / vine (Kg)		No. of bunches/vine		Average bunch weight (g)	
Training system	Fruiting unit length	2006	2007	2006	2007	2006	2007
Cordon	2 buds	17.40	16.26	27.79	24.90	626.1	653.0
	3 buds	18.74	17.37	29.38	26.17	637.6	663.8
	4 buds	16.25	15.02	27.16	23.99	598.3	625.8
Cane	6 buds	15.09	14.27	25.86	23.26	583.7	613.4
	8 buds	14.83	13.75	25.74	22.92	576.1	599.9
	10 buds	14.80	13.66	26.18	23.50	565.6	581.3
new L.S.D. at 0.05 =		1.76	1.87	1.93	2.03	23.8	31.5

These results coincided with those of Fawzi *et al.*, (1984), Abd El-Fattah *et al.*, (1993a), Sourial *et al.*, (1999), El-Mogy (2006 a and b) and Abd El-Ghany (2006) who revealed that vines with long pruning caused significant reduction in the total yield and in weight of bunches in comparison with short pruning.

3. Physical characteristics of berries

Data in Table (3) showed that physical characteristics of berries i.e. berry weight and size and berry length and diameter were significantly affected by the training system as well as fruiting unit lengths. The highest values of these parameters were detected in case of vines trained by cordon system with fruiting unit lengths of 2 or 3 buds/spur, while, cane training system with

fruiting unit length (10 buds/cane) gave the lowest values in both seasons of the experiment.

Effect of training system and fruiting unit lengths on berry shape index was statistically insignificant.

Table (3) : Effect of training system and fruiting unit length on physical characteristics of berries of Flame Seedless grapes in seasons 2006 and 2007

Treatments		Average berry weight (g)		Average berry size (cm^3)		Average berry length (cm)		Average berry diameter (cm)		Berry shape index	
Training system	Fruiting unit length	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Cordon	2 buds	2.68	2.81	2.45	2.60	1.63	1.68	1.66	1.70	0.98	0.99
	3 buds	2.78	2.87	2.56	2.66	1.65	1.71	1.68	1.71	0.98	1.00
	4 buds	2.58	2.72	2.35	2.51	1.60	1.65	1.62	1.64	0.99	1.01
Cane	6 buds	2.53	2.65	2.29	2.45	1.58	1.63	1.60	1.62	0.99	1.01
	8 buds	2.50	2.63	2.25	2.43	1.57	1.62	1.56	1.62	1.01	1.00
	10 buds	2.49	2.58	2.22	2.40	1.55	1.61	1.55	1.60	1.00	1.01
new L.S.D. at 0.05 =		0.12	0.14	0.13	0.15	0.04	0.05	0.03	0.04	N.S.	N.S.

The results are in harmony with those of Fawzi *et al.*, (1984), Abd El-Fattah *et al.*, (1993a), Sourial *et al.*, (1999), El-Mogy (2006 a and b) and Abd El-Ghany (2006) who found that vines with short bearers yielded heavier berries in comparison with those with longer ones.

4. Chemical characteristics of berries

The results presented in (Table 4) revealed that all berry chemical characteristics; i.e. TSS, Acidity, TSS/acid ratio and anthocyanin content of berry skin were significantly affected by training system and fruiting unit lengths. Cordon training system with fruiting unit lengths of 2 or 3 buds/spur resulted in higher values of TSS percentage, TSS/acid ratio, anthocyanin content in berry skin and lower acidity of the juice in comparison with cane training system with fruiting unit length of 10 buds/cane in both seasons.

Table (4) : Effect of training system and fruiting unit length on chemical characteristics of berries of Flame Seedless grapes in seasons 2006 and 2007

Treatments		TSS (%)		Acidity (%)		TSS/acid ratio		Total anthocyanin (mg/100g F.W.)	
Training system	Fruiting unit length	2006	2007	2006	2007	2006	2007	2006	2007
Cordon	2 buds	16.44	16.67	0.61	0.59	26.95	28.25	33.91	35.23
	3 buds	16.53	16.71	0.61	0.58	27.10	28.81	34.07	35.36
	4 buds	16.32	16.53	0.62	0.60	26.32	27.55	33.78	35.06
Cane	6 buds	16.21	16.40	0.63	0.61	25.73	26.89	33.64	34.92
	8 buds	16.15	16.33	0.63	0.62	25.63	26.34	33.51	34.77
	10 buds	16.07	16.23	0.64	0.62	25.11	26.18	33.42	34.65
new L.S.D. at 0.05 =		0.12	0.15	0.01	0.02	0.51	0.63	0.24	0.27

These results are in agreement with those mentioned by Fawzi *et al.*, (1984), Abd El-Fattah *et al.*, (1993a), Sourial *et al.*, (1999), El-Mogy (2006 a and b) and Abd El-Ghany (2006) who reported that vines with long bearers showed a decrease in TSS percentage, TSS/acid ratio, anthocyanin content in berry skin and an increase in total acidity content of the juice in comparison with short bearers.

5-Morphological characteristics of vegetative growth

Data presented in Table (5) showed that training system as well as fruiting unit lengths were accompanied with a pronounced effect on vegetative growth parameters (expressed as shoot length, number of leaves per shoot and total leaf area/vine), coefficient of wood ripening, weight of prunings/vine and size of old wood. Cordon training system with fruiting unit lengths of 2 or 3 buds/spur resulted in higher values of these parameters as compared to cane training system with fruiting unit length of (10 buds/cane) in both seasons.

These results are in agreement with those of Fawzi *et al.*, (1984) and Abd El-Wahab (1997) who revealed that vines with short pruning units increased in shoot length, number of leaves and total leaf area/vine, coefficient of wood ripening and weight of prunings/vine in comparison with longer ones. In addition, the total biomass produced in cordon training system as compared to cane training system provided the frame work for total leaf area/vine which maximized light interception. The old wood of the vine is not only a structural element of the vine skeleton, but it is also a store for nutrients which provide different plant organs with their needs at the appropriate time (Fawzi *et al.*, 1984). The amount of old wood retained on the grapevine can affect the yield and fruit quality. This may be due to the increased photosynthetic capacity (Kliewer *et al.*, 2000). These results are in accordance with (Reynolds and Wardle 1994, Carbonneau, 1999 and Abd El-Ghany and Marwad 2001), who reported that the size of old wood must be developed progressively depending on vine vigor so as to regulate the water flow and increase the reserves close to the bunches.

6. Chemical characteristics of vegetative growth

Data in Table (6) revealed that leaf content of total chlorophyll and cane content of total carbohydrates (%) were significantly affected by training system as well as fruiting unit lengths. The highest values of these estimates were detected in case of vines trained by the cordon system with fruiting unit lengths of 2 or 3 buds/spur, while, cane training system with fruiting unit length of (10 buds/cane) recorded the lowest values in both seasons.

The results in this connection are in accordance with those mentioned by Abd El-Fattah *et al.*, (1993b) and Abd El-Wahab (1997) who found that vines with long pruning units decreased leaf content of total chlorophyll and cane content of total carbohydrates (%) in comparison with short pruning units.

Table (5) : Effect of training system and fruiting unit length on morphological characteristics of vegetative growth of Flame Seedless grapevines in seasons 2006 and 2007

Treatments		Average shoot length (cm)		No. of leaves/shoot		Average leaf area/shoot (cm^2)		Total leaf area/shoot (cm^2)		Total leaf area/vine (m^2)		Coefficient of wood ripening		Weight of prunings/vine (Kg)		Size of old wood/vine (cm^3)	
Training system	Fruiting unit length	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Cordon	2 buds	178.2	185.5	30.9	32.2	135.8	141.4	4196.2	4547.4	14.91	15.19	0.84	0.87	3.63	3.78	3734.2	3925.0
	3 buds	180.3	187.7	31.4	32.8	137.4	143.4	4314.4	4702.4	16.01	16.36	0.85	0.89	3.70	3.86	3797.0	4002.7
	4 buds	172.7	179.1	30.1	31.3	131.9	137.0	3970.2	4285.9	13.97	14.17	0.81	0.85	3.53	3.66	3613.2	3790.8
Cane	6 buds	160.8	167.7	28.7	29.8	129.7	134.6	3722.4	4010.7	12.72	13.10	0.78	0.81	3.15	3.29	3215.9	3393.5
	8 buds	154.6	161.3	28.1	29.1	126.3	130.7	3549.0	3801.8	12.10	12.32	0.76	0.79	3.07	3.18	3130.7	3278.4
	10 buds	151.6	158.2	27.6	28.5	125.7	129.8	3469.3	3702.1	12.04	12.28	0.75	0.77	3.01	3.11	3063.6	3195.8
new L.S.D. at 0.05 =		6.3	7.1	0.9	1.1	5.1	5.9	273.4	311.9	1.79	1.86	0.02	0.03	0.13	0.17	123.4	137.9

Table (6) : Effect of training system and fruiting unit length on chemical characteristics of vegetative growth of Flame Seedless grapevines in seasons 2006 and 2007

Treatments		Leaf content of total chlorophyll		Cane content of total carbohydrates(%)	
Training system	Fruiting unit length	2006	2007	2006	2007
Cordon	2 buds	27.16	28.23	23.54	24.47
	3 buds	27.55	28.60	23.91	24.82
	4 buds	26.35	27.35	22.87	23.74
Cane	6 buds	23.54	24.44	20.43	21.21
	8 buds	22.29	23.13	19.36	20.08
	10 buds	22.14	22.95	19.24	19.95
new L.S.D. at 0.05 =		1.07	1.13	0.84	0.97

Data illustrated in Figures (1 & 2 & 3) indicated the existence of a highly positive correlation between total leaf area per vine (m^2) and yield (kg), between total leaf area per vine (m^2) and anthocyanin content of berry skin (mg/100g F.W.) and between total leaf area per vine (m^2) and percentage of cane total carbohydrates in both seasons.

7. Economical justification of cordon training system with spur pruning compared to cane training system with cane pruning:

It can be shown from the data presented in Table (7) that cordon training system with spur pruning gave the maximum net profit as compared to cane training system with cane pruning in both seasons.

From the obtained results, it can be concluded that cordon training system with fruiting unit lengths of 2 or 3 buds/spur surpassed the cane training system concerning percentages of bud burst, fruitful buds, yield/vine, fruit quality, vegetative growth of Flame Seedless grapevines.

Accordingly, the cordon system can be recommended for training Flame Seedless grapevines.

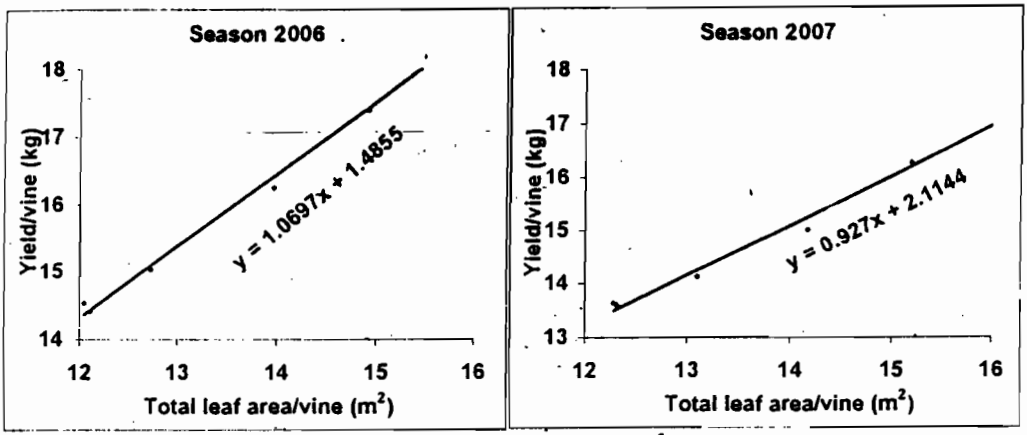

Fig (1): Relationship between total leaf area /vine (m^2) and yield/vine (kg)

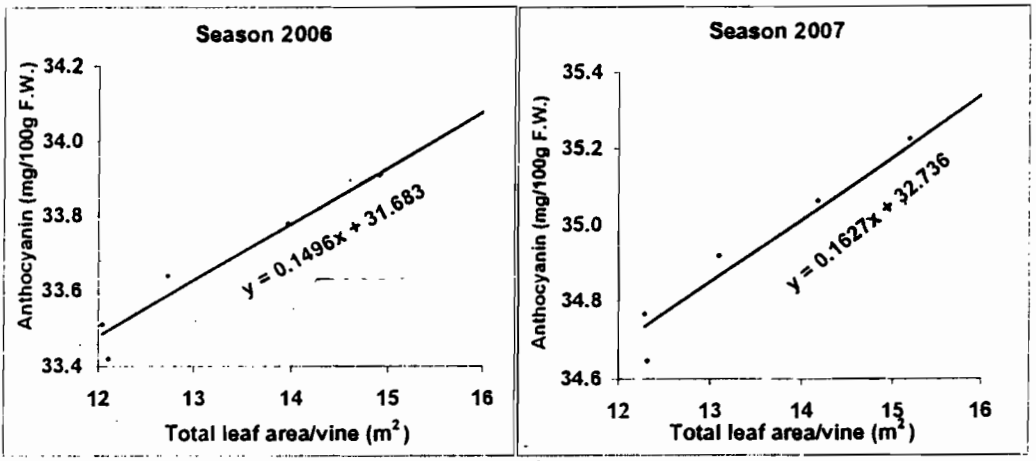

Fig (2): Relationship between total leaf area /vine (m^2) and anthocyanin (mg/100g F.W.) of berry skin

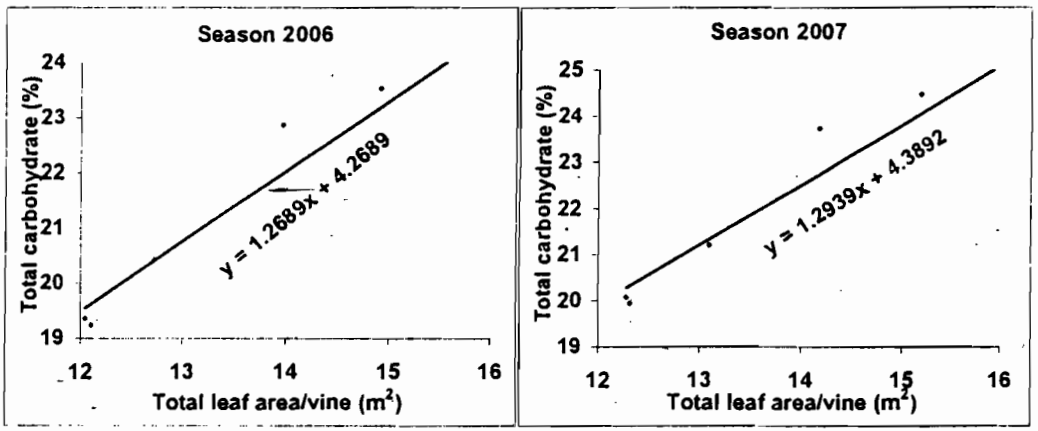

Fig (3): Relationship between total leaf area/vine (m^2) and cane total carbohydrates (%)

Table (7): Economical justification of cordon training system with spur pruning compared to cane training system with cane pruning

Per Feddan	2006, season		2007, season	
	Cordon training system with spur pruning	Cane training system with cane pruning	Cordon training system with spur pruning	Cane training system with cane pruning
Cost of cultural practices (L.E.)	2150	2200	2250	2300
Price of the increase in cost of cordon training system with spur pruning over cane training system with cane pruning (L.E.)	-50	---	-50	---
Yield in (Kg)	9778.7	8209.4	9080.9	7721.4
Increase of the yield of cordon training system with spur pruning over cane training system with cane pruning (Kg)	1569.4	---	1359.4	---
Kg (L.E.)	1.15	1.15	1.25	1.25
Yield (L.E.)	11245.6	9440.8	11351.1	9651.8
Price of the increase in yield of cordon training system with spur pruning over cane training system with cane pruning (L.E.)	1804.8	---	1699.3	---
The net profit (L.E.)	9095.6	7240.8	9101.1	7351.8
The net profit (L.E.) of cordon training system with spur pruning over cane training system with cane pruning (L.E.)	1854.8	---	1749.3	---

REFERENCES

Abd El-Fattah; S.E., Marwad, I.A. and Isis Abd-El-Shahied (1993a): Effect of bud load and spur length on yield, fruit quality and nutritional status of Roumi Red grapevines. I. Yield and fruit quality. Egypt. J. Appl. Sci., 8(8): 586-603.

Abd El-Fattah; S.E., Marwad, I.A. and Isis Abd-El-Shahied (1993b): Effect of bud load and spur length on yield, fruit quality and nutritional status of Roumi Red grapevines. II. Weight of prunings and chemical composition of one year old wood. Zagazig. J. Agric. Res., 20(6). 1889-1900.

Abd El-Ghany, A.A. (2006): Effect of bearing units length on fertility and fruit quality of Flame seedless and ruby seedless grapevines. Bull. Fac. Agric. Cairo Univ., 57 (2006): 477-492.

Abd El-Ghany, A.A. and Marwad, I.A. (2001): Effect of trellis system shape on Thompson Seedless grapevine productivity. J. Agric. Sci. Mansoura Univ., 26 (3): 1649 – 1654.

Abd El-Wahab M. A., (1997): Effect of cane length on bud behavior, growth and productivity of "King Ruby" grapevines. M. S. Thesis, Cairo Univ.

Ali, Mervet A.K.; El-Mogy, M.M. and Rizk I.A. (2000): Effect of cane length on bud behaviour, bunch characteristics, wood ripening and fruit chemical contents of Thompson Seedless grapevines. J. Agric, Sci. Mansoura Univ., 25 (3): 1707 -1717.

Association of Official Agricultural Chemists (1985): Official Methods of Analysis A. O. A. C., Benjamin Franklin Station, Washington, D. C. N. S. A. pp 440-510.

Bessis, R. (1960): Sur Differents Models Expression Quantitative Dela fertilité chez la vigne. Acta p.p. 828-882.

Bouard, J. (1966): Recherches physiologiques sur la vigne et en particulier pour l'aoutment des sarments. Thesis Sc. Nat Bordeaux-France. Pp.34.

Carbonneau, A. (1999): Vineyard training systems: results of the French Mediterranean network. Progres. Agricole Viticole, 116 (22-23): 483-485;503-517 (C.F. Hort. Abst. 70:2938).

Dawn M., Chapman M., Mark A. M. and Jean-Xavier G. (2004): Sensory attributes of Cabernet Sauvignon wines made from vines with different crop yields. Am. J. Enol. Vitic., 55:4

El-Mogy, M.M. (2006a): Effect of some pruning treatments on growth and yield of some grape cultivars. [A] Bud load and cane length of Crimson Seedless grapevines. Mansoura University J. of Agric. Sci. 31(4):2263-2272.

El-Mogy, M.M. (2006b): Effect of some pruning treatments on growth and yield of some grape cultivars. [B] Bud load and spur thickness of Flame Seedless grapevines. Mansoura University J. of Agric. Sci. 31(4): 2253-2262.

Fawzi, F., Bondok, A. Z. and Ghobrial, G.F. (1984): Effect of cane length on bud behavior and wood ripening of Thompson Seedless grape variety. Annual Agric. Sc., Fac Agric. Ain-Shams Univ., 28 (1): 465-474.

Garic, M. (2001): The influence of training systems, bud load and pruning on agro-biological properties of variety Riesling Italian in the Orahovac vineyard district. J. Agric. Sci., Belgrade, 46(1): 31-39.

Higazi, A.M. (1985): Effect of pruning on yield and fruit quality of Thompson Seedless grape. Zagazig J. Agric. Res., 12 (1): 17-33.

Huglin, P. (1958): Recherché sur les bourgeons de la vigne. Initiation florale et development vegetatif. Annals de L'Amelioration de Plantes, Paris, 11:7.

Husia, C. L.; B. S. Luh and C. D. Chichester (1965): Anthocyanin in free stone peach. J. Food Science, 30: 5-12.

Kliewer, W.M.; Wolpert, J. A. and Benz, M. (2000): Trellis and vine spacing effects on growth, canopy microclimate, yield and fruit composition of Cabernet Sauvignon. Acta Hort. 526:21-31.

Marwad, I., Rizk, A.N.A. and Ibrahim. A.H. (1993): Effect of cane length on bud behavior of Thompson Seedless grapvines Egy. J. Appl. Sci., 8 (12). 47-60.

Palma, L. D; Novello, V. and Tarricone, L. (2000): Blind buds, fruitfulness and balance between vegetative and reproductive growth of grape Cv. Victoria as related to bud load and pruning system during vine canopy establishment. Rivista di Frutticoltura e di Ortofloricoltura, 62(3): 69-74.

Pavlov, A. (1995): Investigations on the pruning of Druzhba grapevines. Rastenier-dni-Nauki. 43(7-8): 182-184.

Reynolds, A. G., and Wardle, D. A. (1994): Canopy manipulation of Okanagan Riesling vines for improvement of wine grape quality. Can . J. Plant Sci. 72:489-496.

Rizk. N. A. (1996): Effect of cane length on bud behaviour and bunch characteristics in Thompson Seedless grape cultivar. Egypt. J. App. Sci., 11 (7): 220-234.

Sayed, M.F. (1998): Effect of foliar nutrition, different vine bud loads and spur length on some vegetative and fruiting characters of Roomy Red grapevines. M. SC. Thesis, Fac. Agric., Minia, University.

Smith, F., Gilles, M.A., Hamilton, J.K. and Gedess, P.A. (1956): Colorimetric methods for determination of sugar and related substances, Anal. Chem.28, 350.

Snedecor, G. W. and Cochran, W.G. (1972): Statistical Methods. 6th ed., The Iowa State Univ. Press. Amer., Iowa, U.S.A., pp. 50

Sourial, G.F.; Al-Ashkar, R.A.; Marwad, I.A.; Hassan, A.S. and Safaa A. Nomair (1999): Productivity of some newly-introduced grape varieties in relation to bud fertility and some pruning treatments. Zagazig. J. Agric. Res., 26(3A): 657-672.

Terry B. and Rick D. (2003): Evaluation of vertical shoot distribution on canopy shading, yield, and juice quality of Concord and Niagara grapevines. Rivista di Frutticoltura e di Ortofloricoltura, 65(6): 87-94.

Tourky, M.N., El-Shahat, S.S. and Rizk, M. H. (1995): Effect of Dormex on fruit set, quality and storage life of Thompson seedless grapes (Banati grapes) J. Agric. Sci., Mansoura Univ., 20(12): 5139-5151.

Wood, C.W., Reeves, D.W. and Himelrick, D.G. (1992): Relationships between chlorophyll meter readings and leaf chlorophyll concentration. N status and crop yield. A review: Proc. Agro. Soc. N.Z. 23: 1-9.

تأثير نظام التربية وطول وحدات الإثمار على سلوك العيون والنمـــو والإنتاجيـــة لكرمات عنب الفليم سيدلس

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أجرى هذا البحث لمدة موسمين متتاليين (٢٠٠٦، ٢٠٠٧) على كرمات عنب الفليم سيدلس بهدف دراسة مقارنة لتأثير نظام التربية وطول وحدات الإثمار على سلوك العيون والنمو والإنتاجية، وكانت الكرمات عمرها ١٠ سنوات نامية فى تربـــة طميـــة طينيـــة، منزرعة بمنطقة منية سمنود – التابعة لمحافظة الدقهلية على مسافة ٣X٢,٥ متر، وكانـــت تروى بنظام الرى بالتنقيط ، وتم تقليم الكرمات فى الاسبوع الثانى من فبراير مع حمولـــة براعم كلية (٤٠-٤٢ عين لكل كرمة) تحت نظام التدعيم " T" المزدوج . وقد تم إجـــراء ستة معاملات وهى تقييم استخدام نظامين من التربية وهما: نظام التربية الكردونية وتتكون من ثلاثة مستويات من التقليم الدابرى وهى دوابر تحمل إثنين أو ثلاثة أو أربعة عيون. أما النظام الآخر وهو نظام التربية القصبية ويتكون من ثلاثة مستويات من التقلـــيم القصـــبى وهى قصبات بطول ستة أو ثمانية أو عشرة عيون.

أشارت نتائج الدراسة إلى أن نظام التربية الكردونية قد أعطـــى أفضـــل النتـــائج بالمقارنة بنظام التربية القصبية. وأن التقليم الدابرى المتكون من (٢-٣ عيـــون/دابـــرة) أعطى أعلى نسبة مئوية من البراعم المتفتحة والثمرية وكذلك معامل الخصـــوبة مقارنـــة بالتقليم القصبى المتكون من (٦ عيون/قصبة) الذى أعطى أقل القيم، بالاضافة إلـــى ذلـــك أعطى نظام التربية الكردونية مع طول دابرة (٢-٣ عيون/دابرة) أعلى محصول ومكوناته بالاضافة إلى تحسين الصفات الطبيعية لعناقيد والصفات الطبيعية والكيماوية للحبات مـــع الحصول على أفضل قياسات خضرية وديناميكية نضج الخشب ووزن القصاصة وحجـــم الخشب القديم بالاضافة إلى محتوى الأوراق من الكلوروفيل الكلى ومحتوى القصبات مـــن الكربوهيدرات بالمقارنة بنظام التربية القصبية مع طول قصبة (١٠ عيون/قصـــبة) التـــى أعطت أقل القيم لهذه القياسات.

كما تشير الدراسة الإقتصادية إلى أن نظام التربية الكردونية مع التقلـــيم الـــدابرى للعنب الفليم سيدلس قد أعطى أعلى عائد إقتصادى بالمقارنة بنظام التربية القصـــبية مـــع التقليم القصبى.