

B- EFFECT OF CANE LENGTH ON COLD STORED GRAPE PUNCH QUALITY

El-Zyat, H. and Mervat S. Rizk-Alla
Hort. Res. Inst., Agric. Rec. Cent., Egypt.

ABSTRACT

Pruning combination of (5 x 14 , 6 x 12 , 7 x 10 , 9 x 8) or(number of canes x number of fruitful buds on each cane) were tried to investigate their effects on fruit quality of superior cultivar grape.

Samples of 18 to 20 grape clusters were picked from each pruning treatment in late may, from a farm at new desert lands (Alex. Cairo desert road) in both seasons of 2001 and 2002. Half of the clusters were kept in ambient conditions (4 days) and the other half in cold store (0 °C for 5 weeks). The quality criteria were tested after the keeping period. Results obtained indicated that grape clusters of 1st year were less mature than 2nd year grapes despite. Grapes picking was at the same date. Also grapes on the 1st season have less decay than 2nd year (0.8 % after cold storage 1st year and 7.0 % at the same conditions, 2nd year) T.S.S was generally higher in 2nd year juce than 1st year. Long cane pruning (5 x 14 and 6 x 12) had in general less T.S.S percentage and higher acidity and treatments of 7 x 10 and 9 x 8 had higher T.S.S and lesser acidity than long cane pruning.

INTRODUCTION

Egypt cultivates about one hundred and fifty thousand feddans grapes and has a crop of nearly a million ton, which considered one of the biggest countries producing grapes in the region. Producing good quality grape for export necessitates the attribution of some factors like precocity and high bunch quality (Lincoln T. Eduardo Z., 2001, and Winkler, 1983). Pruning severity certainly affects the quality of harvested clusters (Tamer, 1990, Kliever, 1981, Waqar *et al.* ,2004).

Cultivars in Egypt (such as flame seedless, King ruby, Superior and Early Superior....) satisfy a large scope of needs and covers the whole season. These cultivars help in increasing Egyptian exports to European, Arab and Asian countries. Pruning methods were developed to give maximum yield of acceptable quality. Pruning is the most important practice in the management of grapevines, and it is carried out for selecting fruiting wood to maintain vine shape and form and regulate the number of buds retained per vine. Proper pruning always results a maximum yield of high quality fruit (Gorden *et al.*, 1998).

This work aims at clarifying the effects of some pruning combinations (number of canes x number of fruitful spurs,) on grape quality and bunches storability of Early Superior cultivar.

MATERIALS AND METHODS

Fifteen years old vines of "Early Superior cultivar" grapes (a precocious variety) were chosen, in a location near "Sadat city, Menofyya governorate". The vines were selected to be pruned, in December, in 2001 and 2002,

leaving on each vine the same number of nodes (70 – 72), but varying the number of bearing canes and spurs as follows:-

- (1): 5 canes x 14 buds.
- (2): 6 canes x 12 buds.
- (3): 7 canes x 10 buds.
- (4): 9 canes x 8 buds.

Grape clusters were harvested at maturity stage in early to mid May, Twenty kilograms (45 – 80 clusters) for each treatment were picked and wrapped in vented polyethylene, and half of them were stored for 4 days in ambient conditions (30 °C) while the other half was kept for 5 weeks in cold storage (0 °C).

After the storage periods, the following quality criteria were carried out.

1-Weight loss: -

All clusters were weighted at the start of the experiment and at the end of storage (in ambient and cold conditions). The percentage of loss weight was recorded.

2-External aspect of cluster and berries: -

Judged by the extent of freshness, greenness of stems, and exemption of browning, scratches, fungal growth or other alteration, by a four grade scale: - Excellent(8 – 10), good(6 – 7.9), barely acceptable(4.5 – 5.9), bad(4.5), according to Klayton, 1985.

3- Decay percentage: -

Extent of fungal growth on clusters, by separating infected parts, weighting them, estimating decayed percentage and classifying clusters into a four classes system as follows: - Nil (0.0%), slight (acceptable in appearance 5 % or less), visible (5 – 20 %), and intense (more than 20 %), according to Weaver, 1976.

4- Firmness: -

Berry firmness was evaluated by subjecting (10) berries (from each treatment) separately to a penetrating needle of texture measurement, instrument (MECHATRIC STEVENS), piercing the berry to a (4mm) distance, by a speed of (1mm/sec) and the resistance to penetration was displayed and taken as a firmness value.

5- Total soluble solids (T.S.S) percentage: -

This parameter was measured, in berry juice, using a digital refractometer "Laica", mark П.

6- Acidity percentage: -

Juice acidity was evaluated by titration till end point, with (0.1 N) solution of (Na oh), and acidity estimated as malic and tartaric acid together.

7- Shattering percentage: -

Weight percentage of shattered or dropped berries, after subjecting the cluster to a slight shaking. These berries were weighted and its percentage was calculated, for all clusters in every treatment.

8- Organoleptic notes: -

A three persons panel judged the taste of grape berries and classified it according to 4 grades: - Excellent (over 8), good (7.5 – 6.0), barely acceptable (5.9 – 4.5), and unacceptable (below 4.5).

RESULTS AND DISCUSSION

1-Weight loss:-

Grape clusters weight loss is more noticeable and higher after ambient conditions (4days), than after cold storage for both seasons (5weeks) as shown in table(1)..

Table (1): Weight loss of stored grapes after 4 days in ambient conditions and after cold storage.

First year			
Treatments	Weight loss(%) at ambient cond. (after 4 days)	Weight loss(%) in cold storage (after 5 weeks)	Mean
* 5x14	3.00	5.00	4.00
6x12	4.00	4.33	4.16
7x10	4.00	2.33	3.16
9x8	6.33	2.70	4.51
L.S.D. at 5%		2.438	
Second year			
5x14	7.67	4.17	5.92
6x12	3.67	3.83	3.75
7x10	4.23	3.10	3.66
9x8	4.60	5.80	5.20
L.S.D. at 5%		2.025	

* 5 canes x 14 buds.

6 canes x 12 buds.

7 canes x 10 buds.

9 canes x 8 buds.

2-External appearance: - (shown in table 2)

External aspect of grape clusters declined slightly after 4 days in ambient conditions (30 °C). This aspect depends upon the extent of greenness of cluster stems, and decay spread or other injuries or discoloration. The biggest loss in external aspect was noticed only for treatment of "7 canes by 10 spurs" in the first year (from a note of 6.6 at start to 3.67) after 4 days in room temperature, but at the second year, it kept an acceptable appearance (6.0). Treatments of "7 x 10" in 1st year and "6 x 12" in 2nd year had the lowest aspect notes (3.67 and 5.3 respectively) because of the presence of a higher shattering and decay.

After 5 weeks in cold storage, cluster external aspect deteriorated noticeably compared to ambient storage, as it averaged 4.8 in first year and 4.7 in second year, which were barely acceptable. Clusters that come from bigger number of nodes (5 x 14 and 6 x 12) had slightly better aspect in first year, but declined to 4.3 and 3.7 respectively in second year because clusters were more advanced in maturity in second year than in first year.

3-Decay spread extent: -

In ambient conditions after 4 days, treatment (7 x 10) had the highest decay percentage (3 %) in 1st year, while treatments of (5 x 14) and (6 x 12) had the lowest decay rates in both years as shown in tables(2,4,6 and 8) (1.0 % first year and a range of 0.2 % - 0.3 % in second year).

After 5 weeks of cold storage all treatments in first year (except 9 x 8) were nearly exempted of decay while in 2nd year decay rate was higher and spread in all treatments, ranging from 5.3 % in treatments (7 x 10) to about 6.3 % and 7.7 % respectively in treatments (5 x 14) and (9 x 8). While more decay (9 %) was registered for treatment (6 x 12) . Treatment of (5 x 14) resulted in best results among all treatments and their clusters had the least decay infection as a whole in both seasons. This (5 x 14) pruning case has a less mature berries and by consequence higher acidity and (less sugars), and that may be the reason of a less susceptibility to decay. The results are consistent with the findings of Klayton,(1985).

Table (2): Physical properties of grape clusters after 4 days in ambient condition (30 °C) first year.

Properties	External aspect		Decay percentage		Firmness		Shattering %	
	at start	at end of storage	at start	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	8(±1)	6.33	0.0	1.0	50.3(±1)	52.03	0.0	0.0
6 x 12	8(±1)	6.0	0.0	1.0	51.6(±1.5)	52.63	0.0	0.0
7 x 10	6.6(±0.5)	3.67	0.0	3.0	55.0(±7.6)	44.5	0.0	0.30
9 x 8	5.5(±1)	5.33	0.0	1.33	52.0(±1.75)	47.6	0.0	0.35
L.S.D at 5%		n.s.		1.42		n.s.		0.87

4-Firmness: - As it's displayed in table (2,4,6 and 8)

Berry firmness, either didn't change or declined slightly from its initial value. In first year, there were no significant differences between treatments kept in ambient atmosphere or in cold storage.

This is peculiar to grape, according to its non climacteric metabolism pattern. Softening of tissues after harvest is influenced by storage conditions only and individual differences among clusters.

In the first year, starting from an average of(52.5) all values were around "49" after 4 days in ambient conditions. This average value was "45" after cold storage. While in the second year, in ambient conditions, firmness values averaged "45" and after cold storage, average note was "48". In the second year treatments (7 x 10) and (9 x 8) had lower firmness values, which may be explained by the tendency of short cane pruning clusters to progress more rapidly in ripening there long cane pruning clusters, and by consequence softening phenomena, which distinguish ripening is more obvious. This result is in accordance with Terry *et al* (2003).

5-Shattering percentage: - From tables(2,4,6 and 8); it is noted that in the first year, both ambient and cold storage, clusters of "5 x 14" recorded the best results with (0.0 %) shattering, while (9 x 8) recorded (3.5 %) after four days in ambient conditions. In the second year, at ambient conditions, treatment (5 x 14) had the highest shattering percentage (3.3 %) in cold storage.

In the 1st year, treatments gave lower shattering percentage. Cold storage recorded an average of 0.6 % compared to the 2nd year with an average of (9.2 %), which indicates that grapes were more advanced in

maturity in the second year than in the first year. Treatment of (6 x 12) pruning type, showed the highest shattering percentage after cold storage, second year (21 %). In the mean time there are some fluctuations in results, because of the unexpected lowest shattering percentage of treatment "5 x 14" (5.6 %) under the same conditions.

6-Total soluble solids: - (as shown in table 3, 5, 7, and 9)

This parameter values were varied in both seasons. In the first year, T.S.S of grapes at the time of picking reached an average of (15.24 %), while this percentage was markedly higher in the second year (16 %), which corroborates the conclusion of a more advanced grapes in maturity in the second year than in the first year, in spite of carrying out the picking at the same time in both seasons. Total soluble solids percentage compared to their initial values either didn't change or recorded a slight change after storage. The results didn't show a clear statistical differences among treatments. Examining T.S.S values lead to the conclusion that pruning types had no certain influence on soluble solids accumulation rates. But there was a general noted trend, supporting the ideas mentioned by (Terry et al, 2003) that long cane pruning increased yield and decreased juice soluble solids (as stated for Concord and Niagra varieties), in spite of some inconsistencies in results, treatment (5 x 14) recorded generally low T.S.S values (14.95 % and 14.8 % in ambient condition and in cold storage respectively 1st year) by comparison to the general averages of (15.1 % - 15.2 %). In the second year T.S.S was higher but this treatment gave the lowest T.S.S (16.2 %) in ambient condition compared to a total average of (16.4) and (15.4 %) after cold storage compared to a total average of (16.0). Pruning case of (7 x 10) recorded higher T.S.S values than other treatments, especially after cold storage (1st season 15.7 % compared to a general average of 15.2 % and in second season 16.83%, when compared to a general averaged 16 %). The following higher T.S.S values were recorded for treatment (9x8). These results agree with Marwad (1993) concerning Thompson seedless var., and with Christensen (1994).

Table (3) : Physical properties of grape clusters after 4 days in ambient condition (30 °C) second year.

Properties	External aspect		Decay percentage		Firmness		Shattering %	
	at start	at end of storage	at start	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	7.0	5.70	0.0	0.33	63(±4)	42.67	0.0	3.33
6 x 12	7.0	5.30	0.0	0.20	53(±4)	44.33	0.0	1.50
7 x 10	7.0	6.00	0.0	1.00	47.5(±0.5)	48.67	0.0	2.66
9 x 8	7.0	5.85	0.0	1.50	48(±8)	47.05	0.0	0.83
L.S.D at 5%		n.s.		n.s.		8.6		4.16

7-Acidity percentage: - (as in table 4 & 5)

Grapes acidity declined faster in the 2nd year than in 1st year, from an average start value 0.63 % 1st year acidity reached 0.59 % at 30 °C and 0.6 % after cold storage, while 2nd year this starting value of 0.65 % declined to 0.49

% at 30°C and 0.47 % after cold storage. Grape of 2nd year was more advanced in maturity than 1st year pecolt, in spite of picking at the same date. In all cases treatment of 7 x 10 recorded the lowest acidity value in almost all cases (0.54 % and 0.55 % after cold storage, but after ambient stay respectively in 1st year. In 2nd year, it recorded 0.48 % and 0.46 % for the same treatment). In the mean time canes associated with the biggest number of fruitful spurs (5 x 14) had the largest acidity values in both years, either after cold storage or after stay in ambient conditions. These result are in conformity with Terry *et al* (2003) and Mervat *et al* (2000). showing that long canes increased yield, but decreased soluble solids and increased acidity.

Table (4): Composition and taste notes after 5 weeks at (0 °C) first year.

Properties	T.S.S %		Acidity %		Organoleptic note	
	at start	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	14.85(±0.7)	14.80	0.67(±0.1)	0.65	6(±1)	6.3
6 x 12	15.07(±1.0)	15.0	0.64	0.63	7.0	6.6
7 x 10	15.77(±0.7)	15.7	0.59(±0.2)	0.54	6(±1)	7.6
9 x 8	15.37(±0.1)	15.3	0.61(±0.1)	0.58	6.6	6.8
Average	15.24	15.2	0.63	0.60		6.4
L.S.D at 5%	0.25	1.4	0.021	0.022		1.0

Table (5): Composition and taste note of grape berries after 5 weeks at (0 °C) second year..

Properties	T.S.S %		Acidity %		Organoleptic note	
	at start (AV.)	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	15.5	15.35	0.67	0.51	6.7	5.0
6 x 12	16.0	16.0	0.66	0.45	6.7	4.7
7 x 10	16.53	16.83	0.59	0.48	7.0	5.0
9 x 8	16.2	15.85	0.66	0.455	6.7	5.15
Average	16.04	16.0	0.65	0.47		5.0
L.S.D at 5%	0.15	2.4	0.025	0.019		0.8

8-Organoleptic note: - As it's shown in table (3,5,7 and 9),

organoleptic notes didn't deviate considerably from its initial note (6.2). After a stay in ambient conditions, treatments of (5 x 14) and (9 x 8) had the best taste notes (6.7 and 6.5) and all other treatments had equal notes of a good taste (6.3). After cold storage, treatments of second season recorded lower unexpected note of (5) Organoleptic note (an average of 5) that may be due to the inconvenience of storing advanced mature grapes at low temperature, especially for this early variety, which may not respond well to prolonged cold storage, by formation of senescence substances (volatiles, alcohols – etc) intervening in the taste. This is clear in the first year cold stored grapes with an acceptable taste note (6.4).

Table (6): Composition and taste notes of grape in ambient condition (30 °C) first year.

Properties	Total soluble solids%		Acidity percentage		Organoleptic note	
	at start (AV.)	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	14.85(±0.5)	14.95	0.67(±0.1)	0.64	6(±1)	6.7
6 x 12	15.07(±0.7)	14.93	0.64(±0.1)	0.60	7.0	6.3
7 x 10	15.77(±0.7)	15.7	0.59(±0.1)	0.55	6(±1)	6.3
9 x 8	15.37(±0.2)	15.47	0.61(±0.1)	0.59	6.0	6.5
Average	15.24	15.3	0.63	0.59		6.5
L.S.D at 5%	0.25	1.84		0.02		0.6

Table (7): Composition and taste note of grape clusters after 4 days in ambient condition (30 °C) second year.

Properties	T.S.S %		Acidity %		Organoleptic note	
	at start (AV.)	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	15.5	16.17	0.67	0.54	6.7	5.33
6 x 12	16.0	16.4	0.66	0.51	6.7	6.6
7 x 10	16.53	16.83	0.59	0.46	7.0	7.0
9 x 8	16.2	16.25	0.66	0.46	6.6	6.84
Average	16.04	16.4	0.65	0.49		6.4
L.S.D at 5%	0.15	2.23		0.023		0.97

Table (8): Physical properties of grape clusters after 5 weeks storage on (0 °C) first year.

Properties	External aspect		Decay percentage		Firmness		Shattering %	
	at start (AV.)	at end of storage	at start	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	8.7(±0.3)	5.0	0.0	0.0	50.1(±1.0)	39.2	0.0	0.0
6 x 12	8.7(±0.3)	5.0	0.0	0.0	51.5(±1.5)	42.6	0.0	0.67
7 x 10	6.7(±0.3)	5.0	0.0	0.0	50.9(±1.1)	47.9	0.0	0.33
9 x 8	5.5(±1.0)	3.85	0.0	2.0	51.4(±1.0)	45.55	0.0	0.67
Average		4.8		0.8	52.5	44.0		0.6
L.S.D at 5%		1.6		1.5		15.4		1.3

Table (9): Physical properties of grape clusters stored 5 weeks at (0 °C) second year.

Properties	External aspect		Decay percentage		Firmness		Shattering %	
	at start (AV.)	at end of storage	at start	at end of storage	at start	at end of storage	at start	at end of storage
5 x 14	7.0	4.33	0.0	6.33	63(±4.0)	53.33	0.0	5.67
6 x 12	6.6(±0.3)	3.67	0.0	9.0	53(±5.0)	43.33	0.0	2.1
7 x 10	7.0	5.0	0.0	5.33	47.5(±0.5)	35.0	0.0	7.3
9 x 8	7.0	5.16	0.0	7.67	49.5(±6.0)	36.83	0.0	6.5
Average		4.7		7.2		48.0		9.2
L.S.D at 5%		1.24		4.84		7.48		5.69

Ambient conditions (30 °C) didn't affect Organoleptic notes in a negative way in both years and their taste remained almost the same as the start. (an average of 6.4 in 1st year compared to start value of 6.2 and 6.4 in second year compared to a start value of 6.7). Treatment of (5 x 14) in the second year, after (4) days in ambient conditions, had the lowest taste note (5.3), compared to an average of (6.4).

CONCLUSION

Grape crop of the first year was relatively less mature at the picking date compared to second year grapes. This was indicated by a lower fruit weight loss value in the first year than second year. Decay % in the second year was more pronounced than its incidence in the first year (especially after cold storage). In the mean time total soluble solids were higher in the second year grapes (averaging 16.4 % after amb. stay and 16.0 % after cold storage) than first year (averaging 15.3 % after amb. stay and 15.2 % after cold storage). There was a general trend supporting that long cane pruning decreases juice soluble solids, in spite of some inconsistencies in the obtained results.

Pruning treatments of 5 x 14 and 6 x 12 , is generally speaking, had also higher acidity in juice and lower decay percentage in the first year, which displayed clear differences between treatments than 2nd year. It's obvious that grape quality is a complicated matter, and influenced by many factors beside pruning systems. Variable climates conditions play certainly a big role in speeding or slowing maturity phenomenon, which in turn is reflected upon fruit quality. It's recommended that an average number of (8-10) fruitful spurs be retained on each cane to produce good quality grapes for early superior variety.

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ب- تأثير طول الأقصبة الثمرية على سلوك البراعم والنمو والانتاجية ونضج الخشب والمحتوى الكيماوى لـصنف العنب الايرلى سوبيريور جودة عناقيد العنب المخزنة بالتبريد.

حمدي الزيات - مرفت سمير رزق الله
معهد بحوث البساتين - مركز البحوث الزراعية - جمهورية مصر العربية.

أجريت هذه تجريبه لمعرفة أثر طول القصبات وعدد العيون المثمرة على جودة العنب صنف (إيرلى سوبيريور) وتم تقليم أشجار العنب بحيث تركت عليها (عدد قصبات × عدد عيون) (١٤×٥) و (١٢×٦) و (١٠×٧) و (٨×٩).

أخذت عينات من ١٨ - ٢٠ عنقود عنب من كل معاملة في شهر مايو من مزرعه من الأراضي المستصلحة في (السادات) في موسمي ٢٠٠١ ، ٢٠٠٢ وتركت نصف العناقيد في الجو العادي لمدة ٤ أيام (٣٠ م) و خزنت في الثلج (صفر ٥ م) لمدة ٥ أسابيع. وتم تقييم عوامل الجودة بعد كل فترة . توضح النتائج أن العنب المقطوف في السنة الأولى كان إلى حد ما أقل نضجا من العام الثاني بالرغم من القطف في نفس الميعاد ، وإحتوى على نسبة فطريات أقل في العام الأول عن الثاني (المتوسط العام ٠,٨% بعد التخزين المبرد في العام الأول ، و ٧,٠% في العام الثاني).

معاملات التقليم ذات القصبات الطويلة (١٤×٥) و (١٢×٦) إحتوت على نسبة مواد صلبه ذاتيه كليه أقل - وحموضه أعلى - بينما كانت القصبات القصيره (١٠×٧) و (٨×٩) ذات نسبة سكريات أعلى وحموضه أقل .

