

EFFECT OF SOME PRUNING TREATMENTS ON GROWTH AND YIELD OF SOME GRAPE CULTIVARS:

[A] -Bud load and cane length of Crimson Seedless grapevines

El-Mogy, M. M.

Viticulture Dept., Hort. Res. Institut., Agric. Res. Center, Giza, Egypt

ABSTRACT

In 2002 and 2003 seasons, mature vines of Crimson seedless grapevines were pruned at the dormant season to leave 60, 90 and 120 buds per vine through changing the cane length to be 5, 10 and 15 buds/cane.

Increasing vine load from 60 to 120 buds was accompanied with increase prunings weight, yield/vine, number of clusters per vine, total acidity %, total carbohydrates in canes and reduction in the shoot length, leaf area, cluster weight, berry weight, berry size, berry dimension, berry firmness and berry adherence strength. Also, the high bud load caused decrease of total soluble solids%, as well as, TSS/acid ratio and total anthocyanin. All the studied parameters except yield and total acidity were tended to increase with raising vine load and the cane length.

The highest yield with good quality of Crimson grapevines was obtained with bud load 90 buds per vine and cane length (10-15 buds/cane).

INTRODUCTION

Crimson is a red late seedless variety, which newly introduced to Egypt. The information concerning pruning for this cultivar under Egyptian environmental conditions is quite limited. Also, the adjusting the proper vine bud load and determining the suitable cane length should be beneficial and positively affect the quantity and quality of the fruit yield. Many works indicated that using the optimum number of buds per vine as well as adjusting the length of the selected canes should be favorable for improving yield of any vine cultivar quantitatively and qualitatively. (Fawzi *et al.*, 1984; Higazi 1985, Marwad *et al.*, 1993; Possingham 1994, Wample 1994, Pavlov 1995, Rizk, 1996, Zhou and Zhou 1996, Brancadoro *et al.*, 1997, Abd El-wahab *et al.*, 1997, Bakhshi *et al.*, 1998, Sayed 1998. Gobara 1999, Graviano, 1999, Intrieri, *et al.*, 1999, Liuni, *et al.*, 1999, Viložny *et al.*, 1999, Ali *et al.*, 2000, Palma, *et al.*, 2000, Rives 2000, Garic, 2001, Samra, *et al.*, 2001, Moretti, *et al.*, 2002, Dami *et al.*, 2003, Terry and Rick 2003 and Dawn *et al.*, 2004).

Therefore, the target of the present is determine the optimum number of buds per vine as well as the optimum length of canes which may result in a high yield with good quality of Crimson seedless grapevines.

MATERIALS AND METHODS

This work was carried out during two successive seasons (2002 and 2003) in a private vineyard at El-Mahlla elkobra, Gharbia governorate on "Crimson" Seedless grapevines. The vines were five years old, grown in a loam soil under drip irrigation system.

Vines were spaced 2x3 meters, and they were cane trained and trellised according to the gable system. Vines were nearly uniform in vigour subjected to the same horticultural practices and cane pruned during the last week of January in both seasons.

Determination of the best bud load in Crimson vines:

Nine treatments were conducted to determine the best suitable bud load per vine. Different bud loads were experimented by verifying the length of the vine canes at winter pruning.

The experimented treatments were as follows:-

60 buds / vine = (5, 10 or 15 buds / cane)

90 buds / vine = (5, 10 or 15 buds / cane)

120 buds / vine = (5, 10 or 15 buds / cane)

The treatments were designed in a complete randomized block design with three replicates, each had three vines (3x3).

The measurements:

1- Vegetative growth :

At growth season's end, the ultimate shoot length (cm), shoot base diameter (cm), leaf area (cm²) of the apical 5th and 6th leaves using an areameter, weight of pruning woods/vine (Kg) at the winter pruning were recorded and wood ripening coefficient in the winter were calculated using the following equation (Bouard, 1966).

$$\text{wood ripening coefficient} = \frac{\text{Length of mature part (cm)}}{\text{Total shoot length (cm)}}$$

2- Yield / vine and yield structure:

Number of clusters/vine and average yield/vine (Kg) were determined at harvest time of the two studied seasons. Yield was harvested, when TSS % of berry juice reached 18% in the treatment of the highest bud load + the greatest cane length according to Tourky *et al.*, (1995).

Representative random samples of 12 clusters / treatment (4 clusters from each replicate) were collected at the harvest time, and brought to the laboratory for determining average cluster weight (g), No. of berries/cluster and fruit characteristics (physically and chemically).

3- Physical and Chemical characteristics of berries (fruit quality) :

Weight of 100 berries (g), volum of 100 berries (cm³), berry dimensions (mm), berry firmness and adherence strength (g/cm³). Total soluble solids (TSS%) in berry juice using a hand refractometer, Total titratable acidity (as tartaric acid%) (A.O.A.C, 1985), TSS/acid ratio and total anthocyanin of the berry skin (g/100g fresh weight) according to Husia *et al.*, (1965) were recorded.

4- Cane content of total carbohydrates:

Three canes/vine were collected at winter pruning for determining total carbohydrates (g/100g dry weight) using the phenol sulphoric acid method described by Smith *et al.*, (1956).

5- Statically analysis :

The statistical analysis of the present data was carried out according to the methods described by Snedecor and Cochran (1980). Treatment means

were compared statistically using Duncan's multiple range test at 5% level of probability.

RESULTS AND DISCUSSION

1- Vegetative growth:-

Data in Table (1) clearly showed that increasing bud load/vine and cane length decreased shoot length and leaf area but increased pruning weight. The minimum values of shoot length and leaf area were detected at load 120 buds/vine with 15 buds/cane. Pruning the vines to leave 60 buds / vine with 5 buds/cane gave the highest shoot length and leaf area. The *vice versa* in relation to weight of pruning. These results were true in 2002 and 2003 seasons.

The reduction on shoot length and leaf area in response to high bud load might be attributed to the large number of grown shoots/vine as a result to high bud load/vine, which led also to the promotion of pruning weight. The competition among the large number of grown shoots for water and minerals might be responsible for the reduction of shoot length and leaf area. The present results are in agreement with those obtained by Possingham (1994), Abd El-wahab *et al.*, (1997), Gobara (1999), Moretti, *et al.*, (2002), Dami *et al.*, (2003) and Terry and Rick (2003) who found that increasing bud load/vine decreased shoot length and leaf area of various grape cultivars.

As shown in Table (1) and Figure (1), it was obvious that coefficient of wood ripening was negatively influenced by the increase in bud load/vine (60 – 120), as well as cane length (5 - 15 buds/cane). The decrease in wood ripening was significant only in treatment 120 buds with 15 buds/cane. Data recorded in this respect was (0.76 and 0.71) for the two seasons 2002 and 2003, respectively. These results are in line with those obtained by Fawzi *et al.*, (1984); Marwad *et al.*, (1993); Rizk *et al.*, (1994), Rizk, (1996) and Ali *et al.*, (2000), who found that increasing bud load/vine decreased coefficient of wood ripening of various grape cultivars.

2- Yield/vine and yield structure:

It is clearly from the obtained data in Table (2) that increasing number of buds per vine and cane length were followed by a gradual promotion of yield expressed as weight and number of clusters per vine. The effect of different vine load levels on yield/vine was in some cases insignificant. The best results with regard to yield were obtained from vines pruned to 120 buds/vine with 15 buds of the cane length. The severe pruning (60 buds/vine) and the lowest of the buds/cane (5 buds/cane) gave the minimum yield (9.33 kg/vine in 2002 and 10.43 kg/vine in 2003). Also, it can be seen from the data in table (2) that light pruning (120 buds/vine) with cane length (15 buds/cane) gave the highest yield (11.67 kg/vine in 2002 and 13.15 kg/vine in 2003). These results were true in both seasons.

The yield/vine was proportional to raising fruiting buds and number of clusters per vine as the number of buds remaining on the vines was increased.

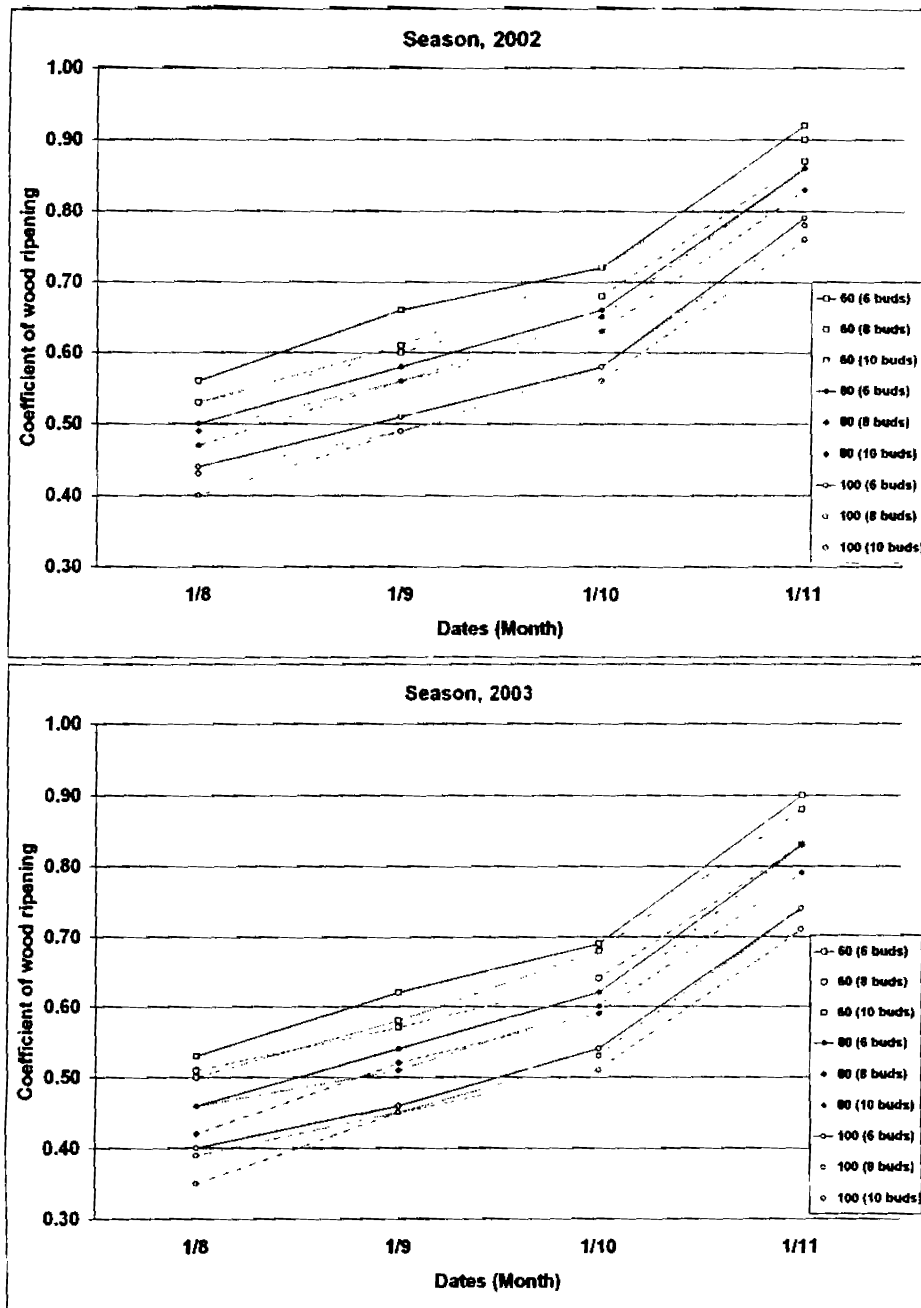


Figure (1): Effect of bud load and cane length on the coefficient of wood ripening at both seasons, 2002-2004

Table (1) : Effect of bud load and cane length on growth of Crimson Seedless grapevines in seasons 2002 and 2003

Shoot length (cm)	Leaf area (cm ²)			Weight of wood pruning (Kg)			Wood ripening coefficient								
	2001		2002	2001		2002	2001		2002						
	2001	2002	2001	2002	2001	2002	2001	2002							
204.30	a	211.60	a	232.60	a	249.60	a	1.65	e	1.89	d	92.00	a	90.00	a
184.60	bc	189.20	bc	201.90	bc	223.60	b	1.73	de	1.94	cd	90.00	a	88.00	a
164.40	de	173.90	d	193.20	bcd	219.10	b	1.78	de	2.01	cd	87.00	ab	83.00	ab
189.70	b	196.30	b	204.80	b	223.10	b	1.88	cde	2.07	bcd	86.00	ab	83.00	ab
172.70	cd	175.90	cd	185.90	cde	209.40	bc	1.92	bcde	2.15	bc	86.00	ab	83.00	ab
155.70	ef	161.70	de	179.30	de	199.60	cd	1.97	abcd	2.26	ab	83.00	bc	79.00	abc
175.80	cd	174.60	d	180.60	de	185.30	de	2.16	abc	2.37	a	79.00	cd	74.00	bc
163.30	de	168.40	de	171.80	e	181.70	e	2.21	ab	2.41	a	78.00	cd	74.00	bc
147.60	f	154.40	e	168.50	e	172.90	e	2.25	a	2.40	a	76.00	d	71.00	c

Mean having the letter in the same column do not significantly differ using Duncan multiple range test at 5% level of probability

Table (2) : Effect of bud load and cane length on yield and physical characteristics of cluster on Crimson Seedless grapevines in seasons 2002 and 2003

Treatments	Bud load	Cane length	Yield / vine (Kg)		No. of clusters/vine		Cluster Weight (gm)		No. of berries/cluster						
			2001		2002		2001		2002						
			2001	2002	2001	2002	2001	2002	2001	2002					
60	5 buds	9.33	c	10.43	d	30.90	d	309.30	a	320.90	a	120.80	a	128.69	a
	10 buds	10.22	c	10.45	d	34.87	cd	299.90	ab	296.30	ab	123.63	a	125.11	a
	15 buds	10.29	c	10.60	d	37.13	cd	284.20	abc	241.40	cd	124.22	a	107.83	a
90	5 buds	10.34	c	12.81	c	40.40	cd	263.40	bcd	286.40	abc	106.22	a	118.22	a
	10 buds	10.42	bc	12.87	c	42.90	bc	250.40	cde	274.10	abc	108.00	a	120.81	a
	15 buds	10.48	bc	12.95	bc	44.40	bc	243.20	cde	269.90	bc	108.26	a	126.44	a
120	5 buds	10.49	abc	13.08	ab	44.83	abc	241.00	de	268.20	bcd	102.18	a	114.98	a
	10 buds	11.60	ab	13.14	a	51.10	ab	234.30	de	255.10	bcd	105.09	a	113.76	a
	15 buds	11.67	a	13.15	a	54.80	a	220.10	e	218.40	d	104.41	a	106.03	a

Mean having the letter in the same column do not significantly differ using Duncan multiple range test at 5% level of probability

These results are in harmony with those obtained by Fawzi *et al.*, (1984); Marwad *et al.*, (1993); Rizk *et al.*, (1994), Rizk, (1996), Zhou and Zhou (1996), Brancadoro *et al.*, (1997), Sayed (1998), Viložny *et al.*, (1999), Gobara (1999), Ali *et al.*, (2000), Samra, *et al.*, (2001), Terry Bates, (2003) and Dawn *et al.*, (2004) who found that increasing bud load/vine increased yield of various grape cultivars.

Data in table (2) obviously show that the tested pruning treatments had apparent effect on cluster weight. Cluster weight was progressively raised with reducing the number of remaining buds/vine and cane length. Differences between those treatments were statistically significant in most cases. Severe pruning with leaving cane length 60 buds/vine (on 5 buds/cane) was responsible for producing the heaviest clusters (309.3 and 320.9 g in both seasons 2002 & 2003, respectively). The lowest cluster weight were borne on vines, which had 120 buds/vine on 15 buds/cane (220.1 and 218.4 g in both seasons respectively). These results could be ascribed to the increase in number of clusters per vine.

No significant differences between all treatments were obtained in relation to the number of berries.

These results are in coincidence with those obtained by Fawzi *et al.*, (1984); Higazi (1985), Marwad *et al.*, (1993); Rizk *et al.*, (1994), Rizk, (1996), Zhou and Zhou (1996), Brancadoro *et al.*, (1997), Abd El-wahab *et al.*, (1997), Sayed (1998), Viložny *et al.*, (1999), and Gobara (1999), Ali *et al.*, (2000). Rives (2000), Samra *et al.*, (2001), Dami *et al.*, (2003), Terry and Rick (2003) and Dawn *et al.*, (2004) who found that increasing bud load/vine decreased cluster weight of various grape cultivars.

3- Physical and Chemical characteristics of berries (fruit quality) :

It is clear from data in table (3) that varying bud load/vine and cane length significantly affected physical characteristics of the berries such as, berry weight, size, dimensions, firmness and adherence strength. However, those parameters were negatively influenced by the increase in bud load/vine (90 - 120) as well as cane length (10 - 15 buds/cane).

Regarding to chemical characteristics of berries, it was obviously from results in table (4), Increasing number of buds/vine and cane length was followed by a decrease of total soluble solids%, as well as TSS/acid ratio and total anthocyanine.

These results, in general, are in agreement with those obtained by Fawzi *et al.*, (1984); Higazi (1985), Marwad *et al.*, (1993); Rizk *et al.*, (1994), Wample (1994), Pavlov (1995), Rizk, (1996), Zhou and Zhou (1996), Brancadoro *et al.*, (1997), Abd El-wahab *et al.*, (1997), Bakhshi *et al.*, (1998), Sayed (1998), Gobara (1999) Viložny *et al.*, (1999), and Gobara (1999), Ali *et al.*, (2000). Rives (2000), Dami *et al.*, (2003) and Terry and Rick (2003). and Dawn *et al.*, (2004) who found that increasing bud load/vine decreased fruit quality of various grape cultivars.

As a conclusion, the best results with regard to yield and quality of the berries of Crimson grapevines were obtained as a result of pruning the vines leaving 90 buds/vine with cane length (10 - 15 buds/cane).

Table (3) : Effect of bud load and cane length on physical characteristics of berries on Crimson Seedless grapevines in seasons 2002 and 2003

Weight of 100 Berries (g)	Vol. of 100 Berries (cm ³)						Berry length (mm)		Berry diameter (mm)		Berry firmness (g/cm ³)		Berry adherence strength (g/cm ³)			
	2001		2002		2001		2002		2001		2002		2001		2002	
271.16 a	266.07 a	250.17 a	244.16 a	24.52 a	26.16 a	15.01 a	15.54 a	546.00 a	560.00 a	576.33 a	535.00 a	576.33 a	535.00 a			
261.25 ab	254.17 ab	237.09 abc	231.06 ab	23.63 a	23.70 b	14.74 a	14.94 a	490.67 b	463.33 b	453.33 c	491.67 c	453.33 c	491.67 c			
248.11 bcd	241.27 bc	223.13 bcd	217.15 bcd	22.07 ab	23.30 b	13.61 b	15.21 a	464.33 c	453.33 c	531.67 c	408.33 d	453.33 c	408.33 d			
267.16 ab	258.24 ab	241.22 ab	236.19 ab	20.16 b	20.77 c	14.45 a	14.53 a	516.67 b	526.67 b	493.33 d	505.00 b	493.33 d	505.00 b			
251.15 bc	241.21 bc	225.14 bcd	221.22 bc	19.17 b	20.50 c	12.77 b	13.68 b	463.33 c	410.00 d	458.33 e	408.33 d	458.33 e	408.33 d			
240.22 cde	233.13 cd	218.21 cd	208.12 cd	18.61 b	18.83 d	12.28 b	12.73 c	453.33 cd	416.67 d	438.33 f	365.00 e	416.67 d	365.00 e			
254.19 b	249.18 abc	229.16 abc	227.23 abc	19.76 b	19.32 d	12.13 b	12.74 c	440.00 d	425.33 d	425.33 f	491.67 c	425.33 d	491.67 c			
237.06 de	241.24 bc	216.05 cd	218.17 bcd	17.49 c	16.97 e	11.82 c	11.67 d	426.67 e	370.00 e	373.33 g	395.00 d	373.33 g	395.00 d			
231.16 e	222.26 d	204.11 d	199.24 d	16.19 c	15.00 e	10.65 d	10.72 e	413.33 f	350.67 f	333.33 h	361.67 e	333.33 h	361.67 e			

Table (4) : Effect of bud load and cane length on chemical characteristics of berries and total carbohydrates of canes on Crimson Seedless grapevines in seasons 2002 and 2003

Treatments	TSS (%)		Acidity (%)		TSS/acid ratio		Total anthocyanin (%)		Total carbohydrates (%)		
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	
Bud load	Cane length		Cane length		Cane length		Cane length		Cane length		
	5 buds	20.93 b	21.20 c	0.42 c	0.41 c	49.83 a	51.71 a	31.60 a	31.30 a	20.04 f	20.06 e
	10 buds	21.33 a	22.27 b	0.57 a	0.47 b	37.42 b	47.38 b	30.85 ab	29.95 ab	21.03 e	22.50 d
60	15 buds	21.73 a	23.27 a	0.60 a	0.48 b	36.22 b	48.48 b	30.55 ab	29.55 abc	22.49 d	23.67 bc
	5 buds	21.80 a	20.87 d	0.46 c	0.50 b	47.39 a	41.74 c	30.10 ab	29.20 bcd	22.40 d	23.07 cd
	10 buds	21.33 a	20.47 d	0.56 a	0.55 b	38.09 b	37.22 d	29.30 bc	28.35 bcde	22.90 d	24.17 b
90	15 buds	20.13 b	19.20 e	0.57 a	0.60 a	35.32 b	32.00 d	29.10 bc	27.90 cde	23.30 c	24.04 b
	5 buds	19.87 c	19.67 e	0.50 b	0.62 a	39.74 b	31.73 d	28.70 bc	27.65 de	24.47 b	25.02 a
	10 buds	18.80 d	18.53 f	0.56 a	0.66 a	33.57 c	28.08 e	27.80 cd	27.35 de	24.33 b	24.95 a
120	15 buds	18.47 d	18.00 f	0.61 a	0.67 a	30.28 c	26.87 e	25.90 d	27.10 e	25.82 a	25.64 a

Mean having the letter in the same column do not significantly differ using Duncan multiple range test at 5% level of probability

4- Total carbohydrates contents of the cane:

Results in Table (4) further revealed that increasing bud load/vine and cane length, was followed by a gradual promotion on percentage of total carbohydrates. The maximum values of total carbohydrates were recorded for vines bearing 120 buds/vine with 15 buds/cane (25.82 & 25.64% in both seasons 2002 and 2003, respectively). On the contrary, the lowest carbohydrates content was found in vines that had 60 buds/vine its recorded (20.04% and 20.06% in both seasons 2002 and 2003 respectively). These results were true in both seasons.

The promotion of total carbohydrates in response to increasing bud load was mainly attributed to the effect of increasing vine size as a result of increasing the number of buds retained on the vine followed stimulation of carbohydrate synthesis.

Similar results were reported by Fawzi *et al.*, (1984); Higazi (1985), Marwad *et al.*, (1993); Rizk *et al.*, (1994), Zhou and Zhou (1996), Rizk, (1996), Zhou and Zhou (1996), Brancadoro *et al.*, (1997), Sayed (1998), Viložny *et al.*, (1999), and Gobara (1999), Ali *et al.*, (2000). Rives (2000), Moretti, *et al.*, (2002), Dami *et al.*, (2003), Terry and Rick (2003) and Dawn *et al.*, (2004) who found that increasing bud load/vine increased total carbohydrates of various grape cultivars.

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تأثير بعض معاملات التقليم على النمو والمحصول لبعض أصناف العنب
(أ) حمولة البراعم وطول القصبة على كرمات عنب الكريسون سيدلس
محفوظ محمد الموجي
قسم بحوث العنب- معهد بحوث البساتين - مركز البحوث الزراعية-جيزة-مصر

خلال موسمي ٢٠٠٢-٢٠٠٣ تم تقليم كرمات عنب الكريسون الناضجة في خلال مرحلة السكون. حيث تم ترك على الكرمة ٦٠-٩٠-١٢٠ عين بأطوال قصبة ٥ - ١٠ - ١٥ عين بالقصبة للوحدة. كان زيادة حمولة الكرمة من ٦٠-١٢٠ برعم مصحوبا بزيادة وزن خشب للتقليم والمحصول وعدد العناقيد في الكرمة، والنسبة المنوية للحموضة الكلية والنسبة المنوية للكربوهيدرات الكلية بينما أدى إلى تقليل طول الفرخ ومساحة الورقة ووزن العنقود ووزن وحجم حبة وأبعاد وصلابة وقوة شد الحبة والنسبة المنوية للمواد الصلبة الذاتية الكلية. ويمكن أن نجمل نتيجة الدراسة في أن أفضل حمل للبراعم بالكرمة هو ٩٠ عين للكرمة الواحدة في صنف الكريسون أي بترك قصبات بطول ١٠ عين للقصبة فبذلك توصلنا لأعلى محصول ثمار بأفضل جودة.