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EFFECT OF BUD LOAD ON BUD BEHAVIOUR AND FRUIT QUALITY OF INTRODUCED MILISSA CULTIVAR

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ABSTRACT

This study was carried out during the two successive seasons, 2004 and 2005 in an attempt to find out the optimum number of buds to be left on vines of the newly introduced Melissa Seedless grape cultivar which realizes to get the highest possible yield with the best fruit quality. 5 Year-old-uniformed vines were chosen and pruned to 6 different levels of bud load, 84, 98, 112, 126,140,154 buds/vine. 14 buds per cane leaving fixed for all treatments.

The results showed that increasing bud load/vine resulted in an increase in the number of bunches/vine, yield/vine and acidity of the juice. On the other hand, percentage of bursted buds, fertility and bunch weight, berry weight, size, length and diameter, wood ripening coefficient, weight of prunings, cane carbohydrate content. T.S.S and T.S.S/acid ratio were found to decrease as the bud load was increased. Berry shape index and compactness coefficient were unaffected. The optimum number of buds/vine to be left at pruning time for Melissa Seedless Cv. ranged between 112, 126 buds/vine.

INTRODUCTION

In Egypt, grape is the second fruit crop after citrus, occupying an area of 159.000 Feddan*. In eighty's of the twentieth century, many cultivars were introduced from U.S.A. Recently, Melissa cultivar was introduced as a mid season white seedless table grape. This cultivar was developed by USDA-ARs in Fresno, U.S.A and released in 1999 (Dokozlian and Peacock).

Bud load is an important factor affecting yield, berry quality and vine vigour (Morris and Cawthon, 1980 on Concord grapes; Fawzi *et al.*, 1984 on Thompson Seedless; Marwad *et al.*, 1993 on Thompson Seedless; and Omar and Abdel-Kawi, 2000 on Thompson Seedless).

The results of their work varied according to the investigated variety.

Being a new cultivar, Melissa Seedless needs more information about its bud load.

This work aimed to determine the suitable bud load for Melissa Seedless grapevines and its effect on yield and bunch quality.

MATERIALS AND METHODS

This study was conducted during two seasons, 2004 and 2005 in a private vineyard of Melissa Seedless grape cultivar at El-Khatatba Governorate on 5-year-old vines, grown in a sandy soil and irrigated by the drip irrigation method. The vines were spaced at 2.5 × 3 meters apart to cane pruned and supported by the Spanish Parron system.

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* Ministry of Agriculture in 2004

Pruning treatments were applied leaving 14 buds/ cane for all different load treatments as follows: (84, 98, 112, 126, 140 and 154 buds). Each treatment contained four replicates, of four vines each.

The following parameters were recorded :

1- Bud behaviour :

A) Bursted buds % = $\frac{\text{Number of bursted buds/vine}}{\text{Total number of buds/vine}} \times 100$

B) Fertility coefficient = $\frac{\text{Number of bunches/vine}}{\text{Total number of buds/vine}}$

According to Huglin (1958) and Bessis (1960).

2- yield/vine and its components: Average number of bunches, average bunch weight and yield/vine were determined at harvesting time (First week of August) for the two seasons.

3- Physical and chemical characteristics of bunches and berries : At harvesting time, bunch weight (g) and dimensions (cm), Coefficient of bunch compactness, number of berries/bunch, Berry weight (g) and size (cm^3), berry dimensions and berry shape index. Total soluble solids (T.S.S%) in berry juice using a hand refractometer, total titratable acidity (%) was determined according to A.O.A.C. (1970), then T.S.S/acid ratio was calculated.

4- Coefficient of wood ripening and Weight of prunings

Coefficient of wood ripening was calculated according to Bouard (1966) as follows :

- Coefficient of wood ripening = $\frac{\text{Length of ripened part of the shoot}}{\text{Total length of the shoot}}$
- Weight of prunings (kg): was recorded at the pruning time in the last week of December.

5- Cane total carbohydrate content:

Samples of one-year old canes were collected at winter pruning to determine total carbohydrates according to the method described by Plummer (1971).

6- Statistical analysis :

Data obtained during both seasons were subjected to the statistical analysis using the new L.S.D for comparing between means at 5% level according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

1- Bud behaviour :

Three distinguished sectors could be observed lengthwise the cane. The basal sector (1^{st} – 4^{th} bud) was characterized by a sharp increase in bud burst, followed by almost no change in the middle sector (5^{th} – 9^{th} bud), then it increased in the distal sector (10^{th} – 14^{th} buds) were it revealed its maximum increasing bud load adversely affected bud burst (Fig. 1). The first possible explanation for this decrease may be the relatively small amounts of nutrients available for each bud to burst out when bud load was increased and vice versa (Omar and Abdel-Kawi, 2000).

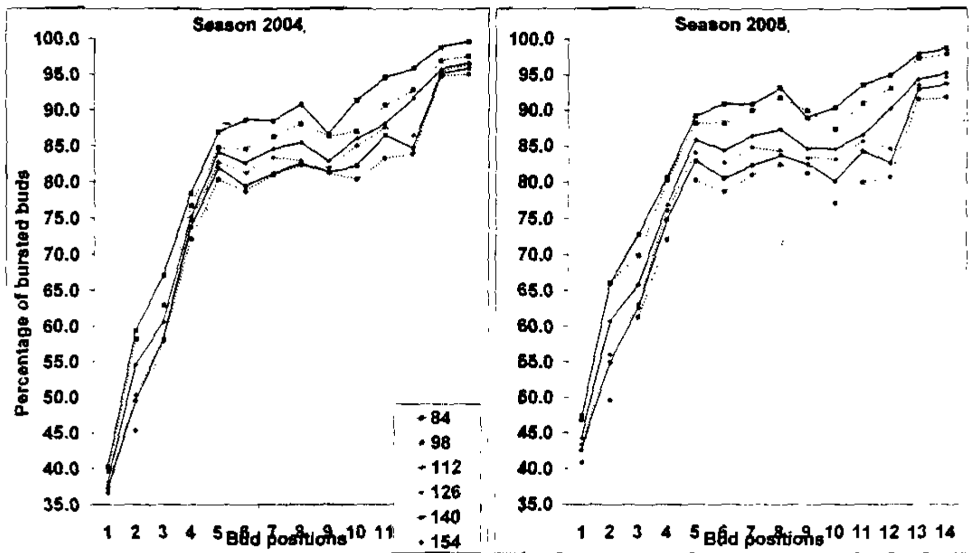

Fig (1): Percentage of bursted buds lengthwise the cane

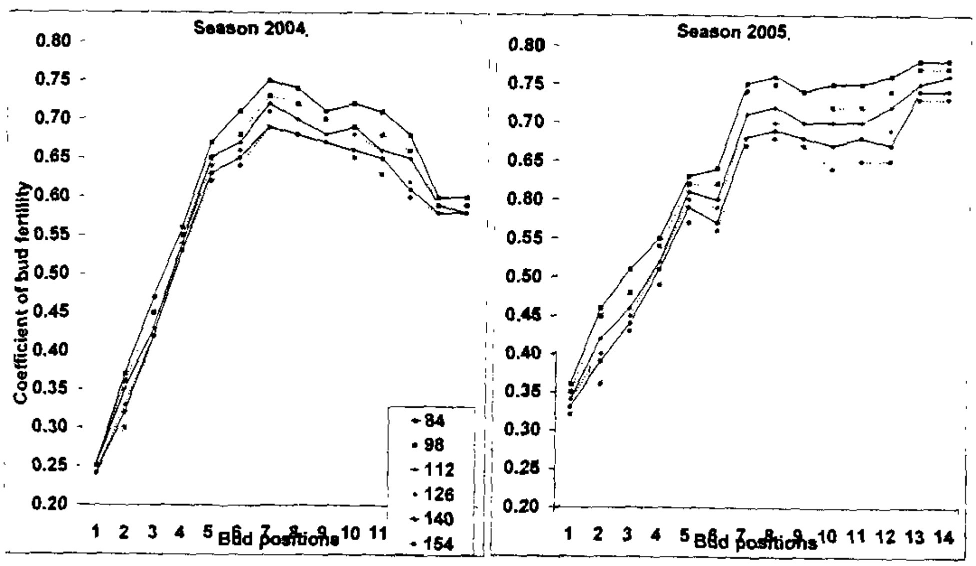

Fig (2): Coefficient of bud fertility lengthwise the cane

The second in perpetration is that the apical buds are acting as a rich source for IAA and GA_3 which increased bud burst at the distal sector of the cane (Phillips, 1975) and finally the accumulation of ABA in the basal sector, translocated basipetally from the distal sector (Badawi *et al.,* 1984).

As regards coefficient of bud fertility, it was found that it increased from the 1st to 7th bud, followed by a slight decrease from 7th to 9th bud after which it decreased sharply from 9th to 14th bud. Increasing bud load resulted in a decrease in *bud fertility coefficient* (Fig.2). *In the second season* it was found that this coefficient was increased from the basal sector of the cane (1st to 7th buds), followed by almost no change at the middle sector (7th to 12th buds), then an increase was observed in the distal sector of the cane (12th to 14th buds).

Table (1) : Effect of bud load on bud behaviour of Milissa grapevines

Bud load	bud burst (%)		Coefficient of bud fertility	
	2004	2005	2004	2005
84	83.37	85.35	0.61	0.66
98	80.92	84.20	0.59	0.64
112	79.04	80.52	0.58	0.62
126	77.46	78.53	0.57	0.61
140	76.40	77.17	0.57	0.60
154	75.23	74.91	0.56	0.58
New L.S.D. (0.05) =	4.99	4.83	0.03	0.04

2- yield/vine and its components :

Number of bunches/vine increased as bud load was increased. The highest values were found at bud load of 154 buds/vine with no significant differences between loads of 126 or 140 buds/vine which indicated that bud load of 126 buds/vine may be suitable for this C.V in this respect (Table, 2). Fig. (3) showed a strong positive correlation (r = +1) between bud load and number of bunches/vine. *Similar results were observed for yield/vine.* A reverse trend was noticed for bunch weight and weight of berries/bunch. *Bunch weight was negatively correlated with bud load,* r= -99 (Fig.4), giving an evidence that the increase of yield was due to only the number of bunches/vine in this study.

Bunch length & width and number of berries/bunch adversely responded to bud load, i.e. increasing bud load produced shorter & narrower bunches with lower number of berries (Table, 2). *It is worth mentioning that,* bud load had no significant effect on coefficient of bunch compactness (Table, 2).

Number of bunches/vine increased as bud load was increased. Higher number of bunches was found as bud load was increased up to 154 buds/vine with no significant differences with 126 or 140 buds/vine which indicate that bud load of 126 buds/vine may be suitable for this Cv. (Table, 2). Similar results were observed for yield/vine (Fig. 5). A reverse trend was found for bunch weight and extended to weight of berries/bunch.

Table (2) : Effect of bud load on some bunch characteristics and yield of Milissa grapevines

Bud load	Average number of bunches		Average bunch weight (g)		Average yield (kg)		Average weight of berries/bunch (g)		Average bunch length (cm)		Average bunch width (cm)		Average number of berries/bunch		Coefficient of bunch compactness	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
84	51.13	55.23	733.70	703.90	37.51	38.88	721.39	686.60	28.67	26.67	14.70	17.20	155.76	142.16	5.43	5.33
98	58.17	63.02	707.20	675.40	41.14	42.56	696.43	657.07	25.67	25.33	14.60	16.90	152.73	138.33	5.95	5.46
112	65.21	69.78	658.90	662.30	42.97	46.22	644.94	646.01	25.00	24.33	14.30	16.70	146.25	137.16	5.85	5.64
126	72.18	77.44	627.30	634.60	45.28	49.14	616.48	626.72	23.00	24.17	14.10	16.40	141.07	134.78	6.13	5.58
140	79.26	83.71	595.60	611.70	47.21	51.21	587.58	598.73	21.33	24.07	13.70	16.30	135.70	129.04	6.36	5.36
154	86.15	89.77	574.10	597.30	49.46	53.62	568.08	591.79	22.33	24.03	13.60	16.10	132.42	128.09	5.93	5.33
New L.S.D. (0.05)	15.96	21.53	32.33	39.45	7.64	6.04	36.94	42.11	1.91	1.25	0.77	0.63	14.23	8.69	N.S	N.S

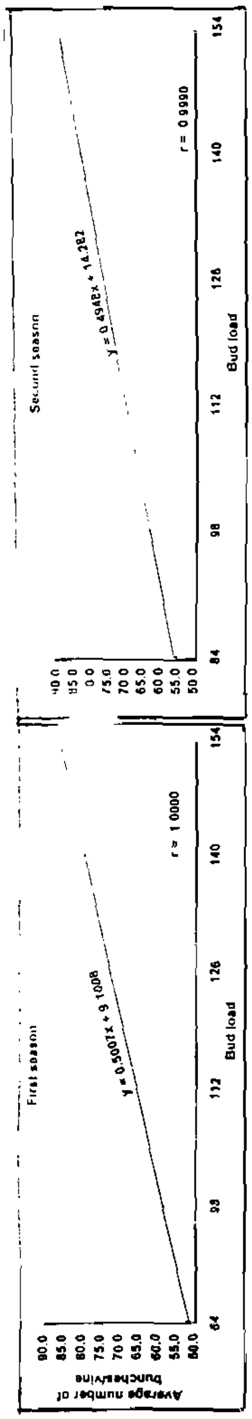

Fig (3): The relationship between bud load and average number of bunchs/vine

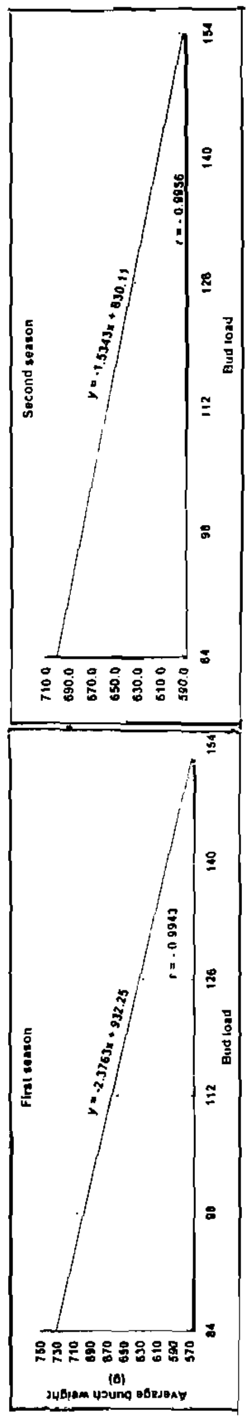

Fig (4): The relationship between bud load and average bunch weight (g)

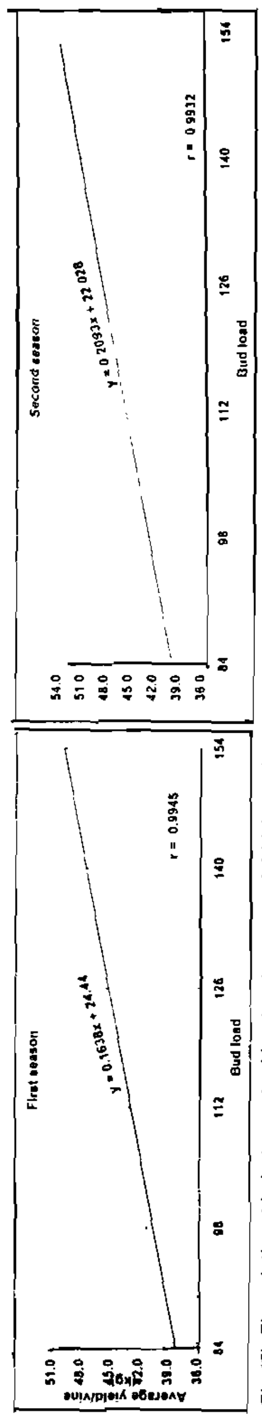

Fig (5): The relationship between bud load and average yield /vine(kg)

Bunches weight were negatively correlated with bud load, r=-99 (Fig.4), which indicated that the increase of yield was related to the number of bunches/vine in this study. These results agree with the findings of Asadullaev (1966), Fawzi *et al.* (1984), Marwad *et al.* (1993) and Rizk (1996).

3- Physical characteristics of bunches and berries :

Bunch length, width and number of berries/bunch were negatively affected by bud load, i.e. increasing bud load resulted in shorter, and narrower bunches with lower number of berries (Table, 2). It is worth mentioning that bud load had no significant effect on coefficient cf bunch compactness (Table, 2). These results agree with Naidenov *et al.* (1980), Fawzi *et al.* (1984), Rizk (1996), Yusta *et al.* (1996), Abd El-Wahab (1997) and Abd El-Rahman (2002).

Table (3) : Effect of bud load on physical characteristics of berries of Milissa grapevines

Bud load	Average berry weight (g)		Average berry size (cm3)		Average berry length (cm)		Average berry diameter (cm)		Berry shape index	
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
84	4.65	4.83	4.39	4.61	2.35	2.39	1.87	1.89	1.26	1.26
98	4.56	4.75	4.37	4.53	2.34	2.37	1.85	1.87	1.26	1.27
112	4.41	4.71	4.25	4.50	2.32	2.35	1.83	1.87	1.27	1.26
126	4.37	4.65	4.22	4.44	2.31	2.35	1.83	1.86	1.26	1.26
140	4.33	4.64	4.18	4.43	2.31	2.34	1.81	1.85	1.28	1.26
154	4.29	4.62	4.15	4.42	2.29	2.33	1.80	1.82	1.27	1.28
new L.S.D. (0.05) =	0.12	0.11	0.10	0.09	0.04	0.03	0.05	0.04	N.S	N.S

4- Chemical characteristics of berries:

T.S.S. as shown in Table (4) was significantly affected by bud load. Increasing bud load up to 154 buds per vine significantly decreased berry T.S.S in comparison with that of 84 buds per vine. These results are in agreement with Howell *et al.* (1991), Abd El-Fattah *et al.* (1993) and Marawad *et al.* (1993).

Table (4) : Effect of bud load on berry chemical characteristics of Milissa grapevines

Bud load	T.S.S. (%)		Acidity (%)		T.S.S./acid ratio	
	2004	2005	2004	2005	2004	2005
84	19.70	18.10	0.33	0.35	59.70	51.71
98	19.40	17.80	0.33	0.37	58.79	48.11
112	19.20	17.80	0.36	0.39	53.33	45.64
126	18.90	17.50	0.38	0.38	49.74	46.05
140	18.90	17.40	0.40	0.41	47.25	42.44
154	18.60	17.20	0.41	0.42	45.37	40.95
New L.S.D. (0.05) =	0.77	0.54	0.04	0.03	5.27	6.03

Data in this respect, clarified that the highest T.S.S. values, (19.7 and 18.1) and (18.6 and 17.2) were found in bud load of 84 buds/vine for two seasons respectively. Total acidity revealed a trend adverse to that of T.S.S. T.S.S./acid ratio was significantly higher with bud load of 84 buds/vine. These results are in harmony with those obtained by Bhujbal (1974).

5- Cane total carbohydrate content:

Cane total carbohydrate content was affected by bud load per vine (Table, 5). Fig. (6) showed a strong positive correlation (r= 0.97) between bud load and cane total carbohydrate content. The highest values were (27.6 and 28.3) for bud load of 84 buds/vine in comparison with bud load 154 buds/vine which had the least values (25.8 and 26.3) for the two seasons, respectively. Similar observations were reported by Kliewer (1973) and Abd El-Fattah *et al.* (1993). They reported that the increment in total yield needs more vegetative growth which results in high total carbohydrates in the cane.

Table (5) : **Effect of bud load on wood ripening, weight of prunings and cane total charbohydrate content (%) of Milissa grapevines**

Bud load	Coefficient of wood ripening		weight of prunings (kg)		Cane total charbohydrate content (%)	
	2004	2005	2004	2005	2004	2005
84	0.86	0.89	3.61	3.95	27.60	28.30
98	0.84	0.88	3.55	3.67	26.90	27.90
112	0.83	0.85	2.92	3.21	26.40	27.40
126	0.80	0.81	2.56	2.88	26.10	27.10
140	0.80	0.79	2.49	2.54	25.90	26.80
154	0.76	0.78	2.11	2.09	25.80	26.30
new L.S.D. (0.05) =	0.06	0.08	0.75	0.99	0.83	0.97

6- Coefficient of wood ripening and weight of prunings :

Wood ripening decreased significantly as bud load was increased. As shown in Table (5), coefficient of wood ripening was always higher at bud load of 84 buds/vine (0.86 and 0.89) as compared to that of 154 buds/vine (0.76 and 0.78) in the two seasons respectively. These results are in line with those obtained by Fawzi *et al.* (1984), Marwad *et al.* (1993) and Rizk (1996).

Fig. (7) illustrates the presence of a strong correlation between bud load and weight of prunings. When bud load was raised to 154 buds/vine the weight of prunings was (2.11 and 2.09) kg/vine in the two seasons respectively but when bud load was lowered to 84 buds/vine, it was (3.61 and 3.95) for 2004 and 2005 seasons, respectively.

On account of the foregoing results, it can be concluded that the appropriate bud load per vine for Melissa Seedless Cv. ranges between 112 to 126 buds so as to produce the highest yield with good quality of bunches.

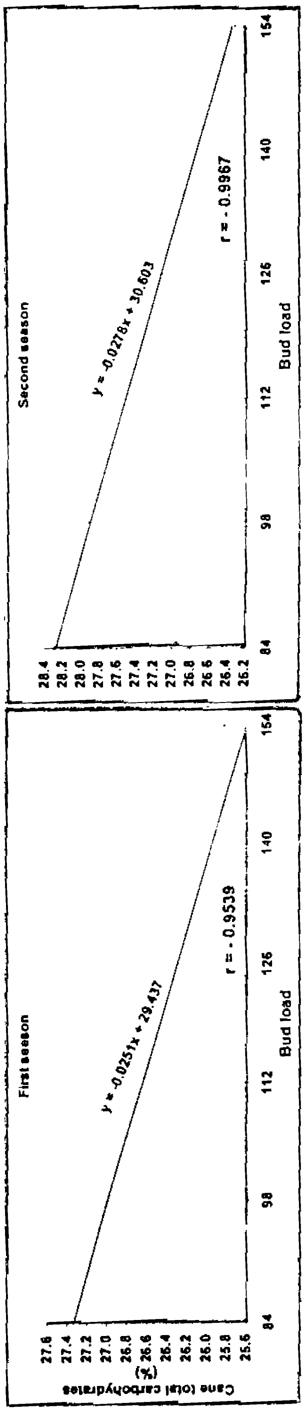

Fig (6): The relationship between bud load and cane total carbohydrate (%)

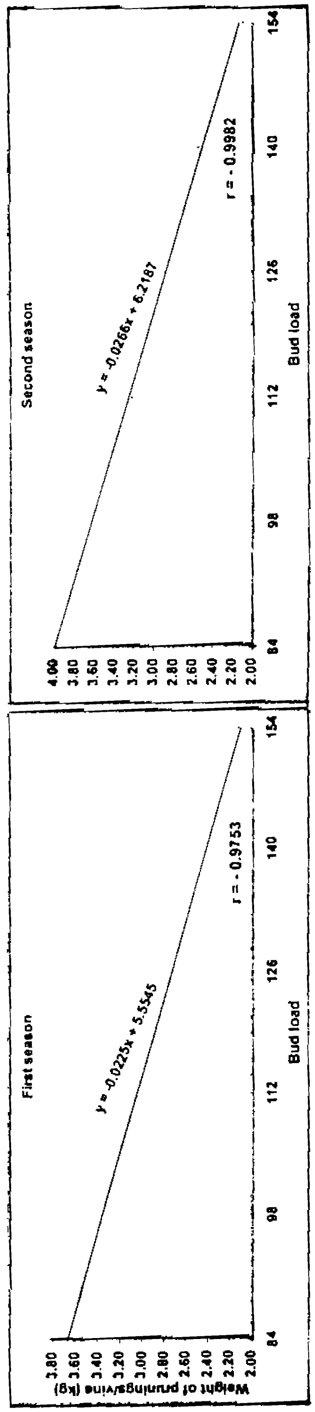

Fig (7): The relationship between bud load and weight of prunings/vine (kg)

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تأثير مستويات التحميل المختلفة علي سلوك العيون وصفات الجودة لثمار العنب صنف الماليسا اللابذري

هناء أحمد الحلو

قسم بحوث العنب – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة – مصر

أجريت هذه الدراسة خلال موسمي ٢٠٠٤ و ٢٠٠٥ بغرض الوصول إلي العدد المناسب من البراعم لكرمة العنب اللابذري صنف ماليسا والذي يعطي أعلي محصول ممكن وبنوعية جيدة.

قلمت كروم العنب عمر ٥ سنوات في شهر يناير إلي ستة مستويات هي : ٨٤ ، ٩٨ ، ١١٢ ، ١٢٦ ، ١٤٠ ، ١٥٤ عين/كرمة مع تثبيت طول القصبة عند ١٤ عين/قصبة.

أظهرت النتائج ما يلي :

- كلما زادت حمولة البراعم علي الكرمة كلما زاد عدد العناقيد ، المحصول ، الحموضة في العصير.
- إنخفضت نسبة البراعم المتفتحة والخصوبة وكذلك إنخفض وزن العنقود ووزن وحجم الحبات وطولها وقطرها كما إنخفض معامل نضج الخشب ووزن القصاصة ونسبة الكربوهيدرات الكلية في القصبات.
- إنخفضت نسبة المواد الصلبة الذائبة الكلية ونسبة المواد الصلبة الذائبة الكلية إلى الحموضة.
- لم يتأثر معامل شكل الحبة (طولها / عرضها) ومعامل تزاحم الحبات فى العنقود.

وقد وجد أن أنسب عدد من العيون يمكن تركه علي كرمة العنب صنف الماليسا يتراوح بين ١١٢ إلي ١٢٦ عين/كرمة