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EFFECT OF CROP LOAD ON CRIMSON SEEDLESS GRAPE A) EFFECT OF CLUSTER THINNING ON SOME CLUSTER AND BERRY CHARACTERISTICS BOFORE, DURING AND AFTER COLD STORAGE

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ABSTRACT

A study was conducted in 2002and 2003 to determine the optimal degree of cluster thinning for crimson seedless grapevines. The vines were grown in a private vineyard at Wadi El Natron, El-Behera Governorate. The vines were 5-year-old. The treatments were: (1) control (the number of clusters per vine was adjusted to 40). (2) The number of clusters per vine was fixed at 35. (3) Number of clusters per vine was fixed at 30. (4) The number of clusters per vine was fixed at 25. The results indicated that, all thinning treatments exerted a substantial increase in average bunch weight, bunch dimensions berry weight and size and berry dimensions. The higher intensity of cluster thinning, the greater was the increase in these parameters. Ripening was hastened in thinning treatments resulting in the highest percentage of TSS, TSS/ Acid ratio, anthocyanine content of berry skin and the lowest acidity of berry juice. The results concerning the effect of treatments on storability and fruit quality during 50 days of cold storage at 0C, RH. 90-95 % cleared out that 25 cluster / vine gave the highest percentage of cluster fresh weight loss and TSS percentage and the lowest values of berry firmness and total acidity.

It was concluded that the decrease obtained in the yield of vines thinned to 30 clusters/vine could be compensated by the higher quality and earlier ripening of clusters which undoubtedly ensure considerably higher prices especially in the foreign markets.

INTRODUCTION

Egypt pays a great attention to maximize the use of table grapes through the production of high quality grapes which is the key for increasing the quantity of grapes exported to the European market and for reducing competition. Crop level manipulated to influence fruit cluster-thinning has been proven to be associated with grape crop to a normal load so that high quality of fruit can be produced (Sharpless et al, 1955, Sarowa and Bakis 1972, Cahoon et al , 1991; Reynolds *et al.*, 1986 and Sanjay 1995). Reducing number of clusters per vine was shown to increase soluble solids in the juice and anthocyanin concentration in grape berry skin (Bravdo *et al.*, 1985; Edson *et al.*, 1993; Howell *et al.*, 1987 Reynollds *et al.*, 1986) Goa1993,Erik *et al* 2003 ,Jessica 2002 and Rizk Alla 2006. The effect that crop control has on titratable acidity was (TA) inconclusive. Some studies indicated that (TA) increased with reduced crop level (Reynolds and Wardle, 1989 and Wolpert *et al.*, 1983), whereas others revealed that it increased (Bravdo *et al.*, 1985 Reynolds *et al.*, 1986).

The crop level of the vine can also influence yield. Limiting crop level through post-set cluster- thinning has the potential to decrease yield by

reducing berry numbers (Looney, 1981, Clark et al 1989, Jessica et al 2002 and Rizk Alla 2006. And producing berries of greater weight (Abd El Wahab 2000, Noar et al, 2002 Fawzi and El Moniem 2003 and Rizl Alla 2006.)

Crimson seedless is a newly-introduced cultivar in Egypt and it is promising for export to countries south the equator as well as Europe and Arab countries.

The present study aimed to throw the light on the effect of flower cluster thinning on the yield/vine as well as physical and chemical characters of Crimson seedless grapes.

MATERIAL AND METHODS

This study was carried out during 2002 and 2003 seasons on five years old Crimson seedless grapevines grown in a private vineyard located in El-nubariya- region, El-Behera governorate.

The goal of the present study was to examine the effect of cluster thinning after berry set (Weaver and Pool 1972, Ferree *et al.*, 2003and Ezzahouani and Williams 2003) on yield as well as physical and chemical properties of grapes cv., Crimson seedless).

The vines were five years old, supported by gable system. Distance was 1.5 m between vines in the row and 3 m between rows. Sixty uniform Crimson seedless vines grown in a sandy soil were chosen (4 treatments x 3 replicates x 5 vines per replicate). Each vine was pruned to six canes of 10 buds each. The design was randomized complete blocks. All vines were similar in vigor .and received the same cultural practices already applied in the vineyard. The treatments were: 25 clusters/vine, 30 clusters/vine, 35 clusters/vine and control (40 clusters/vine).

At harvest time, when clusters attained their technical ripening phase (Halime, 1981), representative samples of clusters were taken to the laboratory for carrying out physical and chemical analysis which included the following parameters:

Yield/vine (kg), average cluster weight (g), cluster dimensions (length and width in (cm), berry weight (g) and berry size (cm^3). Percentage of total soluble solids determined by a hand-refractometer ,total acidity % (expressed as g. tartaric acid 100 juice) according to the procedures out lined in A. O. A.C.(1969) , TSS / Acid ratio was calculated whereas total anthocyanin in berry skin was determined at O .D 530 nm (Hisa et al ,1965) .

Storage ability:

Harvested clusters were carefully stored to eliminate berries with any obvious mechanical damage. Sound selected clusters were packed in one layer cartoon boxes to avoid cracking of berries and then stored at 0 c and 85 90 RH.

Five grape clusters of each treatment were taken to determine the initial physio-chemical properties which were followed up every week throughout the storage period as follows:

Five clusters of each treatment were labeled and the initial weight of each cluster was recorded. Subsequent periodical weight determinations were carried out every week throughout the storage period. The percentage of weight loss of each cluster was calculated for each treatment. Fresh weight loss was calculated by the difference between the initial weight of the cluster and that recorded at the date of sampling by dividing weight loss in (g) by the initial weight of cluster x 100.

Berry firmness potential of the above grape treatments (50 berries of each) was determined by using Effegi pressure tester with a flat plunger (Effegi, 48011 Alfonsine, Italy).

A sample of clusters was taken every week until the end of the storage period for the determination of TSS (%) and total acidity (%).

The statistical analysis:

Mean separation was determined using Duncan's test (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

1. Yield/vine and cluster characteristics

Yield/vine:

The results in (Table 1) show that all thinned vined significantly reduced the vine yield compared with control in both seasons of the investigation. However, Vines thinned to 25 clusters had the lowest yield compared with the other thinning treatments and control in both seasons of this study.

Cluster weight:

Average cluster weight decreased linearly with increasing crop load Table (1). The maximum values of cluster weight were obtained with the treatments 25 and 30 clusters per vine at the two seasons of the investigation (Fig. 1). These results are in agreement with those obtained by Howell *Et al.*1987, Clark *et al.*, 1989 Palliotti *et al.*, 2000, Morinaga *et al.*, 2000. Jessica *et al.*, 2002Cheema et al .2003, Fawzi and El- Moniem 2003 and Rizk Alla 2006 who stated that thinning improved cluster quality and weight of cluster.

Cluster dimensions:

As shown in Table (1), cluster length and width were significantly increased in both seasons of the investigation in 25 and 30 clusters/vine treatments in comparison with the other treatments. These results coincide with the finding of Risk and Hassn (1996), Fawzi and El-Moniem (2003) and Rizk-Alla (2006) who pointed out that cluster thinning significantly increased cluster length and width.

These results are in agreement with those obtained by loony (1981), Clark et al (1989), Kaps and Cahoon (1989), Reynold et al (1991) Ann and David (1996), Harun and Serdar (2002), Jessica et al (2002), Risk-Alla (2006) and Ezzahouani and William (2001).

2. Physical characteristics of berries:

Berry weight and size:

As shown in Table (2), berry weight and size were significantly increased in 25 and 30 clusters/vine treatments in comparison with the control.

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T1

T2

Gerges, V. H.

F1

The heaviest and largest berries were produced from cluster thinning to 25 clusters/vine. The results are in coincidence with those obtained by: Howell et al (1987), Clarck et al (1989), Kaps and Cahoon (1989), Shehata and El-Barary (1996), Abd El- Wahab (2000), Palliotti et al (2000), Morinagaet al (2000), Ezzahouani and Williams (2001), Noar et al (2002), Cheema et al (2003), Ezzahouani and Williams (2003), Fawzi and El Moniem (2003), Ferree et al (2003) and Rizk-Alla (2006).

Berry Dimensions:

Berry dimensions as expressed by berry height and diameter were significantly increased in 25 and 30 clusters/vine as compared with the other treatments Table (2). The results could be explained by the beneficial effect of cluster thinning that coincides with the still active cell division in the pericarp of the berries with the rapid normal berry growth. These results are in agreement with those obtained by Howell *et al* (1987), Clark *et al* (1989), Rizk and Haasn (1996) and Rizk- Alla (2006).

3. Chemical berry characteristics:

Data revealed that the treatment of 25 clusters/vine gave the best results as it significantly increased TSS, TSS/Acid ratio, anthocyanin content of berry skin and lowered acidity percentage in the two seasons (Table 3). This results concide with the finding of Clark et al (1989), Nick Dokoozlian et al (1993), Reynolds (1994), Colapietra *et al* (1995), Dokoozlian and Hirschfelt (1995), Sangay (1995), Ann and David (1996), Salvador et al (1996), Shehata and El-Barbary (1996), Abd-El-Wahebe (2000), Marinaga et al (2000), Palliottiet et al (2000), Ezzahouani ad Williams (2001), Erik et al (2002), Goro *et al* (2002), Harun and Serdar (2002), Jessica et al (2002), Cheema *et al* (2003), Fawzi and El-Moniem (2003), Cus *et al* (2004), Ferree *et al* (2004), Rubio *et al* (2004) and Rizk-Alla (2006).

4. Storage ability:

Storage ability indices (cluster weight losses (%), berry firmness (Ib/in2), TSS (%) and acidity (%)) were weekly monitored from one week till seven weeks in both seasons.

A. Cluster weight losses (%)

Cluster weight losses (%) (Figure 2) increased steadily by time elapse throughout the considered sampling dates to reach its peak after seven weeks for all treatments in both seasons. Vines thinned at 25 clusters had the highest values of cluster weight losses (%) as compared to control.

B. Berry firmness (Ib/in^2)

Berry firmness (Ib/in^2) (Figure 3) decreased gradually throughout the considered sampling dates. Control and vines thinned at 35 clusters/vine had the highest values of berry firmness (Ib/in^2) as compared to vines severely thinned to (25 clusters/vine).

These results show that the small load of clusters per vine (25) gave the highest percentage of weight loss besides the lowest firmness.

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T3

F2

Gerges, V. H.

F3

The possible interception of these results could be searched in the biological characteristics of this cultivar manifested in the high vigour of its vines especially at the load of 25 clusters/vine. The higher percentage of weight loss in an indication of the higher content of water in the clusters and berries before the cold storage and is also responsible for the increase in TSS of berry juice and the decrease in berry firmness during storage.

C. TSS (%)

TSS (%) (Figure 4) increased gradually by time elapse throughout the considered sampling dates to reach its peak after seven weeks for all treatments in both seasons. Vines thinned at 25 clusters had the highest values of TSS (%) as compared to control.

D. Acidity (%)

Acidity (%) (Figure 5) decreased gradually throughout the considered sampling dates. Vines thinned at 25 & 30clusters/vine had the lowest values of acidity (%) as compared to control.

In conclusion: in the light of the results obtained in this investigation, it can be stated that 25 clusters per vine retained after fruit set produced a remarkable increases in cluster weight and increased berry quality of clusters of Crimson seedless grapevines. The decrease in the yield observed in 25clusters per vine treatment can be compensated by the remarkable improvement of cluster quality which undoubtedly ensures higher prices in the market. The results concerning the effect of treatments on storability and fruit quality during 50 days of cold storage at 0 c, RH. 90-95 % cleared out that 30 cluster / vine gave the highest percentage in cluster fresh weight loss and TSS percentage and the lowest values in berry firmness and total acidity.

F4

F5

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تأثير حمولة المحصول على عنب الكريمسون سيدلس
أ) تـأثير خـف العناقيـد علـى خصـائص العناقيـد والحبـات قبـل وأثنـاء وبعـد التخـزين البارد

فيكتور حبيب جرجس
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اجريت هذه الدراسة خلال موسمي 2002 , 2003 لتحديد انسب درجة من خف العناقيد وذلك للحصول علي اعلى درجة من الجودة لعناقيد صنف العنب كريمسون سيدلس. والكرمات نامية في احدى المزارع الخاصة وعمرها خمسة سنوات.

وكانت المعاملات كما يلي: الكنترول (عدد العناقيد على الكرمة 40 عنقود)، معاملة مخفوفة عند عدد عناقيد على الكرمة 35 عنقود، و معاملة مخفوفة عند عدد عناقيد على الكرمة 30 عنقودا، و معاملة مخفوفة عند عدد عناقيد على الكرمة 25 عنقود، وقد تم الخف بعد العقد. واشارت النتائج المتحصل عليها من هذه الدراسة الى ان معاملات الخف ادت الى زيادة جوهرية في وزن العنقود لمعاملة 30،25 عنقود، كذلك وزن وابعاد الحبات. ولقد لوحظ انه كلما زادت درجة الخف للعناقيد كلما كانت الزيادة فى هذه الصفات كبيرة.

أدت معاملات الخف كذلك الى الاسراع في نضج الثمار حيث ازدادت النسبة المئوية للمواد الصلبة الذائبة والنسبة بين المواد الصلبة الذائبة الكلية: الحموضة , كذلك زاد محتوى قشرة الثمار من الانثوسيانين بينما قل محتوى الحموضة في العصير للحبات وذلك بالمقارنة بالكرمات التي تحتوي على العدد الأكبر من العناقيد.

بالنسبة لتأثير المعاملات السابقة على قابلية الثمار للتخزين المبرد لمدة 7 اسابيع على درجة الصفر المئوي ورطوبة نسبية 90-95 % فقد لوحظ زيادة نسبة الفقد في وزن الحبات وكذلك زيادة المواد الصلبة الذائبة تدريجياً خلال فترة التخزين بينما نقص محتوى العصير من الحموضة و درجة الصلابة تدريجياً خلال فترة التخزين.

وبناء على تلك النتائج انه يمكن التوصية بترك عدد 30 عنقود على الكرمة لتحسين جودة ولون ثمار العنب الكريمسون اللا بذري وزيادة قابلية الثمار للتخزين والحفاظ على جودتها اثناء التخزين المبرد على درجة الصفر المئوي.