Assiut J. of Agric. Sci., 41 (3) (29-42)

Effect of Some Fruit Improving Treatments on Ruby and Thompson Seedless Grapevines Productivity

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Key words: Berry thinning, Pinching, Leaves removed, Quality, Ruby seedless, Tompson seedless

Abstract

The effect of berry thinning, shoot topping and basal leaves removal on productivity of Ruby and Thompson seedless grapevines during 2008 and 2009 seasons were studied. All grapevines were 12 year old, grown at the Experimental Orchard, Faculty of Agriculture, Assiut University. Berry thinning was performed after berry set, whereas pinching and leaves removal were carried out at two weeks of berry set and at verasion phase respectively. The experiment was set up as complete randomized block (CRB) with four replicates, one vine per each.

The obtained results could be summarized as follow

Berry thinning as removing either 25% of apical cluster or 25% of shoulders significant decreases the berries number per cluster and consequently unsignificantly decreased the cluster weight and yield/vine compared to untreated one. Such berry thinning methods significantly increased berry weight and the chemical constituents of juice compared to untreated ones. In addition, removing 25% of apical cluster significantly decreased the compactness coefficient of clusters.

Shoot pinching alone or along with defoliation significantly increased the berry weight and consequently significantly increased the cluster weight and yield/vine as well as improved the berry chemical quality compared to untreated one (control). Whereas, the defoliation at verasion phase significantly improved juice chemical constituents, but the effect was unsignificant on the berry weight, cluster weight and yield/vine compared with undefoliation ones.

From this study, it is clear that to improve cluster and berries quality we can make berry thinning as alternatively about 25% of shoulders or combined pinching plus defoliation.

Introduction

The grape is considered as one of the most important fruit crops in the world, for being of an excellent flavor, nice taste and high nutritional value. It is the second fruit crop in Egypt after citrus. The cultivated area has grown rapidly in the last two decades reaching 153954 feddans with annual production of 1531368 tons (According to the Annual Statistical of the Ministry of Agriculture in 2008).

Berry thinning has been used to obtain the needed loosened, large berries, highest berry

weight and accerated ripening. Hand thinning plays an important role with some grape varieties since its control crop and improves its quality and hastens the ripening (Dhillon *et al*., 1992; Fitzgerald and Patterson, 1994; Palliotti and Cartechini, 1998; Selim, 2007 and Hussein, Maha, 2008). The thinning necessary depended on the cultivar and sunshine as well as temperature and nutrient supply (Poni, 2003, Cheema *et al*., 2003 and El-Salhy *et al*., 2010).

Excessive vegetative growth resultant from unbalance existed between various nutrients produced unfavorable clusters, vine vigour may be accommodate canopy modification or can be controlled through summer hedging (Reynolds and Wardle, 1989; Wolf *et al*., 1990; Morando *et al*., 1991; Omran *et al*., 2004 and El-Salhy *et al*., 2010). Leaves removed is performed in cluster area to enhance coloration, to allow more light to enter and easily spraying cluster with growth regulators. Two basal leaves can be removed without adverse effects, but removal of all leaves from the apical cluster downward greatly reduces the yield (Jensen *et al*., 1975; Petrie, 2003 and Abdel-Ghany *et al*., 2005). So this work aimed to study the effect of berry thinning and pinching on yield and cluster and berry traits of Thompson and Ruby seedless grapevines.

Materials and Methods

This study was carried out during two successive seasons of 2008 and 2009 on two seedless cultivars of *Vitis vinifera* L., i.e. Ruby and Thompson seedless grapevines. All grapevines were 12 year old, spaced at 1.5xm, grown at the experimental vineyard Plant Pathology Department, Faculty of Agriculture, Assiut University. The chosen vines were received the usual agriculture practices that are used in the vineyard including soil fertilization, irrigation and pest control. The vine trained in traditional double cordon with three wires and pruned during the second week of January. Each vine was pruned to four arms of four fruiting spurs with 3 buds length, a total 48 buds/vine. Crop load at all vines was adjusted to 25 & 30 clusters/vine after berry set for Thompson and Ruby seedless grapevines, respectively. The chosen vines for two cultivars were divided into five different thinning pinching, defoliation treatments including the control. The experiment was arranged in complete randomized block design with four replications per treatment one vine each. Thus the treatments were as follow:

1- Thinning by cutting back about 25% from the apical clusters portion.

2- Thinning by alternatively removing about 25% from cluster branches (latrals).

3- Removing about 25% of shoot length (pinching 25% of shoot top).

4- Four basal leaves removal of fruiting shoot at veraison phase.
5- Pinching 25% of shoot top plus removing.
6- Control (untreated vines).

Thinning treatments were performed after berry set using special shears. Whereas, pinching and leaves removal were performed at two weeks of berry set and at verasion phase, respectively.

At harvest date, when soluble solids contents (SSC%) attained (16-18%) and color development in 80% Ruby seedless berries. Three clusters were taken at random from the yield of each vine to determine the following characters.

Average weight of cluster (g), cluster length (cm), and berries number of cluster, as well as, cluster compactness coefficient according to Winkler *et al*. (1974).

In addition, berry quality in terms of berry weight SSC, total acidity and reducing sugars % according to A.O.A.C. (1985).

All obtained data were tabulated and statistically analyses according to Gomez and Gomez (1984) and Snedecor and Cochran (1990) using the L.S.D. test for distinguishing the significance differences between various treatment means.

Results

1- Effect of berry thinning, shoot pinching and leaf removing on yield and cluster traits:

It is clear from data in Tables (1 & 2) that berry thinning by removing either 25% of cluster apical (T1) or 25% of shoulders (T2) significantly decreased the berries number per cluster and consequently unsignificantly decreased the cluster weight and yield/vine of Ruby and Thompson seedless grapevines compared to untreated one. Contrarly, either shoot toping (T3) or defoliation (T4) each alone or together (T5) gave no clear affect on number of berries per cluster, while significantly increased the cluster weight and yield/vine except (T4) compared to untreated ones.

The reduction percentage of berries number per cluster was ranged about (19.28 & 21.55%) and (16.97 & 20.16%) for Ruby seedless and (16.74 & 21.11%) and (18.06 & 22.02%) for Thompson seedless, due to T1 and T2 compared to untreated ones, during the two seasons, respectively. The corresponding decrement percentage of cluster weight attained (3.24 & 4.76%) and (3.18 & 4.36%) and (3.53 & 5.15%) and (3.28 & 4.92%), respectively.

Also, the corresponding decrement percentage of yield/vine were (3.57 & 4.29%) and (2.95 & 5.48%) for Ruby seedless and (4.51 & 5.12%) and (3.96 & 5.05%) for Thompson seedless grapevines due to T1 and T2 compared to control in both studied seasons, respectively.

On the other hand, the increment percentage of cluster weight attained (13.55, 3.24 & 16.02%) and (11.59, 2.42 & 10.78%) for Ruby seedless cluster and (11.34, 4.25 & 15.56%) and (7.54, 4.89 & 6.48%) for Thompson seedless cluster due to T3, T4 and T5 compared to untreated ones during the two studied seasons, respectively.

Furthermore, all treatments except berry thinning by removing 25% of cluster apical (T1) failed to show any significant effect on cluster length compared to untreated one (control), whereas (T1) significantly decreased the cluster length comparable to other treatments during two studied seasons.

Therefore, data in the previously tables showed significant decrease in the cluster compactness coefficient due to (T2) whereas (T1) significantly increased such trait compared the control and other treatments. Moreover, other treatments (T3, T4 and T5) had unsignificantly affected on such character than control.

The decrement percentage of cluster compactness coefficient was (24.86 & 22.65) and (24.20 & 25.67%) for Ruby seedless and Thompson seedless clusters due to T2 compared to control during the two studied seasons, respectively. On other side, the increasing percentage of such character attained (10.13 & 10.63%) and (8.53 & 7.73%) for Ruby seedless and Thompson seedless clusters due to T1 during the studied seasons, respectively.

2- Effect of berry thinning, shoot pinching and leaf removing on berry quality:

Data from Tables (3 & 4) showed that berry thinning as any method and shoot tip either alone or combined plus leaves removal significantly improved the Ruby and Thompson seedless grapes quality in terms of berry weight,

soluble solid contents, reducing sugars and SCC/acidity ratio and decreasing titratable acidity %.

Furthermore, defoliation significantly improving the chemical berry juice compared to either untreated ones or other treatments used. Whereas, such treatment failed to show any significantly affect on berry weight compared to untreated ones (control).

The increment of Ruby seedless berry weight was (17.02, 20.41, 15.57, 2.54 & 19.92%) and (16.36, 19.04, 14.66, 1.62 & 12.76%) due to T1, T2, T3, T4 and T5 compared to untreated ones during the two studied seasons, respectively. The corresponding increment of soluble solid contents was (12.35, 13.78, 15.73, 22.24 & 17.68%) and (11.88, 14.06, 13.13, 15.63 & 13.13%) due to T1 to T5 compared to untreated ones during the two studied seasons, respectively.

Similarly, the increment percentage in Thompson seedless berry weight was (14.38, 21.13, 9.89, 3.61 & 8.00%) and (20.27, 24.61, 10.71, 2.93 & 7.40%) due to T1, T2, T3, T4 and T5 compared to control during the two studied seasons, respectively. The corresponding increment percentage of SSC was (3.42, 7.14, 3.52, 5.49 & 6.21%) and (6.04, 15.38, 13.25, 16.88 & 12.77%) due to T1, T2, T3, T4 and T5 compared to untreated ones during the two studied seasons, respectively.

Furthermore, berry thinning by removing 25% from shoulders gave the heaviest berry weight and best chemical juice quality compared to other treatments. In addition, defoliation gave the best chemical berry juice quality.

Discussion and Conclusion

Thinning as removing some of cluster branches induce a reduction of number of berries, so the compactness coefficient was decrease. The purpose is to give individual berries enough space to fully develop and still have a fruit cluster that is not too compact so, that high quality berry is produced. Hence, there was correlated positively between percentage of removing cluster shoulders and its compactness coefficient. The decreasing in berries number surely reflected in decreasing the cluster weight, consequently reduce the yield/vine.

In addition, reducing the berries number per cluster without changing the number of leaves, which reduce the competition between the berries on essential materials which lead to increase berry weight.

So, it can be concluded that the berry thinning treatments accumulated carbohydrates content, which activate the process of growth and development, hence increased the berry weight and hastened ripening. These reflected on advancing the berry ripening and improving its quality for increasing sugars and soluble

solid contents and decreasing total acidity.

Therefore, one can be concluded that berries thinning must be done to improve the clusters and berries attributes of Thompson and Ruby seedless grapes. Since, now improve in clusters and berries quality are most important target than total yield as grape quality, since results an increase in packable.

The results are in vine with these obtained by many research workers, such as Dhillon *et al*. (1992), Rizk (1998), El-Hammady *et al*. (2000), Dhillon and Bindra (2002), Abdel-Galil and El-Wasfy (2003), Singh and Singh (2003), Mohsen-Abeer (2005), Selim (2007), Hussein, Maha (2008) and El-Salhy *et al*. (2010).

As well as, shoot pinching increased the berry weight and size and consequently increased the cluster weight, indirectly by suppression shoot growth at time of berry elongation and growth, shifted the balance of competition between vegetative growth and reproductive organs in favor of the latter. In addition, the positive action of pinching on producing new laterals induce more leaf surface expansion lead to improve the carbohydrates accumulation, which activate the process of growth and development, hence increased the berry weight, cluster weight and hastened berry ripening. On the other hand, grapevine leaves are not importers of carbohydrates until they reach 50-80% of their final size. The photosynthetic rate increases until leaves attain full size (approximately 40 days after unfolding) and decreases steadily, therefore, leaf removal at veraison phase is performed in the cluster area to enhance coloration, to allow more light to enter, where it would increase the rate of physiological processes and improve the berry ripening and its chemical properties. So, it can be say that four basal leaves removal at veraison phase was able to activate the process of berry ripening induce a significant improving berry quality. Thus leaf removal as a canopy management practice an important tool for improving the microclimate inside the grapevine canopy especially in the fruiting zone.

Similar results were reported by Wolf *et al*. (1990), Abdel-Ghany (1995), Dokoozlian *et al*. (1995), Mohamed (1999), Seleem, Bassma (2001), Petrie *et al*. (2003), Omran *et al*. (2004), Abdel-Ghany *et al*. (2005), Ali, Mervat *et al*. (2006) and El-Salhy *et al*. (2010).

Therefore, it could be concluded that berries thinning must be done. In addition, pinching the shoots tips after berry set along four basal leaves removal at veraison phase to improve the clusters and berries attributes of Ruby and Thompson seedless grapes.

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تأثير بعض معاملات تحسين الثمار على إنتاجية شجيرات العنب البناتى والروبى

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أجريت هذه الدراسة بمزرعة كلية الزراعة – جامعة أسيوط – مصر خلال موسمى 2008-2009 بغرض دراسة تأثير خف الحباب وتطويش الأفرخ وإزالة الأوراق القاعدية للأفرع المثمرة على إنتاجية العنب البناتى والروبى . حيث تم إجراء خف الحبات والتطويش بعد أسبوعين من العقد بينما إزالة الأوراق فى بداية نضج وتلوين الحبات .

ويمكن تلخيص أهم النتائج المتحصل عليها كالآتى :

1. أدى خف الحبات سواء 25% من طرف العنقود أو فريعاته نقصاً جوهرياً فى عدد الحبات وبالتالى حدث نقص غير جوهرى فى كل من وزن العنقود ووزن المحصول / شجرة مقارنة بالشجيرات التى لم تخف عناقيدها .
2. أدى إزالة 25% من طرف العنقود إلى نقص طوله وبالتالى زيادة معامل تزاحم الحبات .
3. أظهر الخف زيادة جوهرية فى وزن الحبات ومحتوى عصيرها من المواد الصلبة والسكريات.
4. أدى تطويش الأفرخ فردياً أو مع خف الأوراق القاعدية للأفرخ المثمرة زيادة جوهرية فى كل من وزن العنقود والمحصول / شجيرة ووزن الحبات وتحسين خصائصها الكيميائية مقارنة بعناقيد أو حبات الشجيرات التى لم تعامل تطويشاً أو توريقاً .
5. لم تظهر إزالة الأوراق القاعدية أسفل العنقود قبل نضج الحبات أى تأثير على عدد الحبات بالعنقود ووزن العنقود ووزن المحصول / شجيرة بينما أدت إلى تحسين معنوى فى الصفات الكيميائية للحبات مقارنة بالمعاملات الأخرى أو عناقيد وحبات الشجيرات الغير معاملة .

من نتائج هذه الدراسة يمكن التوصية بأهمية إجراء خف الحبات بإزالة 25% من الفريعات مع تطويش الأفرخ وذلك بعد العقد بالإضافة إلى إزالة الأوراق القاعدية أسفل العنقود قبل نضج وتلوين الحبات وذلك لإنتاج محصول جيد ذو صفات ثمرية مرتفعة .