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# INFLUNCE OF SUMMER PRUNING ON IMPROVING THE RESPONSE OF THOMPSON SEEDLESS GRAPEVINES TO DORMEX APPLICATION

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## ABSTRACT

This study was designed to found the effect of summer pruning on improving the response of Thompson Seedless grapevines to dormex application . Dormex was sprayed at 4% on 20 january . Summer pruning treatments icluded : head suckering , pinching the main shoots and topping the laterals . The results showed that dormex spraying at 4%, either alone or combined with summer pruning, hastened bud burst by 17 and 16 days compared with the control during the two seasons respectively . All applications increased the percentage of bud burst, fertility and fruit set . All treatments also, seemed to be very effective concerning improving vegetative growth (leaf area) , coefficient of wood ripening, yield as well as physical and chemical properties of berries compared with the untreated vines . The most effective treatments were dormex + summer pruning followed by dormex alone . This study confirmed the benefeit of carrying out summer pruning in combination with dormex for Thompson Seedless grape cv .

## INTRODUCTION

Dormex is one of the plant growth regulators that acts as a dormancy breaking agent, advance maturity, improve fruit set resulting in better yield and higher quality of the fruits ( Poni *et al.,* 1990 ; Cirami and Furkaliev 1991 ; and Tourky *et al* ., 1995 ) .

Summer pruning also is consider an important horticultural practice already carried out in all vineyards . It is carried out by head suckering , pinching or topping the main shoots or the main laterals and removal of laterals. Neglecting or not carrying out summer pruning can be accompanied with undesirable influence on the yield and fruit quality of the current year besides the following one. The effect of summer pruning on growth and fruiting of various grape cvs was reviewed by many workers . All of them emphasized the necessity of summer pruning for enhancing growth and production of grapes (Samra *et al.,* 1987; Reynolds, 1989; Wolf *et al* .,1990 ; Said-rafat , 1995 , and Alia *et al* ., 2001) .

In spite of the above mentioned literature , it is difficult to find information concerning the effect of dormex and summer pruning as a combined application on bud behavior and production of grapes . Thus , this study was undertaken to find out the influence of summer pruning on improving the response of Thompson Seedless grapevine to dormex application .

## MATERIALS AND METHODS

This investigation was conducted in a vineyard situated near Aga city (Dakahlia govenorate) and extended for two successive years : 2000 and 2001 .

All vines were grown at 3x2 meters apart in a clay loam soil and trained according to the cane training system and pruned to five canes per vine with 14 nodes per cane . The vines received the normal agricultural practices as in the commercial grape orchards under Dakahlia conditions . All vines were sprayed with GA3 at10 PPM at full bloom and GA3 at 20 ppm after fruit set .

During each season , 36 vines of almost similar vigour were selected and arranged in randomized block design , 3 vines were selected at random and replicated 3 times to receive one of the following treatments:-

1- control (sprayed with water and triton at 0.1 %) .
2- dormex at 4 % in 20 january .
3- dormex at 4 % + summer pruning .
4- summer pruning .

Summer pruning treatments included: head suckering, pinching the main shoots and topping laterals . Usually, head suckering is followed when shoot length reached 20 cm by removing undesired shoots inside the vine head (Lilov and Michailoca,1965) . Pinching the main shoots was established 10 days before blooming start by removing 1-2 cm of the shoot tip . Topping laterals was done by cutting off shoots leaving only 4-5 leaves per shoot . At fullbloom, leaf area of the basal 7th and 8th leaves were measured (according to Ahmed and Morsy, 1999) .

The effect of treatments on the date of bud burst was recorded when 50% of the buds burst. Moreover, number of bursted buds on one - year old canes and number of clusters per vine were recorded.

Accordingly, percent of bud burst and fertility were calculated as follows:-

Bud burst % = bursted buds / total number of buds per Vine x 100 .

Fertility % = number of clusters per vine / total number Of buds per vine x 100 .

Three flower clusters per vine from each replicate were bagged in polyethylene to determine the fruit set percentage using the following equation :-

Fruit set % = average berry number per cluster / average of flower number per cluster x 100 .

At harvest time, the average yield for each treatment was determined as kg/vine . Moreover, representative samples of bunches and berries were

taken and brought to the laboratory for carrying out physical and chemical analyses .

Data involved in this investigation included the following : bunch weight and length, Bunch compactness coefficient calculated by determining the number of berries / cm laterals on the second and third basal laterals, according to Tourky (1977) Berry weight , volume and dimension , juice volume , percentage of total soluble solids, titrable acidity and T.SS. acid ratio were also determined . On october, Total length of the ripened shoots as well as the length of brownish colour was measured . Then, the coefficient of wood ripening was calculated by dividing length of the ripened part by the total length of the shoots according to Bouard (1966) . Data were statistically analyzed according to Snedecor and Cochran,W.G. (1972) .

## RESULTS AND DISCUSSION

**Leaf area and wood ripening:**

It is clear from table (1) that both of leaf area and coefficient of wood ripening were always higher in all treatments in comparison with the control . Moreover, summer pruning application either alone or with dormex gave the highest values in these aspects .

The increase in the coefficient of wood ripening may be attributed to the served organic foods especially carbohydrates stored in the canes (Alia *et al.*, 2001) . Also, Said-Rafat (1995) found that all summer pruning treatments increased the growth rate of the shoots and the leaf area of Thompson Seedless grapevine .

**Table (1): Effect of Dormex and Summer pruning on leaf area and wood ripening factor .**

| Treatments | Leaf area (cm2) | | | Wood ripening F. | | |
|---|---|---|---|---|---|---|
| | 2000 | 2001 | Mean | 2000 | 2001 | Mean |
| Control | 94.3 | 99.5 | 96.9 | 0.53 | 0.57 | 0.55 |
| Dormex at 4% | 125.6 | 130.5 | 128.1 | 0.63 | 0.67 | 0.65 |
| Dor + S.P. | 132.6 | 140.0 | 136.3 | 0.77 | 0.83 | 0.80 |
| Summer P. | 120.1 | 126.5 | 123.3 | 0.73 | 0.70 | 0.72 |
| L.S.D at 5% | 7.5 | 8.0 | ------ | 0.10 | 0.10 | ------ |

*Dor = Dormex spraying at 4% .*
*S.P. = Summer pruning .*

**Bud burst, fertility and fruit set :**

Data in table (2) clearly show that dormex spray either alone or combined with summer pruning hastened bud burst by about 17 and 16 days than the control during the two seasons respectively. While, summer pruning practice alone showed almost a similar trend to that noticed in the untreated vines in this aspect .

Concerning the percentage of bud burst, data in the same table indicated that vines treated with dormex either alone or combined with summer pruning showed a significant increase in bud burst percentage compared with the summer pruning alone or the control during the two

seasons of the study. Furthermore, application of dormex + summer pruning gave the most pronounced effect in this respect .

These results may be due to cyanide and cyanamide which are known to inhibit catalase enzyme and promote mitochondrial respiration ( Taylorson & Hendriks , 1977 and Shulman *et al.*,1983). Both compounds contain the very reactive C?N group which react with the enzyme-fe of catalase thus inhibiting the decomposition of H2O2, which is poisonous to plant cells (Hendricks and Taylorson, 1975) .

As for bud fertility, it is obvious that spraying vines with dormex or combined with summer pruning had significantly increased bud fertility . Moreover, spraying dormex + summer pruning gave the highest values in this respect compared with the other treatments used or the control . However, the differences of bud fertility between summer pruning treatment and the control were not significant . These results agree with those found by Poni *et al.*(1990) and Tourky *et al.*(1995) .

Data in table (2) also indicated that all applications used were effective in improving fruit set percentage compared with the untreated vines . Furthermore, spraying dormex alone or combined with summer pruning were significantly effective in this respect . The positive action of summer pruning on fruit set percent could explain the present results . Such increase can be ascribed to the higher content of the reserved materials especially carbohydrates, besides the temporary cessation of the growth of the main shoots which aids in the redistribution of assimilates (Ahmed,1985) . These results are in harmony with those obtained by Ahmed (1985), Wolf *et al.* (1990), Said-Rafat (1995) and Alia *et al.* (2001) they found that all summer pruning treatments significantly increased berry set .

**Table (2) : Effect of dormex and summer pruning on date and percentage of bud burst , bud fertility and fruit set of Thompson seedless grapes .**

| Treatments | Date of bud burst | | Bud burst (%) | | Bud fertility | | Fruit set | |
|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2000 | 2001 | 2000 | 2001 | 2000 | 2001 |
| Control | 9/3 | 13/3 | 52.9 | 52.8 | 37.3 | 40.5 | 18.6 | 17.7 |
| Dormex at 4 % | 20/2 | 25/2 | 68.5 | 71.8 | 51.3 | 53.9 | 24.3 | 25.4 |
| Dor. + S.P. | 20/2 | 25/2 | 69.5 | 72.1 | 53.3 | 55.1 | 26.0 | 26.8 |
| S.P. | 11/3 | 14/3 | 55.9 | 56.6 | 38.5 | 41.3 | 18.9 | 19.0 |
| L.S.D at 5 % | ----- | ----- | 3.5 | 3.1 | 4.4 | 2.3 | 1.1 | 1.4 |

**Dor = Dormex spraying at 4% .**
**S.P. = Summer pruning**

***Yield components:***

As shown in table ( 3 ) , a significant increase in the yield per vine occurred in all the treatments used compared to the control during the two seasons of study . Moreover, dormex spray + summer pruning gave the highest values of yield per vine followed with dormex alone compared to summer pruning alone or the untreated vines . Under these two treatments, yield increased by about (47%) and ( 40-41%)

than the control in both seasons respectively . The increase in yield may be ascribed primary, to the high bud fertility and fruit set, besides the high weight of bunches. . The increased bunch weight due to dormex treatments might be attributed to a greater number of lateral branches of raches . Thus, Nazemille (1987) suggested that the increase in inflorescence weight with hydrogen cyanamide (dormex) treatments might be due to the preferential development of floral primordial .

As well as, the positive action of summer pruning on fruit set percentage and weight of bunches could explain the present results . Such increase can be ascribed to the increase in fertility percent .

The results in this respect are in harmony with those of George and Nissen (1990), Wolf *et al.* (1990), Lotfy (1993), Said-Rafat (1995) and Alia *et al* (2001) .

Concerning the effect on bunch weight, the data of table (3) show that all treatments used increased bunch weight compared with the control . The heaviest bunches in the two seasons ( 707 and 722 gm.) were obtained for the vines sprayed with dormex and summer pruning . The increase in bunch weight observed in summer pruning can be attributed primarily to the berry set percent, then the increase in the weight of berries .

**Table (3) : Effect of dormex and summer pruning on yield, bunch weight , length and compactness of Thompson Seedless grapes .**

| Treatments | Yield / vine (kg) | | Bunch weight (gm) | | Bunch length (cm) | | Compactness (f) | |
|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2000 | 2001 | 2000 | 2001 | 2000 | 2001 |
| Control | 9.6 | 9.8 | 479.5 | 490.3 | 25.7 | 26.7 | 3.3 | 3.5 |
| Dormex at 4% . | 13.4 | 13.8 | 671.1 | 683.8 | 25.3 | 27.0 | 4.2 | 4.5 |
| Dor + S.P. | 14.1 | 14.4 | 707.0 | 722.0 | 26.7 | 28.3 | 4.7 | 5.1 |
| Summer P. | 10.7 | 11.0 | 543.5 | 544.0 | 25.7 | 27.0 | 3.5 | 3.7 |
| L.S.D at 5% | 1.8 | 2.0 | 90.7 | 104.4 | 1.1 | 1.2 | 0.29 | 0.33 |

**Dor = Dormex spraying at 4% .**
**S.P. = Summer pruning .**

These results are in accordance with those obtained by Tourky *et al.*(1995), Said-Rafat (1995) and Alia *et al* . (2001) .

As far as bunch length, the treatments used had no apparent effect compared with the control during the two seasons . Bunch compactness was increased with all applications used compared with the control .
The highest values in this respect were obtained by dormex application + summer pruning during the two seasons ( 4.7 and 5.1% respectively ) . The increase in bunch compactness might be imputed to the increasing of berry set percentage (table2). Tourky *et al.* (1995) and Alia *et al* . (2001) found similar results with applications of dormex and summer pruning respectively .

**Physical characters of the berries:**

Data in table (4) show significant increment in berry weight, volume, dimension and juice volume with all applications used in comparison with the control. The highest values in this respect resulted from the application of

dormex with summer pruning. These increments were expected since the pathway of hydrogen cyanamide (dormex) degradation in the plant is urea (SKW technical data sheet, 1991). In addition, the increase in berry weight and dimension observed in summer pruning treatments can be interpreted in view of the fact that these treatments lead to the increase in photosynthetic activity of leaves as a result of the pronounced increase in their area. As a consequence of that, immigration of assimilates from leaves towards berries is enhanced (Winkler, 1965).

These results are in agreement with those obtained by Mann & Kushal (1985), Reynolds (1989), Tourky *et al.* (1995) Said-Rafat (1995) and Alia *et al.* (2001).

**Table (4) : Effect of dormex and summer pruning on berry weight, volume, dimension and juice volume of Thompson seedless grapes.**

| Treatments | Berry weight (gm) | | B.volume (cm) | | Berry dimension | | Juice volume (ml) | |
|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2000 | 2001 | 2000 | 2001 | 2000 | 2001 |
| Control | 1.2 | 1.2 | 117 | 118 | 1.2 | 1.1 | 73 | 75 |
| Dormex at 4 % | 1.6 | 1.6 | 154 | 158 | 1.3 | 1.3 | 103 | 104 |
| Dor. + S.P. | 1.8 | 1.8 | 170 | 172 | 1.3 | 1.3 | 118 | 120 |
| S.P. | 1.5 | 1.4 | 136 | 137 | 1.2 | 1.2 | 95 | 94 |
| L.S.D at 5 % | 0.2 | 0.1 | 8.8 | 3.2 | 0.13 | 0.10 | 13.8 | 9.1 |

**Dor = Dormex spraying at 4%.**

**S.P. = Summer pruning.**

**Chemical characters of the berries:**

Data of table (5) obviously reveals that all treatments used were significantly effective in improving quality of the berries in terms of increasing the total soluble solids and the ratio between it and in decreasing the total acidity than the untreated vines. The best results in regard to the chemical fruit quality were detected on vines received dormex + summer pruning in both seasons of this study.

The obtained results concerning the effect of dormex on T.S.S. and acidity percentage might be attributed to the advanced bud burst (table 2) and consequently to all subsequent stages of the yearly growth cycles. As well as, the favorable influence of summer pruning on fruit quality may be explained by promoting vine vigour, which aids in supplying the clusters with assimilators. These results are in coincidence with those obtained by Vergas (1984), Jordan (1985/86), Wolf *et al.* (1990), Lotfy (1993), Said-Rafat (1995), Tourky *et al.* (1995) and Alia *et al.* (2001).

In brief, the obtained results conclude that, dormex applications at 4% alone or combined with summer pruning on Thompson Seedless grapevines advanced bud burst, flowering, fertility percentage and berry ripening. Consequently the weight of bunches and the yield per vine were obviously increased. Moreover, fruit quality: berry weight and size, juice volume, T.S.S./acid ratio and wood ripening factor were improved by dormex applications alone. But, for increasing the beneficial effects of dormex, it is necessary for carrying summer pruning in combination with dormex treatments.

Table (5) : Effect of dormex and summer pruning on T.S.S., acidity and T.S.S. / Acid ratio of Thompson seedless grapes .

| Treatments | T.S.S. % | | Acidity % | | T.S.S./acid ratio | |
|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2000 | 2001 | 2000 | 2001 |
| Control | 15.8 | 16.2 | 0.87 | 0.89 | 18.2 | 18.2 |
| Dormex at 4 % | 17.7 | 17.8 | 0.70 | 0.70 | 25.4 | 25.5 |
| Dor. + S.P. | 17.3 | 18.2 | 0.69 | 0.64 | 25.5 | 28.3 |
| S.P. | 16.8 | 17.0 | 0.80 | 0.77 | 21.3 | 22.1 |
| L.S.D at 5 % | 1.0 | 0.4 | 0.10 | 0.05 | 3.2 | 2.1 |

Dor = Dormex spraying at 4% .
S.P. = Summer pruning .

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## تأثير معاملات التقليم الصيفى على تحسين إستجابة العنب البناتى لمادة الدورمكس

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أجريت هذة الدراسة فى موسمى ٢٠٠٠،٢٠٠١م لمعرفة مدى تأثير إجراء التقليم الصيفى على كفاءة استخدام مادة الدورمكس فى العنب البناتى لإنتاج أفضل محصول و ثمار ذات جودة عالية . وقد أستخدمت مادة الدورمكس رشا فى ٢٠ يناير وبتركيز ٤% منفردة أو مع إجراء معاملات التقليم الصيفى . كما تم إجراء تقليم صيفى منفرداً – والتقليم الصيفى يشمل السرطنة التاجية وتطويش الأفرع الرئيسية مع قصف الأفرع الجانبية ، وتركت أشجار بدون معاملات للمقارنة .

وقد أظهرت النتائج أن الرش بالدورمكس بتركيز ٤% منفرداً أو مع إجراء تقليم صيفى على نفس الأشجار أدى إلى تبكير تفتح البراعم بحوالى ١٧ ، ١٦ يوم عن الكنترول خلال موسمى الدراسة على الترتيب . كما نتج عن جميع المعاملات زيادة فى النسبة المئوية لتفتح البراعم و الخصوبة و العقد . هذا بالإضافة إلى أن كل المعاملات كانت فعالة جداً فى تحسين النمو الخضرى و معامل نضج الخشب و المحصول و الصفات الطبيعية و الكيميائية للحبات مقارنة بالأشجار الغير معاملة . وكانت أكثر المعاملات تأثيراً هى الرش بالدورمكس مع إجراء التقليم الصيفى يليها معاملة الرش بالدورمكس فقط .

وتؤكد نتائج هذة الدراسة على أهمية إجراء التقليم الصيفى مع إستخدام مادة الدورمكس لهذا الصنف من العنب حيث أن التقليم الصيفى يزيد من كفاءة تأثير مادة الدورمكس فى زيادة تفتح البراعم والعقد والخصوبة وتحسين صفات الجودة للثمار .