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RESPONSE OF SUPERIOR GRAPEVINES TO FOLIAR SPRAYSELENIUM WITH SOME VITAMINS

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ABSTRACT

This study was carried out during 2015 and 2016 seasons to investigate the effect of different concentrations and frequencies of application (once, twice or thrice) of selenium and some vitamins (B complex, A and D) on growth, vine nutritional status, yield and berries quality of Superior grapes.

The treatment of grapevine once, twice or thrice with a mixture of selenium at 25 to 100 ppm as well as vitamins B complex (B_1 + B_2 + B_6 + B_{12}) at 250 to 1000 ppm and vitamins A and D at 25 to 100 ppm caused a remarkable promotion on all growth aspects, pigments and nutrients in the leaf, yield as well as both physical and chemical characteristics of the berries over the check treatment.

***Conclusively,** subjecting superior grapevines grown under Minia and the resembling conditions twice with a mixture of Selenium at 50 ppm in combined with vitamins B complex (B_1+B_2+B_6+B_{12}) at 500 ppm, A and D each at 50 ppm was responsible for improving yield and berries quality.*

Keywords: Superior grapevines, Selenium, Vitamins B, A and D, Growth, Yield, berries quality.

INTRODUCTION

The decline in the yield and the inferior on quality due to the small of berries and the presence of higher shot berries in clusters of such grape cv represent the most important serious problems which face the production and produce unfavourable clusters from the consumer point of view. Shot berries in the clusters of such grapevine cv consider a serious defect, since they detract from eye appeal and reduce at the lower extent the production and the potential for exportation. These shot berries were produced from unfertilized flowers, unfavourable nutrient and environment conditions (Weaver, 1976). These

problems were produced as a result of unsuitable environmental conditions. Using materials increased the tolerance of the trees to biotic and abiotic stress succeeded in solving these problems.

Selenium was found by many authors to enhance the activities of enzymes such as glutathione peroxidase, the tolerance of trees to abiotic and biotic stresses and the biosynthesis of carbohydrates and proteins. It also reduces reactive oxygen species (ROS) and protects plant cells from aging and death (Turakainen *et al*., 2004 and 2006; Kirn *et al.*, 2005; Nowak-Barbara, 2008 and Jakovljevic *et al*., 2011).

Nowadays, there is a widespread use of antioxidants. They are very effective in protecting plant cells from senescence and disorders (Robinson, 1973) as well as enhancing cell division, the biosynthesis of natural hormones such as IAA, GA_3 and cytokinins, nutrient and water uptake, photosynthesis, biosynthesis of plant pigments and proteins as well as the biosynthesis of alpha ketoglutaric acid which is united with ammonia to form amino acids and proteins (Oretili, 1987; Samiullah *et al.*, 1988; Foyer and Lelandias, 1993 and Singh, *et al.*, 2001).

Using selenium was very effective in enhancing growth, vine nutritional status, yield and berries quality in different grapevines cvs (Abd El-Hameed, 2012; Al-Wasfy, 2014; El-Khawaga, 2014; Uwakiem, 2015 and Masoud, 2017).

Treating different grapevine cvs twice or thrice with vitamins C, A, B, E and K was favourable in improving growth, vine nutritional status, yield and berries quality (Abd El-Latif, 2014; Abdelaal *et al*, 2014; Al-Wasfy, 2014; El-Khawaga, 2014; Abd El-Wahab, 2015; Ebrahiem, 2015 and Ahmed, 2016).

Therefore, the target of this study was examining the effect of different concentrations and frequencies of application of selenium and some vitamins on (B complex B1, B2, B6 and B12) and Vitamins A & D on growth traits, nutritional status of the vines, yield and quality of Superior grapevines.

MATERIALS AND METHODS

This study was carried out during 2015 and 2016 seasons on 30 uniform in vigour 14 years old Superior grapevines grown in a Private vineyard located at Abowan Village, Matay district, Minia Governorate where the texture of the soil is clay (Wilde *et al*, 1985), well drained and water table not less than two meters deep. All the selected vines are planted at 2.5 x 3.0 m apart (560 vines/fed). The chosen vines (30 vines) were pruned during the first week of January in the two seasons using cane pruning method with the assistance of Gable supporting system. Vine load was 72 eyes for all the selected vines

Table (1): Analysis of the tested soil:

Constituents	**Values**
Particle size distribution:	
Sand %	11.0
Silt %	22.5
Clay %	68.5
Texture	Clay
pH(1:2.5 extract)	8.05
EC (1 :2.5 extract) (dsm^{-1}) 1 cm / 25^{o}C.	1.03
O.M. %	1.88
$CaCO_3$ %	2.55
Total N %	0.10
Available P (Olsen, ppm)	2.22
Available K (ammonium acetate, ppm)	400

on the basis of six fruiting canes x ten eyes plus six renewal spurs x two eyes. Surface irrigation system was followed using Nile water. All agricultural and horticultural practice were carried as usual.

This study included the following ten treatments from different concentrations and frequencies application of selenium and vitamins B, A and D, in addition to the control treatment:

1- Control (untreated vines).
2- 25ppm Se+250ppm vit. B+25ppm vit A + 25 ppm vit D once at the beginning of growth (1st of March)
3- 25ppm Se+250ppm vit. B+25ppm vit A + 25 ppm vit D twice at the beginning of growth and two weeks later (3rd week of March)
4- 25ppm Se+250ppm vit. B+25ppm vit A + 25 ppm vit D thrice at the beginning of growth and at three weeks later (3rd week of March and 2nd week of April)
5- 50 ppm Se+500 ppm vitB+50 ppm vit A + 50 ppm vit D once as previously mentioned.
6- 50 ppm Se+500 ppm vit. B+50 ppm vit A + 50 ppm vit D twice as previously mentioned.
7- 50 ppm Se+500 ppm vit. B+50 ppm vit A + 50 ppm vit D thrice as previously mentioned.
8- 100 ppm Se+1000 ppm vit. B+100 ppm vit A + 100 ppm vit D once as previously mentioned.
9- 100 ppm Se+1000 ppm vit. B+100 ppm vit A + 100 ppm vit D twice as previously mentioned.
10- 100 ppm Se+1000 ppm Vit. B+100 ppm Vit. A + 100 ppm Vit. D thrice as previously mentioned. Each treatment was replicated three times, one

vine per each (30 vines). Selenium (pure %) and the three vitamins (Vit. B: Vitamin B complex (B_1: Thiamine; B_2: Riboflavin; B_6: Pyridoxine; B_{12}: Cyanocoblamine); Vit. A: Vitamin A (Retinol); Vit. D: (Cholecalciferol) were used.

Triton B as a wetting agent was used with all selenium and vitamin treatments at 0.05 % (0.5 ml/L). Spraying was done till run off (2 litres/ vine). Control treatment was carried out by spraying water and Triton B (0.05%).

Randomized complete block design was followed where the experiment consisted of sixteen treatments, each treatment was replicated three times, one vine per each.

During both seasons the following parameters were recorded:

1- Vegetative growth characteristics namely main shoot length, leaf area and number of leaves/shoot (Ahmed and Morsy, 1999).
2- Leaf chemical componence namely chlorophylls a &b and total chlorophylls (mg/100g F.W) (Von- Wettstein, 1957) as well as percentages of N, P, K and Mg (Wilde *et al*., 1985 and Balo *et al*., 1988).
3- Yield / vine expressed in weight (kg) and number of cluster per vine.
4- Cluster weight (g) and dimensions (length and shoulder) (cm).
5- Percentage of shot berries.
6- Physical and chemical characteristics of the berries namely berry weight (g) and dimensions (longitudinal and equatorial) (cm), T.S.S%, reducing sugars% and titratable acidity % (expressed as g tartaric acid/100 ml juice) (Lane and Eynon,1935 and A.O.A.C, 2000).

The obtained data were tabulated and significantly analyzed according to Mead *et al.,* (1993). Differences between treatment means were compared during new L.S.D. test at 5% level of probability.

RESULTS

Vegetative growth characteristics:

It is clear from the data in Table (2) that main shoot length, leaf area and number of leaves/shoot were remarkably stimulated in response to spraying the vines once, twice and thrice with a mixture of Se at 25 to 100 ppm, vitamin B complex at 250 to 1000 ppm and vitamins A and D at 25 to 100 ppm compared with control. The higher values were obtained due to

spraying this mixture at higher concentrations three times without differences them. These results were true during both seasons.

2- Leaf chemical components:

One can say from the data in Table (3 & 4) that a material promotion was observed on chlorophylls a & b, total chlorophylls as well as percentages of N, P, K and Mg in the leaves when a mixture of Se and the three vitamins was used once, twice or thrice over the check treatments. Spraying the vines with a mixture of Se at 100 ppm, vitamin B complex at 1000 ppm and vitamins A & D at 100 ppm gave the maximum values. The same trend was observed in 2015 and 2016 seasons.

3- Yield as well as cluster weight and dimensions.

Data in Tables (5 and 6) showed that using Se at 25 to 100 ppm as well as vitamins B complex at 250 to 1000 ppm and vitamins A and D each at 25 to 100 ppm significantly improved yield and cluster aspects compared with the control treatment. Increasing concentrations of Se from 50 to 100 ppm, vitamin B complex from 500 to 1000 ppm and vitamins A and D from 50 to 100 ppm had no significantly promotion on the yield as well cluster weight and dimensions. Therefore, from economical point of view, using this mixture consisted of Se at 50 ppm, vitamin B complex at 500 ppm and vitamins A and D each at 50 ppm twice at the beginning of growth start and at two weeks later was very effective in this respect. Similar trend was revealed during both seasons.

4-Percentage of shot berries:

It was noticeable from the data in Table (6) that a great reduction was observed on such undesirable phenomenon due to using a mixture containing Se and the three vitamins and this reduction was in proportional to increasing number of sprays from twice to thrice as well as increasing concentrations of Se and the three vitamins. For minimizing the percentage of shot berries it was preferable to use the mixture of Se at 50 ppm, vitamin B complex at 500 ppm and vitamins A and D at 50 ppm from economical point view. These findings were nearly the same during both seasons.

5- Quality of the berries

There was an obvious and significant promotion on both physical and chemical characteristics of the berries due to using Se in combined with three vitamins over the check treatment. This was significantly appeared in terms of increasing berry weight and dimensions, T.S.S.% and reducing sugars% and decreasing titratable acidity % (Tables 6 and 7) . Treating the vines with Se at

50 ppm plus

50 ppm plus vitamin B complex at 500 ppm and vitamins A & D at 50 ppm gave the best results in this connection from economical point view.

DISCUSSION

The beneficial effects of selenium on fruiting of Superior grapevines might be attributed to its positive action on enhancing the tolerance of the trees to biotic and abiotic stresses and the biosynthesis of carbohydrates and proteins. It is effective in reducing reactive oxygen species (ROS) since it considered as an important antioxidant protects the plant cells from death. Thereby, it is responsible for producing healthy trees able to produce more fruits (Nowak-Barbara, 2008 and Jakovljevic *et al*., 2011). These results are in harmony with those obtained by Ibrahiem and Al-Wasfy (2014); Gad El-Kareem *et al* (2014); Uwakiem (2015) and Masoud, (2017).

The positive action of vitamins on fruiting of Superior grapevine might be attributed to their essential roles on protecting the plant cells from senescence and disorders as well as enhancing cell division, the biosynthesis of natural hormones such IAA and ethylene, nutrient and water uptake, photosynthesis, building of plant pigments and proteins, amino acids and plant metabolism. These important functions of vitamins were surely reflected on enhancing growth and vine nutritional status in favour of enhancing yield and fruit quality. (Robinson, 1973; Oretili, 1987; Samiullah *et al.,* 1988; Foyer and Lelandias, 1993; Singh *et al.,* 2001).

These results are in harmony with those obtained by Abd El- Latief (2014); Abdelaal *et al.,* (2014); Al- Wasfy (2014); Abd El- Wahab (2015) and Ahmed, (2016).

Conclusively, subjecting superior grapevines grown under Minia and the resembling conditions twice with a mixture of Selenium at 50 ppm in combined with vitamins B complex (B1+B2+B6+B12) at 500 ppm, A and D each at 50 ppm was responsible for improving yield and berries quality.

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استجابة كرمات العنب السوبيريور للرش الورقى بالسيلينيوم وبعض الفيتامينات

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***قسم البساتين – كلية الزراعة – جامعة المنيا – مصر**

****قسم بحوث العنب – مركز البحوث الزراعية – الجيزة – مصر**

أجريت هذه الدراسة لبيان تأثير تركيزات مختلفة وعدد مرات الرش بالسيلينيوم (مرة ، مرتين أو ثلاث مرات) وبعض الفيتامينات (فيتامين ب المركب وفيتامين أ، د) علي النمو والحالة الغذائية للكرمات وكمية المحصول وجودة حبات االعنب.

أدت معاملة الكرمات مرة، مرتين، ثلاث مرات بخليط من السلينيوم بتركيز ما بين 25 إلي 100 جزء فى المليون كذلك فيتامينات ب المركب (ب $_1$ + ب $_2$ + ب$_6$+ب$_{12}$) بتركيز ما بين 250 إلي 1000 جزء فى المليون وفيتامينات أ، د بتركيز ما بين 25 إلي 100 جزء فى المليون لكل منهما إلي حدوث زيادة واضحة فى جميع صفات النمو الخضرى والصبغات (كلوروفيل أ، ب) والعناصر الغذائية (النيتروجين ، الفوسفور، البوتاسيوم والماغنسيوم) فى الورقة وكمية المحصول للكرمة وكذلك الخصائص الطبيعية والكيميائية للحبات بالمقارنة بمعاملة الكونترول.

إن معاملة كرمات العنب السوبيريور النامية تحت ظروف منطقة المنيا والظروف المماثلة مرتين بخليط يتكون من السلينيوم بتركيز 50 جزء فى المليون جنبا إلي جنب مع رش فيتامين ب المركب(ب $_1$ + ب $_2$ + ب$_6$+ب$_{12}$) بتركيز 500 جزء فى المليون وفيتامين أ، د بتركيز 50 جزء فى المليون لكل منهما يكون فعالا لتحسين انتاجية الكرمات وخصائص الجودة للحبات.

الكلمات الدالة: كرمات العنب السوبيريور – السيلينيوم – فيتامينات ب المركب، أ،د – النمو – كمية المحصول – خصائص الجودة للحبات.