FACULTY OF AGRICULTURE

Minia J. of Agric. Res. & Develop.
Vol. (29) No. 3 pp 335 -353 , 2009

RESPONSE OF RED ROOMY GRAPEVINES TO FOLIAR APPLICATION OF BORON, MAGNESIUM AND ZINC

H. I. M. Ibrahim, A, A. Gobara and Nermeen, M. Abdel Gaber
Hort. Dept. Fac. of Agric, Minia Univ. Minia, Egypt.

Received 15 Oct. 2009 Accepted 15 Nov. 2009

ABSTRACT

This study was carried out during 2007 and 2008 seasons to investigate the effect of single or combined application of boric acid, magnesium sulphate and chelated-Zn on leaf area, berry setting percentage, yield, shot berries percentage and physical and chemical properties of Red Roomy grapes. Selecting the best treatment produced filled clusters with lower shot berries and high productivity quantitively and qualitatively was also considered.

Results showed that spraying boric acid at 0.05%, chelated Zn at 0.05% and magnesium sulphate at 0.5%, in ascending order was very effective in enhancing the leaf area, berry setting yield and quality of the berries. The best results were obtained with using the three nutrients together.

For producing filled clusters, controlling shot berries in the clusters and improving yield quantitively and qualitatively of Red Roomy grapevines, it is necessary to spray vines with boric acid at 0.05%, chelated-Zn at 0.05% and magnesium sulphate at 0.5% four times on growth start, first bloom, just after berry setting and at one month later. Net profit per one feddan by the application of this recommendation reached 5150 and 8650 Egyptian pounds in both seasons, respectively over the check treatment.

INTRODUCTION

Grapevine is one of the major horticultural crops throughout the world. Many cultivars of *Vitis vinifera L.* have been commercialized over the past centuries such as seedless varieties group. Grapevine culture is of great importance in Europe where it occupies more than 60% of the cultivated area (Stoev, 1971 and Valeria., *et al.*, 1997).Grapes also are grown successfully in Egypt, since Egypt occupied thirty second position all over the world (F.A.O.2006).

The poor berry setting and the great decline in the yield of Red Roomy grapevine cv. (namely cluster looseness) is considered to be a serious problem facing grape growers at Minia region. The main reason for this problem is the deficiency of micronutrients and macronutrients due to the great depletion and exhaustion of these nutrients by vines as well as the neglection of their use by growers and the imbalance between different nutrients and organic foods. Deficiency of nutrients and organic foods especially total carbohydrates is accompanied with disturbance of plant physiology and metabolism as well as causes great promotion on growth at the expense of fruiting (Jackson, 1988).

The presence of the unfilled clusters and higher shot berries in Red Roomy grape cv. represent the most important serious problems which face the production and produce unfavorable clusters from the consumer point of view. These problems were produced as a result of deficiency of specific essential nutrients as well as the unbalanced of these nutrients with plant tissues. Using boron, magnesium and zinc at balanced concentration can solve these problems. Macronutrients especially Mg as well as micronutrients namely Zn and B play a key role in the nutrition of the fruit crops especially grapevines.

Micronutrients such as boron and zinc and macronutrients such as magnesium deficiencies in Egypt became a widespread problem in the last twenty years. Their deficiencies cause a great disturbance in the physiological activities which is reflected on reducing the yield

and lowering quality of the berrie (Aksentyuk and Zhuravel , 1985, Gobara, 1999; Kamel, 2002; Abada, 2002; Fadl, 2004; Madian, 2004 and Amin, 2007), Mg (Ibrahim, 1993; Abd El-Aziz, 1995; Gobara *et al,,* 2001; and Ahmed and Abd El-Hameed, 2003) and B (Ahmed and Morsy, 1994; Abd-El-Hady, 1995)

Previous studies showed that application of some micronutrients (boron and zinc) and macronutrient such as magnesium plays many important regulatory roles in plant development and improving yield (Price *et al,* 1972; Christensen, 1977; Reed 1977; Mengel, 1985, Nijjar 1985 and Ibrahim, 1993).

This study was designed with objective of examining the effect of foliar application of boron, magnesium and zinc on leaf area, percentage of berry setting, yield, shot berries percentage as well as physical and chemical properties of Red Roomy grapes. Also, the effect of these nutrients on solving the problems of unfilled clusters and shot berries which reflected in facilitating the possibility of marketing such grapevine cv to local markets were also considered.

MATERIALS AND METHODS

This study was carried out during 2007 and 2008 seasons on fourty-eight uniform in vigour 10-years old head trained Red Roomy grapevines grown in a private vineyard located at Samalout district, Minia Governorate to examine the effect of single or combined application of boron, magnesium and zinc on the leaf area, berry set, yield, shot berries as well as physical and chemical characters of Red Roomy grapes.

The texture of the soil is silty clay; soil analysis was carried out according to procedures outlined by Chapman and Pratt (1965) and the obtained results are shown in Table 1. The vines were pruned at the first week of Jan in both seasons to leave vine load per vine reached 60 eyes (12 fruiting spurs x 4 buds plus 6 replacement spurs x 2 buds).

Table 1: Analytical data of the soil at the tested area.

Constituents	Values
Particle size distribution	
Sand %	**25.00**
Silt %	**40.90**
Clay %	**34.10**
Texture %	**Silty clay**
pH (1: 2.5 extract)	**7.9**
O.M %	**1.60**
$CaCO_3$ %	**2.80**
Total N %	**0.09**
Available P (Olsen method) ppm	**15.0**
Available K (ammonium acetate) ppm	**611.0**
EDTA extractable micronutrients (ppm):-	
Fe	**4.10**
Mn	**6.60**
Zn	**2.99**
Cu	**1.00**

The experiment involved the following eight treatments from single and combined application of three nutrients namely boron, magnesium and zinc in addition to the control treatment:-

1- Control (sprayed with water).
2- Spraying chelated zinc at 0.05% (0.5 g/L).
3- Spraying boric acid at 0.05% (0.5 g/L).
4- Spraying magnesium sulphate at 0.5% (5.0 g/L).
5- Spraying chelated-Zn+ boric acid at the same previous concentrations.
6- Spraying chelated-Zn+ magnesium sulphate at the same previous concentrations.
7- Spraying boric acid+ magnesium sulphate at the same previous concentrations.
8- Spraying chelated-Zn + boric acid + magnesium sulphate at the same previous concentrations.

Each treatment was replicated three times, two vines per each. Boric acid (17% B); Magnesium sulphate (9.6% Mg) and Chelated-Zinc (14% Zn) at the recommended concentrations namely 0.05, 0.5

and 0.05% respectively according to Abd El-Hady, (1995) ; Abd El-Aziz, (1995) and Abada, (2002) were sprayed four times at growth start (2nd week of April), just before first bloom (1st week of May), just after berry setting (2nd week of June) and at one month later (2nd week of July). Triton B as a wetting agent was added at 0.05 % to all treatments including the control treatment. Spraying was conducted till runoff (2 litres/vine). The experiment was set in a completely randomized block design.

For evaluating the effect of the present treatments, the following parameters were measured:

Averages main shoot length and leaf area $(cm)^2$: Ten main shoots were selected from each vine for measuring shoot length (1st week of July at the same time), twenty mature leaves per vine were picked from those leaves opposite to the first clusters on each shoot (Summer, 1985) and the leaf area was estimated according to the equation reported by Ahmed and Morsy (1999).

Berry set %: was calculated by caging five clusters per each vine in perforated white paper bags before bloom, after setting of all berries in each cluster, the bags were removed for counting of: number of attached berries and number of dropped berries and umber of dropped flowers.

Number of total flowers (a+ b+ c) per cluster, berry set % was estimated by dividing number of attached berries by total number of flowers per cluster and multiplying the product by 100.

Yield and berries quality: Harvesting took place when TSS/ acid ratio in the berries of the check treatment reached at least 25:1 (at the last week of Sept. in both seasons). The yield of each vine was recorded in terms of weight (in kg.) and number of clusters per vine, then the average weight of cluster was recorded (g).

Five clusters from each vine were taken at random for determination of the following physical and chemical characters:-

- Percentage of shot berries.
- Average berry weight (g).

- Average berry dimensions (Longitudinal and equatorial, in cm).
- Percentage of total soluble solids in the juice by handy refractometer.
- Percentage of total sugars in the juice by Lane and Eynon volumetric method as described in A.O.A.C (1985).
- Percentages of total acidity (as g tartaric acid / 100 ml juice) by titration against 0.1 NaOH using phenolphthalein as an indicator (A.O.A.C., 1985).
- The ratio between total soluble solids and acid.

All obtained data were tabulated and statistically analyzed according to Mead *et al.* (1993) using new L.S.D. parameters at 5 % for comparisons among different treatments.

RESULTS AND DISCUSSION

Effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on the main shoot length and leaf area .

Data of the effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on main shoot length and leaf area of Red Roomy grapevines during 2007 and 2008 seasons are shown in Table 2. The obtained data reveal that single or combined application of chelated-Zn at 0.05%, boric acid at 0.05% and magnesium sulphate at 0.5% significantly stimulated main shoot length and leaf area compared with check treatment. Spraying boric acid at 0.05%, chelated-Zn at 0.05% and magnesium sulphate at 0.5%, in ascending order was favourable in stimulating the two growth characters. Double or triple application of these nutrients was significantly very effective in enhancing main shoot length and leaf area compared to the use of each nutrient alone.

Table 2: Effect of foliar application of boric acid, chelated-Zn and magnesium sulphate on the main shoot length, leaf area (cm2), percentage of berry setting and number of clusters per vine of Red Roomy grapevines during 2007 and 2008 seasons.

Treatment	Main shoot length (cm)		Leaf area (cm^2)		Berry setting %		No. of clusters per vine	
	2007	2008	2007	2008	2007	2008	2007	2008
1- Control	80.0	86.0	131.2	139.1	5.96	6.11	25.0	25.0
2- Chelated-Zn at 0.05%	86.0	94.5	136.9	145.0	7.41	7.20	26.0	28.0
3- Boric acid at 0.05%	84.0	90.0	134.0	142.9	6.60	6.65	25.0	26.0
4- Magnesium sulphate at 0.5%	90.0	98.0	141.2	151.3	8.11	7.75	26.0	29.0
5- Zn + B.	94.0	103.0	144.3	151.3	8.80	8.30	26.0	30.0
6- Zn + Mg.	100.0	109.0	152.0	157.2	9.60	9.00	26.0	32.0
7- B + Mg.	97.0	107.0	149.0	155.0	9.50	8.90	26.0	31.0
8- Zn + B + Mg.	104.0	115.7	158.2	160.3	10.30	9.55	26.0	33.0
New L.S.D at 5%	1.8	2.0	2.0	1.9	0.61	0.51	NS	1.0

- Zn = Chelated-Zn
- B = Boric acid
- Mg = Magnesium sulphate

Significant differences on main shoot length and leaf area were detected among all treatments. The maximum main shoot length and leaf area were recorded on vines received the three nutrients together, as leaf area reached 158.2 and 160.3 cm3 in both seasons, respectively. The minimum values (131.2 and 139.1 cm3 in both seasons, respectively) were recorded on the untreated vines. These results were true in both seasons.

The outstanding effect of boron on controlling water, activating the formation of meristems, encouraging cell development and the elongation of cells and root development as well as enhancing the biosynthesis and movement of sugars and IAA which reflected in improving growth could explain the present results (Adriano, 1985).

The stimulating effect of boron on growth characters was supported by the results of Ahmed and Abd El-Hameed (2003) on Red Roomy grapevines and Farahat (2008) on Red Globe grapevines.

The great stimulation on these growth aspects in relation to application of magnesium might be attributed to its effect in enhancing the formation of carbohydrates and the transport of P from roots to vegetative portions (Nijjar, 1985). These results with respect to the stimulating effect of magnesium on the main shoot length and leaf area are in agrement with those obtained by Ahmed and Abd El-Hameed (2003) on Red Roomy grapevines; Gobara *et al* (2001) on Banaty grapevines and Kamel (2002) on Flame seedless grapevines.

The important of Zinc on stimulating growth characters might be attributed to its effect in enhancing the biosynthesis of most organic foods and the natural hormone namely IAA as well as activating cell division, cell enlargement as well as water and nutrient transport (Mengel, 1985). The simulative effect of Zinc on the leaf area was confirmed by the results of Gobara *et al* (2002) and Madian (2004) on Red Roomy grapevines.

Effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on the percentage of berry setting.

Values of percentage of berry set of Red Roomy grapevines during 2007 and 2008 seasons in relation to foliar application of boric acid, magnesium sulphate and chelated-Zn are shown in Table 2. The data show that percentage of berry setting varied significantly among boron, magnesium and zinc treatments. It was significantly improved with using boric acid, magnesium sulphate and chelated-Zn either applied singly or used in different combinations rather than non-application. The highest values were presented in the vines treated with boric acid, chelated-Zn and magnesium sulphate, in ascending order. Combined application of these nutrients was preferable than using each nutrient alone in enhancing percentages of berry setting. Application of the three nutrients together significantly surpassed the application of the two elements in enhancing such percentage. Significant differences on percentage of berry setting were observed among all nutrient treatments. The maximum values were recorded on the vines received the three nutrients together. Percentages of berry setting reached 10.30 and 9.55% in the vines treated with such promised treatment compared to 5.96 and 6.11 produced by untreated vines in both seasons, respectively. These results were true in both seasons.

The beneficial effect of B on the biosynthesis and translocation of carbohydrates as well as N metabolism and enhancing germination of pollens could result in improving berry setting.

The improving effect of boron on berry setting are in accordance with those obtained by Abd El-Hady (1995) on Red Roomy grapevines and Farahat (2008) on Red Globe grapevines.

The effect of magnesium on enhancing growth characters and vine nutritional status could result in increasing the availability of mineral and organic foods to flowers. The promotive effect of magnesium on berry setting was confirmed by the results of Ahmed and Abd El-Hameed (2003) on Red Roomy grapevines; Gobara *et al* (2001) on Thompson seedless grapevines and Zaki (2006) on Superior grapevines.

The great increase on berry setting due to spraying zinc might be attributed to its influence on increasing the biosynthesis of organic foods and IAA as well as enhancing the movement of water and nutrients (Nijjar, 1985). The effect of zinc on improving growth and vine nutritional status surely reflected on amending the flowers with their requirements from organic and mineral foods, consequently increased the retained grapes. The promoting effect of zinc on berry setting was supported by the results of Gobara (1999) on Flame seedless grapevines.

Effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on yield and cluster weight.

The data of the effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on number of clusters per vine, yield per vine and cluster weight of Red Roomy grapevines during 2007 and 2008 seasons are shown in Tables 2 and 3. The obtained data show that single or combined application of chelated-Zn, boric acid and magnesium sulphate had no significant effect on the number of clusters per vine in the first season of study and significantly improved the yield expressed in weight and number of clusters per vine (in the second season) and cluster weight compared with check treatment. Spraying the vines four times with boric acid at 0.05% , chelated-Zn at 0.05% and magnesium sulphate at 0.5%, in ascending order was very effective in improving the yield as well as cluster weight. Combined application of these nutrients was preferable in improving yield as well as cluster weight than using each nutrient alone. Significant differences in these parameters were observed among the eight nutrient treatments. The best results with regard to yield were obtained on vines treated with boric acid, chelated-Zn and magnesium sulphate together. Yield per vine under application of this treatment reached 12.7 and 15.7 kg compared with 7.6 and 8.0 kg for untreated vines, in both seasons, respectively. These results were true in both seasons.

The heaviest cluster borne in vines treated with boron treatments were attributed to their important role in enhancing berry set as well as berry weight. The beneficial effect of boron on yield might be attributed to their important roles in stimulating growth

characters, nutritional status of the vines, berry set, number of clusters per vine and weight of cluster and berry. These results concerning the improving effect of boron on yield and cluster weight are in agreement with those obtained by Youssef (1997) on Red Roomy grapevines and Farahat (2008) on Red Globe grapevines.

The promoting effect of magnesium on berry setting, cluster weight and number of clusters surely reflected on increasing the yield. The promoting effect of magnesium on the yield and cluster weight was confirmed by the results of Ibrahim (1993) on Red Roomy grapevines; Kamel (2002) on Flame seedless grapevines and Zaki (2006) on Superior grapevines. The increment on the yield owing to using zinc might be attributed to its effect in stimulating growth, vine nutritional status, berry set, number of clusters as well as weights of berry and cluster. The results regarding the beneficial effect of zinc on the yield and cluster weight are in harmony with those obtained by Amin (2007) on Red Roomy grapevines.

Effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on the percentage of shot berries.

The results of percentage of shot berries of Red Roomy grapevines during 2007 and 2008 seasons, in response to foliar application of boric acid, magnesium sulphate and chelated-Zn are given in Table 3. Single or combined application of boric acid, chelated-Zn and magnesium sulphate significantly controlled the percentage of shot berries more than non-application. Using boric acid, chelated-Zn and magnesium sulphate , in ascending order was significantly accompanied with reducing the percentage of shot berries. A remarkable reduction in the percentage of shot berries was observed when the three nutrients were applied together compared with using each nutrient alone.

The lowest values of shot berries were recorded on the clusters harvested from vines treated with the three nutrients together. Under such promised treatment, shot berries reached 2.00 and 2.05% while were 6.55 and 7.00% in the clusters picked from untreated vines. These results were true in both seasons.

The great decline in shot berries in the clusters due to the application of boron might be attributed to its role in improving the efficiency of fertilization through its effect in enhancing the germination of pollens as well as preventing the abortion of flowers. The great effects of boron on building, translocation and absorption of sugars also could result in checking shot berries (Sister *et al.*, 1965). The reducing effect of boron on shot berries was confirmed by the results of Ahmed and El-Morsy (1994) on Red Roomy grapevines.

The reduction on shot berries in response to application of magnesium was mainly attributed to its effect in increasing carbohydrates that reached to small berries which aid in elongation of these grapes. Similar results regarding the effect of magnesium on reducing shot berries in the clusters of Red Roomy were obtained by Ahmed and Abd El-Hameed (2003) on Red Roomy grapevines and Zaki (2006) on Superior grapevines.

The effect of zinc on controlling shot berries was mainly attributed to its effect in increasing the availability of mineral and organic foods and IAA to the berries as well as enhancing cell division which are responsible for elongating berries (Price *et al*, 1972). The reducing effect of zinc on shot berries was confirmed by the results of Gobara *et al* (2002) on Red Roomy grapevines.

Effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on some physical and chemical characters of the grapes.

Data regarding the effect of foliar application of boric acid, magnesium sulphate and chelated-Zn on berry weight, percentages of total soluble solids, total acidity and total sugars as well as total soluble solids/acid of Red Roomy grapes during 2007 and 2008 seasons are shown in Tables 3 and 4.

Table 3: Effect of foliar application of boric acid, chelated-Zn and magnesium sulphate on the yield per vine (kg.), cluster weight (g) and shot berries % and berry weight (g.) of cluster of Red Roomy grapevines during 2007 and 2008 seasons.

Treatment	Yield/vine (kg.)		Cluster weight (g.)		Shot berries %		Berry weight (g.)	
	2007	2008	2007	2008	2007	2008	2007	2008
1- Control	7.6	8.0	305.0	320.0	6.55	7.00	3.30	3.36
2- Chelated-Zn at 0.05%	9.2	10.0	355.0	358.0	6.10	6.00	3.90	3.75
3- Boric acid at 0.05%	8.3	8.8	330.0	339.0	6.35	6.33	3.60	3.56
4- Magnesium sulphate at 0.5%	9.9	11.2	380.0	385.0	5.40	5.50	4.11	3.95
5- Zn + B.	10.7	12.2	410.0	408.0	5.00	4.85	4.35	4.15
6- Zn + Mg.	12.0	14.5	463.0	452.0	3.00	2.90	4.80	4.60
7- B + Mg.	11.4	13.3	440.0	430.0	4.00	3.95	4.59	4.40
8- Zn + B + Mg.	12.7	15.7	490.0	475.0	2.00	2.05	5.00	4.89
New L.S.D at 5%	0.7	0.8	19.0	19.0	0.15	0.18	0.20	0.19

- Zn = Chelated-Zn
- B = Boric acid
- Mg = Magnesium sulphate

Table 4: Effect of foliar application of boric acid, chelated-Zn and magnesium sulphate on the percentage of total soluble solids, total acidity, total soluble solids / acid ratio and percentage of total sugars in the grapes of Red Roomy grapevines during 2007 and 2008 seasons.

Treatment	T.S.S %		Total acidity %		T.S.S/ acid		Total sugars %	
	2007	2008	2007	2008	2007	2008	2007	2008
1- Control	18.5	19.0	0.741	0.760	25.0	25.0	17.2	17.5
2- Chelated-Zn at 0.05%	19.1	20.0	0.694	0.720	27.5	27.8	17.8	18.2
3- Boric acid at 0.05%	18.8	19.5	0.720	0.740	26.1	26.4	17.5	17.9
4- Magnesium sulphate at 0.5%	19.4	20.5	0.672	0.700	28.9	29.3	18.1	18.5
5- Zn + B.	19.8	20.8	0.650	0.680	30.5	30.6	18.5	18.8
6- Zn + Mg.	20.4	21.6	0.610	0.650	33.4	33.2	19.1	19.4
7- B + Mg.	20.1	21.2	0.630	0.660	31.9	32.1	18.8	19.1
8- Zn + B + Mg.	20.8	21.9	0.600	0.630	34.7	34.8	19.4	19.7
New L.S.D at 5%	0.2	0.3	0.020	0.018	0.9	1.0	0.2	0.2

- Zn = Chelated-Zn
- B = Boric acid
- Mg = Magnesium sulphate

Single or combined application of boric acid, magnesium sulphate and chelated-Zn was significantly responsible for improving physical and chemical properties of the grapes in terms of increasing berry weight; total soluble solids, total sugars and total soluble solids/acid and decreasing total acidity compared to the control treatment.. Fruit quality was significantly affected by varying nutrient treatments. The best results with regard to quality of the grapes were obtained on the vines that sprayed four times with boric acid, chelated-Zn and magnesium sulphate. Unfavourable results were recorded on untreated vines. Similar results were attained in both experimental seasons.

The great important of boron on the biosynthesis and translocation of sugars could result in accumulated more sugars in the berries and highly advanced maturity stage and improved quality of the berries. The results with regard to the improving effect of boron on physical and chemical characters of the berries are in concordance with those obtained by Wassel *et al* (1996) on Red Roomy grapes and Farahat (2008) on Red Globe grapes.

The improving effect of magnesium on fruit quality might be attributed to its effect on enhancing plant pigments formation, building carbohydrates and activating the uptake of P and different enzymes involved in fruit maturity (Nijjar, 1985). The promotive effect of magnesium on physical and chemical characters of the grapes coincided with those obtained by Ibrahim (1993) on Red Roomy grapes Zaki (2006) on Superior grapes.

The present results regarding the effect of zinc on improving quality of the grapes might be attributed to its effect in enhancing the biosynthesis and translocation of carbohydrates (Nijjar, 1985).

The remarkable promotion on physical and chemical characters of Red Roomy grapes due to the use of zinc are in accordance with the results of Madian (2004) on Red Roomy grapes and Fadl (2004) on Early Superior grapes.

In conclusion, for producing filled clusters, controlling shot berries in the clusters and improving yield quantitively and qualitatively of Red Roomy grapevines, it is necessary spraying vines

with boric acid at 0.05%, chelated-Zn at 0.05% and magnesium sulphate at 0.5% four times on the growth start, first bloom, just after berry setting and at one month later. The net pro per one feddan because of the application of this recommendation reached 5150 and 8650 Egyptian pounds in both seasons, respectively over the check treatment.

REFERENCES

Abada, M.A.M (2002): Effect of yeast and some micronutrients on the yield and quality of Red Roomy grapevines. M.Sc. Thesis Fac. of Agric. Minia Univ. Egypt.

Abd El- Aziz, F.H. (1995): Response of Banaty grapevines to spraying magnesium. Minia J. Agric. Res & Dev. 17, No.1 , 59-76.

Abd El- Hady A.M (1995): Response of Roomy grapevines to foliar sprays of urea and boron. Ph.D Thesis. Fac. of Agric. Minia Univ.

Adriano, D.C. (1985) : Trace Elements in the Terrestrial Environment. Springer Verlag, New York, pp20-40.

Ahmed, A.M. and Abd El-Hameed, H.M. (2003) : Growth, uptake of some nutrients and productivity of Red Roomy vines as affected by spraying of some amino acids, magnesium and boron. Minia J. of Agric. Res & Develop. 23(4) : 649-666.

Ahmed, F.F. and Morsy, F.M. (1994): Improving productivity of Red Roomy grapevines by the application of paclobutrazol and boron. Agric. Sci. Mansoura Univ. 19(2) : 767-776.

Ahmed, F.F. and El-Morsy, M.H (1999): A new method for measuring leaf area in different fruit species. Minia. J. Agric. Res & Dev. 19:99:105.

Amin, M.M.A. (2007): Response of Red Roomy grapevines to application of amino acids and some micronutrients. M.Sc. Thesis. Fac. of Agric. Minia. Univ.

Association of Official Agricultural Chemists (A.O.A.C.) (1985): Official Methods of Analysis 14th ed. A.O.A.C., Benjamin Franklin Station Washington, D.E., U.S.A. pp490-510.

Chapman, H.D. and Pratt, P.F. (1965) : Methods of Analysis for Soils, Plants and Water. Univ. of California. Division of Agric., Sci 172-173.

Christensen, P. (1977) : Boron deficiency in vineyards. Cooperative Extension Work in Agric and Home Economics U.S. Dept. of Agric. Calif. Univ. and Country of Fresno Cooperating.

Fadl, T.R. (2004) : Effect of thinning, gridiling and some micronutrients on shot berries of grapevines cv. Early superior. M.Sc. Thesis Fac. Agric. Minia Univ.

Farahat, I.A.M. (2008) : Effect of some antioxidants and boron treatments on growth and fruiting of Red Globe grapevines. M.Sc. Thesis. Fac. of Agric. Minia. Univ.

Food Agriculture Organization (F.A.O) (2006) : Quarterly Bulletin of Statistics 8, No. (112) : 31. Year Annuario production, 45.

Gobara, A.A (1999) : Behaviour of Flame seedless grapevines to fertilization with some nutrients and vine load. J. Agric. Sci. Mansoura Univ. 24 (3) : 1309- 1331.

Gobara, A.A.; Ahmed, F.F. and El-Shamaa, M.S. (2001) : Effect of varying N, K and Mg application ratios on growth, leaf chemical composition and productivity of Banaty grapevines. The Fifth Arabian Hort. Conf. Ismailia, Egypt. March 24-28, 83-90.

Ibrahim, H.I.M (1993) : Effect of Mepiquat chloride and some nutrient foliar sprays on Red Roomy grapevines (*Vitis vinifera* L.), M.Sc. Thesis. Fac. of Agric. Minia Univ.

Jackson, D. (1988) : Poor fruit set in vines. The significance of early bunch-stem necrosis. Australian & New Zealand Vine. Industry Journal, 3 (2) : 42-43 (En, 2 ref., 1 col. Pl.) Department of Horticulture, Lincoln College, Canterbury, New Zealand.

Kamel, M.K. (2002) : Physiological studies on pruning and fertilization of Flame seedless grapevines. (*Vitis vinifera* L.) Ph.D. Thesis. Fac. of Agric. Minia Univ.

Madian, A.M. (2004) : Response of Red Roomy grapevines to spraying with some micronutrients and antioxidants. M.Sc. Thesis. Fac. of Agric. Minia Univ.

Mead, R.; Currnow, R.N. and Harted, A.M. (1993) : Statistical Methods in Agricultural and Experimental Biology. Second Ed. Chapman, Hall London. Pp10-44.

Mengel, K. (1985) : Dynamics and availability of major nutrients in soils. Advances in soil Sci., Vol. 2, Springer-Verlag New York, Increase. pp.89-91.

Nijjar, G.S. (1985) : Nutrition of Fruit Trees. Mrs Usha. Raj Kumar for Kalyani Publisher, New Delhi, India, pp.1-89.

Price, C.A. Clark, H.E. and Funkhouser, E.A. (1972) : Micronutrients in Agriculture. Soil Sci. Soc. Am. Increase. Madison. Pp231-247.

Reed, H.S. (1977): A physiological study on boron deficiency in plants. Hilgardiei, 7: 377-411.

Sister, E.C.; Dugger, W.M. and Gaush, H.O. (1965): The role of boron in the translocation of organic compounds in plants. Plant phisiol., 31: 11-13.

Stoev, K. (1971): Physiological bases of viticulture. Section 1, Publishing House. Bulgerian Academic Science, Sofia. Pp10-20.

Summer, M.E. (1985) : Diagnosis and Recommendation Integrated system (DRIS) as a guide to orchard fertilization. Hort. Abst. 55 (8) : 7502.

Valeria, B.K., Nikolai, D.N. and Yuri, Y.G. (1997) : Somaclonal variation and in vitro induced mutagenesis in grapevines. Plant cell, Tissue and Organ culture 49 : 17-27.

Wassel, A.H; Mansour, A.E.M.; Ahmed, F.F. and Ragab, M.A. (1996): Extending the storage of Red Roomy grapes on vines by foliar application of potassium and boron. Fourth Arabic Conf. for Horticultural Crops. El-Minia Egypt. Part II Pomology 815 : 824pp.

Youssef, W.S. (1997): Effect of spraying mepiquat chloride and macro and micro nutrients on growth, yield and quality of Red Roomy grapevines. (*Vitis vinifera* L.). Ph.D. Thesis. Fac. of Agric. Minia.

Zaki, A.S. (2006) : Some techniques for improving the quality of Superior grapes. M.Sc. Thesis. Fac. of Agric. Minia. Univ.

استجابة كرمات العنب الرومي الأحمر للرش الورقي بالبورون والماغنسيوم والزنك

حمدى ابراهيم محمود إبراهيم، على عبد العزيز جبارة ، نرمين محمد عبدالجابر

قسم البساتين– كلية الزراعة– جامعة المنيا

أجريت هذه الدراسة خلال موسمى ٢٠٠٧، ٢٠٠٨ على كرمات عنب رومى احمر مرباه بالطريقة الرأسية لبيان تأثير الاستخدام الفردي أو المشترك لحامض البوريك ، كبريتات الماغنسيوم و الزنك المخلبي علي مساحة الورقة والنسبة المئوية لعقد الحبات وكمية المحصول والنسبة المئوية للحبات الصغيرة وكذلك علي الخصائص الطبيعية والكيميائية لحبات العنب الرومي الأحمر. وكان هناك هدف آخر وهو اختيار أفضل معاملة تعطي عناقيد ممتلئة وبأقل عدد من الحبات الصغيرة وأكبر كمية محصول كماً ونوعاً.

ولقد أشارتنتائج الدراسة أن رش حامض البوريك بتركيز ٠،٠٥ % ، الزنك المخلبي بتركيز ٠،٠٥ % وكبريتاتالماغنسيوم بتركيز ٠،٥ % مرتبة تنازلياً كان فعالاً جداً في تحسين مساحة الوؤقة ونسبة العقد وكمية المحصول وجودة الحبات. وأمكن الحصول علي أفضل النتائج غند أستخدام العناصر الثلاثة معاً.

لأجل الحصول علي عناقيد ممتلئة وتقليل عدد الحبات الصغيرة في العناقيد وتحسين كمية المحصول كماً ونوعاً في كرمات العنب الرومي الأحمر ، فإنه يكون من الضروري رش الكرمات بحامض البوريك بتركيز ٠,٠٥% والزنك المخلبي بتركيز ٠,٠٥% وكبريتات الماغنسيوم بتركيز ٠,٥% أربعة مرات في بداية النمو الخضري، في بداية الأزهار ، بعد عقد الحبات مباشرة ، وبعد عقد الحبات بشهر.