

Behaviour of Superior Grapevines to Foliar Application of Some Vitamins and Amino AcidsFaissal F. Ahmed¹; Farouk H. Abdelaziz,¹ Ali. A. Gobara¹, Emad A.H. El- Mamlouk² and Moustafa H.A. Hashem²¹ Hort. Dept. Fac. of Agric. Minia Univ. Egypt.² Central Lab. of Organi Agric. ARC, Giza, Egypt.Email: Faissalfadel@yahoo.com

Abstract: During 2012, 2013 and 2014 seasons, Superior grapevines were treated four times with some vitamins namely C at 500 ppm, B, K, E, D and A each at 100 ppm and/ or amino acids (tryptophane, methionene and cysteine) at 100 ppm as an attempt for improving yield and quality of the berries. Spraying all vitamins and/ or amino acids was very effective in enhancing growth characters, plant pigments, N, P, K, Mg, Ca, Zn, Fe, Mn and Cu, berry setting yield and quality of the berries comparing with the control. Percentage of shoot berries was greatly controlled due to using all vitamins and amino acids. Using amino acids was superior than using vitamins in this respect. The best vitamin was C, B, K, E, D and A, in descending order. Four sprays at growth start, just before blooming, just after berry setting and at one month later with vitamins C at 500 ppm, B, K, E, D and A each at 100 ppm besides amino acids at 100 ppm was responsible for enhancing yield and quality of Superior grapevines.

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1. Introduction

Recently, many attempts were conducted to improve yield and fruit quality by using vitamins and amino acids instead of using various chemicals for avoiding environment pollution and producing organic grapes.

Vitamins with their antioxidant properties play an important role in plant defence against oxidative stresses induced by unfavourable conditions. Application of vitamins is accompanied with enhancing alpha keto glutaric acid biosynthesis which is united with ammonia to form amino acids and proteins, controlling the incidence of disorders. and stimulating the biosynthesis of natural hormones like IAA, cytokinins and GA₃, cell division, plant pigments, enzymes, organic foods and plant metabolism (Samiullah *et al.*, 1988).

Amino acids are responsible for enhancing proteins, cell division, plant pigments and natural hormones such as IAA, GA₃ and ethylene (Davies, 1982).

The benefits of vitamins on growth and fruiting of grapevine cvs were emphasized by the findings of Madian and Refaai (2011); Mekawy (2012), Mohamed – Entesam (2012); Ibrahim- Rehab (2012); Abdelaal (2012); Ahmed *et al.*, (2012a) and (2012b); Abdelaal and Aly (2013); Abada (2014); Abd El- Latief (2014); Abdelaal *et al.*, (2014) and Al- Wasfy (2014). The results of Khattab – Magda and Shaban (2012); Abdelaal *et al.*, (2013); Gad El- Kareem and Abada (2014; Mohamed (2014); and El- Khawaga (2014) supported the beneficial effects

of using amino acids on growth and fruiting of grapevines.

The target of this study was elucidating the great benefits of using some vitamins C, B, K, E, D and A and amino acids (tryptophane, methionene and cysteine) on growth and fruiting of Superior grapevines.

2. Material And Methods

This study was carried out during 2012, 2013 and 2014 seasons on 96 uniform in vigour 7- years old Superior grapevines grown in a private vineyard located at Talha village, Benha district, Qlyubia Governorate where the texture of the soil is clay, well drained and water table not less than two meters deep. All the selected vines are planted at 2.0 x 3.0 m apart. The chosen vines (96 vines) were pruned during the first week of January in both seasons using cane pruning method with the assistance of Y supporting system. Vine load was 66 eyes for all the selected vines on the basis of six fruiting canes X nine eyes plus six renewal spurs X two eyes. Surface irrigation system was followed using Nile water.

Except those dealing with the present treatments (application of vitamins and amino acids via foliage), all the selected vines (96 vines) received the usual horticultural practices which are commonly used in the vineyard.

Mechanical, physical and chemical analysis of the tested soil were carried out at the start of the experiment according to the procedures of Wilde *et al.*, (1985) and the data are shown in Table (1).

Table (1) : Analysis of the tested soil:

Constituents	Values
Particle size distribution:	
Sand %	10.0
Silt %	21.5
Clay %	68.5
Texture	Clay
pH(1:2.5 extract)	8.05
EC (1 :2.5 extract) (dsm ⁻¹) 1 cm / 25°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

This study included the following sixteen treatments from application of single and combined sprays of vitamins K, E, D, A & B (B₁+B₂+B₆+B₁₂) and ascorbic acid (vitamin C) as well as amino acids in addition to the control treatment:

- 1- Control (untreated vines)
- 2- Spraying vitamin C at 500 ppm (0.5 g/l)
- 3- Spraying vitamin B complex (B₁+B₂+B₆+B₁₂) at 100 ppm (0.1 g/l)
- 4- Spraying vitamin K at 100ppm
- 5- Spraying vitamin E at 100 ppm.
- 6- Spraying vitamin D at 100 ppm.
- 7- Spraying vitamin A at 100 ppm.
- 8- Spraying all vitamins.
- 9- Spraying amino acids at 100 ppm.
- 10- Spraying vitamin C + Amino acids.
- 11- Spraying vitamin B + Amino acid.
- 12- Spraying vitamin K + Amino acid.
- 13- Spraying vitamin E + Amino acid.
- 14- Spraying vitamin D + Amino acid.
- 15- Spraying vitamin A + Amino acid.
- 16- Spraying all vitamins namely K, E, D, A, B and ascorbic acid and amino acids at the previous concentrations.

Each treatment was replicated three times, two vines per each. Vitamins B (B₁+B₂+B₆+B₁₂) & ascorbic acid were dissolved in water. While vitamin K, E, D and A were dissolved in few drops of Ethyl alcohol before application. The selected vines received four sprays of these vitamins and amino acids (tryptophane, methionene and cysteine) at growth start (1st week of March), just before bloom (1st week of April); just after berry setting (1st week of May) and at one month later (1st week of June).

Triton B as a wetting agent was used with all vitamins at 0.05 % (0.5 ml/ l). Spraying was done till run off (2 litres/ vine).

The investigated vitamins and amino acids were applied at fixed concentrations according to the

previous studies carried out by **Madian and Refaai (2011)**.

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

During the three seasons of the study, following parameters were measured, main shoot length (cm.); number of leaves/ shoot, leaf area (cm²) (**Ahmed and Morsy, 1999**); chlorophylls a & b, total chlorophylls, total carotenoids (mg/ 100 g F.W.) (**Von- Wettstein, 1957**), percentages of N, P, K, Mg and Ca as well as Zn, Fe, Zn and Cu (as ppm) (**Wilde et al., 1986**), berry setting %, number of clusters/ vine, yield expressed in weight (kg.) and number of clusters / vine, cluster weight (g.) and dimensions (length and width in cm.), shot berries %, berry weight (g.) and dimensions (longitudinal and equatorial in cm.), T.S.S.%, total acidity %, (as g tartaric acid/ 100 ml juice), T.S.S./ acid, reducing sugars % (**A.O.A.C., 2000**), as well as nitrate and nitrite in the juice (as ppm) (**Ridnour – Lisa, et al., 2000**).

Statistical analysis was performed (according to **Mead et al., (1993)**). Treatment means were compared during new L.S.D. at 5%.

3. Results

1- Effect of single and combined applications of some vitamins and amino acid on growth and vine nutritional status

Data in Tables (2 & 3 & 4 & 5) clearly show that single and combined applications of vitamins C at 500 ppm, B, K, E, D and A each at 100 ppm and amino acids (tryptophane, methionene and cysteine) at 100 ppm significantly was accompanied with enhancing main shoot length, number of leaves/ shoot, leaf area, chlorophylls a, b, total chlorophylls, total carotenoids, N, P, K, Mg, Ca, Zn, Fe, Mn and Cu in the leaves rather than non- application. Using vitamins C, B, K, E, D and A, in descending order was significantly very effective in enhancing growth characters, plant pigments and nutrient status in the leaves. Using amino acids was significantly superior than using amino acids in this respect. Combined applications of vitamins and amino acids significantly surpassed the application of each alone in this respect. The maximum values were recorded on the vines that received four sprays of a mixture of all vitamins and amino acid. The lowest values were recorded on the untreated vines. These results were true during 2012, 2013 and 2014 seasons.

2- Effect of single and combined applications of some vitamins and amino acid on berry setting %, yield as well as cluster weight and dimensions.

Data in Tables (6 & 7) obviously reveal that percentage of berry setting, yield expressed in weight (kg.) and number of clusters/ vine as well as cluster

weight and dimensions were significantly improve din response to spraying vitamins C, B, K, E, D and A and/ or amino acids comparing with the check treatment. The promotion on these parameters was significantly associated with using vitamins C, B, K, E, D and A in descending order. Using amino acids was significantly preferable than using vitamins. Combined applications of vitamins and amino acids was significantly favourable than using each alone in this respect. The best results with regard to berry setting, yield and cluster characters was obtained due to using all vitamins plus amino acids. The untreated vines produced the lowest values. These results were true during the three seasons.

3- Effect of single and combined applications of some vitamins and amino acid on the percentage of shot berries

Data in Table (7) clearly show that the percentage of shot berries was significantly declined as a result of spraying vitamins and amino acids either singly or in combinations over the check treatment. The best vitamins in this respect were vitamins C, B, K, E, D and A, in descending order. Using amino acids was significantly superior than using vitamins. Using all vitamins together was significantly preferable than

using each vitamin alone in controlling shot berries in the clusters. Using all vitamins with amino acids resulted in the lowest values. The highest values were recorded on the untreated vines. These results were true during the three seasons.

4- Effect of single and combined applications of some vitamins and amino acid on the quality of the berries

Tables (7 & 8 & 9) clearly show that using vitamins C, B, K, E, D and A and/ or the three amino acids significantly improved berries quality in terms of increasing berry weight and dimensions (longitudinal and equatorial), T.S.S. %, reducing sugars % and T.S.S. /acid and decreasing total acidity % and both nitrate and nitrite in the juice rather than non-application. Using vitamins C, B, K, E, D and A, in descending order was significantly preferable in enhancing quality of the berries. Using amino acids was significantly favourable than using vitamins in this connection. The best results with regard to quality of the berries were obtained due to using all vitamins and amino acids together. These results were true during the three seasons. Unfavourable effects were observed in the untreated vines.

Table (2) : Effect of single and combined applications of some vitamins and amino acids on some vegetative growth characters and chlorophyll a in the leaves of Superior grapevines during 2012 & 2013 & 2014 seasons.

Vitamin and amino acid treatments	Main shoot length (cm.)			No. of leaves / shoot			Leaf area (cm) ²			Chlorophyll a (mg/ 100 g F.W.)		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	89.1	90.0	90.9	15.0	15.0	15.0	100.3	101.0	101.5	10.1	10.6	10.8
Vit. C at 500 ppm	101.9	102.8	103.7	17.0	18.0	18.0	110.0	110.7	111.6	15.5	16.0	17.1
Vit. B complex at 100 ppm	98.9	99.8	101.0	17.0	17.0	18.0	108.2	109.0	110.0	14.5	15.1	16.2
Vit. K at 100 ppm	97.3	98.2	99.1	17.0	17.0	18.0	106.3	107.0	108.0	13.7	14.2	14.4
Vit. E at 100 ppm	95.0	95.9	97.0	17.0	17.0	18.0	105.0	105.9	107.0	12.8	13.4	14.5
Vit. D at 100 ppm	93.0	94.0	94.8	17.0	17.0	17.0	103.2	104.0	105.0	11.9	12.5	12.6
Vit. A at 100 ppm	91.3	92.2	93.1	17.0	17.0	17.0	102.0	102.8	104.0	11.0	11.6	12.8
All vitamins	103.5	104.4	105.3	20.0	20.0	21.0	112.3	113.0	114.0	15.1	15.7	16.9
Amino acids at 100 ppm	106.2	107.1	108.0	22.0	22.0	23.0	114.5	115.2	116.3	16.0	16.7	17.9
Vit. C + Amino acid	119.9	120.8	121.7	24	25.0	25.0	125.5	126.2	127.3	21.0	21.9	23.0
Vit. B complex + Amino acids	117.0	118.0	119.0	24	24.0	25.0	124.0	125.0	126.0	20.0	21.0	22.0
Vit. K + Amino acids	115.5	116.4	117.3	24	24.0	25.0	122.3	123.3	126.3	19.1	20.0	21.0
Vit. E + Amino acids	112.3	113.2	114.1	24	24.0	25.0	120.9	123.0	124.0	18.0	19.0	20.0
Vit. D + Amino acids	110.0	110.0	111.0	24	24.0	25.0	118.0	119.0	120.0	17.0	18.0	19.1
Vit. A + amino acids	108.3	109.4	110.5	24	24.0	25.0	126.3	117.0	118.3	16.2	17.0	18.1
All vitamins + amino acids	125.7	126.8	129.1	26	27.0	28.0	128.3	131.0	130.9	22.3	24.0	25.9
New L.S.D. at 5%	1.0	0.9	0.9	2.0	2.0	2.0	0.9	1.0	1.0	0.5	0.6	0.6

Table (3) : Effect of single and combined applications of some vitamins and amino acids on some plant pigments and percentage of N in the leaves of Superior grapevines during 2012 & 2013& 2014 seasons.

Characters Vitamin and amino acid treatments	Chlorophyll b (mg/100 g. F.W)			Total chlorophylls (mg/100g.F.W)			Total carotenoids (mg/100gF.W)			Leaf N%		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	5.1	5.0	5.1	15.2	15.6	15.9	4.9	5.2	5.1	1.61	1.59	1.63
Vit. C at 500 ppm	6.5	6.6	6.8	22.0	22.6	23.9	6.3	6.6	6.5	1.96	1.94	1.98
Vit. B complex at 100 ppm	6.2	6.4	6.5	20.7	21.5	22.7	6.0	6.3	6.2	1.90	1.88	1.42
Vit. K at 100 ppm	6.0	6.2	6.4	19.7	20.4	20.8	5.8	6.1	6.0	1.83	1.81	1.85
Vit. E at 100 ppm	5.7	6.0	6.2	18.5	19.4	20.7	5.5	5.8	5.8	1.77	1.75	1.79
Vit. D at 100 ppm	5.6	5.6	5.8	17.5	18.1	18.4	5.4	5.7	5.6	1.71	1.69	1.73
Vit. A at 100 ppm	5.4	5.3	9.5	16.4	16.9	22.3	5.2	5.5	5.4	1.66	1.64	1.68
All vitamins	7.1	7.0	7.2	22.2	22.7	24.1	6.9	7.2	7.0	2.03	2.02	2.05
Amino acids at 100 ppm	7.4	7.5	7.7	23.4	24.2	25.6	7.2	7.5	7.4	2.06	2.05	2.08
Vit. C + Amino acid	9.2	9.5	9.8	30.2	31.4	32.8	9.0	9.3	9.3	2.40	2.38	2.42
Vit. B complex + Amino acids	9.0	9.0	9.2	29.0	30.0	21.2	8.8	9.1	9.1	2.33	2.31	2.35
Vit. K + Amino acids	8.6	8.7	9.0	27.7	28.7	30.0	8.4	8.8	8.9	2.27	2.25	2.30
Vit. E + Amino acids	8.4	8.4	8.6	26.4	27.4	28.6	8.2	8.4	8.6	2.21	2.19	2.23
Vit. D + Amino acids	8.0	8.1	8.3	25.0	26.1	27.4	7.8	8.1	8.1	2.15	2.13	2.18
Vit. A + amino acids	7.7	7.9	8.1	23.9	24.9	26.2	7.5	7.8	7.7	2.10	2.08	2.12
All vitamins + amino acids	9.4	9.9	10.1	31.7	33.9	36.0	9.2	9.5	10.1	2.47	2.45	2.55
New L.S.D. at 5%	0.2	0.2	0.2	0.7	0.7	0.6	0.2	0.2	0.2	0.05	0.05	0.06

Table (4) : Effect of single and combined applications of some vitamins and amino acids on the percentages of P, K, Mg and Ca in the leaves of Superior grapevines during 2012 & 2013& 2014 seasons.

Characters Vitamin and amino acid treatments	Leaf P%			Leaf K%			Leaf Mg%			Leaf Ca%		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	0.12	0.14	0.15	1.33	1.30	1.34	0.50	0.47	0.45	2.01	2.00	1.99
Vit. C at 500 ppm	0.24	0.24	0.25	1.58	1.55	1.59	0.70	0.69	0.71	2.40	2.45	2.42
Vit. B complex at 100 ppm	0.22	0.22	0.23	1.55	1.53	1.57	0.67	0.66	0.68	2.33	2.38	2.35
Vit. K at 100 ppm	0.20	0.19	0.20	1.51	1.48	1.52	0.64	0.63	0.65	2.27	2.32	2.30
Vit. E at 100 ppm	0.18	0.17	0.18	1.47	1.44	1.47	0.60	0.59	0.61	2.20	2.25	2.22
Vit. D at 100 ppm	0.16	0.15	0.16	1.42	1.39	1.43	0.56	0.55	0.57	2.12	2.17	2.15
Vit. A at 100 ppm	0.14	0.14	0.15	1.38	1.35	1.39	0.53	0.52	0.54	2.06	2.11	2.08
All vitamins	0.26	0.25	0.26	1.64	1.61	1.65	0.73	0.72	0.74	2.46	2.51	2.48
Amino acids at 100 ppm	0.28	0.28	0.29	1.69	1.66	1.70	0.76	0.75	0.77	2.55	2.60	2.57
Vit. C + Amino acid	0.37	0.37	0.38	1.99	1.96	2.00	0.86	0.85	0.87	3.06	3.11	3.08
Vit. B complex + Amino acids	0.36	0.35	0.36	1.95	1.93	1.97	0.85	0.84	0.86	2.99	3.04	3.03
Vit. K + Amino acids	0.35	0.35	0.34	1.90	1.87	1.91	0.84	0.83	0.85	2.92	2.97	2.95
Vit. E + Amino acids	0.34	0.33	0.33	1.83	1.86	1.90	0.83	0.82	0.83	2.82	2.87	2.85
Vit. D + Amino acids	0.32	0.32	0.30	1.78	1.75	1.79	0.80	0.79	0.81	2.70	2.75	2.73
Vit. A + amino acids	0.30	0.30	0.28	1.74	1.71	1.75	0.77	0.76	0.76	2.62	2.67	2.64
All vitamins + amino acids	0.40	0.39	0.41	2.03	2.00	2.04	0.91	0.93	0.94	3.11	3.18	3.23
New L.S.D. at 5%	0.02	0.02	0.02	0.04	0.05	0.05	0.03	0.03	0.03	0.05	0.05	0.05

Table (5) : Effect of single and combined applications of some vitamins and amino acids on the leaf content of Zn, Fe, Mn and Cu (ppm) of Superior grapevines during 2012 & 2013& 2014 seasons.

Characters Vitamin and amino acid treatments	Leaf Zn(ppm)			Leaf Fe(ppm)			Leaf Mn(ppm)			Leaf Cu (ppm)		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	49.1	50.0	51.7	45.1	44.7	49.0	47.0	46.0	46.3	1.03	1.10	1.11
Vit. C at 500 ppm	65.0	66.0	67.8	60.0	61.1	67.0	61.1	62.0	62.6	1.30	1.37	1.40
Vit. B complex at 100 ppm	61.9	62.8	64.5	57.9	59.0	58.8	59.0	59.9	60.5	1.22	1.30	1.33
Vit. K at 100 ppm	60.0	61.0	62.7	55.0	56.1	56.1	56.3	57.0	57.6	1.20	1.27	1.30
Vit. E at 100 ppm	57.3	58.2	60.0	52.5	53.6	53.0	54.1	55.0	55.6	1.15	1.22	1.25
Vit. D at 100 ppm	55.0	56.0	57.8	50.0	91.2	50.5	52.1	53.0	53.7	1.11	1.18	1.21
Vit. A at 100 ppm	53.0	53.9	55.6	47.1	48.3	49.1	50.0	51.0	51.7	1.07	1.14	1.17
All vitamins	68.0	69.0	64.7	63.0	64.2	63.3	64.0	64.9	65.3	1.39	1.46	1.50
Amino acids at 100 ppm	71.0	72.0	80.7	66.0	67.3	66.6	66.6	67.5	68.4	1.45	1.52	1.55
Vit. C + Amino acid	88.9	90.0	91.8	82.3	83.5	82.0	80.0	80.9	81.9	1.90	1.97	1.50
Vit. B complex + Amino acids	85.9	87.0	88.9	80.0	81.2	80.0	77.5	78.0	79.0	1.83	1.90	1.93
Vit. K + Amino acids	83.0	83.9	85.0	76.3	77.5	77.1	76.3	77.1	78.0	1.77	1.85	1.87
Vit. E + Amino acids	79.0	80.5	82.0	73.9	75.1	74.0	74.2	74.9	75.3	1.67	1.75	1.77
Vit. D + Amino acids	76.0	77.0	79.9	71.0	72.2	71.0	72.1	73.0	73.7	1.60	1.67	1.70
Vit. A + amino acids	74.0	75.0	77.0	68.5	69.7	69.0	70.0	71.0	71.8	1.51	1.57	1.60
All vitamins + amino acids	72.3	94.9	96.9	85.3	86.5	86.3	83.3	86.3	87.3	1.99	2.06	2.13
New L.S.D. at 5%	1.9	2.0	4.0	2.0	2.0	4.0	1.9	1.9	3.8	0.02	0.02	0.02

Table (6) : Effect of single and combined applications of some vitamins and amino acids on the percentage of berry setting, yield and cluster weight of Superior grapevines during 2012 & 2013& 2014 seasons.

Characters Vitamin and amino acid treatments	Berry setting%			No of clusters /vine			Yield/vine (kg.)			Cluster weight(g.)		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	7.5	7.20	7.1	18.0	19.0	22.0	6.3	6.7	7.8	350.0	355.0	356.0
Vit. C at 500 ppm	9.1	9.2	9.5	19.0	21.0	24.0	7.2	8.1	9.4	378.0	386.0	390.0
Vit. B complex at 100 ppm	9.0	9.1	9.4	19.0	21.0	24.0	7.1	8.0	9.3	375.0	383.0	387.0
Vit. K at 100 ppm	8.7	8.8	9.1	19.0	21.0	24.0	7.0	8.0	9.2	371.0	380.0	384
Vit. E at 100 ppm	8.4	8.5	8.8	19.0	21.0	24.0	7.0	7.9	9.1	367.0	376.0	380
Vit. D at 100 ppm	8.1	8.2	8.5	19.0	21.0	24.0	7.0	7.9	9.0	366.0	374.0	378
Vit. A at 100 ppm	7.8	7.9	8.2	19.0	21.0	24.0	6.9	7.7	9.0	361.0	369.0	373
All vitamins	9.5	9.6	10.0	20.0	23.0	27.0	7.6	9.0	10.6	381.0	390.0	393
Amino acids at 100 ppm	10.0	10.1	10.4	20.0	23.0	27.0	7.8	9.1	10.8	388.0	396.0	400
Vit. C + Amino acid	11.8	11.9	12.2	21.0	26.0	29.0	8.9	11.3	12.7	424.0	433.0	437
Vit. B complex + Amino acids	11.6	11.7	12.0	21.0	26.0	29.0	8.9	11.2	12.6	422.0	430.0	433
Vit. K + Amino acids	11.3	11.4	11.7	21.0	26.0	29.0	8.8	11.1	12.5	420.0	427.0	431
Vit. E + Amino acids	11.0	11.1	11.4	21.0	26.0	29.0	8.8	11.1	12.4	417.0	425.0	429
Vit. D + Amino acids	10.6	10.7	11.0	21.0	26.0	29.0	8.7	11.0	12.3	413.0	420.0	424
Vit. A + amino acids	10.3	10.5	10.8	21.0	26.0	29.0	8.6	11.0	12.3	411.0	420.0	424
All vitamins + amino acids	12.2	12.9	12.9	21.0	28.0	30.0	9.2	12.5	13.5	440.0	447.0	451
New L.S.D. at 5%	0.3	0.3	0.3	NS	1.7	1.8	0.4	0.4	0.4	9.0	10.0	10.0

Table (7) : Effect of single and combined applications of some vitamins and amino acids on the length and width of cluster, shot berries % and berry weight of Superior grapevines during 2012 & 2013& 2014 seasons.

Characters Vitamin and amino acid treatments	cluster length (cm.)			Cluster width(cm)			Shot berries%			Berry weight (g.)		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	21.0	21.3	21.4	13.0	12.9	13.1	9.0	9.1	9.5	3.41	3.44	3.39
Vit. C at 500 ppm	24.5	25.0	25.0	15.0	14.9	15.1	6.5	6.6	6.3	3.77	3.87	3.90
Vit. B complex at 100 ppm	24.0	24.4	24.5	14.6	14.5	14.7	6.9	7.0	6.7	3.71	3.81	3.84
Vit. K at 100 ppm	23.7	24.0	24.1	14.3	14.2	14.4	7.2	7.3	7.0	3.65	3.75	3.78
Vit. E at 100 ppm	23.0	23.4	23.5	14.0	13.9	14.1	7.7	7.8	7.5	3.59	3.69	3.72
Vit. D at 100 ppm	22.2	22.6	22.7	13.7	13.6	13.8	8.2	8.3	8.0	3.54	3.64	3.67
Vit. A at 100 ppm	21.7	22.0	22.1	13.3	13.2	13.4	8.7	8.8	8.5	3.47	3.57	3.60
All vitamins	25.0	25.3	25.5	15.5	14.4	15.6	6.0	6.0	5.8	3.84	3.94	3.97
Amino acids at 100 ppm	25.7	26.0	26.1	15.8	15.7	15.9	5.5	5.9	5.3	3.90	4.00	4.04
Vit. C + Amino acid	29.5	30.2	30.3	18.2	18.1	18.3	3.5	3.5	3.2	4.22	4.23	4.27
Vit. B complex + Amino acids	29.0	29.3	29.4	18.1	18.0	18.1	3.8	9.8	3.6	4.21	4.31	4.35
Vit. K + Amino acids	28.2	28.5	28.6	17.8	17.7	17.8	4.0	3.9	3.8	4.20	4.30	4.52
Vit. E + Amino acids	27.5	28.0	28.2	17.4	17.3	17.4	4.3	4.2	4.1	4.11	4.21	4.24
Vit. D + Amino acids	27.0	27.4	27.5	17.0	16.9	17.0	4.7	4.6	4.5	4.04	4.15	4.18
Vit. A + amino acids	26.4	26.8	27.0	16.7	16.6	16.7	5.0	4.9	4.8	3.97	4.08	4.12
All vitamins + amino acids	29.9	30.0	30.1	18.5	18.4	18.6	2.5	2.1	2.0	4.51	4.60	4.64
New L.S.D. at 5%	0.6	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.05	0.05	0.05

Table (8) : Effect of single and combined applications of some vitamins and amino acids on the berry longitudinal and equatorial of berry and percentages of total soluble solids and total acidity % in the of Superior grapevines during 2012 & 2013& 2014 seasons.

Characters Vitamin and amino acid treatments	Berry longitudinal(cm)			Berry equatorial(cm)			T.S.S %			Total acidity%		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	2.11	2.11	2.09	1.89	1.90	1.91	17.9	18.0	18.0	0.716	0.720	0.719
Vit. C at 500 ppm	2.76	2.70	2.60	2.26	2.29	2.30	19.5	19.3	19.5	0.570	0.569	0.568
Vit. B complex at 100 ppm	2.63	2.57	2.47	2.20	2.23	2.24	19.2	19.0	19.2	0.519	0.590	0.589
Vit. K at 100 ppm	2.50	2.45	2.35	2.13	2.16	2.17	19.0	18.8	19.0	0.615	0.614	0.613
Vit. E at 100 ppm	2.48	2.43	2.33	2.07	2.13	2.14	18.7	18.5	18.7	0.647	0.646	0.645
Vit. D at 100 ppm	2.36	2.31	2.21	2.01	2.07	2.08	18.5	18.3	18.5	0.669	0.668	0.667
Vit. A at 100 ppm	2.24	2.19	2.09	1.95	2.02	2.03	18.2	18.0	18.2	0.691	0.690	0.688
All vitamins	2.88	2.83	2.73	2.33	2.39	2.40	19.8	14.6	19.8	0.550	0.549	0.547
Amino acids at 100 ppm	3.00	2.95	2.85	2.40	2.43	2.44	20.0	19.8	19.8	0.530	0.529	0.527
Vit. C + Amino acid	3.66	3.60	3.50	2.66	2.69	2.70	21.0	20.8	20.8	0.400	0.400	0.399
Vit. B complex + Amino acids	3.50	3.45	3.35	2.65	2.68	2.69	20.9	20.7	20.7	0.420	0.419	0.418
Vit. K + Amino acids	3.48	3.43	3.33	2.64	2.67	2.68	20.8	20.6	20.7	0.450	0.449	0.448
Vit. E + Amino acids	3.36	3.30	3.20	2.58	2.61	2.62	20.6	20.4	20.5	0.417	0.470	0.469
Vit. D + Amino acids	3.24	3.19	3.09	2.52	2.55	2.56	20.4	20.2	20.4	0.490	0.489	0.488
Vit. A + amino acids	3.12	3.07	3.00	2.46	2.50	2.51	20.2	20.0	20.2	0.510	0.509	0.508
All vitamins + amino acids	3.77	3.70	3.60	2.72	2.76	2.76	21.3	2.14	21.5	0.380	0.379	0.378
New L.S.D. at 5%	0.11	0.12	0.11	0.06	0.07	0.06	0.2	0.2	0.2	0.019	0.020	0.019

Table (9) : Effect of single and combined applications of some vitamins and amino acids on some chemical of the berries of Superior grapevines during 2012 & 2013 & 2014 seasons.

Characters Vitamin and amino acid treatments	T,S,S/acid			Reducing sugars%			Nitrate in the juice(ppm)			Nitrite in the juice(ppm)		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Control	25.0	24.8	25.0	15.1	15.0	15.0	9.11	9.00	8.80	2.11	2.15	2.50
Vit. C at 500 ppm	34.2	33.9	34.3	16.9	17.0	17.3	7.30	7.19	7.00	1.51	1.50	1.50
Vit. B complex at 100 ppm	32.5	32.2	32.6	16.6	16.7	17.0	7.50	7.39	7.20	1.61	1.60	1.59
Vit. K at 100 ppm	30.9	30.6	31.0	16.3	16.4	16.7	7.80	7.69	7.45	1.71	1.70	1.69
Vit. E at 100 ppm	28.9	28.6	29.0	16.0	16.1	16.4	8.05	7.90	7.70	1.80	1.79	1.78
Vit. D at 100 ppm	27.7	27.4	27.7	15.7	15.8	16.2	8.60	8.49	8.29	2.00	1.98	1.97
Vit. A at 100 ppm	26.3	26.1	26.5	15.4	15.5	15.8	8.81	8.71	8.51	2.05	2.03	2.02
All vitamins	26.5	26.6	26.2	17.1	17.2	17.5	6.90	6.39	6.20	1.31	1.29	1.28
Amino acids at 100 ppm	37.7	37.4	37.6	17.4	17.5	17.8	6.11	6.00	5.80	1.20	1.18	1.17
Vit. C + Amino acid	52.5	52.0	61.4	18.2	18.3	18.6	3.05	2.90	2.71	0.66	0.65	0.64
Vit. B complex + Amino acids	49.8	49.4	49.5	18.1	18.2	18.5	3.92	3.80	3.60	0.70	0.69	0.68
Vit. K + Amino acids	46.2	45.9	46.2	18.0	18.1	18.4	4.11	4.00	3.80	0.80	0.79	0.78
Vit. E + Amino acids	43.7	43.4	43.7	17.8	18.0	18.3	4.81	4.71	4.51	0.90	0.88	0.87
Vit. D + Amino acids	41.6	41.3	41.8	17.6	17.7	18.0	5.11	5.00	4.81	1.00	0.98	0.97
Vit. A + amino acids	39.6	39.3	39.8	17.5	17.6	17.9	5.60	5.50	5.20	1.10	1.08	1.06
All vitamins + amino acids	56.0	56.5	56.9	18.8	18.9	19.2	2.51	2.41	2.09	0.60	0.58	0.55
New L.S.D. at 5%	1.0	0.9	1.0	0.3	0.3	0.3	0.10	0.10	0.11	0.06	0.07	0.06

4. Discussion

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

These results are in harmony with those obtained by Madian and Refaai (2011); Mekawy (2012), Mohamed – Entesam (2012); Ibrahim-Rehab(2012); Abdelaal (2012); Ahmed *et al.*, (2012a) and (2012b); Abdelaal and Aly (2013); Abada (2014); Abd El- Latief (2014); Abdelaal *et al.*, (2014) and Al- Wasfy (2014).

The promoting effect of amino acids on fruiting of Superior grapevines might be attributed to the favourable effects of these organic substances on enhancing the biosynthesis of proteins through polymerization of amino acids, ethylene, GA₃, plant pigments, and organic foods (Davies, 1982).

These results are in concordance with those obtained by Khattab – Magda and Shaban (2012); Abdelaal *et al.*, (2013); Gad El- Kareem and Abada (2014; Mohamed (2014); and El- Khawaga (2014).

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