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Promoting Berries Colouration, Yield and Quality of Flame Seedless Grapevines by Using Amino Acids Enriched With Different Nutrients

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Abstract

This study was carried out during 2015 and 2016 seasons to examine the effect of spraying amino acids enriched with N,P,K,Mg,Zn,Fe,Mn and B on overcoming irregular berries colouration problem and improving both yield and quality of the berries in grapevines cv. Flame seedless grown under Minia Governorate dimatic conditions. Spraying was done three times.

Treating the vines three times with various nutrients besides amino acids at 0.1% was very effective in enhancing growth, vine nutritional status, berries colouration, yield and quality of the berries over the check treatment. Treating the vines with all nutrients (N,P,K,Mg,Zn,Fe,Mn and B) plus amino acids was superior than using nutrients alone in this respect. Using amino acids was essential for enhancing the efficiency of using nutrients.

For promoting berries colouration, yield and quality of the berries in Flame seedless grapevines grown under Minia Governorate dimatic condition, it is necessary to use a mixture of NPKMgZnFeMnB and amino acids at 0.1%.

***Keywords**: Flame seedless grapevines, nutrients, amino acids, berries colouration, yield and berries quality.*

Introduction

Detection of compounds such as amino acids capable of enhancing the tolerance of plants to biotic and abiotic stresses is of great importance from practical point of view. Amino acids with their antioxidative properties play an important role in plant defense against oxidative stress induced by unfavourable conditions. They are responsible for enhancing protein and natural harmones biosynthesis and cell division (Waller and Nawaki, 1978 and Davis, 1985). Macro and micronutrients have important regulatory roles in building of proteins, amino acids, plant pigments enzymes, RNA, ADP, ATP, hormones, vitamins and antioxidants. They are responsible for stimulating the biosynthesis, and translocation of carbohydrates, cell division, regulating reduction, oxidation reaction and respiration process (Mengel *et al.*, 2001). Boron plays a special roles in building nucleic acid, proteins, natural hormones, photosynthesis and carbohydrates, translocation of sugars, cell division, pollen germination and water and nutrient uptake (Ahmad *et al.*, 2009).

Using amino acids (Amin, 2007; Ahmed *et al*, 2007; Abdel El-Kareem, 2009; Ahmed *et al.*, 2010 and Abdelaal, 2012) and different nutrients (Ahmed *et al.*, 2007; Abde El-Gaber Nermean, 2009; Abd El-Wahab, 2010; El-Kady Hanaa, 2011 and Ahmed *et al.*, 2012) was very effective in enhancing growth, yield and quality of the berries in different grapevine cvs.

Therefore, the idea of using amino acid enriched with N,P,K,Mg,Zn,Fe,Mn and B for solving the problem of berries colouration as well as improving both yield and quality.

The target of this study was elucidating the effect of amino acids enriched with different nutrients on enhancing berries colouration, yield and berries quality of Flame seedless grapevines grown under Minia region conditions.

Materials and Methods

This study was carried out during the two successive seasons of 2015 and 2016 on eighty- four 7-years old uniform in vigour Flame seedless grapevines grown on own roots in a private vineyard located at Samalout district, Minia Governorate where the soil texture is clay and well drained and water table is not less than two meters deep. Vines are spaced at 2 (between vine) X 3 meters (between rows) (700 vines per feddan). The selected vines (84 vines) were chosen as uniform in vigour as possible and devoted to achieve this study. The chosen vines were pruned during the first week of January in both seasons. Spur pruning system using cordon trellis supporting system was followed. Vine load for all the selected vines was adjusted to 72 vines (on the basis of 20 fruiting spurs x 3 eyes plus six replacement spurs x two eyes). Surface irrigation system was followed using Nile water (EC was 150 ppm).

Physical and chemical analysis of the tested soil at 0.0 – 90.0 cm depth were carried out at the start of the expriemnt according to the procedures of Wilde *et al.,* (1985).

Table 1. Analysis of the tested soil

Constituents	Values
Particle size distribution	
Sand %	10.7
Slit %	9.0
Clay %	80.3
Texture %	Clay
pH (1:2.5 extract)	7.5
E.C. (1 : 2.5 extract) ppm	210
O.M. %	2.0
$CaCO_3$ %	2.25
Total N%	0.10
Available P (Olsen method, ppm)	4.9
Available K (ammonium acetate, ppm)	488.5
EDTA extractable micronutrients (ppm):	
Fe	3.5
Mn	3.1
Zn	4.2
Cu	0.5

This experiment included the following fourteen treatments from single and combined applications of amino acids and N, P, K, Fe, Mn, Zn, B and Mg can be listed as follows:

1. Control (water spraying vines).

2. Spraying amino acids (tryptophan + methionene + cysteine) at 0.1%.
3. Spraying chelated-Zn, Fe and Mn each at 0.05%.
4. Spraying urea(N), orthophosphoric acid (P) and potassium sulphate (K) each at 0.5%.
5. Spraying chelated-Zn, Fe and Mn + urea + orthophosphoric acid + potassium sulphate each at 0.05%.
6. Spraying chelated-Zn, Fe and Mn each at 0.05% + urea + orthophosphoric acid + potassium sulphate each at 0.5% + boric acid at 0.05%.
7. Spraying chelated-Zn, Fe and Mn + urea + orthophosphoric acid + potassium sulphate each at 0.05% + magnesium sulphate at 0.5%.
8. Spraying all nutrients together.
9. Spraying chelated-Zn, Fe and Mn each at 0.05% + amino acids at 0.1%.
10. Spraying urea, orthophosphoric acid and potassium sulphate each at 0.5% + amino acids at 0.1% .
11. Spraying urea, orthophosphoric acid and potassium sulphate each at 0.5% + chelated-Zn, Fe and Mn each at 0.05% + amino acids at 0.1%.
12. Spraying urea, orthophosphoric acid and potassium sulphate + chelated-Zn, Fe and Mn each at 0.05% + boric acid at 0.05% + amino acids at 0.1%.
13. Spraying urea, orthophosphoric acid and potassium sulphate + chelated-Zn, Fe and Mn each at 0.05% + magnesium sulphate at 0.5% + amino acids at 0.1%.
14. Spraying all nutrients together + amino acids at 0.1%.

Therefore, this study involved fourteen treatments. Each treatment was replicated three times, two vines per each. All nutrients (N,P,K,Mg and B) and amino acids were sprayed three times during the two seasons the 1st spray at growth start when the mean lengths of main shoot reached at least 30cm (mid of March), the 2nd spray just after berry setting (2nd week of April) and the 3rd spray at one month (2nd of May). Tritan B as a wetting agent was applied at 0.05% to all nutrient solutions before spray. Control vines were sprayed with tap water containing Tritan B at 0.05%. Spraying was done till runoff (1-2 L vine solution according to date of spraying).

The present experiment was set up in a complete randomized block design (CRBD with three replicates each consisted from two Flame grapevines.

During both seasons, the following parameters were measured:

1- Main shoot length (cm.), and leaf area (cm^2) (Ahmed and Morsy, 1999).

2- Chlorophylls a&b & total chlorophylls (mg/100 g F.W.) (Von-Wettstein, 1957).

3- Leaf content of N, P, K and Mg (a s%) and Zn, Fe and Mn (as ppm) (Cottenie *et al*., 1982 and Balo *et al*., 1988).

4- Percentage of berry setting, yield weight (kg.)/vine and number of clusters /vine.

5- Weight, length, shoulder and compactness of cluster

6- Percentage of berries colouration.

7- Physical characteristics of the berries namely berry weight, longitudinal and equatorial of berry.

8- Chemical characteristics of the berries namely T.S.S. %; total acidity % (as g tartaric acid/100 juice, T.S.S. /acid , and reducing sugars% (A.O.A.C, 2000) and total anthocyanin (mg/100g F.W) (Fulcki and Fracis, 1968).

Statistical analysis was done and the new L.S.D. test at 5% was used to differentiate among the various treatment means (Snedecor and ohan, 1967 and Mead *et al.,* 1993).

Results and Discussion

1. Effect of spraying some amino acids, nutrient enriched with N,P,K,Mg,Zn,Fe,Mnand B on the main shoot length and leaf area:

It is clear from the obtained data in Table (2) that treating Flame seedless grapevines three times with the eight nutrients (N,P,K,Mg,Zn,Fe,Mn and B) at 0.05 % and/or amino acids at 0.1% significantly stimulated the main shoot length and leaf area relative to the check treatment. Spraying N+P+K, Zn + Fe + Mn, N + P + K + Zn + Fe + Mn, N + P +K + Zn + Fe + Mn + B, N + P + K + Zn + Fe + Mn + Mg and N + P + K + Zn + Fe + Mn + B + Mg significantly stimulated was superior than using amino acids alone at 0.1% in enhancing such two growth criteria. Using NPK was significantly superior than using Zn Fe Mn in this respect. Using Zn + Fe + Zn + N + P + K was preferable than using each group alone in this connection. Supplying the vines with Mg and/or B besides N,P,K,Mn,Zn and Fe significantly stimulated such two growth aspects comparing with using NPKZnFeMn alone. Using amino acids at 0.1% to all nutrients groups significantly enhanced main shoot length and leaf area relative to the application of nutrients alone. Using the eight nutrients (N,P,K,Mg,Zn,Fe, Mn and B) along with amino acid at 0.1% gave the maximum values of shoot length (120.9 & 123.0 cm) and leaf area (119.9 & 120.9 cm^2), during both seasons, respectively. The untreated vines produced the minimum values. These results were true during both seasons.

2. Effect of spraying some amino acids enriched with N,P,K, Mg,Zn,Fe,Mn and B on the leaf chemical components:

It is revealed from the obtained data in Tables (3 to 5) that application of nutrients and/or amino acids at 0.1% significantly improved chlorophylls a & b, total chlorophylls, N, P, K, Mg, Zn, Fe and Mn relative to the control treatment. Application the used macro and /or micro nutrients was significantly favourable than using amino acids at 0.1% in stimulating these chemical components. Using macro and micro nutrients together was significantly superior than using macro or micro nutrients alone in enhancing these chemical components. A significant promotion on these chemical constitutes was appeared due to using B and/or Mg with N,P,K,Zn,Fe and Mn. Adding amino acids at 0.1% to all solutions of nutrients significantly was responsible for maximizing these nutrients in the leaves than using solutions of nutrients alone (without amino acids). Using all nutrients (eight elements) besides amino acids at 0.1% gave the maximum values of chlorophyll a (5.8 & 6.3 mg/100g F.W), b (3.3 &

2.8 mg/ g F.W), total chlorophylls (9.1 & 9.1 mf/100g F.W), N% (2.37 & 2.25%), P% (0.33 & 0.39%), K% (1.64 & 1.59%), Mg% (0.74 & 0.82%), Zn (55.9 & 57.0 ppm), Mn (68 & 67.3 ppm) and Fe (68.9 & 68.9 ppm), during both seasons, respectively. The lowest values were recorded on the untreated vines. Similar results were announced during both seasons.

3. Effect of spraying some amino acids enriched with N,P,K, Mg,Zn,Fe,Mn and B on the percentage of berry setting, yield and cluster aspects:

It is obvious from the obtained data in Tables (5 & 6) that single and combined applications of the nutrients and amino acids at 0.1% caused significant promotion on the percentage of berry setting, yield expressed in weight (g) and number of clusters/ vine as well as weight, length, shoulder and compactness of cluster relative to the control treatment. Significant differences on these parameters were recorded among the thirteen treatments from nutrients and amino acids. Treating the vines with nutrients was significantly preferable than using amino acids alone in improving these parameters. Supplying the vines with Mg and/or N,P,K,Zn,Fe and Mn nutrition considerably were favourable than using N,P,K,Zn,Fe and Mn nutrition alone in improving berry setting %, yield and cluster aspects. An outstanding and significant promotion on these parameters was observed due to using amino acids with different nutrients comparing with using the nutrients alone (without amino acids). The maximum values of berry setting (25.9 & 25.9%), yield (10.3 & 13.7 kg), cluster weight (429.9 & 416.9), cluster length (21.1 & 20.9 cm), cluster shoulder (16.7 & 16.5 cm^2) and cluster compactness (12.3 & 12.4 cm) were observed on the vines received three sprays of a mixture of NPKZnFeMnMgB and amino acids at 0.1% during both seasons, respectively. The yield of untreated vines reached 7.8 kg during both seasons. The percentage of increment on the yield due to using the best treatment above the control treatment reached 32.1 & 75.6% during both seasons, respectively. Number of clusters/vine was unaffected with the present treatments in the first season of study. These results were true during both seasons.

4. Effect of spraying some amino acids enriched with N,P,K, Mg,Zn,Fe,Mn and B on the percentage of berries colouration:

It is clear from the obtained data in Table (6) that percentage of berries colouration was significantly varied among the fourteen nutrients and amino acid treatments. It was significantly enhanced with single and combined applications of macro and micronutrients and the addition of amino acids relative to the control treatment. Using macro and/or micronutrients was significantly preferable than using amino acids alone in increasing the percentages of berries colouration. Using macro and micronutrients along with Mg and/or B had significant promotion on the percentage of the berries colouration than using nutrients without Mg and B. The promotion on the berries colouration percentage was significantly enhanced when the application of nutrients was accompanied with using amino acids at 0.1%. The highest values of berries colouration was recorded on the vines that received three sprays of a mixture containing N,P,K,Zn,Fe,Mn,Mg and B and amino acids at 1%. Under such promised treatment values of berries colouration reached 88.6 & 88.7 % during both seasons, respectively. The lowest values (71.9 & 68.9%) were observed on the untreated vine during both seasons, respectively. The percentage of increment on the percentage of berries colouration due to using the best treatment (N,P,K,Zn, Fe,Mn,B and Mg + amino acids) over the check treatment reached 23.2 & 28.7% during 2015 and 2016 seasons, respectively. Similar trend was noticed during both seasons.

5. Effect of spraying some amino acids enriched with N,P,K, Mg,Zn,Fe,Mn and B on both physical and chemical characteristics of the berries:

It is clear from the obtained data in Tables (7 & 8) that varying amino acid and nutrients treatments had significant effect on the eight physical and chemical characteristics of the berries. Treating the vines three times with the eight nutrients (N,P,K,Zn, Fe,Mn,Mg and B) and/or amino acids at 0.1% caused significant promotion on quality of the berries expressed in increasing weight, longitudinal and equatorial of berry, T.S.S.%, reducing sugars%, T.S.S./acid and total anthocyanins and decreasing total acidity% over the check treatment. Generally speaking, using nutrients was favourable than using amino acids alone in enhancing quality of the berries and using all nutrients together was significantly favourable in this respect than using some nutrients alone. Using Mg and/or B with N,P,K,Zn,Fe and Mn mixture was significantly effective in promoting berries quality than using N,P,K,Zn,Fe and Mn mixture alone. Supplying the vines with amino acids at 0.1% besides the eight investigated nutrients significantly was superior the application of nutrients alone in this respect. Combined application of the eight macro and micro nutrients plus amino acids gave the best results with regard to physical and chemical characteristics. The highest values of berry weight (4.92 & 4.69), T.S.S.% (20.0 & 20.1%) and total anthocyanin (30.6 & 30.4 mg/100g F.W) and the lowest total acidity% (0.699 & 0.705%) were recorded on the grapes from vines that received all nutrients and amino acids together during 2015 and 2016 seasons, respectively. These results could explain the great impact of nutrients and amino acids on enhancing colouration of berries previously mentioned in Table (6). The remarkable promotion on total anthocyanins and total sugars gave good evidence for these effects.

Discussion

The previous positive action of amino acids on growth, nutritional status of the vines, yield as well as physical and chemical characteristics of the berries in Flame seedless grapevines might be attributed to the antioxidative aspects of these amino acids which plays an important role in plant defense against oxidative stresses induced by unfavourable conditions. Also, they are responsible for stimulating the biosynthesis of proteins, natural hormones like IAA, ethylene, cytokinins and GA_3, DNA, RNA, cell division, organic foods and plant pigments (Waller and Nowaki, 1978). These beneficial effects surely reflected on producing healthy vines.

The present positive effects of amino acids on growth aspects, nutritional status of the vines, yield and fruit quality of Flame seedless grapevines are in agreement with those obtained by Amin*,* (2007).

The beneficial effects of N, P, K, Mg, Zn, Fe, Mn and B on growth characters, nutritional status of the vines , yield and fruit quality might be ascribed to their essential roles in building proteins, amino acids, vitamins, natural hormones, organic foods, organic acid, various enzymes and plant cells. Their positive action on enhancing cell division and the tolerance of the vines to all unfavourable stress could add another explanation. The beneficial of Zn in controlling water absorption and strengthening cell water as well as boron in enhancing plant metabolism and the biosynthesis of IAA and carbohydrates as well as the transportation of sugars and pollen germination could gave an addition explanation (Mengel *et al*., 2001 and Ahmed *et al*., 2009).

These results regarding the effect of different nutrients on growth, nutritional status of the vines, yield and fruit quality are in harmony with those obtained by Ahmed et al*,* (2007) and Farahat (2017) on Early sweet grapevines.

Conclusion

Treating Flame seedless grapevines three times at growth start, just after fruit setting and at one month later with a mixture of urea, phosphoric acid whereas the 1st spray, potassium sulphate the 2nd spray and magnesium sulphate the 3rd spray at 0.5% per each and chelated zinc, iron, manganese and boric acid each at 0.05% plus amino acids each at 0.1% gave the best results with regard to improving yield, berries colouration and quality of the berries.

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Table 2. Effect of some amino acids enriched with nutrients treatments on the main shoot length, leaf area as well as chlorophylls a & b in the leaves of Flame seedless grapevines during 2015 and 2016 seasons

Amino acid and nutrient treatments	Main shoot length (cm)		Leaf area $(cm)^2$		Chlorophyll a (mg/100g F.W)		Chlorophyll b (mg/100g F.W)	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	111.0	110.9	109.0	110.1	4.1	3.8	1.4	1.1
Amino acids (A)	112.5	113.2	110.1	111.2	4.4	4.5	1.6	1.3
Zn Fe Mn	114.0	114.7	111.2	112.2	4.5	4.7	1.9	1.6
N P K	115.1	115.8	112.3	113.3	4.6	4.9	2.1	1.9
N P K Zn Fe Mn	116.2	117.3	113.4	114.5	4.9	5.1	2.3	2.1
N P K Zn Fe Mn + Boron	117.1	118.4	114.5	115.6	5.2	5.4	2.5	2.3
N P K Zn Fe Mn + Mg	118.3	119.9	115.6	116.7	5.5	5.7	2.7	2.5
N P K Zn Fe Mn + Boron +Mg	119.4	120.9	116.9	118.0	5.6	6.0	3.0	2.6
Zn Fe Mn + Amino acids	115.1	116.3	113.4	113.3	4.6	5.0	2.1	1.9
N P K + amino acids	116.2	118.0	114.5	114.6	4.9	5.2	2.3	2.1
N P K Zn Fe Mn + Amino acids	117.3	119.1	115.6	115.7	5.2	5.4	2.5	2.3
N P K Zn Fe Mn + Boron+ Amino acids	118.4	120.3	116.9	116.9	5.5	5.6	2.7	2.5
N P K Zn Fe Mn + Mg + Amino acids	119.5	121.9	118.0	118.9	5.5	5.9	3.0	2.6
N P K Zn Fe Mn+Mg+Boron+Amino acids	120.9	123.0	119.9	120.9	5.8	6.3	3.3	2.8
New L.S.D at 5%	**1.0**	**1.2**	**0.9**	**1.0**	**0.2**	**0.3**	**0.3**	**0.2**

Table 3. Effect of some amino acids enriched with nutrients treatments on the leaf total chlorophylls as well as percentages of N, P and K in the leaves of Flame seedless grapevines during 2015 and 2016 seasons

Amino acid and nutrient treatments	Total chloro-phylls (mg/100g F.W)		Leaf N %		Leaf P%		Leaf K%	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	5.5	4.9	1.79	1.67	0.16	0.17	1.11	1.09
Amino acids (A)	6.0	5.8	1.86	1.73	0.17	0.19	1.16	1.17
Zn Fe Mn	6.4	6.3	1.93	1.80	0.18	0.21	1.21	1.22
N P K	6.7	6.8	2.00	1.86	0.20	0.23	1.27	1.27
N P K Zn Fe Mn	7.2	7.2	2.07	1.92	0.22	0.25	1.33	1.33
N P K Zn Fe Mn + Boron	7.7	7.7	2.14	2.01	0.25	0.27	1.41	1.39
N P K Zn Fe Mn + Mg	8.2	8.2	2.21	2.11	0.27	0.29	1.52	1.47
N P K Zn Fe Mn + Boron +Mg	8.6	8.6	2.29	2.18	0.29	0.32	1.57	1.55
Zn Fe Mn + Amino acids	6.7	6.9	2.00	1.86	0.22	0.25	1.27	1.27
N P K + amino acids	7.2	7.3	2.07	1.92	0.25	0.27	1.33	1.33
N P K Zn Fe Mn + Amino acids	7.7	7.7	2.14	2.01	0.27	0.32	1.41	1.39
N P K Zn Fe Mn + Boron+ Amino acids	8.2	8.1	2.21	2.11	0.29	0.36	1.52	1.47
N P K Zn Fe Mn + Mg + Amino acids	8.5	8.5	2.29	2.18	0.31	0.37	1.59	1.55
N P K Zn Fe Mn + Mg + Boron + Amino acids	9.1	9.1	2.37	2.25	0.33	0.39	1.64	1.59
New L.S.D at 5%	**0.2**	**0.3**	**0.06**	**0.05**	**0.02**	**0.03**	**0.04**	**0.05**

Table 4. Effect of some amino acids enriched with nutrients treatments on the leaf content of Mg (as %) and Zn, Mn and Fe (as ppm) of Flame seedless grapevines during 2015 and 2016 seasons

Amino acid and nutrient treatments	Leaf Mg %		Leaf content of Zn (ppm)		Leaf content of Mn (ppm)		Leaf content of Fe (ppm)	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	0.49	0.46	41.1	39.9	47.3	46.7	50.0	49.1
Amino acids (A)	0.52	0.51	43.0	41.4	50.0	49.1	52.1	52.0
Zn Fe Mn	0.55	0.55	44.9	43.5	53.0	52.2	55.0	54.9
N P K	0.59	0.61	47.0	46.0	55.9	55.0	56.9	56.8
N P K Zn Fe Mn	0.63	0.66	48.9	48.5	58.0	57.0	59.9	60.0
N P K Zn Fe Mn + Boron	0.64	0.71	50.1	50.5	60.0	59.0	61.1	61.0
N P K Zn Fe Mn + Mg	0.67	0.74	51.9	52.5	62.0	61.9	63.0	62.9
N P K Zn Fe Mn + Boron +Mg	0.70	0.79	53.0	54.6	64.0	63.9	64.9	65.0
Zn Fe Mn + Amino acids	0.59	0.61	43.0	46.0	56.0	55.0	57.0	57.0
N P K + amino acids	0.63	0.66	45.0	48.6	58.0	57.0	60.0	59.9
N P K Zn Fe Mn + Amino acids	0.64	0.71	57.1	50.6	60.0	59.0	61.3	61.4
N P K Zn Fe Mn + Boron+ Amino acids	0.67	0.74	59.2	52.5	62.0	62.1	63.0	62.9
N P K Zn Fe Mn + Mg + Amino acids	0.70	0.79	52.9	54.7	64.9	64.0	66.0	65.9
N P K Zn Fe Mn + Mg + Boron + Amino acids	0.74	0.82	55.9	57.0	68.0	67.3	68.9	68.9
New L.S.D at 5%	**0.02**	**0.03**	**1.9**	**2.0**	**2.1**	**2.0**	**1.8**	**1.6**

Table 5. Effect of some amino acids enriched with nutrients treatments on the percentage of berry setting, yield and average cluster weight of Flame seedless grapevines during 2015 and 2016 seasons

Amino acid and nutrient treatments	Berry setting %		No. of clusters/vine		Av. Cluster weight		Yield/vine (kg.)	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	13.0	11.9	23.0	23.0	341.0	339.0	7.8	7.8
Amino acids (A)	14.2	13.5	23.0	24.0	351.0	350.7	8.1	8.4
Zn Fe Mn	15.6	14.9	23.0	25.0	361.9	361.2	8.3	9.1
N P K	16.9	11.2	24.0	26.0	371.7	369.9	8.9	9.6
N P K Zn Fe Mn	17.9	17.2	24.0	26.0	382.2	382.5	9.2	9.9
N P K Zn Fe Mn + Boron	20.1	19.4	24.0	26.0	395.0	394.7	9.5	10.3
N P K Zn Fe Mn + Mg	21.9	21.2	24.0	27.0	404.9	404.7	9.7	10.9
N P K Zn Fe Mn + Boron +Mg	24.0	23.3	24.0	30.0	416.0	415.9	10.0	12.5
Zn Fe Mn + Amino acids	17.0	16.3	24.0	27.0	372.0	372.0	8.9	10.0
N P K + amino acids	18.0	17.3	24.0	28.0	384.0	383.9	9.2	10.7
N P K Zn Fe Mn + Amino acids	20.1	19.4	24.0	30.0	379.0	396.9	9.5	11.9
N P K Zn Fe Mn + Boron+ Amino acids	22.0	21.3	24.0	32.0	405.0	404.9	9.5	12.9
N P K Zn Fe Mn + Mg + Amino acids	24.0	23.3	24.0	32.0	417.0	416.9	10.0	13.3
N P K Zn Fe Mn + Mg + Boron + Amino acids	25.9	25.9	24.0	33.0	429.9	416.0	10.3	13.7
New L.S.D at 5%	**1.2**	**1.5**	**NS**	**1.0**	**10.0**	**9.7**	**0.2**	**0.3**

Table 6. Effect of some amino acids enriched with nutrients treatments on the length, width and compactness of cluster and percentage of colouration of Flame seedless grapevines during 2015 and 2016 seasons

Amino acid and nutrient treatments	Cluster length (cm)		Cluster Width (cm)		Cluster compactness		Colouration %	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	15.0	14.9	10.9	10.0	8.7	8.0	71.9	68.9
Amino acids (A)	15.5	15.7	11.3	10.4	9.2	8.6	73.9	74.0
Zn Fe Mn	16.0	16.1	11.9	11.3	9.8	9.3	75.6	75.7
N P K	16.6	16.9	12.9	12.0	10.2	9.6	77.0	77.1
N P K Zn Fe Mn	17.3	17.8	13.5	12.7	10.3	9.7	79.0	79.1
N P K Zn Fe Mn + Boron	18.1	18.4	14.0	13.7	11.1	10.5	81.0	80.9
N P K Zn Fe Mn + Mg	18.7	19.0	14.5	14.3	11.7	11.2	83.0	82.9
N P K Zn Fe Mn + Boron +Mg	19.9	19.7	15.0	15.0	12.1	11.8	85.0	85.1
Zn Fe Mn + Amino acids	17.0	16.9	13.0	12.0	10.0	9.6	79.0	79.0
N P K + amino acids	18.1	18.0	14.0	12.7	9.9	9.6	81.5	81.6
N P K Zn Fe Mn + Amino acids	19.3	18.5	14.9	13.7	10.4	10.5	83.0	82.9
N P K Zn Fe Mn + Boron+ Amino acids	20.6	19.0	15.6	14.3	10.7	11.2	84.9	85.0
N P K Zn Fe Mn + Mg + Amino acids	21.9	20.0	16.3	15.1	11.0	11.7	87.0	87.1
N P K Zn Fe Mn + Mg + Boron + Amino acids	21.1	20.9	16.7	16.5	12.3	12.4	88.6	88.7
New L.S.D at 5%	0.3	0.4	0.2	0.3	0.3	0.4	1.4	1.3

Table 7. Effect of some amino acids enriched with nutrients treatments on weight, longitudinal and equatorial of berry as well as percentages of total soluble solids in the grapes of Flame seedless grapevines during 2015 and 2016 seasons

Amino acid and nutrient treatments	Berry weight (g.)		Berry length (cm)		Berry diameter (cm)		T.S.S. %	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	3.99	4.00	1.52	1.50	1.22	1.20	17.5	17.3
Amino acids (A)	4.11	4.15	1.56	1.55	1.25	1.24	17.8	17.9
Zn Fe Mn	4.18	4.22	1.61	1.59	1.29	1.28	18.0	17.9
N P K	4.31	4.34	1.65	1.63	1.32	1.33	18.3	18.2
N P K Zn Fe Mn	4.50	4.55	1.71	1.69	1.36	1.38	18.5	18.6
N P K Zn Fe Mn + Boron	4.61	4.66	1.76	1.74	1.40	1.42	18.7	18.8
N P K Zn Fe Mn + Mg	4.71	4.75	1.80	1.80	1.43	1.45	19.0	19.1
N P K Zn Fe Mn + Boron +Mg	4.80	4.84	1.83	1.81	1.46	1.48	19.5	19.6
Zn Fe Mn + Amino acids	4.33	4.87	1.66	1.65	1.32	1.33	18.5	18.4
N P K + amino acids	4.51	4.55	1.72	1.71	1.36	1.38	18.7	18.8
N P K Zn Fe Mn + Amino acids	4.62	4.66	1.78	1.79	1.41	1.42	19.0	19.1
N P K Zn Fe Mn + Boron+ Amino acids	4.73	4.74	1.80	1.81	1.44	1.45	19.3	19.5
N P K Zn Fe Mn + Mg + Amino acids	4.81	4.85	1.84	1.84	1.46	1.49	19.6	19.7
N P K Zn Fe Mn + Mg + Boron + Amino acids	4.92	4.96	1.87	1.88	1.50	1.51	20.0	20.1
New L.S.D at 5%	0.06	0.07	0.02	0.03	0.02	0.03	0.2	0.3

Table 8. Effect of some amino acids enriched with nutrients treatments on the percentage of total acidity, T.S.S./acid and percentage of reducing sugars and berries content of total anthocyanins in the grapes of Flame seedless grapevines during 2015 and 2016 seasons

Amino acid and nutrient treatments	Total acidity %		T.S.S/ acid		Reducing sugars %		Total anthocyanins (mg/100 g F.W)	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	0.874	0.864	20.0	20.0	15.6	15.8	25.0	24.7
Amino acids (A)	0.853	0.844	20.9	21.2	16.0	16.3	25.4	25.3
Zn Fe Mn	0.830	0.820	21.7	21.8	16.3	16.7	26.0	26.1
N P K	0.809	0.801	22.6	22.7	16.7	17.1	26.5	26.7
N P K Zn Fe Mn	0.781	0.781	23.7	23.8	17.1	17.5	27.0	27.4
N P K Zn Fe Mn + Boron	0.761	0.759	24.6	24.8	17.6	18.0	27.6	28.0
N P K Zn Fe Mn + Mg	0.739	0.736	25.7	26.0	18.0	18.3	28.1	28.6
N P K Zn Fe Mn + Boron +Mg	0.711	0.716	27.4	27.4	18.3	18.7	28.8	29.4
Zn Fe Mn + Amino acids	0.808	0.800	22.9	23.0	16.8	17.2	26.6	26.8
N P K + amino acids	0.780	0.771	24.0	24.4	17.2	17.7	27.4	27.3
N P K Zn Fe Mn + Amino acids	0.758	0.750	25.1	25.5	17.6	18.3	28.3	28.2
N P K Zn Fe Mn + Boron+ Amino acids	0.738	0.730	26.2	26.7	18.0	18.7	28.8	29.0
N P K Zn Fe Mn + Mg + Amino acids	0.717	0.723	27.3	27.2	18.4	19.0	29.4	29.6
N P K Zn Fe Mn + Mg + Boron + Amino acids	0.699	0.705	28.6	28.5	18.8	19.3	30.6	30.4
New L.S.D at 5%	**0.017**	**0.016**	**0.9**	**1.0**	**0.2**	**0.3**	**0.3**	**0.4**

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تحسين تلوين الحبات وكمية المحصول وخصائص الجودة فى كرمات العنب الفليم سيدلس باستخدام الأحماض الأمينية المزودة بالعناصر الغذائية المختلفة

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الملخص

أجريت هذه الدراسة خلال موسمي ٢٠١٥ و ٢٠١٦ لاختبار تأثير رش الأحماض الأمينية المزودة ببعض العناصر الغذائية مثل النيتروجين والفوسفور والبوتاسيوم والماغنسيوم والزنك والحديد والمنجنيز والبورون فى حل مشكلة عدم انتظام تلوين حبات العنب وتحسين كمية المحصول وجودة الحبات فى كرمات العنب صنف الفليم سيدلس النامية تحت ظروف منطقة المنيا ولقد تم رش الكرمات ثلاث مرات بهذه المواد.

أوضحت نتائج هذه التجربة أن معاملة الكرمات ثلاث مرات بهذه العناصر الغذائية جنبا الي جنب مع الأحماض الأمينية بتركيز ٠,١% كان فعالا جدا فى تحسين النمو والحالة الغذائية للكرمات وتلوين الحبات وكمية المحصول وخصائص الجودة للحبات وذلك بالمقارنة بمعاملة الكونترول وكان معاملة الكرمات بجميع العناصر الغذائية والأحماض الأمينية متفوقا عن رش العناصر الغذائية فقط فى هذا الصدد وكان استخدام الأحماض الأمينية ضروريا لتحسين كفاءة استخدام العناصر الغذائية.

لأجل تحسين تلوين الحبات وكمية المحصول وخصائص الجودة للحبات فى كرمات العنب الفليم سيدلس النامية تحت ظروف منطقة المنيا فانه يكون من الضرورى استخدام مخلوط يتكون من عناصر النيتروجين والفوسفور والبوتاسيوم والماغنسيوم والزنك والمنجنيز والحديد والبورون مع الأحماض الأمينية بتركيز ٠,١%.

الكلمات الدالة: كرمات العنب الفليم سيدلس– العناصر الغذائية – الأحماض الأمينية – تلوين الحبات – كمية المحصول – خصائص الجودة للحبات.