

RESPONSE OF “SUPERIOR” GRAPEVINES TO SPRAYING OF TWO AMINO ACID SOURCES

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ABSTRACT

This study was undertaken during 2015 and 2016 seasons to throw some lights on the effect of two amino acid sources namely “Vegetamine” (24.8% free amino acids + 5.5 % N) and Amino green (15% amino acids + 2.9% Fe, 1.4% Zn and 0.7% Mn) each at 0.05 to 0.4% on some growth aspects, vine nutritional status, berry setting %, yield and berries quality of “Superior” grapevines.

Treating the vines three times with “Vegetamine” each at 0.05 to 0.4% caused an appreciable promotion on some growth aspects, leaf pigments and nutrients, berry setting %, yield and berries quality over the check treatment. A gradual promotion on the investigated parameters was observed with increasing concentrations of each source of amino acids. All the studied characteristics were unaffected with increasing concentrations from 0.2 to 0.4%. Using Amino green source was materially superior than using the other source of amino acids namely “Vegetamine” in improving growth, vine nutritional status, yield and berries quality.

Accordingly, treating “Superior” grapevines three times with amino acids in the source of Amino green at 0.2% gave the best results with regard to yield and berries quality.

Keywords: Amino acids, “Vegetamine”, Amino green, berries quality, “Superior” grapevines.

INTRODUCTION

Recently, antioxidants such as amino acids are promising for improving yield and berries quality in different grapevine cvs. Amino acids with their antioxidative properties play an important role in plant defense against oxidative stress induced by unfavourable conditions. Application of amino acids was accompanied with enhancing proteins biosynthesis as well as protecting plant cells from senescence and death, preventing the free radicals from oxidation of lipids the components of plasma membrane which is accompanied with the loss of permeability and controlling the incidence of disorders (Orth *et al*, 1993). They are responsible for stimulating the biosynthesis of natural hormones like, IAA , ethylene , cytokinins and GA₃, cell

division, organic foods, enzymes as well as DNA and RNA. These positive effects surely reflected on producing healthy trees (**Vianello and Marci, 1991 and Elade, 1992**).

Davies (1982) emphasized the beneficial effects of using amino acids on counteracting the adverse effects of biotic and abiotic stresses on fruiting of fruit crops.

Previous studies showed that supplying fruit crop species with amino acids had an obvious promotion on growth, yield and fruit quality (**Ahmed and Abd El-Hameed, 2003; Ahmed *et al.*, 2007; Amin, 2007; Seleem-Basma and Abd El-Hameed, 2008; Sayed-Heba, 2010; Ahmed *et al.*, 2011 and Mohamed, 2014**).

The goal of this study was examining the effect of “Vegetamine” (24.8% free amino acids + 5.5 % N) and Amino green (15% amino acids + 2.9% Fe, 1.4% Zn and 0.7% Mn) as sources as amino acids on growth and fruiting of “Superior” grapevines.

MATERIAL AND METHODS

This study was carried out during two consecutive seasons of 2015 and 2016 on fifty- four uniform in vigour 9-years old “Superior” grapevines grown in a private vineyard located at El-Hawarta Village, Minia district, Minia Governorate where the soil texture is clay (Table, 1) and well drained water, since water table depth is not less than two meters. The chosen vines are planted at 2 x 3 meters apart. Cane pruning system was followed at the first week of Jan. leaving 84 eyes per vine (on the basis of six fruiting canes x 12 eyes plus six renewal spurs x two eyes) with the assistance of Gable shape supporting system. The vines were irrigated through surface irrigation system using Nile water.

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Table (1): Analysis of the tested soil

Constituents	Values
Particle size distribution	
Sand %	5.5
Slit %	27.6
Clay %	66.9
Texture %	Clay
pH (1:2.5 extract)	7.7
O.M. %	2.50
CaCO ₃ %	1.92
Total N%	0.10
Available P (Olsen method, ppm)	6.3
Available K (ammonium acetate, ppm)	490
EDTA extractable micronutrients (ppm):	
Zn	2.2
Fe	2.4
Mn	2.5

This study included the following nine treatments from two sources of amino acids “Vegetamine” (24.8% free amino acids + 5.5 % N) and “Amino green” (15% amino acids + 2.9% Fe, 1.4% Zn and 0.7% Mn):

1. Control (sprayed with water vines).
2. Spraying “Vegetamine” at 0.05% (0.5 g/l).
3. Spraying “Vegetamine” at 0.1% (1.0 g/l).
4. Spraying “Vegetamine” at 0.2% (2.0 g/l).
5. Spraying “Vegetamine” at 0.4% (4.0 g/l).
6. Spraying “Amino green” at 0.05% (0.5 g/l).
7. Spraying “Amino green” at 0.1% (1.0 g/l).
8. Spraying “Amino green” at 0.2% (2.0 g/l).
9. Spraying “Amino green” at 0.4% (4.0 g/l).

Each treatment was replicated three times, two vines/each. Both sources of amino acids namely “Vegetamine” (24.8% free amino acids + 5.5 % N) and “Amino green” (15% amino acids + 2.9% Fe, 1.4% Zn and 0.7% Mn) were sprayed three times at growth start (1st week of Mar.), just after berry setting (2nd week of Apr.) and at three weeks later (1st week of May). Triton B as a wetting agent was added at 0.05%. Spraying was done till runoff. Randomized complete block design (RCBD) was followed:

During both seasons, the following measurements were recorded:

1. Growth aspects namely main shoot length (cm), number of leaves/shoot, leaf area (cm)² (**Ahmed and Morsy, 1999**) and pruning wood weight/vine (kg.), wood ripening coefficient (**Bouard, 1966**) and cane thickness (cm)..
2. Leaf chemical components namely chlorophylls a, b, total carotenoids (mg/100 g F.W) (**Hiscox and Isralstam, 1979**), N, P and K (**Wilde et al. 1985 and Summer,, 1985**).
3. Yield expressed in weight and number of clusters/vine as well as cluster weight and dimensions (length and shoulder).
4. Percentages of shot berries.
5. Physical and chemical characteristics of the berries namely weight, longitudinal and equatorial, T.S.S., total acidity% and reducing sugars% (**Lane and Eynon, 1965 and A.O.A.C, 2000**).

Statistical analysis was done and treatment means were compared using new L.S.D. at 5% (according to **Mead et al., 1993 and Rao, 2007**).

RESULTS AND DISCUSSION

1- Vegetative growth characteristics:

Data in Table (2) clearly show that treating “Superior” grapevines three times with any one of the two sources of amino acids namely “Vegetamine” and “Amino green” each at 0.05 to 0.4% significantly stimulated the six growth aspects namely main shoot length, number of leaves/shoot, leaf area, wood ripening coefficient, cane thickness and pruning weight compared to the control treatment. Using “Amino green” as a source of amino acids was significantly superior than using the other amino acids source namely “Vegetamine” in enhancing these growth traits. The promotion on these growth aspects was associated with increasing concentrations of “Vegetamine” and “Amino green” from 0.05 to 0.4%. Increasing concentrations from 0.2 to 0.4% failed to show significant promotion on these growth traits. The maximum values were recorded on the vines that supplied with “Amino green” at 0.4%. The lowest values were recorded on untreated vines. These results were true during both seasons.

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Table (2): Effect of spraying two amino acid sources on some vegetative growth characteristics of “Superior” grapevines during 2015 and 2016 seasons.

Amino acid treatments	Main shoot length (cm)		No. of leaves/shoot		Leaf area (cm) ²		Wood ripening coefficient		Cane thickness (cm)		Pruning wood weight (kg./vine)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	101.3	101.0	13.0	14.0	99.9	101.0	0.69	0.70	1.16	1.14	1.25	1.19
Vegetamine at 0.05 %	103.3	104.0	15.0	16.0	101.8	102.8	0.74	0.74	1.22	1.19	1.35	1.29
Vegetamine at 0.1 %	108.0	108.8	17.0	18.0	104.0	103.9	0.80	0.78	1.30	1.24	1.46	1.39
Vegetamine at 0.2 %	111.3	112.1	19.0	20.0	106.0	105.9	0.86	0.82	1.36	1.30	1.56	1.50
Vegetamine at 0.4 %	111.6	112.2	20.0	21.0	106.6	106.0	0.87	0.82	1.37	1.31	1.57	1.51
Amino green at 0.05 %	113.0	113.7	21.0	23.0	107.9	107.9	0.91	0.86	1.41	1.36	1.67	1.62
Amino green at 0.1 %	114.6	115.3	23.0	25.0	110.0	110.1	0.95	0.91	1.46	1.41	1.78	1.73
Amino green at 0.2 %	116.0	116.7	25.0	27.0	112.6	112.8	0.96	0.95	1.52	1.46	1.88	1.83
Amino green at 0.4 %	116.3	117.0	26.0	28.0	113.0	113.0	0.96	0.96	1.53	1.47	1.89	1.84
New L.S.D at 5%	1.2	1.4	2.0	2.0	1.2	1.4	0.04	0.03	0.05	0.04	0.10	0.11

2- Leaf chemical components:

Data in Table (3) clearly reveal that chlorophylls a & b, total carotenoids, N, P, K and Mg in the leaves were significantly increased as a result of using the two sources of amino acids namely “Vegetamine” and “Amino green” each at 0.05 to 0.4% over the check treatment. There was a gradual stimulation on these chemical constituents with increasing concentrations of both sources of amino acids. Significant differences on these pigments and nutrients were observed among most concentrations except among the higher two concentrations namely 0.2 and 0.4%. Using “Amino green” significantly surpassed the application of “Vegetamine” in this respect. The maximum values were recorded on the vines that foliar fertilized with “Amino green” at 0.4%. Untreating the vines with these sources of amino acids gave the lowest values. These results are nearly the same during the two seasons.

Table (3): Effect of spraying two amino acid sources on the leaf chemical components of “Superior” grapevines during 2015 and 2016 seasons.

Amino acid treatments	Chlorophyll a (mg/100g F.W)		Chlorophyll b (mg/100g F.W)		Total carotenoids (mg/100g F.W)		Leaf N %		Leaf P %		Leaf K %		Leaf Mg %	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	3.1	3.0	1.3	1.3	1.0	1.0	1.59	1.55	0.11	0.10	1.09	1.10	0.56	0.51
Vegetamine at 0.05 %	3.6	3.5	1.6	1.7	1.2	1.3	1.66	1.62	0.13	0.13	1.14	1.13	0.59	0.54
Vegetamine at 0.1 %	4.1	4.0	2.0	2.1	1.4	1.7	1.71	1.70	0.16	0.16	1.18	1.14	0.62	0.58
Vegetamine at 0.2 %	4.7	4.5	2.3	2.4	1.6	2.0	1.76	1.76	0.18	0.19	1.22	1.18	0.66	0.62
Vegetamine at 0.4 %	4.8	4.6	2.4	2.4	1.7	2.1	1.77	1.82	0.19	0.20	1.23	1.19	0.67	0.63
Amino green at 0.05 %	5.3	5.1	2.7	2.6	2.0	2.4	1.81	1.86	0.22	0.23	1.28	1.23	0.72	0.67
Amino green at 0.1 %	5.7	5.6	3.0	3.1	2.3	2.7	1.86	1.92	0.25	0.26	1.32	1.27	0.75	0.71
Amino green at 0.2 %	6.1	6.2	3.3	3.3	2.6	3.0	1.91	1.98	0.28	0.29	1.36	1.30	0.78	0.75
Amino green at 0.4 %	6.2	6.3	3.4	3.3	2.7	3.3	1.92	1.99	0.29	0.30	1.37	1.31	0.79	0.76
New L.S.D at 5%	0.4	0.4	0.3	0.2	0.2	0.3	0.05	0.06	0.02	0.03	0.04	0.03	0.02	0.03

3- Percentage of berry setting, yield and cluster aspects:

Table (4) shows that supplying “Superior” grapevines three times with “Vegetamine” or “Amino green” each at 0.05 to 0.4% had significant promotion on the percentage of berry setting, yield expressed in weight and number of clusters/vine and weight and dimensions of cluster over the control. The promotion on these parameters was in proportional to the increase in the concentrations of both sources of amino acids. Using “Amino green” source of amino acids was significant favourable than using “Vegetamine” each at 0.05 to 0.4% in improving berry setting, yield and cluster aspects. These parameters were significantly unaffected with increasing concentrations of both sources of amino acids from 0.2 to 0.4%. Therefore, from economical point of view, the best treatment was the application of “Amino green” as a source of amino acids at 0.2% three times. Under such promised treatment, the yield per vine reached 10.0 and 14.5 kg while the yield of untreated vines reached 7.9 & 7.8 kg during both seasons, respectively. The percentage of increment on the yield due to using the previous promised treatment over the control treatment reached 26.6 and 85.9% during 2015 and 2016 seasons, respectively. The number of clusters per vine in the first season of study was significantly unaffected by the present treatments.

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Table (4): Effect of spraying two amino acid sources on berry setting %, yield and some physical characteristics of clusters of “Superior” grapevines during 2015 and 2016 seasons.

Amino acid treatments	Berry setting %		No. of clusters/vine		Yield/vine (kg.)		Cluster weight (g.)		Cluster length (cm)		Cluster width (cm)		Shot berries %	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	9.9	9.7	22.0	22.0	7.9	7.8	360.0	355.0	18.9	19.0	9.9	9.6	12.9	13.0
Vegetamine at 0.05 %	11.2	11.0	23.0	24.0	8.6	8.8	372.0	367.0	20.0	20.2	10.5	10.1	11.7	11.7
Vegetamine at 0.1 %	12.3	12.1	23.0	26.0	8.9	9.9	385.0	379.0	21.1	21.3	11.2	10.7	10.5	10.2
Vegetamine at 0.2 %	14.4	14.2	23.0	28.0	9.1	10.9	397.0	390.0	22.2	22.4	12.0	11.8	9.3	8.9
Vegetamine at 0.4 %	14.5	14.3	23.0	28.0	9.1	10.9	397.3	391.0	23.1	22.5	12.1	11.9	9.2	8.8
Amino green at 0.05 %	16.0	15.9	23.0	30.0	9.4	12.1	410.0	403.0	23.2	23.6	12.8	12.4	8.0	7.4
Amino green at 0.1 %	17.0	17.0	23.0	32.0	9.7	13.2	422.0	414.0	24.3	24.7	13.4	13.0	6.8	6.0
Amino green at 0.2 %	18.1	18.0	23.0	34.0	10.0	14.5	435.0	425.0	25.4	25.8	14.0	13.6	5.6	4.7
Amino green at 0.4 %	18.2	18.1	23.0	34.0	10.0	14.5	435.0	426.0	25.5	25.9	14.1	13.7	5.5	4.4
New L.S.D at 5%	1.0	0.9	NS	2.0	0.3	0.5	11.1	10.9	0.9	1.1	0.6	0.5	1.1	1.3

4- Percentage of shot berries:

It is obvious from the data in Table (4) that subjecting “Superior” grapevines three times with “Vegetamine” or “Amino green” each at 0.05 to 0.4% significantly reduced the percentage of shot berries compared to the control. The reduction was related to the increase in concentrations of such two sources of amino acids. Percentage of shot berries was significantly unaffected by increasing concentrations from 0.2 to 0.4%. Using “Amino green” was significantly favourable than using “Vegetamine” in reducing shot berries. The minimum values of shot berries (5.5 and 4.4%) were recorded on the vines that percentage subjected with “Amino green” at 0.4%. The untreated vines produced the maximum values of shot berries (12.9 & 13.0%) during both seasons, respectively. Similar trend was noticed during both seasons.

5- Physical and chemical characteristics:

It can be stated from the data in Table (5) that treating the vines with “Vegetamine” or “Amino green” each at 0.05 to 0.4% significantly improved both physical and chemical characteristics of the berries in terms of increasing berry weight and dimensions (longitudinal and equatorial), T.S.S.% and total sugars% and decreasing total acidity% relative to the control treatment. The promotion on berries quality was associated with increasing concentrations of each amino acids source. Increasing concentrations from 0.2 to 0.4% had meaningless promotion on quality of the berries. Using “Amino green” was significantly preferable than using “Vegetamine” in this respect. From economical point of view, the best results with regard to berries quality were obtained due to treating the vines three times with “Amino green” at 0.2%. Similar trend was noticed during 2015 and 2016 seasons.

Table (5): Effect of spraying two amino acid sources on some physical and chemical characteristics of the berries of “Superior” grapevines during 2015 and 2016 seasons.

Amino acid treatments	Berry weight (g.)		Berry longitudinal (cm)		Berry equatorial (cm)		T.S.S.%		Total acidity %		Total sugars %	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	3.55	3.49	1.99	2.03	1.90	1.93	17.7	17.9	0.706	0.711	15.0	14.8
Vegetamine at 0.05 %	3.66	3.59	2.04	2.06	1.94	1.97	18.0	18.3	0.681	0.690	15.3	15.1
Vegetamine at 0.1 %	3.77	3.76	2.10	2.10	1.98	2.00	18.4	18.7	0.660	0.671	15.6	15.3
Vegetamine at 0.2 %	3.87	3.88	2.16	2.14	2.02	2.04	18.7	19.1	0.640	0.651	16.0	15.7
Vegetamine at 0.4 %	3.88	3.89	2.17	2.15	2.03	2.05	18.8	19.2	0.639	0.650	16.1	15.8
Amino green at 0.05 %	4.00	4.01	2.23	2.20	2.07	2.09	19.2	19.5	0.619	0.630	16.6	16.4
Amino green at 0.1 %	4.11	4.12	2.27	2.26	2.10	2.12	19.6	19.9	0.601	0.611	17.1	16.8
Amino green at 0.2 %	4.22	4.24	2.31	2.32	2.14	2.17	20.0	20.2	0.581	0.589	17.7	17.1
Amino green at 0.4 %	4.23	4.25	2.32	2.33	2.15	2.22	20.1	20.3	0.580	0.588	17.8	17.2
New L.S.D at 5%	0.09	0.10	0.04	0.03	0.03	0.04	0.2	0.2	0.015	0.014	0.2	0.3

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 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, GA₃, DNA, RNA, cell division, organic foods and plant pigments (Vianello and Marci, 1991, Elade, 1992 and Orth *et al*, 1993). These beneficial effects surely reflected on producing healthy trees.

The present positive effects of amino acids on growth aspects, nutritional status of the vines of “Superior” grapevines are in agreement with those obtained by Amin, (2007) and Ahmed *et al.*, (2007) on Red Romy grapevines, Sayed-Heba, (2010); Seleem-Basma and Abd El-Hameed, (2008) and Ahmed *et al.*, (2011) on Thompson seedless grapevines, and Mohamed, (2014) on “Superior” grapevines.

CONCLUSION:

Accordingly, treating “Superior” grapevines three times with amino acids in the source of “Amino green” at 0.2% gave the best results with regard to yield and berries quality.

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إستجابة كرمات العنب "السوبريور" للرش بمصدرين للأحماض الأمينية

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أجريت هذه الدراسة خلال موسمي ٢٠١٥ ، ٢٠١٦ لالقاء المزيد من الأضواء علي تأثير مصدرين من مصادر الأحماض الأمينية هما "الفيجيتامين" و"الأمينو جرين" بتركيز ما بين ٠.٥ إلى ٠.٤ % علي النمو الخضري والحالة الغذائية للكرمة ونسبة العقد وكمية المحصول وكذا خصائص الجودة لحبات العنب "السوبريور".

كان هناك تحسن ملحوظ في النمو الخضري ومحتوى الورقة من الصبغات والعناصر الغذائية ونسبة العقد و المحصول وبعض صفات الجودة للحبات عند معاملة الكرمات ثلاث مرات "بالفيجيتامين" و"الأمينو جرين" بتركيز ٠.٥ إلى ٠.٤ % مقارنة بالكонтроل وكان هناك تحسن طردي في القياسات السابقة بزيادة تركيز الأحماض الأمينية مع ملاحظة أنه لم تتأثر الصفات التي تم دراستها عند زيادة تركيز الأحماض الأمينية من ٠.٢ إلى ٠.٤ %.

تفوق مصدر الأحماض الأمينية "الأمينو جرين" علي مصدرى الأحماض الأمينية "الفيجيتامين" في تحسين صفات النمو والحالة الغذائية للكرمة وكمية المحصول وخصائص الجودة للحبات.

أمكن الحصول على أعلى محصول الكرمة وخصائص جودة حبات عند معاملة الكرمات " ثلاث مرات بالأحماض الأمينية في صورة مركب "الأمينو جرين" بتركيز ٠.٢ %.

الكلمات الدالة: الأحماض الأمينية - الفيجيتامين - الأمينو جرين كمية محصول الكرمة- خصائص الجودة للحبات – كرمات العنب السوبريور.