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Foliar Application of Some Amino Acids and Vitamins to Improve Growth, Physical and Chemical Properties of Flame Seedless Grapevines

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THIS STUDY was carried out during two successive seasons (2014 & 2015) in a private vineyard at El-deer village, Aga, Dakahlia Governorate, Egypt. The experiment was conducted on 12-year-old Flame seedless grapevines cultivar. The vines were grown in clay soil under surface irrigation system, trained to quadrilateral cordon using Gable supporting system. Three amino acids namely Methionine, Glutamic acid and Argenine at a rate (500 ppm) were used as a spray application either alone or with Vitamin B1 (Thiamin) or Vitamin B2 (Riboflavin) at a rate (250 ppm) on the vines for three times at growth start (when shoots length reached about 40 - 50 cm), after fruit set and 2 weeks after fruit set as an attempts to improve growth, physical and chemical properties of Flame seedless grapevines.

The Results showed that single applications of amino acids or in combination with vitamins B1 or B2 were effective in improving shoot length, leaf surface area, total chlorophyll and total amino acids in the leaves in addition percentages of N, P, K and Mg in the leaves as well as enhancing yield per vine, cluster weight, berry weight, soluble solids content, total sugars, total anthocyanin and total phenols while reducing total acidity in berries as compared with control in both seasons of study. In this respect, applications of amino acids plus vitamins were superior to using amino acids alone.

The best results with regard to vegetative growth, yield/vine, fruit quality and net profit of Flame seedless grapevines were obtained when vines were sprayed with Argenine plus vitamin B2.

Keywords: Grapevines, Flame seedless, Amino acids, Methionine, Glutamic acid, Argenine, Vitamins B1 and Vitamin B2.

Flame seedless grape is considered one of the most important grape cultivars grown in Egypt. This is basically due to it is high acceptance by both local consumers and exporters. Small sized berries and uneven colouration clusters one of the main draw backs that local growers of Delta. Overcoming these problems would lead to improve the market price for local consumption and exportation.

Using amino acids not only increase growth but also enhance yield quality and quantity. The promoting affect of amino acids on protecting plant cells from oxidation and all stresses as well as enhancing the biosynthesis of proteins, plant pigments, natural hormones such as IAA, gibberellin and Ethylene and cell division is reflected on stimulating vine nutritional status and fruiting. Also, amino acids contain both acid and basic groups which act as buffers that help to maintain favorable pH value within the plant cell (Davies, 1982, Yagodin, 1990 and Rai, 2002).

Vitamins with their antioxidant properties play a vital role in plant defence against oxidative stresses induced by unfavorable 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 gibberellins, cell division, plant pigments, enzymes, organic foods and plant metabolism (Oretili, 1987 and Samiullah *et al.*, 1988).

It was suggested that all vitamins participate in plant growth and development. Most studies showed that most of the essential physiological processes such as photosynthesis building of all organic foods and enzymes, building of plant pigments, nutrient and water uptake and cell division depended more or less on the availability of vitamins (Robinson, 1973).

The beneficial effects of amino acids and vitamins on growth, yield and quality of grapevines cvs. were emphasized by the findings of (Melouk, 2007, Megawer & Abd El-Hameed 2009, Sabry Gehan, 2009, Fayed, 2010, Ahmed *et al.*, 2011, Madian & Refaai, 2011, Khan *et al.*, 2012, El-Sayed, 2013 , Abd-Elaal *et al.*, 2014, Al-Khawaga 2014, Faissal *et al.*, 2014 , Al-Wasfy, 2014 and Faissal *et al.*, 2015).

The target of this study is to improve yield and quality of Flame seedless grapevines by using some amino acids and vitamins.

Materials and Methods

This investigation was carried out during two successive seasons (2014 & 2015) in a private vineyard at El-deer village, Aga, Dakahlia Governorate, Egypt. The experiment was conducted on 12-year-old Flame seedless grapevines cultivar. Vines were cultivated at 1.5 x 3 m. in a clay soil as shown in Table 1 under surface irrigation system from Nile water. Vines were trained to quadrilateral cordon using Gable supporting system. During January of each experimental season, the tested vines were spur- pruned by leaving 6 spurs with 2 eyes on each cordon. The total bud load was 48 buds. Ninety vines uniform in vigor as possible were chosen for this study, all vines received the same cultural management recommended by ministry of agriculture. The experiment consisted of ten treatments arranged in a complete randomize blocks design, each treatment include three replicates, each made of three vines.

TABLE 1. Mechanical and chemical analysis of the experimental soil.

Mechanical	Clay (%)	48.15
	Silt (%)	24.69
	Sand (%)	27.16
	Texture	Clay
Chemical	O.M. (%)	2.1
	pH (1:25)	7.8
	E.C.(1:5 extract) (Mmhos/cm)	0.62
	Ca Co_3 (%)	1.88
	N (ppm)	38
	P (ppm)	11
	K (ppm)	282

Three amino acids i.e. Methionine ($C_5H_{11}NO_2S$), Glutamic acid ($C_5H_9NO_4$) and Argenine ($C_6H_{14}N_4O_2$) were foliar applied at a rate (500 ppm) with or without Vitamin B1 (Thiamin) or Vitamin B2 (Riboflavin) at a rate of (250 ppm) on the vines for three times, at growth start (when shoots length reached about 40 - 50 cm), after fruit set and 2 weeks after fruit set. Treatments applied as follow:

- Control
- Methionine
- Methionine + vitamin B1
- Methionine + vitamin B2
- Glutamic Acid
- Glutamic Acid + vitamin B1
- Glutamic Acid + vitamin B2
- Argenine
- Argenine + vitamin B1
- Argenine + vitamin B2

Measurements

Vegetative growth parameters (shoot length and leaf surface area)

Vegetative growth parameters were determined after two weeks from last treatment (one month after fruit set) from non-fruiting shoots as follows:

- Average shoots length (cm).
- Average leaf area (cm^2): Sixth and seventh leaves from the tip of the growing shoot were used for leaf surface area measurement according to (Montero *et al.*, 2000).

Chlorophyll content in the leaves

Sixth and seventh leaves from the tip of the growing shoots were used for the determination of total chlorophyll content in the leaves after two weeks from last treatment according to (Mackinny, 1941) total chlorophyll was calculated as (mg/g fresh weight).

N, P, K, Mg and total amino acids content in the leaves

After two weeks from last treatment, samples of 20 leaf petioles per each replicate were taken from leaves opposite to cluster and used for the determination of N, P, K and Mg content according to (Cottenie *et al.,* 1982). The blades of leaves were used for the determination of total free amino acids as (g /100g dry weight) according to (Selim *et al.,* 1978).

Yield

At harvesting time when SSC % of berries reached about 16-17 % in control, six clusters/ vine were weighted and the average cluster weight was multiplied by number of clusters /vine to calculation average yield / vine.

Physical and chemical properties

A sample of 6 clusters /vine was taken to determine:

- Average cluster weight (g) and average of 100 berry weight (g)
- Soluble solids content (SSC %) was determined by using hand refractometer.
- Total acidity percentage was determined according to (A.O.A.C. 1980).
- Total sugars (%) were determined according to (Sadasivam and Manickam, 1996).
- Total anthocyanin content of the berries skin (mg/100g F.W) was calculated according to (Husia *et al.,* 1965).
- Total phenols in the berries (mg/100g D.W) were determined according to (Malick and Singh, 1980).

Statistical Analysis

The complete randomized blocks design was adopted for the experiment. The statistical analysis of the present data was carried out according to (Snedecor and Chocran, 1980). Averages were compared using the new L.S.D. values at 5% level.

Results

Shoot length, leaf surface area, total chlorophyll and total amino acids

It is clear from the obtained data in Table 2 that treating the vines with amino acids namely Methionine and Argenine without or with vitamin B1 or vitamin B2 significantly enhanced shoot length, leaf area, total chlorophyll and total amino acids in the leaves as compared with control. Non-significantly differences between Methionine (T2) and Argenine (T8) were clear in this respect. Also, the data showed non-significantly differences between Glutamic (T5) and control (T1) on shoot length and total chlorophyll in both seasons of study. The highest values were recorded when the vines were spraying Argenine plus vitamin B2 (T10) which recorded (188.0 and 188.3 cm) for shoot length, (192 and 197.3 cm^2) for leaf area, (17.04 and 16.81 mg/g F.W.) for total chlorophyll, and (1.32 and 1.44 g /100g D.W.) for total amino acids in 2014 and 2015 seasons, respectively as compared with other treatments.

TABLE 2. Effect of some amino acids and vitamins application on shoot length, leaf area, total chlorophyll and total amino acids in Flame seedless grapevines during 2014 and 2015 seasons

Characteristics / Treatments		Shoot length (cm)		Leaf area (cm^2)		Total chlorophyll (mg/g F.W)		Total amino acids (g /100g D.W)	
		2014	2015	2014	2015	2014	2015	2014	2015
1	Control	157.7	160.3	163.3	165.0	13.80	14.13	0.96	1.01
2	Methionine	172.7	171.6	177.3	178.0	14.92	15.18	1.14	1.22
3	Methionine + vitamin B1	178.0	179.0	185.7	185.7	15.32	15.68	1.23	1.35
4	Methionine + vitamin B2	185.0	187.0	194.0	190.0	16.11	16.34	1.28	1.42
5	Glutamic Acid	165.0	168.3	172.0	173.0	14.14	14.53	1.12	1.20
6	Glutamic Acid+	175.0	179.7	182.7	182.0	15.04	15.35	1.20	1.31
7	Glutamic Acid +	183.0	177.0	185.7	188.0	15.85	15.94	1.26	1.387
8	Argenine	170.0	173.3	179.0	182.0	15.30	15.58	1.17	1.25
9	Argenine + vitamin B1	180.0	185.0	187.7	192.7	16.68	16.32	1.26	1.38
10	Argenine + vitamin B2	188.0	188.3	192	197.3	17.04	16.81	1.32	1.44
New L.S.D at 5%		7.8	8.2	5.6	7.8	0.40	0.42	0.04	0.04

N, P, K and Mg (%) content in leaf petioles

The concerned data in Table 3 showed that spraying grapevines with amino acids either alone or with vitamin B1 or vitamin B2 increased the nutrients content as it gave the highest values of N, P, K and Mg content in leaf petioles compared with control. The results also indicated that the differences between the values of Glutamic acid (T5) and control (T1) was insignificant of P % and Mg% in leaf petioles during both seasons of study. Also, the data showed that the treatment of Argenine + vitamin B2 (T10) recorded pronounced significant values in N, P, K and Mg content in leaf petioles. The N values were (2.54 and 2.62%), the P values were (0.32 and 0.35%), the K values were (1.85 and 1.85 %) and the Mg values were (0.80 and 0.78%) during 2014 and 2015 seasons, respectively. While the lowest values in this respect were recorded by control (T1) which recorded values of (1.77 and 1.84), (0.18 and 0.20), (1.42 and 1.38) and (0.44 and 0.47) in N, P, K and Mg content in leaf petioles, respectively, in both seasons of study.

TABLE 3. Effect of some amino acids and vitamins application on percentages of N, P, K and Mg in Flame seedless grapevines during 2014 and 2015 seasons

Characteristics / Treatments		Leaf N (%)		Leaf P (%)		Leaf K (%)		Leaf Mg (%)	
		2014	2015	2014	2014	2014	2015	2014	2015
1	Control	1.77	1.84	0.18	0.20	1.42	1.38	0.44	0.47
2	Methionine	2.15	2.28	0.24	0.26	1.62	1.66	0.58	0.62
3	Methionine + vitamin B1	2.34	2.45	0.27	0.32	1.75	1.77	0.70	0.72
4	Methionine + vitamin B2	2.46	2.58	0.29	0.35	1.82	1.85	0.78	0.78
5	Glutamic Acid	1.97	2.11	0.22	0.22	1.55	1.6	0.52	0.54
6	Glutamic Acid+ vitamin B1	2.28	2.35	0.26	0.28	1.67	1.74	0.66	0.68
7	Glutamic Acid + vitamin B2	2.39	2.48	0.26	0.32	1.8	1.8	0.73	0.72
8	Argenine	2.22	2.28	0.24	0.27	1.72	1.7	0.64	0.65
9	Argenine + vitamin B1	2.42	2.51	0.28	0.34	1.8	1.82	0.74	0.75
10	Argenine + vitamin B2	2.54	2.62	0.32	0.35	1.85	1.85	0.8	0.78
New L.S.D at 5%		0.16	0.21	0.05	0.06	0.10	0.11	0.10	0.10

Yield, cluster weight and 100 berry weight

Data in Table 4 clearly indicated that spraying Flame seedless grapevines three times with Methionine, Glutamic acid and Argenine either single or combination with vitamin B1 or vitamin B2 significantly increased yield per vine, cluster weight and 100 berry weight as compared with control during both seasons. The combinations of amino acids plus vitamin B1 or vitamin B2 were favorable than using amino acids alone in this respect. The treatment of Argenine + vitamin B2 (T10) recorded the best significant values in yield per vine (12.72 and 13.15 kg/vine), cluster weight (570 and 588 g/vine) and 100 berry weight (293 and 296 g/vine) in 2014 and 2015 seasons, respectively. While the control treatment (T1) gave the lowest values in this respect (10.90 and 11.25 kg/vine) as for yield per vine, (437 and 442 g/vine) for cluster weight and (224 and 232 g/vine) for 100 berry weight in 2014 and 2015 seasons, respectively.

TABLE 4. Effect of some amino acids and vitamins application on yield/vine, cluster weight and 100 berry weights in Flame seedless grapevines during 2014 and 2015 seasons.

Characteristics / Treatments		Yield/vine (Kg)		Cluster weight (g)		100 berry weight (g)	
		2014	2015	2014	2015	2014	2015
1	Control	10.90	11.25	437	442	224	232
2	Methionine	11.51	11.4	480	482	265	270
3	Methionine + vitamin B1	11.94	12.76	498	532	275	285
4	Methionine + vitamin B2	12.35	13.04	538	572	286	292
5	Glutamic Acid	11. 40	11.37	467	475	254	258
6	Glutamic Acid+ vitamin B1	11.68	12.09	487	518	274	279
7	Glutamic Acid + vitamin B2	12.24	12.94	503	547	282	289
8	Argenine	11.69	11.64	487	490	272	280
9	Argenine + vitamin B1	12.06	12.75	510	554	280	290
10	Argenine + vitamin B2	12.72	13.15	570	588	293	296
New L.S.D at 5%		0.15	0.10	20	21	29	24

Chemical characteristics of the berries

Data in Table 5 clearly showed that all treatments used significantly increased soluble solids content %, total sugars %, total anthocyanin and total phenols while these reduced total acidity % in berries as compared with control except Glutamic acid treatment (T5) gave a non significantly differences in SSC % and total acidity % as compared with control in both seasons of study. Using amino acids in combination with vitamins were more favorable than using amino acids alone in this respect. The results also indicated that the difference between the treatment of Methionine + vitamin B2 (T4) and Argenine + vitamin B2 (T10) of soluble solids content, total sugars, total anthocyanin and total acidity were insignificant.

The treatment of Methionine + vitamin B2 (T4) gave in both seasons not only the highest values in soluble solids content (19.2 and 18.8 %), total sugars (16.76 and 16.59 %) and total anthocyanin (36.70 and 37.22 mg/100g F.W) but also the lowest total acidity (0.513 and 0.527 %) in 2014 and 2015 seasons, respectively, as compared with other treatments. Furthermore the treatment of Argenine + vitamin B2 (T10) recorded pronounced significant values in total phenols (109.83 and107.33 mg/100g D.W) in 2014 and 2015 seasons, respectively, as compared with other treatments.

TABLE 5. Effect of some amino acids and vitamins application on soluble solids content (SSC), acidity, total sugars, total anthocyanin and total phenols in Flame seedless grapevines during 2014 and 2015 seasons.

Characteristics / Treatments		SSC (%)		Total Acidity (%)		Total sugars (%)		Total anthocyanin (mg/100g F.W)		Total phenols (mg/100g D.W)	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
1	Control	16.8	17.0	0.684	0.650	14.76	15.00	32.87	33.37	28.90	27.4
2	Methionine	18.2	18.2	0.564	0.566	16.00	16.10	35.51	35.94	61.86	64.70
3	Methionine + vitamin B1	18.8	18.4	0.534	0.562	16.55	16.28	36.45	36.81	83.50	85.43
4	Methionine + vitamin B2	19.2	18.8	0.513	0.527	16.76	16.59	36.70	37.22	98.33	97.6
5	Glutamic Acid	17.4	17.6	0.635	0.618	15.39	15.54	34.48	5.40	57.80	60.3
6	Glutamic Acid + vitamin B1	17.8	18.0	0.605	0.583	15.75	15.90	35.23	36.18	78.83	80.23
7	Glutamic Acid + vitamin B2	18 .2	18.2	0.568	0.570	16.08	16.16	35.98	36.85	90.53	91.8
8	Argenine	17.6	17.8	0.614	0.602	15.60	15.8	35.15	35.67	71.66	73.20
9	Argenine + vitamin B1	18.4	18.2	0.551	0.573	16.23	16.12	35.85	36.48	94.33	93.73
10	Argenine + vitamin B2	18.6	18.4	0.534	0.563	16.4	16.31	36.42	37.01	109.83	107.33
New L.S.D at 5%		0.61	0.64	0.051	0.053	0.57	0.61	0.30	0.36	6.32	5.39

The economic study

It is clear from the obtained data in Table 6 that spraying amino acids i.e. Methionine, Glutamic acid and Argenine either alone or combination with vitamin B1 or vitamin B2 gave the best net profit /feddan as compared with control. Also, the combination of amino acids plus vitamin B2 gave the highest net profit /feddan compared with amino acids plus vitamin B1 or amino acids alone. In addition, the treatment of Argenine + vitamin B2 gave the highest values in net profit /feddan which recorded 3580 (L. E.) over control as average two seasons.

TABLE 6. Economic study on costs and net profit /feddan of some amino acids and vitamins applications of Flame seedless as average for two seasons (2014 and 2015).

Characteristics / Treatments		Costs of *cultural practices/ fed. (L.E.)	Treatments costs/fed. (L.E.)	Total costs / fed. (L.E.)	Yield/ fed. Kg	Total production /fed. (L.E.)	Net profit / fed. (L.E.)	Net profit /fed. over control (L.E.)
1	Control	6200	0	6200	9968	24920	18720	0
2	Methionine	6200	30	6230	10310	25775	19545	825
3	Methionine + vitamin B1	6200	500	6700	11115	27788	21088	2368
4	Methionine + vitamin B2	6200	480	6680	11425	28563	21883	3163
5	Glutamic Acid	6200	20	6220	10246	25615	19395	675
6	Glutamic Acid+ vitamin B1	6200	490	6690	10697	26743	20053	1333
7	Glutamic Acid + vitamin B2	6200	470	6670	11331	28327	21657	2937
8	Argenine	6200	150	6350	10498	26245	19895	1175
9	Argenine + vitamin B1	6200	620	6820	11164	27910	21090	2370
10	Argenine + vitamin B2	6200	600	6800	11640	29100	22300	3580

* Cultural practices such as (Fertilizers, Pesticides, fungicides, Irrigation and Labour)
- Methionine (g) 150 x 3doses = 450 g = 30 (L.E.) / feddan
- Glutamic Acid (g) 150 x 3doses = 450 g = 20 (L.E.) / feddan
- Argenine (g) 150 x 3doses = 450 g = 150 (L.E.) /feddan
- Vitamin B1 (g) 75 x 3doses = 225 g = 470 (L.E.) / feddan
- Vitamin B2 (g) 75x 3doses = 225g = 450 (L.E.) / feddan
- One feddan = 900 vines
- Price/1 kg from Yield = 2.5 (L .E.)

Discussion

The increment in yield per vine and chemical characteristics of the berries, could be attribute to enhancing effect on berry weight as result of enhancing the nutritional status of the vines (Table 3) and enhancing leaf surface area and total chlorophyll in leaves (Table 2) as result using amino acids and vitamins.

The promoting effect of amino acids on growth and fruiting of Flame seedless grapevines might be attributed to their positive action on protecting plants from oxidative stress, enhancing the biosynthesis of proteins through polymerization of amino acids, ethylene, GA_3, IAA, cyokinins, plant pigments, and organic foods (Davies, 1982).

Arginine plays an important role in cell division, the healing of wounds, removing ammonia from the body, immune function, and release of hormone (Stanislavov and Nikolova, 2003). Also, Arginine is an important and unique amino acid in plants. It serves not only as an important nitrogen reserve and recycling, but also as a precursor of the biosynthesis of polyamines, nitric oxide and so on. Polyamines and nitric oxide are important messengers involved in almost all physiological and biochemical processes including regulation of DNA replication, transcription of gens, cell division, fruit ripping, leaf senescence, growth, development, and adaptation of plants to environmental disturbances. (Yang and Gao, 2007).

Glutamic acid is an essential amino acid that counteracts the adverse effects of all stresses around the trees as well as its effect on forming proteins and other related compounds (Yagodin, 1990).

Methonin as amino acid plays a significant role in plant metabolism through its metabolite, S-adenosyl – methonin (SAM), methonin controls the levels of several key metabolites such as ethylene, polyamines and biotin. SAM is also the primary methyl group donor that regulates different processes in plants such as cell wall and chlorophyll synthesis (Rachel and Hacahm, 1998).

The positive action of vitamins on growth and fruiting of Flame seedless grapevines 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 favor of enhancing yield and fruit quality (Samiulla *et al.,* 1988) .

Vitamin B1 (Thiamin) is a necessary ingredient for biosynthesis of the co-enzyme thiamin pyrophosphate. It plays an impotent role in carbohydrate

metabolism .It is an essential nutrient for plants, it is synthesized in the leaves and in transported to the root where it controls the growth. (Kawasaki, 1992).

Vitamin B_2 (Riboflavin) occurs generally in plant tissues, but only a small amount appears to be free while the main part as coenzymes, flavin monoucleotide and flavin adenine, dinucleotide. It has a pronounced role in photosynthesis (Mer, 1957).

These results regarding the beneficial effects of amino acid and vitamins on growth, vines nutritional status, yield as well as physical and chemical characteristics of the berries are in harmony with those obtained by (Melouk, 2007, Megawer & Abd El-Hameed 2009, Sabry Gehan, 2009, Fayed, 2010, Ahmed *et al.,* 2011, Madian & Refaai, 2011, khan *et al.*, 2012, El-Sayed, 2013, Abdelaal *et al.,* 2014, Al-khawaga 2014, Faissal *et al.,* 2014 , Al- Wasfy, 2014 and Faissal *et al.,* 2015).

Conclusion

The best results with regard to vegetative growth, yield, fruit quality and net profit /feddan of Flame seedless grapevines were obtained when the vines were spraying with Argenine at a rate (500 ppm) plus vitamin B2 at a rate (250) ppm for three times at growth start (when shoots length reached about 40 - 50 cm), after fruit and 2 weeks after fruit set.

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استخدام بعض الأحماض الأمينية والفيتامينات لتحسين النمو والصفات الطبيعية والكيمائية لعنب الفليم سيدلس

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أجريت هذه الدراسة خلال موسمى ٢٠١٤ و ٢٠١٥ فى مزرعة خاصة فى قرية الدير التابعة لمركز أجا محافظة الدقهلية على كرمات عنب فليم سيدلس عمرها ١٢ سنة ومنزرعة فى تربة طينية وتروى بنظام الرى بالغمر ومنزرعة على مسافة ١.٥ ×٣ م ومرباه بالطريقة الكردونية وتحت نظام تدعيم الجيبل .
وذلك بهدف دراسة تأثير الرش ببعض الأحماض الأمينية مثل الميثونين وحمض الجلوتاميك والأرجنين بصورة منفردة أو مع الرش بفيتامين ب١ أو فيتامين ب ٢ على النمو والمحصول وجودة الحبات فى صنف الفليم سيدلس .
وقد أظهرت النتائج الاتى:

- أن الاستخدام الفردي للأحماض الأمينية مثل (الميثونين وحمض الجلوتاميك والأرجنين) بصورة منفردة أو رشها مع الفيتامينات (ب١ أو ب٢) كان فعالا في زيادة قيم النمو الخضرى مثل (طول الأفرع ، المساحة الورقية) وأيضا المحتوى الكلى للكلوروفيل والأحماض الأمينية الكلية فى الأوراق و النسبه المئويه لكل من النيتروجين ، الفوسفور، البوتاسيوم ، الماغنسيوم وكذلك تحسين كمية المحصول ووزن العنقود ووزن الحبات وتحسين صفات الجودة فى الحبات مثل المواد الصلبة الذائبة والسكريات الكلية وصبغة الأنثوسيانين والفينولات الكلية وخفض نسبة الحموضة وكذلك زيادة صافى ربح الفدان وذلك بالمقارنه بالكنترول خلال موسمى الدراسة.
- وكانت المعاملات المشتركة من الأحماض الأمينية جنبا الي جنب مع الفيتامينات أفضل حالا من استخدام الأحماض الأمينية منفردة فى هذا الصدد وكانت أفضل النتائج المتحصل عليها المعاملة (بالأرجنين + فيتامين ب٢)
- ولذلك لتحسين صفات الجودة للعناقيد وزيادة المحصول وزيادة صافى ربح الفدان يوصى برش عنب الفليم سيدلس بحمض الأرجنين بتركيز (٥٠٠) جزء فى المليون + فيتامين ب٢ بتركيز (٢٥٠) جزء فى المليون ثلاثة مرات عند بداية النمو الخضرى وعند تمام العقد وبعد العقد باسبوعين.