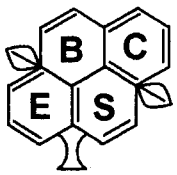

Journal

RESPONSE OF SUPERIOR GRAPEVINES TO FERTILIZATION BY ENRICHED HUMIC ACID AND CHICKEN MANURE

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ABSTRACT

This investigation was carried out during 2006 and 2007 seasons on 7- years- old Superior grapevines. The vines were grown in a sandy loam soil, spaced at 2 X 3 meters apart and irrigated by the drip irrigation system with well water, cane-pruned and trellised by the "Y" shape system. This study aimed to study the effect of fertilization by some combinations of enriched humic acid and chicken manure on yield, berries quality, vegetative growth and leaf petiole mineral contents. The following treatments were carried out :1- Control (90% Mineral fertilizer + 10% Chicken manure).2- 100% Humic acid(HA) + 0% Chicken manure(Ch.M).3- 75% HA + 25% Ch.M.4- 50% HA + 50% Ch.M.5- 25% HA + 75% Ch.M.6- 0% HA + 100% Ch.M. The obtained results indicated a gradual increment in bud burst percentage from mid of February until second week of March in all treatments. Third and fourth treatments gave the highest values of bud burst percentage, yield/vine, cluster number/vine, cluster weight, cluster length and cluster width. The third one had the highest records of fruitful buds percentage. Moreover, the same treatment recorded the highest values of the studied physical characteristics as well as soluble solids content of berries, vegetative parameters and annual pruning wood weight/vine. The lowest nitrate and nitrite berries juice contents were obtained by the sixth treatment. Also, the highest petiole leaf mineral contents were noticed by the third and fourth treatments.

Key words: Bud behavior – Chicken manure – Humic acid - Leaf mineral content– Organic fertilization - Superior grapevines–Vegetative growth– Yield.

INTRODUCTION

Grape (*Vitis vinifera* L.) is considered the first major fruit crop in its production all over the world. In Egypt, grapes rank third among fruit crops while citrus and mango being the first and second crops respectively. The Egyptian grape production reached about 1490000 tons produced from 171000 feddan (according to the statistics of M.A.L.R. (2007).

Among various problems that man faces the pollution problem raises as the most severe problem. This problem is strongly connected with health that pollution causes many diseases. Mineral nitrogen fertilization causes the accumulation of harmful residual substances like NO_3 and NO_2 in the edible portion, berries or leaves, of grapevines (Ibraheem, 1994 and Montasser *et al.*, 2003).

Organic fertilization increased growth and nutritional status of grapevines (Kassem and Marzouk, 2002). The mineral nutrition with 60 nitrogen units/feddan was recommended to reduce the residual of nitrate and nitrite in leaves and berries of Thompson Seedless grapevine (Montasser *et al.*, 2003).

Due to the limited amounts of organic fertilizers nowadays in Egypt, many trials are being accomplished to find out the possibility of using some new natural materials to improve soil fertility and productivity of fruit trees. In addition, it was thoughtful to depress to the lower extent the pollution occurring in our Egyptian environment due to the exaggeration in the application of chemicals and mineral fertilizers (Yagodin 1984; De-Ell and Prang, 1993; Mba, 1994 and El-Haggar *et al.*, 2004).

Humic acid (HA) as an organic fertilizer is very beneficial in increasing the productivity of fruit crops due to the conversion of unavailable minerals into soluble forms that plants can use, improving plant nutrition by stimulating the absorption of mineral elements through the roots, stimulating root growth, especially in the vertical direction thus enabling better uptake of nutrients, retaining water soluble inorganic fertilizers in the root zones and reducing their leaching and enhancing the uptake of nitrogen by plants. The role of these organic fertilizers in improving growth, chlorophyll content

enhanced photosynthesis and increased tissue concentrations of N was supported by the results of (Li-Nan *et al.*, 1999; Silva *et al.*, 1999; and Hussein *et al.*, 2005).

The possibility of using the organic fertilization particularly at the appropriate rate for increasing yield and improving fruit quality was approached by many workers (Zhu and Zhu, 2000; Guo *et al.*, 2000; Hussein *et al.*, 2005 and Omar, 2005).

The goal of this study is to try the use of the liquid organic fertilizer (enriched humic acid) in reducing the application rate of organic fertilizer (chicken manure) without any risk on the yield, berries quality, as well as improving vine growth and vine nutritional status of Superior grapevines.

MATERIALS AND METHODS

This investigation was conducted in a private vineyard located at Berkash, Giza governorate Egypt on mature Superior grapevines cv. . The study was started one year before the real experiment treatments in (2005) to get rid off the residual effect of the previous fertilization application. The study extended for another two successive seasons (2006 and 2007). At the start of the experiment, the vines were seven years old, grown in a sandy loam soil (Table 1), spaced at 2 X 3 meters apart and irrigated by the drip irrigation system using well water, cane-pruned and trellised by the modified "Y" shape system. The vines were pruned during the last week of December for the two seasons of the study to leave (6 canes X 12 buds/cane) each along with 4 renewal spurs each with 2 buds, in all 80 buds were left per vine. Experiment consists of 6 treatments arranged as a randomized complete block design. Each treatment include four replicates and each represented by three vines, the vines were uniform in growth as possible. Thus the total number of vines used in the experiment was 72 vines.

Some physical and chemical analysis of the experimented soil were determined before the application of the fertilization treatments according to the method outlined by Piper (1950) as shown in table (1). The physical and chemical analysis of the used chicken manure is presented in table (2). The different constituents of the applied liquid organic fertilizer (enriched humic acid) were determined and illustrated in (Table 3).

Fourty unit actual nitrogen per feddan was applied for all treatments under study [Shaltout *et al* (1996)].

The following treatments were carried out:

1- Control (90% Mineral fertilizer + 10% Chicken manure)

2- 100% Humic acid + 0% Chicken manure

3- 75% Humic acid + 25% Chicken manure

4- 50% Humic acid + 50% Chicken manure

5- 25% Humic acid + 75% Chicken manure

6- 0% Humic acid + 100% Chicken manure

Liquid humic acid and ammonium nitrate (mineral nitrogen source) were added as a fertigation treatment but, chicken manure (organic nitrogen source) was added as a drench treatment in weekly equal doses from third week of February to last week of August, except June without any nitrogen fertilization . All other horticultural practices were done as well as applied in the orchard.

The following parameters were measured to evaluate the tested treatments:

1- Bud behavior:

Dormant buds per vine were watched at weekly intervals along the bursting period. The percentages of burst buds, the vegetative and fruitful buds were calculated. In addition, coefficient of bud fertility was calculated by dividing the fruitful buds per vine by the total number of bud burst.

2- Yield and cluster characteristics:

Average number of clusters/vine and weight of yield / vine (Kg) were determined at harvesting time (which characterized by about 16% SSC, 0.70% acidity and complete yellow colour of berries skin for control fruits) of the two studied seasons.

Representative random samples of 12 clusters/ treatment (3 clusters from each replicate) were picked at the harvesting stage, and brought to the laboratory for the following determinations:-

a) Average weight of cluster (g).

b) Average length of cluster (cm).

c) Average width of cluster (cm).

3- Physical characteristics of berries

a) Weight of 100 berries (g).
b) Volume of 100 berries (cm^3).
c) Berry firmness (g/cm^2) using Shatilons's instrument.
d) Berry adherence strength (g) "separating force" using Shatilons's instrument.

4- Berries chemical characteristics

a) Soluble solids content (SSC %) in berry juice by using a hand refractometer in (Brix).
b) Total titratable acidity (as tartaric acid %) according to the Official Analysis Methods (A.O.A.C., 1985).
c) SSC / acid ratio was calculated.
d) Berries nitrate (NO_3) content
e) Berries nitrite (NO_2) content

Berries nitrate and nitrite (ppm) were determined according to the method of Sen and Donaldson (1978).

5- Vegetative growth parameters:

a) Average shoot length (cm) on 15^{th} June in both studied seasons.
b) Average number of leaves/shoot.
c) Average leaf area (cm^2) of the apical 5th and 6th full expended leaves by using a CI-203- Laser Area-meter made by CID, Inc., Vancouver, USA.
d) Weight of annual pruning wood (kg) at pruning time (last weak of December).

6- Leaf mineral content:

Leaf samples were taken at veraison stage from mature leaves (5-7th leaves from shoot tip). The petioles were oven dried at 70^0 until a constant weight, then ground to a powder mixture and 0.2 g was taken for N, P and K determination. Total nitrogen was determined according to (Pregl 1945), phosphorus was determined calorimetrically according to (Jackson 1958). Potassium was determined with Flame Photometer (Piper, 1950). Calcium, magnesium, iron, zinc and manganese were determined by Perking Elemer Atomic absorption spectrophotometer model 2380 AL, according to Yoshida *et al.* (1972).

The obtained data were statistically analyzed and Duncan's multiple range test at 5% level was used for means comparison according to Snedecor and Cochran (1980).

Table (1): Analysis of the experimental soil:

Physical analysis	Sand (%)	70.3
	Silt (%)	2.4
	Clay (%)	27.3
	Texture	Sandy loam
Chemical analysis	Organic carbon (%)	0.06
	pH	7.75
	EC (mmhos/cm)	1.45
	Water holding capacity (%)	27.0
	Ca Co_3 (%)	0.6
	N (%)	0.89
	P (%)	0.11
	K (%)	0.54

Table (2): Analysis of the used chicken manure

Weight of m^3 (kg)	510
Moisture content (%)	40.5
pH value (1:5)	10.25
EC value (1:5) (mmohs/cm)	3.88
Organic carbon (%)	50.75
Organic matter (%)	87.5
Total nitrogen (%)	3.06
Ammonium-N (ppm)	3276
Nitrite-N (ppm)	Free
C/N ratio	16.5-1
Ash (%)	12.5
K (%)	1.99
P (%)	0.47

Table (3): Analysis of the used enriched liquid organic fertilizer (Humic acid):

Humic acid (%)	2.9
Organic matter/total solid (%)	42.51
Total humic acids/total solid (g/L)	165.84
Organic carbon (%)	24.64
C/N ratio	2.46
pH	8.18
EC (dS/m)	59.3
N (%)*	10
P (%)*	10
K (%)*	10
Ca (%)**	0.06
Mg (%)**	0.05
B (mg/L)*	70
Fe (mg/L)**	90
Mn (mg/L)**	90
Zn (mg/L)**	90
Cu (mg/L)**	90

* Soluble in distilled water

** Digest by H_2SO_4

RESULTS AND DISCUSSION

Data in figure (1) show the effect of humic acid and chicken manure combinations treatments on periodical bud burst percentage of Superior grapevines in 2006&2007seasons.

1- Bud behavior:

A- Periodical bud burst percentages:

all treatments in both first and second seasons of investigation showed that, dynamics of bud burst was started from mid of February

and continued up to the second week of March. Generally, data showed gradual increase in bud burst percentage from mid of February until second week of March.

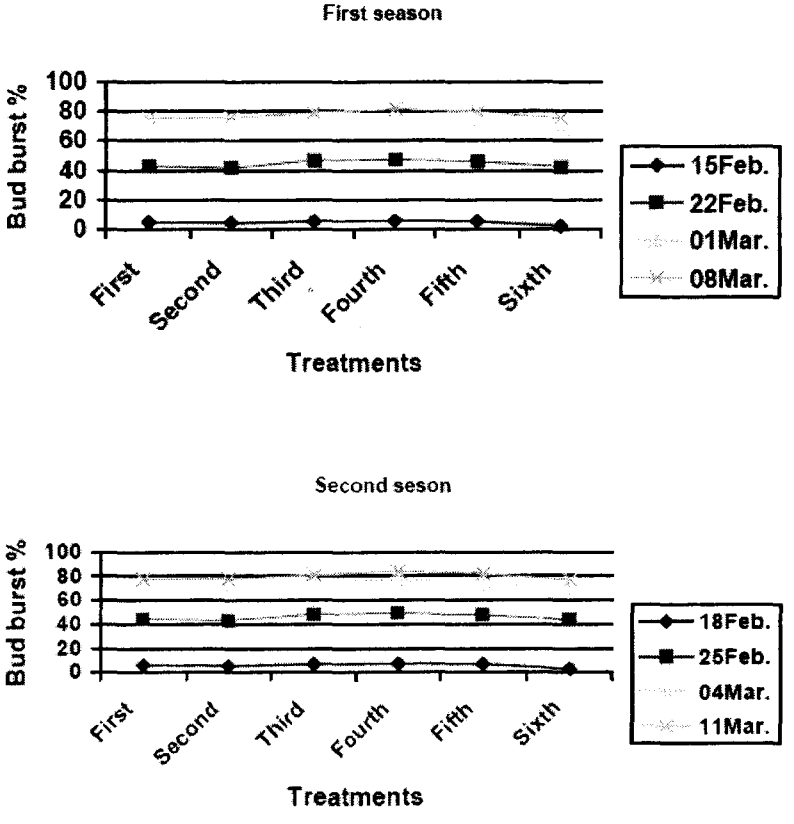

Figure (1) Effect of humic acid and chicken manure combinations treatments on periodical bud burst percentage of Superior grapevines in 2006 & 2007 seasons.

B- Final bud burst percentage:

Data presented in table (4) showed the effect of humic acid and chicken manure combinations on bud behavior of Superior grapevines in 2006&2007 seasons (bud burst percentage, vegetative bud percentage, and fruitful bud percentage and bud fertility coefficient) of Superior grapevines in 2006 and 2007 seasons.

Table (4): Effect of humic acid and chicken manure combinations on bud behavior of Superior grapevines in 2006&2007 seasons

First season (2006)								
Treatments	Bud behavior							
	Final bud burst (%)		Vegetative buds (%)		Fruitful buds (%)		Coefficient of bud fertility	
1-Control (90% Mineral fertilizer + 10% Chicken manure)	75.58	b	56.82	a	43.18	a	0.43	a
2- 100% Humic acid + 0% Chicken manure	76.97	b	57.18	a	42.82	a	0.43	a
3- 75% Humic acid + 25% Chicken manure	77.12	ab	56.40	a	43.60	a	0.44	a
4- 50% Humic acid + 50% Chicken manure	78.84	a	56.11	a	43.89	a	0.44	a
5- 25% Humic acid + 75% Chicken manure	76.98	ab	55.94	a	44.06	a	0.44	a
6- 0% Humic acid + 100% Chicken manure	75.41	b	56.17	a	43.83	a	0.44	a
Second season (2007)								
1-Control (90% Mineral fertilizer + 10% Chicken manure)	77.03	c	55.64	a	44.36	a	0.44	a
2- 100% Humic acid + 0% Chicken manure	77.63	bc	55.81	a	44.19	a	0.44	a
3- 75% Humic acid + 25% Chicken manure	78.94	ab	56.19	a	43.81	a	0.44	a
4- 50% Humic acid + 50% Chicken manure	79.97	a	56.06	a	43.94	a	0.44	a
5- 25% Humic acid + 75% Chicken manure	78.81	ab	55.70	a	44.30	a	0.44	a
6- 0% Humic acid + 100% Chicken manure	76.82	c	55.34	a	44.66	a	0.45	a

Means followed by the same letter (s) in each column in each season are not significantly different at 5% level

At the end of each bursting period (March 8th in the first season and March 11th in the second season), data presented in Table (4) show that vines receiving 50% humic acid + 50% chicken manure gave the highest significant average 78.84% in the first season, and 79.97% in the second season, respectively compared with most other

treatments. While, vines received 0% humic acid + 100% chicken manure, control and 100% humic acid + 0% chicken manure gave the lowest significant average 75.41%, 75.58% and 76.97% in the first season, 76.82%, 77.03% and 77.63% in the second season, respectively compared with most other treatments.

C- Vegetative buds percentage:

It is obvious that no significant differences were found among treatments in both seasons.

D- Fruitful buds percentage:

It appears, in general, that the fruitful buds behavior showed a reversed trend to that found with vegetative buds. In this respect, the results indicate that no significant differences were found among all treatments in both seasons.

E- Bud fertility Coefficient:

It can be notice that no significant differences among all treatments in both seasons.

These results are in contrast with the finding of Omar (2005) who found that mineral fertilization and its combinations with compost and/or humic acid significantly increased bud fertility coefficient of Thompson Seedless grapevines. Also, Ali *et al.*, (2006) mentioned that bud burst percentage and percentage of fruitful buds increased by applying of 15ml/vine of humic acid on Flame Seedless and Superior Seedless grapevines.

2- Yield and cluster characteristics:

Data in table (5) show the effect of humic acid and chicken manure combinations on yield and cluster characteristics (cluster No. /vine, cluster weight, cluster length and cluster width) of Superior grapevines in 2006&2007 seasons.

A- Yield/vine:

The yield of Superior grapevines was greatly affected by humic acid and chicken manure in both seasons. The highest value of yield was obtained with vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (10.71,10.12 and 11.17,10.8) in the first and second season respectively, compared with most other treatments. While, the lowest value was obtained by vines received zero humic acid + 100% chicken manure (9.54 and 9.81 respectively) in both seasons.

Table (5): Effect of humic acid and chicken manure combinations on yield and cluster characteristics of Superior grapevines in 2006&2007 seasons

First season (2006)									
Treatments	Yield and cluster characteristics								
	Yield/vine (kg)		No. of clusters/vine		Cluster weight (g)		Cluster length (cm)		Cluster width (cm)	
1-Control (90% Mineral fertilizer + 10% Chicken manure)	9.62	cd	23.5	a	409.4	cd	27.6	cd	18.4	d
2- 100% Humic acid + 0% Chicken manure	9.78	bcd	23.7	a	412.1	bc	28.2	c	18.9	c
3- 75% Humic acid + 25% Chicken manure	10.21	ab	24.2	a	421.8	ab	29.6	ab	19.4	ab
4- 50% Humic acid + 50% Chicken manure	10.71	a	24.9	a	429.7	a	30.2	a	19.7	a
5- 25% Humic acid + 75% Chicken manure	10.14	bc	24.4	a	415.1	bc	29.5	b	19.3	b
6- 0% Humic acid + 100% Chicken manure	9.45	d	23.8	a	397.2	d	27.3	d	18.3	d
Second season (2007)										
1-Control (90% Mineral fertilizer + 10% Chicken manure)	10.11	cd	24.6	a	411.1	c	28.1	cd	18.5	de
2- 100% Humic acid + 0% Chicken manure	10.32	c	24.7	a	417.8	c	28.5	c	18.8	cd
3- 75% Humic acid + 25% Chicken manure	10.85	ab	24.9	a	435.7	ab	29.7	ab	19.3	ab
4- 50% Humic acid + 50% Chicken manure	11.17	a	25.3	a	441.3	a	30.2	a	19.6	a
5- 25% Humic acid + 75% Chicken manure	10.80	b	25.1	a	429.6	b	29.6	b	19.1	bc
6- 0% Humic acid + 100% Chicken manure	9.81	d	24.7	a	397.2	d	27.8	d	18.2	e

Means followed by the same letter (s) in each column in each season are not significantly different at 5% level

B- Clusters number /vine:

It is obvious that no significant differences were found among treatments in both seasons.

C- Cluster weight:

The highest significant values of cluster weight were obtained with vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (429.7,421.8 and 441.3, 435.7) in first and second season respectively, compared with most other treatments. The lowest values were obtained by vines received zero humic acid + 100% chicken manure (397.2and 397.2) in both seasons.

D- Cluster length:

Vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure recorded the highest significant values(30.2,29.6 and 30.2,29.6 in first and second season respectively. While, the lowest value was obtained by vines receiving zero humic acid + 100% chicken manure compared with most other treatments in both seasons.

E- Cluster width:

The highest values of cluster width were recorded by vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure19.7,19.4 and 19.6,19.3. While, the lowest values were obtained by vines received zero humic acid + 100% chicken manure and control vines (18.2,18.4 and 18.2,18.5) in both seasons respectively compared with most other treatments.

These findings could be attributed to the improvement in growth and nutritional status of vines which in turn reflected on increasing yield as well as number of clusters / vine and cluster weight.

These results are contrary to those found by, Omar (2005) who mentioned that mineral fertilization and its combinations with compost and/or humic acid significantly increased yield and cluster weight of Thompson Seedless grapevines. In this trend, Omar and Abd El-All (2005) recorded that applying humic acid at 12 liter /feddan divided into four equal doses added in February, April, May and June increased yield and cluster weight of Superior grapevines.

Also, Ali *et al.*, (2006) mentioned that yield and cluster weight increased by applying of 15ml/vine of humic acid on Flame Seedless and Superior Seedless grapevines.

3- Berries physical characteristics:

Data presented in table (6) show the effect of humic acid and chicken manure combinations on some physical characteristics (weight of 100 berries, volume of 100 berries, berry firmness and berry adherence strength) of Superior grapevines in 2006 and 2007 seasons.

A- Weight of 100 berries:

The highest values were obtained by vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (312.6,303.6and 302.4, 292.4) in both seasons, respectively. While, the lowest values were obtained by vines received zero humic acid + 100% chicken manure and control treatment (285.3,286.7 and 273.1, 274.9) in both first and second seasons, respectively as compared with most other treatments.

B- Volume of 100 berries

The highest values of this estimate were recorded by vines receiving 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (282.8,275.2 and 263.8,254.9) in both seasons, respectively. While, the lowest value was obtained by vines received zero humic acid + 100% chicken manure (252.7and 241.7) in both seasons, respectively as compared with most other treatments.

C- Berry firmness

The highest values were obtained by vines received 50% humic acid + 50% chicken manure and vines receiving 75% humic acid + 25% chicken manure (504.7,499.1 and 518.7,514.0) in both seasons respectively. While, the lowest value was obtained by vines receiving zero humic acid + 100% chicken manure (469.5 and 469.4) in both seasons, respectively as compared with most other treatments.

D- Berry adherence strength

The highest values of this estimate were recorded by vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure 621.3,606.1 and 632.6, 627.4),

Table (6): Effect of humic acid and chicken manure combinations on physical characteristics of Superior grapevines berries in 2005&2006 seasons

Treatments	Some physical berries characteristics			
	Weight of 100 berries (g)	Volume of 100 berries (cm^3)	Berry firmness (g/cm^2)	Berry adherence strength (g)
First season (2006)				
1-Control (90% Mineral fertilizer + 10% Chicken manure)	286.7 c	260.2 cd	474.5 de	579.3 de
2- 100% Humic acid + 0% Chicken manure	293.9 bc	266.0 bc	483.5 cd	589.9 cd
3- 75% Humic acid + 25% Chicken manure	303.6 ab	275.2 ab	499.1 ab	606.1 ab
4- 50% Humic acid + 50% Chicken manure	312.6 a	283.8 a	504.7 a	621.3 a
5- 25% Humic acid + 75% Chicken manure	300.4 b	271.3 bc	490.3 bc	601.4 bc
6- 0% Humic acid + 100% Chicken manure	285.3 c	252.7 d	469.5 e	568.7 e
Second season (2007)				
1-Control (90% Mineral fertilizer + 10% Chicken manure)	274.9 c	243.5 bc	482.9 c	595.3 cd
2- 100% Humic acid + 0% Chicken manure	282.9 bc	247.5 bc	491.7 c	603.4 c
3- 75% Humic acid + 25% Chicken manure	292.4 ab	254.9 ab	514.0 ab	627.4 ab
4- 50% Humic acid + 50% Chicken manure	302.4 a	263.8 a	518.7 a	632.6 a
5- 25% Humic acid + 75% Chicken manure	287.9 b	249.4 bc	509.6 b	620.1 b
6- 0% Humic acid + 100% Chicken manure	273.1 c	241.7 c	469.4 d	583.4 d

Means followed by the same letter (s) in each column in each season are not significantly different at 5% level

respectively as compared with most other treatments. While, the lowest values were obtained by vines received zero humic acid + 100% chicken manure (568.7 and 583.4) respectively in both seasons.

These results are in contrast with the finding of Omar (2005) who found that mineral fertilization and its combinations with compost and/or humic acid significantly increased berry weight and size of Thompson Seedless grapevines. In this concern, Omar and Abd El-All (2005) recorded that applying humic acid at 12 litre/feddan divided into four equal doses added in February, April, May and June increased berry weight and size of Superior grapevines. Also, Ali *et al.*, (2006) mentioned that berry weight and size increased by applying of 15ml/vine of humic acid on Flame Seedless and Superior Seedless grapevines.

4- Chemical characteristics of berries:

Data in table (7) show the effect of humic acid and chicken manure fertilization treatments on SSC, acidity, SSC/acid ratio, nitrate and nitrite berries contents of Superior grapevine in 2006 and 2007 seasons.

A- Soluble Solids content (SSC %):

The highest percentage was obtained by vines received 50% humic acid + 50% chicken manure(16.4) .While, the lowest percentage was obtained by vines received zero humic acid + 100% chicken manure(15.8) in the first season. In the second season control treatment showed the highest value(16.5) of SSC percentage but treatment of zero humic acid +100% chicken manure had the lowest one (15.9).

B- Titratable acidity

The highest significant value was obtained with vines received zero humic acid + 100% chicken manure in both seasons (0.69 and 0.74) compared with most other treatments. But those received 50% humic acid + 50% chicken manure recorded lowest significant values(0.62 and 0.68) in the first and second season, respectively compared with most other treatments

C- SSC / acid ratio

The highest value was recorded by vines received 50% humic acid + 50% chicken manure (26.5 and 23.8) in the first and second season respectively. While, the lowest values were obtained by vines

Table (7): Effect of humic acid and chicken manure combinations on chemical characteristics of Superior grapevines berries in 2006&2007 seasons.

Treatments	Some berries chemical characteristics									
	SSC (%)		Acidity (%)		SSC/acid ratio		Juice Nitrate Content (ppm)		Juice Nitrite Content (ppm)	
First season (2006)										
1-Control (90% Mineral fertilizer + 10% Chicken manure)	16.1	c	0.68	ab	23.7	d	4.91	a	0.94	a
2- 100% Humic acid + 0% Chicken manure	16.2	bc	0.65	abc	24.9	c	4.07	b	0.68	b
3- 75% Humic acid + 25% Chicken manure	16.3	ab	0.63	c	25.9	ab	3.91	b	0.66	b
4- 50% Humic acid + 50% Chicken manure	16.4	a	0.62	c	26.5	a	3.73	b	0.59	b
5- 25% Humic acid + 75% Chicken manure	16.3	ab	0.64	bc	25.5	bc	3.50	bc	0.55	b
6- 0% Humic acid + 100% Chicken manure	15.8	d	0.69	a	22.9	d	2.83	c	0.43	b
Second season (2007)										
1-Control (90% Mineral fertilizer + 10% Chicken manure)	16.5	a	0.72	ab	22.9	b	5.03	a	0.98	a
2- 100% Humic acid + 0% Chicken manure	16.4	ab	0.70	bc	23.4	ab	4.13	b	0.68	b
3- 75% Humic acid + 25% Chicken manure	16.3	ab	0.69	c	23.5	ab	3.98	b	0.62	bc
4- 50% Humic acid + 50% Chicken manure	16.2	bc	0.68	c	23.8	a	3.80	b	0.53	bcd
5- 25% Humic acid + 75% Chicken manure	16.0	cd	0.69	c	23.2	ab	3.57	b	0.45	cd
6- 0% Humic acid + 100% Chicken manure	15.9	d	0.74	a	21.5	c	2.79	c	0.40	d

Means followed by the same letter (s) in each column in each season are not significantly different at 5% level

received zero humic acid + 100% chicken manure and control treatment in the first and second season (22.9,23.7 and 21.5, 22.9) respectively.

The obtained results may be attributed to the effect of organic fertilization in decreasing acidity is due to increasing exchangeable K, Ca and Mg and decreased acidity by forming potassium tartrate which is relatively insoluble

These results are agree with those obtained by Omar (2005) who found that mineral fertilization and its combinations with compost and/or humic acid significantly increased TSS%, TSS/acid ratio and decreased total acidity of Thompson Seedless grapes. Also, Ali *et al.*, (2006) mentioned that TSS% and TSS/acid ratio increased and total acidity decreased by applying of 15ml/vine of humic acid on Flame Seedless and Superior Seedless grapes.

D- Berries juice nitrate content (NO_3):

The lowest value of berries nitrate (NO_3)was obtained by vines received zero humic acid + 100% chicken manure (2.83and 2.79) in the first and second season respectively , while, the highest value was given by vines received 90% of the mineral nitrogen + 10% chicken manure (control) [4.91and 2.79] in the first and second season, respectively.

E- Berries juice nitrite content (NO_2):

The lowest value of berries nitrite (NO_2)was obtained by vines received zero humic acid + 100% chicken manure (0.43and 0.40) in first and second season respectively, while, the highest value was given by vines received 90% of the mineral nitrogen + 10% chicken manure [(control) 0.94 and 0.98] in the first and second seasons respectively.

Such levels of NO3 and NO_2 in berries juice are less than those of maximum contaminant level (MCLs) of nitrate (10 mg/L) and of nitrite (1mg/L) in drinking water as recommended by U.S.E.P.A.(2008).

These results are in harmony with those found by, Omar (2005) who recorded that the highest nitrate & nitrite residues in the berries were observed in mineral fertilization, whereas the lowest values were recorded for compost fertilization followed in a descending order by humic acid and the combination of mineral + organic fertilization of Thompson Seedless grapes.

5- Vegetative growth:

Data in table (8) show the effect of humic acid and chicken manure fertilization treatments on vegetative growth parameters (shoot length, leaves No./shoot, leaf area and weight of annual pruning wood) of Superior grapevine in 2006 and 2007 seasons.

A- Shoots length:

The highest values were obtained by vines received 50% humic acid + 50% chicken manure and vines received75% humic acid + 25% chicken manure (199.85,188.4 and 194.5,181.6) in the first and second season, respectively. While, the lowest values were obtained by vines received zero humic acid + 100% chicken manure and control treatment (165.5,171.4 and 160.7, 165.1) in both seasons.

B- Leaf number /shoot:

The highest values of this estimate were recorded by vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (31.4, 29.0 and 32.4, 31.0) in the first and second season, respectively. While, the lowest value was obtained by vines received zero humic acid + 100% chicken manure (25.1 and 26.1) in the first and second season, respectively.

C- Leaf area :

The highest values were obtained by vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (177.3,168.2 and 193.1, 189.1) in the first and the second season respectively. While, the lowest values were obtained by vines received zero humic acid + 100% chicken manure and control treatments (139.8,145.3 and 152.3, 163.5) in the first and second season, respectively.

D- Weight annual pruning wood/vine:

The highest value of this estimate were recorded by vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (3.43,3.21 and 3.80, 3.63) in the first and second season, respectively. While, the lowest values were obtained by vines receiving zero humic acid + 100% chicken manure and control treatments (2.64,2.69 and 2.98, 3.21) in the first and second season, respectively.

These results agree with those obtained by Omar (2005) who found that mineral fertilization and its combinations with compost

Table (8): Effect of humic acid and chicken manure combinations on some vegetative growth of Superior grapevines in 2006&2007 seasons

Treatments	Some vegetative growth parameters							
	Shoot length (cm)		Number of leaves/shoot		Leaf area (cm^2)		Weight of annual pruning wood (kg)	
First season (2006)								
1-Control (90% Mineral fertilizer + 10% Chicken manure)	171.4	d	25.9	c	145.3	d	2.69	c
2- 100% Humic acid + 0% Chicken manure	173.7	cd	27.3	bc	150.8	cd	2.82	c
3- 75% Humic acid + 25% Chicken manure	188.4	ab	29.0	ab	168.2	ab	3.21	ab
4- 50% Humic acid + 50% Chicken manure	199.8	a	31.4	a	177.3	a	3.43	a
5- 25% Humic acid + 75% Chicken manure	185.9	bc	28.9	b	161.6	bc	3.10	b
6- 0% Humic acid + 100% Chicken manure	165.5	d	25.1	c	139.8	d	2.64	c
Second season (2007)								
1-Control (90% Mineral fertilizer + 10% Chicken manure)	165.1	d	26.9	cd	163.5	cd	3.21	c
2- 100% Humic acid + 0% Chicken manure	168.0	cd	28.5	c	165.8	c	3.29	c
3- 75% Humic acid + 25% Chicken manure	181.6	ab	31.0	ab	189.1	ab	3.63	ab
4- 50% Humic acid + 50% Chicken manure	194.5	a	32.4	a	193.1	a	3.80	a
5- 25% Humic acid + 75% Chicken manure	179.3	bc	30.4	b	181.2	b	3.59	b
6- 0% Humic acid + 100% Chicken manure	160.7	d	26.1	d	152.3	d	2.98	d

Means followed by the same letter (s) in each column in each season are not significantly different at 5% level

and/or humic acid significantly increased leaf area of Thompson Seedless grapevines. In this concern, Omar and Abd El-All (2005) recorded that applying humic acid at12 litre/feddan divided into four equal doses added in February, April, May and June increased leaf area of Superior grapevines. Also, Ali *et al.*, (2006) mentioned that leaf area increased by applying of 15ml/vine of humic acid on Flame Seedless and Superior Seedless grapevines.

6- Leaf petiole mineral content:

Data in table (9) show the effect of humic acid and chicken manure fertilization treatments on petiole leaf mineral contents (nitrogen, phosphorus, potassium, calcium, magnesium, iron, zinc and manganese) of Superior grapevine in 2006 and 2007 seasons.

6-1 Leaf petiole nitrogen content

The highest values were obtained by vines received 50% humic acid + 50% chicken manure and vines received 75% humic acid + 25% chicken manure (2.59, 2.55 and 2.16, 2.57) in the first and second season, respectively. While, the lowest value was obtained by vines received zero humic acid + 100% chicken manure and control treatments (2.34 and 2.46 in the first and second season respectively.

All other nutrients (P, K, Ca, Mg, Fe, Zn and Mn take the same trend of nitrogen.

Finally we can conclude that, the application of 50% humic acid + 50% chicken manure or 75% humic acid + 25% chicken manure were the recommended treatments (without any significant difference between them) to Superior grapevines seemed to be the best fertilization program where it increased vine yield and improved fruit quality without hazard effect on vegetative growth parameters. Also it could be noticed that zero humic acid+ 100% chicken manure recorded the lowest level of nitrate and nitrite in berries juice.

Table (9): Effect of Effect of humic acid and chicken manure combinations on leaf petiole mineral contents (nitrogen, phosphorus, calcium, magnesium, iron, zinc and manganese) of Superior grapevine in 2006 and 2007 seasons.

Treatments	Leaf petiole mineral contents							
	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	Fe (ppm)	Zn (ppm)	Mn (ppm)
First season (2006)								
1-Control (90% Mineral fertilizer + 10% Chicken manure)	2.41 d	0.29 c	1.58 cd	2.93 d	0.40 c	97 cd	40 cd	87 c
2- 100% Humic acid + 0% Chicken manure	2.49 c	0.35 b	1.60 bc	3.01 c	0.42 bc	99 bcd	43 bc	91 bc
3- 75% Humic acid + 25% Chicken manure	2.55 ab	0.37 ab	1.63 ab	3.08 ab	0.45 ab	111 ab	48 ab	103 ab
4- 50% Humic acid + 50% Chicken manure	2.59 a	0.39 a	1.68 a	3.13 a	0.47 a	121 a	53 a	114 a
5- 25% Humic acid + 75% Chicken manure	2.54 b	0.36 b	1.62 bc	3.07 b	0.43 b	104 bc	45 bc	97 bc
6- 0% Humic acid + 100% Chicken manure	2.34 e	0.24 d	1.53 d	2.88 d	0.36 d	88 d	37 d	85 c
Second season (2007)								
1-Control(90% Mineral fertilizer + 10% Chicken manure)	2.48 cd	0.30 de	1.67 d	2.97 cd	0.36 cd	119 c	54 cd	107 cd
2- 100% Humic acid + 0% Chicken manure	2.53 bc	0.33 cd	1.72 c	3.02 bc	0.39 bc	123 bc	56 bc	114 c
3- 75% Humic acid + 25% Chicken manure	2.57 ab	0.37 ab	1.75 ab	3.07 ab	0.44 ab	129 ab	59 ab	127 ab
4- 50% Humic acid + 50% Chicken manure	2.61 a	0.40 a	1.76 a	3.12 a	0.48 a	135 a	61 a	136 a
5- 25% Humic acid + 75% Chicken manure	2.55 b	0.35 bc	1.73 bc	3.05 b	0.41 bc	127 b	57 bc	119 bc
6- 0% Humic acid + 100% Chicken manure	2.46 d	0.27 e	1.61 e	2.93 d	0.31 d	111 d	51 d	95 d
Optimum level*	N 0.7-1.3	P 0.15-0.4	K 0.8-2.5	Ca 1.0-3.0	Mg 0.5-1.5	Fe 15-100	Zn 15-100	Mn 20-200

Means followed by the same letter (s) in each column in each season are not significantly different at 5% level

Optimum level recommended by: Cline (1990)*

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استجابة كرمات العنب صنف سوبيريور للتسميد بحامض الهيوميك المخصب وسماد الدواجن

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أجريت هذه الدراسة خلال موسمي 2006 -2007 على كرمات العنب صنف سوبيريور عمرها سبع سنوات مزروعة في تربة رملية طميية على مسافات 2 x3 م ومربـاة بطريقة الـ Y تروى بماء الآبار بطريقة الري بالتنقيط .وكان الهدف دراسة تأثير التسميد بتوليفات من حمض الهيوميك المخصب وسماد الدواجن على المحصول وجودة الثمار والمحتوى المعدني لأعناق الأوراق للعنب صنف سوبيريور .وأجريت المعاملات التالية:1- المقارنة[(40 وحدة نيتروجين /فدان) 90% معدني و10% عضوي] 2- 100% حامض هيوميك مخصب + صفر % سماد دواجن. 3- 75% حامض هيوميك مخصب + 25% سماد دواجن.4-50% حامض هيوميك مخصب +50% سماد دواجن.5-25% حامض هيوميك مخصب + 75% سماد دواجن.6- صفر% حامض هيوميك مخصب + 100% سماد دواجن. وأشارت النتائج الى : تفتح تدريجي للبراعم من منتصف فبراير الى الأسبوع الثاني من مارس في كل المعاملات. وسجلت المعاملة الثالثة والرابعة أعلى القيم لكل من نسبة البراعم المتفتحة ومحصول الكرمة وعدد العناقيد على الكرمة وعرض وطول العنقود. وكانت أعلى القيم لكل من نسبة البراعم الزهرية والصفات الطبيعية للحبات ومحتوى الجوامد الذائبةوخشب التقليم السنوي للكرمة مع المعاملة الثالثة. بالأضافة الى ذلك كانت أقل القيم لكل من النترات والنيتريت ظهرت مع المعاملة السادسة.كما لوحظت أعلى القيم للعناصر الغذائية بأعناق الأوراق مع المعاملة الثالثة والرابعة.