Behavior of Superior Grapevines to Some Humic Acid, EM and Weed Control Treatments

Farouk H. Abdelaziz[1]; Emad A. H. El-Mamlouk[2]; and Mohamed A.H. Sultan[1]

[1]Hort. Dept. Fac. of Agric. Minia Univ, Egypt; [2]Organic Agric. Lab, ARC, Giza, Egypt

Abstract: This study was carried out during 2014 and 2015 seasons to investigate the effect of using humic acid and/or EM each at 10 ml/vine and some weed control treatments (Mulching with black or blue polyethylene sheets, sawdust mulches, hand hoeing or chemical control with glyphosate) on controlling weeds and improving yield and berries quality of Superior grapevines. Using EM and/or humic acid and controlling weeds with mulching (black or blue polyethylene sheets, sawdust, chemical and hand hoeing) was very effective in controlling weeds and stimulating growth, yield and quality of the berries relative to the check treatment. The best weed control means was soil mulching specially with black polyethylene sheets followed by hand hoeing and chemical agent with glyphosate occupied the last position in this respect. Soil mulching with black polyethylene sheets for two months in combined with supplying the vines with EM and humic acid each at 10 ml/vine gave satisfactory control of weeds and was responsible for improving yield and quality of the berries in Superior vineyards.

[Farouk H. Abdelaziz; Emad A. H. El-Mamlouk and Mohamed A.H. Sultan. **Behavior of Superior Grapevines to Some Humic Acid, EM and Weed Control Treatments.** *N Y Sci J* 2017;10(7):86-101]. ISSN 1554-0200 (print); ISSN 2375-723X (online). http://www.sciencepub.net/newyork. 13. doi:10.7537/marsnys100717.13.

Keywords: EM, Humic acid, Weeds, Hand hoeing, mulching, yield, berries quality, Superior grapevines.

1. Introduction

Weed competition in fruit crops orchards is a chronic problem faces extension and improvement of the Egyptian grape industry. Leaving weeds without control restricts growth directly and severely limits the ability of grapevines to respond to favourable nutritional and soil moisture conditions, resulting in poor growth and reduces yield (**Oren, 1988**). In addition, weeds harbour insects and diseases and reduce the efficiency of cultural practices and impede harvesting operations. Therefore, it is necessary to control weeds in vineyards. There are many methods of weed control adopted to specific weeds situations. These include mulching, hand hoeing and using chemical agents. Controlling weeds in fruit orchards was accompanied with improving growth, yield and fruit quality (**El-Shammaa and Hassan, 2001; Olmstead *et al*, 2001; Erhart and Hartel, 2002 and Fredrikson *et al*., 2011).** Humic acid acts as a soil conditioner and improves soil structure and fertility, root development, nutrient uptake, plant pigments, fertilizer retention, aeration of soil and water holding capacity and reduces soil erosion and soil pH (**Hayes and Wilson, 1997; Davis and Ghabbour, 1998; and Kabeel *et al,* 2008**). EM is capable for enhancing soil fertility, soil organic matter, soil aeration, water retention, cation exchange capacity, microflora activity, N fixation and plant pigments, lowering soil pH and controlling insects, pests and diseases (**Wani and lee, 1995; Wood *et al,* 1997 and Mickan and Muller, 2009**).

It is essential for controlling weeds in fruit orchards by different soil management systems for enhancing growth and fruiting of the trees (**Sandler *et al*., 2009; Kucukgumuk and Kelen, 2010; Fredrikson *et al*., 2011 and Abd El-Kareem, 2014**).

Using EM (**Farag, 2006; Ahmed and Ibrahim-Asmaa, 2009; Ahmed *et al*., 2012; El-Khatagy, 2013; El-Sehrawy, 2008 and Abd El-Kareem, 2014**) and humic acid (**Abada, 2009; Abada *et al*., 2010; Abd El-Aziz, 2011 and Mekawy, 2012**) was very effective in improving yield and quality of various grapevine cvs.

The target of this study was examining the effect of some EM_1, humic acid and weed control treatments on killing weeds as well as improving, growth, yield and berries quality of Superior grapevines.

2. Material and Methods

This study was carried out during 2014 and 2015 seasons on uniform in vigour 8 -years old Superior grapevines grown at El- Hawarta village, Minia district, Minia Governorate. The texture of soil is clay. Cane pruning system with using Gable supporting method was adopted. Vine load was 72 eyes (6 fruiting canes x 10 eyes + 6 renewal spurs x two eyes). The vines are planted at 2 x 3 meters (700 vines / fed.) Surface irrigation system using Nile water was followed.

Mechanical, physical and chemical analysis of the tested soil at 0.0 - 90 cm depth were carried out at the start of the experiments according to the procedures that outlined by **Wilde *et al.,* (1985)**.

Except those dealing with the present treatments (humic acid, EM_1 and weed control treatments), all the selected vines (72 vines) received the usual horticultural practices which are commonly used in the vineyard.

Table (1): Analysis of the tested soil:

Constituents	Values
Particle size distribution	
Sand %	5.2
Silt %	23.8
Clay %	71.0
Texture	Clay
pH (1: 2.5 extract)	7.7
EC (1: 2.5 extract) mmhos/ 1 cm 25°cm	0.79
Total CaCO3 %	1.96
O.M. %	1.72
Total N %	0.07
P ppm (Oslen)	4.2
K ppm (ammonium acetate)	605.0
Mg (ppm)	6.0
Available micronutrients (EDTA, ppm):	
Fe	3.8
Zn	3.0
Mn	5.3
Cu	1.0

This experiment included two factors (A & B). The first factor (A) involved four treatments from humic acid & EM_1. hamely a_1) control (untreated vines), a_2) application of humic acid at 10 ml / vine, a_3) application of EM_1 at 10 ml/ vine and a_4) application of humic acid at 10 ml / vine + EM_1 at 10 ml/ vine. While the second factor (B) contained from the following six weed control treatments:

b_1 Unweeded control.

b_2 Soil mulching with black polyethylene sheets for two months.

b_3 Soil mulching with blue polyethylene sheets for two months.

b_4 Soil mulching with sawdust for two months.

b_5 Chemical control with Clash at 2 L/fed.

B_6 Hand hoeing three times started at the middle of Mar. and at three week intervals (1st and last weeks of April). Therefore, this experiment included 24 treatments. Each treatment was replicated three times, one vine per each.

In mulching treatments, black polyethylene sheets (120 micron thick) were used to cover the area around vine (0.143 kg/ m^2). Each sheet was 4 m width 120 m length. Clash (glyphosate) as systemic post emergence herbicide at 2L / fed was applied at the middle of March and again at one month later and the used rate was added to 200 L water / fed.

The liquid stock culture of the EM_{-1} used in this study was supplied by Bio. Fertilization, Minia Univ. Egypt. and contained a mixture of lactic acid bacteria, *Lactobacillus plantaruin, Candida utilis, Streptoinyces albus*. EM_1 is available in a dormant state and requires activation before application. Activation involves the addition of 20 litres of water and 2 kilograms of Jaggery (pure cane sugar Juice) to 1 litre of dormant EM. The mixture was poured into a clean airtight plastic container with no air left in the container. The container was stored away from direct sunlight at ambient temperatures for 8 to 10 days. The gas was released from every day until fermentation completed. During the period of activation, a white layer of actinomycetes formed on the top of the solution accompanied by a pleasant smell and acidic pH within the range of 4.0 each ml of EM_1 contained 0.6×10^7 cells.

Humogreen (10 % humic acid) was used as a source of humic acid. Both EM and humic acid was added once (before growth start) at 10 ml/ vine year under vine canopy on wetted soil.

This experiment was set up in a randomized complete block design (RCBD) in split plot arrangement where each treatment was replicated three times, one vine per each. The whole and subplots were the four treatments of EM_1 and humic acid and the six weed control treatments, respectively.

The scientific English and Arabic names as well as the family of the dominant annual and perennial weeds in the tested vineyard.

During both seasons, the following parameters were recorded:

1. Weed density (fresh and dry weight of weeds g).
2. Vegetative growth characteristics (main shoot length, leaf area (**Ahmed and Morsi, 1999**) and fresh weight of leave).
3. Percentage of water of leave.
4. Leaf photosynthetic pigments (chlorophylls a & b, total chlorophylls and total carotenoids) (**Von-Wettstein, 1957**).
5. Leaf content of nutrients (N, P, K and Mg as % as well as Zn, Fe, Mn and Cu as ppm) on dry weight basis according to (**Cottenie *et al.*, 1982, Summer, 1985 and Wilde *et al.*, 1985).**
6. Percentage of berry setting.
7. Yield expressed in weight (kg) and number of cluster per vine.
8. Cluster weight (g) and dimensions (length and shoulder cm).
9. Percentage of shot berries.
10. Berries quality namely berry weight and dimensions (longitudinal and equatorial of berry cm), T.S.S%, total acidity% as g tartaric acid/100ml juice, T.S.S/acid and reducing sugars%) (**Lane and Eynon, 1965 and A.O.A.C, 2000**).

The proper statistical analysis was done. Treatment means were compared using new L.S.D. at 5% (according to **Rangaswamy, 1995**).

Table (2): The scientific English and Arabic names as well as the family of the dominant annual and perennial weeds in the tested vineyard.

Scientific	English	Family	Arabic
Annual weeds:			
Portulaca oleraceae L.	Common puslane	Portylacene	الرجلـة
Corcheus olitorius L.	Jews mallow	Tiliacaeae	الملوخيـــة
Xanthium strumarium L.	Broad cocklebur	Compositae	الشـــــبيط
Melva parviflora L.	Chees weed mall	Malvaceae	الخمـــيرة
Perennial weeds:			
Cyperus rotundus L.	Purplenut sedge	Cyperaceae	الســـعد
Cynodon dactylon L.	Bermuda grass	Gramineae	جيـلالـن
Convolvuius arvensis L.	Ind weed	Comnvduelaceae	العليـــق

3. Results

1- The spectrum of annual and perennial weeds infesting the experimental vineyard area before the application of different weed control treatments

The spectrum of annual and perennial weeds infesting the experimental vineyard area (in m^2) just before the application of different weed control treatments during 2014 and 2015 seasons was illustrated in Table (3).

It is clear from the data in Table (3) that weeds invaded the tested vineyard are into three divisions were Cyperus rotundus L.,Portulaca oleraceae L., Cynodon dactylon L., Corcheus olitorius L., Xanthium strumarium L., Convolvuius arvensis L. and Melva parviflora L.

Cyperus rotundus L occupied the first occupation since fresh weight and percentage of this species were (703.0 g & 46.6 %) in the first season and (710.0 g & 45.2 %) in the second season.

Weed species Melva parviflora L. ranked the last position. In such weed species fresh weight reached 30.0 & 40.0 g while percentage of such weed species among all weeds reached 2.0 & 2.5 % during both seasons, respectively.

2- Fresh and dry weights of annual weeds invaded Superior vineyards.

It is clear from the obtained data in Table (4) that supplying the vines with humic acid and/ or EM_1 each at 10 ml/ vine / year significantly resulted in depressing fresh and dry weights of annual weeds invaded the vineyard in relative to the check treatment. Application of EM_1 was superior than using humic acid in reducing these annual weeds. Combined application of these organic and biofertilizer was significantly preferable than using each fertilizer alone in controlling the annual weeds. The lowest values were recorded on the vineyard that supplied with humic acid and EM_1 together. The untreated vineyard area gave the highest values. These results were true during both seasons.

It is evident from the obtained data in Table (4) that controlling weeds by soil mulching with black and blue polyethylene, sawdust muscles, chemical control or hand hoeing three times significantly reduced fresh and dry weights of annual weeds invaded the vineyard rather than unweeded control. Soil mulching was significantly surpassed chemical control and hand hoeing in reducing weights of annual weeds. In addition, hand hoeing three times significantly decreased fresh and dry weights of annual weeds in relative to chemical control. In another words, the best means of weeds control was soil mulching followed by hand hoeing and chemical control occupied the last position in this connection. The best soil mulches was black polyethylene sheets followed by blue ethylene sheets and sawdust muscles, in descending order. The lowest fresh and dry weights of annual weeds was observed with mulching the soil with black polyethylene bages for two months, unweeded control gave the maximum values. These results were true during both seasons.

The interaction between application of humic acid, EM_1 and weed control treatments had significant effect on the fresh and dry weights of annual weeds. Controlling weeds by soil mulching with black polyethylene sheets for two months besides application of humic acid and EM_1 resulted in significant reduction on the fresh and dry weights of annual weeds. The maximum values were recorded on unweeded control. These results were true during 2014 and 2015 seasons.

3-Some vegetative growth characteristics.

It is obvious from the obtained data in Tables (5 & 6) that using humic acid and / or EM_1 significantly was accompanied with enhancing main shoot length, leaf area and fresh weight of leaf relative to the control treatment. Using EM1 had an announced effect on these characters than using humic acid. The highest values of main shoot length, leaf area and fresh weight of leaf and leaf area were observed with using humic acid and EM_1 together. The lowest main

shoot length, leaf area and fresh were recorded on untreated vines. Similar results were observed during 2014 and 2015 seasons.

The three vegetative growth characteristics namely main shoot length, leaf area and fresh and dry weights of leaf were significantly affected by varying weed control treatments. Controlling weeds by soil mulching, chemical control and hand hoeing significantly was accompanied with stimulating the main shoot length, leaf area and fresh and dry weights of leaf in relative to unweeded control. Soil mulching was significantly superior them chemical control or hand hoeing in enhancing these growth characters. Hand hoeing was superior than chemical control in this connection. In descending order, the best soil mulches was black polyethylene sheets, blue polyethylene sheets and sawdust mulches. The maximum values were recorded with soil mulching for two months. Unweed control gave the lowest values. These results were true during both seasons.

The investigated interactions had significant effect on all the vegetative growth characters. Controlling weeds with mulching the soil with black polyethylene sheets for two months besides organic and biofertilziation with humic acid and EM_1 gave the greatest values of main shoot length, leaf area and fresh weight of leaf. The maximum dry weight of leaf was observed when the soil was mulched with black polyethylene sheets for two months and did not treat with humic acid or EM_1. Unterated vines produced the lowest values of main length, leaf area, and fresh weight of leaf. These results were true during both seasons.

4- Hydration ratio.

It is worth to mention from the data in Table (6) that application of humic acid and/ or EM_1 was significantly followed by great promotion on hydration ratio in relative to the control treatment. Using EM_1 biofertilizer was significantly superior than using humic acid in enhancing hydration ratio. Using both fertilizers together was significantly preferable than using each fertilizer alone in enhancing hydration ratio. The maximum values were recorded on the vines that treated with humic acid and EM together. Similar results were recorded during 2014 and 2015 seasons.

It is clear from the obtained data in Table (6) that controlling weeds by soil mulching, chemical control and hand hoeing significantly promoted hydration ratio rather than unweeded control. Soil mulching was significantly superior than the other two weed control treatments (chemical control & hand hoeing) in increasing hydration ratio. Hand hoeing was superior than chemical control in enhancing hydration ratio. Significant differences on hydration ratio were observed among the three different soil mulches (black polyethylene sheets, blue polyethylene sheets and sawdust mulches. The best soil mulches in this respect was black polyethylene sheets followed by blue polyethylene sheets and sawdust mulches occupied the last position in this respect. The maximum hydration ratio was recorded when weeds were controlled by soil mulching with black polyethylene sheets for two months. The lowest values were recorded on unweeded control. These results were true during both seasons.

The studied interactions had significant effect on hydration ratio. Controlling weeds in Superior vineyard by soil mulching with black polyethylene for two months besides using humic acid and EM_1 each at 10 ml/vine gave the maximum values. Leaving the weeds without control as well as unorganic and biofertilization gave the lowest values. These results were true during 2014 and 2015 seasons.

5-Leaf pigments and various nutrients in the leaves.

It is clear from the obtained data in Tables (7 to 12) that organic and biofertilizaiton with humic acid and/ or EM_1 significantly stimulated plant pigments namely chlorophylls a & b, total chlorophylls and total carotenoids as well as nutrients namely N, P, K, Mg, Zn, Fe and Mn in the leaves relative to the check treatment. Using EM_1 was superior than application of humic acid in improving plant pigments and various nutrients in the leaves. Combined application of humic acid and EM_1 was significantly favourable than using each alone in this connection. The maximum values were recorded on the vines that treated with humic acid and EM_1 together. Untreated vines produced the minimum values. Leaf content of Cu was unaffected by fertilization and organic treatments. These results were true during both seasons.

It is worth to mention that controlling weeds by soil mulching, chemical control and hand hoeing was significantly accompanied with stimulating all leaf pigments and different nutrients in the leaves rather than unweeded control. Controlling weeds by soil mulching was superior than chemical control or hand hoeing in enhancing leaf pigments and nutrients. Hand hoeing gave the maximum values relative to chemical control. The promotion on leaf pigments and nutrients was significantly associated with the type of mulches. Using black polyethylene bags, blue polyethylene sheets and sawdust mulches, in descending order enhanced leaf pigments and different nutrients in the leaves. Controlling weeds by using black polyethylene sheets gave the maximum values. Unweeded control gave the lowest values. Similar results were announced during both seasons.

Leaf pigments namely chlorophylls a & b, total chlorophylls and total carotenoids as well as nutrients namely N, P, K, Mg, Zn, Fe and Mn in the leaves

were significantly affected by all the investigated interactions. They were maximized when the weeds were controlled by soil mulching with black polyethylene sheets for two months besides using humic acid and EM1 together. The unweeded control with the neglection of using organic and biofertilization of the vines produced the minimum values. These results were true during both seasons.

6-Percentage of berry setting and yield.

Data in in Tables (13 to 14) clearly show that single and combined applications of humic acid and EM_1 significantly was accompanied with improving berry setting as well as yield expressed in weight and number of clusters per vine relative to the check treatment. Using EM_1 was significantly preferable than using humic acid in improving berry setting, yield and number of clusters per vine. Using both organic and biofertilizers together gave the maximum values relative to using each fertilizer alone in this respect. Number of clusters/ vine did not alter significantly with the present treatments in the first season of study. The maximum values were recorded on the vines that supplied with humic acid and EM_1 together. Untreated vines gave the lowest values. These results were true during both seasons.

It is reveal from the obtained data that controlling weeds by using different soil mulches (black and blue polyethylene sheets and sawdust mulches), chemical control and hand hoeing, significantly was very effective in improving berry setting %, yield and number of clusters per vine relative to the check treatment. Soil mulching was significantly favourable in improving these parameters rather than using hand hoeing or chemical control. Hand hoeing was significantly superior than chemical control in this connection. The best soil mulches was black polyethylene sheets, followed by blue polyethylene sheets and sawdust mulches in improving berry setting and yield/ vine. The present treatments had no significant effect on the number of clusters in the first season of study. Controlling weeds by black polyethylene sheets for two months gave the maximum values. The unweeded control treatment gave the lowest values. These results were true during both seasons.

The studied interaction had significant effect on the percentage of berry setting and yield. The maximum yield was recorded with controlling weeds in vineyard by using black polyethylene sheets for two months besides treated the vines with humic acid and EM_1 together. Under such promised treatment, yield per vine reached 10.2 and 14.1 kg in relative to the check treatment that produced 7.2 and 7.3 kg during both seasons, respectively. The percentage of increment on the yield due to using the best treatment in relative to the check treatment reached 41.7 and 93.2 % during both seasons, respectively.

7-Cluster weight and dimensions.

It is indicated from the obtained data in Tables (14 & 15) that single and combined applications of humic acid and EM_1 each at 10 m, l/vine significantly was followed by great promotion on weight, length and shoulder of cluster rather than non- application. Application of EM_1 was significantly favourable than using humic acid in improving cluster weight and dimensions (length & shoulder). Combined application of humic acid and EM_1 was significantly favourable in improving cluster aspects rather than application of each fertilizer alone. The maximum values were recorded on the vines that treated with both fertilizers together. The check treatment produced the minimum values. These results were true during both seasons.

It is clear from the obtained data that controlling weeds by soil mulching, chemical control or hand hoeing significantly caused a great promotion on weight and dimensions of cluster rather than unweeded control. Mulching the soil was superior than chemical control and hand hoeing in improving cluster weight and dimensions. Hand hoeing was significantly preferable than chemical control in promoting cluster growth. The best soil mulches in this respect was black polyethylene sheets followed by blue polyethylene sheets and sawdust mulches. The heaviest and longest clusters were borne on the vine under control weeds with soil mulching with black polyethylene sheets for two months. Unweeded control treatment produced the small clusters. Similar results were announced during both seasons.

Weight and dimensions of cluster were significantly affected with the investigated interactions. Controlling weeds by soil mulching with black polyethylene sheets for two months besides application of humic acid and EM_1 each at 10 ml/ vine produced the heaviest clusters. The small clusters were borne in untreated vines. These results were true during both seasons.

8- Percentage of shot berries:

It is obvious from the obtained data in Table (16) that using humic acid and / or EM_1 significantly was accompanied with reducing shot berries % relative to the control treatment. Using EM1 had reducing effect on these undesirable phenomenon than using humic acid. The lowest values of shot berries were observed with using humic acid and EM_1 together. The highest values were recorded on untreated vines. Similar results were observed during 2014 and 2015 seasons.

The percentage of shot berries was significantly affected by varying weed control treatments. Controlling weeds by soil mulching, chemical control and hand hoeing significantly was accompanied with

reducing the percentage of shot berries relative to unweeded control. Soil mulching was significantly superior than chemical control or hand hoeing in decreasing such trait. Hand hoeing was superior than chemical control in this connection. In descending order, the best soil mulches was black polyethylene sheets, blue polyethylene sheets and sawdust mulches. The maximum values were recorded with soil mulching for two months. Unweed control gave the highest values. These results were true during both seasons.

The investigated interactions had significant effect on percentage of shot berries. Controlling weeds with mulching the soil with black polyethylene sheets for two months besides organic and biofertilziation with humic acid and EM_1 gave the lowest values of percentage of shot berries. The minimum percentage of shot berries was observed when the soil was mulched with black polyethylene sheets for two months and did not treat with humic acid or EM_1. Unterated vines produced the highest values of percentage of shot berries. These results were true during both seasons.

9-Some physical and chemical characteristics of the berries.

It is clear from the data in Tables (16 & 19) that single and combined applications of humic acid and EM significantly improved both physical and chemical characteristics of the berries in terms of increasing berry weight and dimensions, T.S.S. %, total sugars%, T.S.S./ acid and total acidity % relative to the check treatment. Using EM_1 was significantly preferable than using humic acid in improving quality of the berries. A Supreme effect on quality of the berries was observed due to using both humic acid and EM_1 together rather than application of each fertilizer alone. The best results were announced in the vines that received humic acid and EM_1 together. Unfavourable effects on quality of the berries were observed on the untreated vines. Similar results were obtained during both seasons.

Killing the weeds in the vineyard by soil mulching, chemical control or hand hoeing significantly was accompanied with improving quality of the berries rather than unweeded control. The promotion on quality of the berries was attributed, to using soil mulching, hand hoeing and chemical control for killing weeds, in descending order. The best mulches used for improving quality of the berries was black polyethylene sheets followed by blue polyethylene sheets and sawdust mulches. Hand hoeing surpassed the use of chemical control in improving quality of the berries. Controlling the weeds by black polyethylene for two months gave the best results with regard to quality of the berries. Unweeded control treatment gave worst results on quality of the berries. These results were true during both seasons.

All The Investigated Interactions Had Significant Effect On Both Physical And Chemical Properties Of The Berries. Controlling Weeds In Superior Vineyards By Soil Mulching With Black Polyethylene Sheets For Two Months As Well As Treating The Vines With Humic Acid + EM_1 Gave The Best Results With Regard To Quality Of The Berries. The Vice Versa Was Obtained On Untreated Vines. Similar Results Were Announced During Both Seasons.

Table (3): Weed density (measured as fresh weight g^{-1}/ m^2 as well as percentages in the experimental vineyard in 2014 and 2015 seasons just before treatment.

Weeds name	2014		2015	
	g^{-1}/ m_2	%	g^{-1}/ m_2	%
Cyperus rotundus L.	703.0	46.6	710.0	45.2
Portulaca oleraceae L.	300.0	19.9	305.0	19.4
Cynodon dactylon L.	230.0	15.2	245.0	15.6
Corcheus olitorius L.	112.0	7.4	125.0	8.0
Xanthium strumarium L.	75.0	5.0	80.0	5.1
Convolvuius arvensis L.	60.0	4.0	65.0	4.1
Melva parviflora L.	30.0	2.0	40.0	2.5

Table (4): Effect of some humic acid, effective microorganisms ($E.M_1$.) and weed control treatments on the total fresh and dry weights of annual weeds (g.) /m^2 of Superior vineyards during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Fresh weight of weeds									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	1111.9	941.0	772.2	552.9	844.3	1121.9	951.0	782.0	560.0	853.7
b_2 Mulching with black polyethylene sheets	71.0	62.0	50.0	41.0	56.0	82.5	73.7	61.0	52.0	67.3
b_3 Mulching with blue polyethylene sheets	80.9	71.0	62.0	52.0	66.5	91.0	81.0	72.0	62.0	76.5

b_4 Mulching with sawdust sheets	99.9	90.0	80.7	70.8	85.4	109.9	100.7	89.9	80.0	95.1
b_5 Chemical control with glyphosate	150.3	140.0	131.0	122.2	135.9	160.0	150.0	141.0	131.3	145.6
b_6 Hand hoeing	111.0	100.0	90.0	80.0	95.3	120.6	110.0	100.9	94.0	106.4
Mean (A)	270.8	234.0	197.5	153.2		281.0	244.4	207.8	163.2	
New L.S.D. at 5%		**A 2.1**	**B 2.5**	**AB 5.0**			**A 2.2**	**B 2.6**	**AB 5.2**	
	Dry weight of weeds									
b_1 Unweeded control	229.9	189.0	155.5	111.0	171.4	232.3	192.0	158.0	114.4	174.2
b_2 Mulching with black polyethylene sheets	14.1	12.0	10.2	8.2	11.1	16.1	13.9	12.2	10.1	13.1
b_3 Mulching with blue polyethylene sheets	17.0	13.5	14.0	12.0	14.1	19.0	17.5	16.0	14.0	16.6
b_4 Mulching with sawdust sheets	20.0	18.0	16.9	15.1	17.5	22.0	19.9	16.9	15.0	18.5
b_5 Chemical control with glyphosate	29.9	27.0	25.0	23.6	26.4	32.2	28.0	26.0	24.0	27.6
b_6 Hand hoeing	22.0	20.0	18.6	16.8	19.4	24.0	22.0	20.6	18.8	21.4
Mean (A)	55.5	46.6	40.0	31.1		57.6	48.9	41.6	32.7	
New L.S.D. at 5%		**A 1.1**	**B 1.4**	**AB 2.8**			**A 0.9**	**B 1.2**	**AB 2.4**	

Table (5): Effect of some humic acid, effective microorganisms ($E.M_1$.) and weed control treatments on the main shoot length and leaf area of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Main shoot length (cm)									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	110.0	112.0	115.0	118.0	113.8	111.7	113.8	117.0	119.8	115.6
b_2 Mulching with black polyethylene sheets	124.0	125.5	127.0	129.0	126.6	125.8	127.2	128.3	131.0	128.1
b_3 Mulching with blue polyethylene sheets	120.3	122	123.0	125.5	122.7	122.0	123.9	125.3	127.0	124.6
b_4 Mulching with sawdust sheets	118.0	119.0	122.0	125.0	121.0	119.7	121.2	123.9	127.1	123.0
b_5 Chemical control with glyphosate	113.0	115.0	117.0	129.0	118.5	114.0	116.0	118.1	120.5	117.2
b_6 Hand hoeing	115.5	117.5	119.5	122.0	118.6	116.6	118.6	120.7	123.4	119.8
Mean (A)	116.8	118.5	120.6	124.8		118.3	120.1	122.2	124.8	
New L.S.D. at 5%		**A 1.1**	**B 1.5**	**AB 3.0**			**A 1.4**	**B 1.7**	**AB 3.4**	
	Leaf area $(cm)^2$									
b_1 Unweeded control	107.3	109.0	110.7	112.0	109.8	108.7	110.6	112.0	113.8	111.3
b_2 Mulching with black polyethylene sheets	121.3	123.0	124.7	126.6	123.9	122.8	124.4	126.0	127.4	125.2
b_3 Mulching with blue polyethylene sheets	117.4	119	120.7	122.0	119.8	119.0	120.6	122.2	124.0	121.5
b_4 Mulching with sawdust sheets	115.2	117.0	118.5	120	87.7	116.5	118.0	119.6	121.0	118.8
b_5 Chemical control with glyphosate	110.1	112.0	113.8	115.0	112.7	111.0	112.6	114.0	115.7	113.3
b_6 Hand hoeing	112.3	114.0	115.3	117.0	114.7	113.6	115.0	116.7	118.5	116.0
Mean (A)	113.9	115.7	117.3	118.8		115.3	116.9	118.4	120.1	
New L.S.D. at 5%		**A 1.1**	**B 1.4**	**AB 2.8**			**A 1.4**	**B 1.6**	**AB 3.2**	

Table (6): Effect of some humic acid, effective microorganisms (E.M$_1$.) and weed control treatments on the fresh weight of leaf and hydration ratio content of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Fresh weight of leaf (g.)									
	Humic acid and EM$_1$ treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**
b_1 Unweeded control	1.29	1.34	1.38	1.44	1.36	1.22	1.28	1.34	1.40	1.31
b_2 Mulching with black polyethylene sheets	1.55	1.61	1.66	1.71	1.63	1.70	1.77	1.83	1.90	1.80
b_3 Mulching with blue polyethylene sheets	1.50	1.55	1.60	1.66	1.58	1.60	1.65	1.70	1.75	1.68
b_4 Mulching with sawdust sheets	1.44	1.50	1.56	1.61	1.13	1.50	1.55	1.60	1.66	1.58
b_5 Chemical control with glyphosate	1.34	1.40	1.45	1.50	1.42	1.30	1.35	1.40	1.44	1.37
b_6 Hand hoeing	1.38	1.43	1.49	1.56	1.47	1.40	1.45	1.50	1.55	1.48
Mean (A)	1.42	1.47	1.52	1.58		1.45	1.51	1.56	1.62	
New L.S.D. at 5%		**A 1.1**	**B 1.5**	**AB 3.0**			**A 1.4**	**B 1.7**	**AB 3.4**	
	Hydration ratio									
b_1 Unweeded control	1.01	1.12	1.26	1.37	1.19	0.26	1.07	1.20	1.31	0.96
b_2 Mulching with black polyethylene sheets	1.94	2.06	2.17	2.31	2.12	1.88	1.99	2.11	2.25	2.06
b_3 Mulching with blue polyethylene sheets	1.67	1.78	1.91	2.01	1.84	1.60	1.71	1.84	1.95	1.78
b_4 Mulching with sawdust sheets	1.47	1.58	1.70	1.80	1.19	1.40	1.51	1.62	1.73	1.57
b_5 Chemical control with glyphosate	1.11	1.23	1.35	1.47	1.29	1.04	1.16	1.28	1.40	1.22
b_6 Hand hoeing	1.27	1.38	1.50	1.60	1.44	1.20	1.31	1.42	1.54	1.37
Mean (A)	1.41	1.53	1.65	1.76		1.23	1.46	1.58	1.70	
New L.S.D. at 5%		**A 1.1**	**B 1.4**	**AB 2.8**			**A 1.4**	**B 1.6**	**AB 3.2**	

Table (7): Effect of some humic acid, effective microorganisms (E.M$_1$.) and weed control treatments on chlorophylls a & b (mg/100 g F.W) in the leaves of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Chlorophyll a (mg/100g F.W)									
	Humic acid and EM$_1$ treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**
b_1 Unweeded control	4.1	4.4	4.7	5.0	4.6	5.0	5.3	5.6	6.0	5.5
b_2 Mulching with black polyethylene sheets	6.5	6.9	7.3	7.7	7.1	8.5	8.8	9.0	9.3	8.9
b_3 Mulching with blue polyethylene sheets	6.0	6.4	6.8	7.2	6.6	7.7	8.0	8.4	8.8	8.2
b_4 Mulching with sawdust sheets	5.4	5.7	6.0	6.3	4.3	7.0	7.3	7.7	8.0	7.5
b_5 Chemical control with glyphosate	4.5	4.8	5.1	5.4	5.0	5.6	5.9	6.2	6.5	6.1
b_6 Hand hoeing	4.9	5.3	5.6	5.9	5.4	6.2	6.4	6.7	7.0	6.6
Mean (A)	5.23	5.58	5.92	6.25		6.67	6.95	7.27	7.60	
New L.S.D. at 5%		**A 0.2**	**B 0.2**	**AB 0.4**			**A 0.2**	**B 0.3**	**AB 0.6**	
	Chlorophyll b (mg/100g F.W)									
b_1 Unweeded control	1.9	2.2	2.5	2.8	2.4	2.0	2.3	2.6	3.0	2.5
b_2 Mulching with black polyethylene sheets	3.9	4.2	4.6	5.0	4.4	4.0	4.3	4.6	5.0	4.5
b_3 Mulching with blue polyethylene sheets	3.5	3.9	4.2	4.5	4.0	3.6	4.0	4.4	4.7	4.2
b_4 Mulching with sawdust sheets	3.1	3.4	3.7	4.0	2.6	3.3	3.6	4.0	4.3	3.8
b_5 Chemical control with glyphosate	2.4	2.7	3.0	3.3	2.9	2.5	2.8	3.1	3.4	3.0
b_6 Hand hoeing	2.8	3.1	3.4	3.8	3.3	2.8	3.1	3.4	3.7	3.3
Mean (A)	2.93	3.25	3.57	3.90		3.03	3.35	3.68	4.02	
New L.S.D. at 5%		**A 0.2**	**B 0.2**	**AB 0.4**			**A 0.2**	**B 0.3**	**AB 0.6**	

Table (8): Effect of some humic acid, effective microorganisms (E.M$_1$.) and weed control treatments on total chlorophylls and carotenoids (mg/100 g F.W) in the leaves of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Total chlorophylls (mg/100g F.W)									
	Humic acid and EM$_1$ treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**
b_1 Unweeded control	6.0	6.6	7.2	7.8	6.9	7.0	7.6	8.2	9.0	8.0
b_2 Mulching with black polyethylene sheets	10.4	11.1	11.9	12.7	11.5	12.5	13.1	13.6	14.3	13.4
b_3 Mulching with blue polyethylene sheets	9.6	10.3	11.0	11.7	10.7	11.3	12.0	12.8	13.5	12.4
b_4 Mulching with sawdust sheets	8.5	9.1	9.7	10.3	6.8	10.3	10.9	11.7	12.3	11.3
b_5 Chemical control with glyphosate	6.9	7.5	8.1	8.7	7.8	8.1	8.7	9.3	9.9	9.0
b_6 Hand hoeing	7.7	8.4	9.0	9.7	8.7	9.0	9.5	10.1	10.7	9.8
Mean (A)	8.18	8.83	9.48	10.15		9.70	10.30	10.95	11.62	
New L.S.D. at 5%		**A 0.2**	**B 0.3**	**AB 0.6**			**A 0.3**	**B 0.3**	**AB 0.6**	
	Total carotenoids (mg/100g F.W)									
b_1 Unweeded control	1.5	1.7	2.0	2.2	1.9	1.4	1.7	2.0	2.3	1.9
b_2 Mulching with black polyethylene sheets	3.2	3.5	3.8	4.0	3.6	3.2	3.5	3.8	4.1	3.7
b_3 Mulching with blue polyethylene sheets	2.8	3.0	3.2	3.4	3.1	2.8	3.1	3.4	3.7	3.3
b_4 Mulching with sawdust sheets	2.4	2.7	3.0	3.2	2.0	2.4	2.7	3.0	3.3	2.9
b_5 Chemical control with glyphosate	1.7	1.9	2.1	2.3	2.0	2.2	2.0	2.3	2.6	2.2
b_6 Hand hoeing	2.0	2.3	2.6	3.0	2.5	1.7	2.5	2.3	3.1	2.5
Mean (A)	2.27	2.52	2.78	3.02		2.28	2.58	2.80	3.23	
New L.S.D. at 5%		**A 0.2**	**B 0.3**	**AB 0.6**			**A 0.3**	**B 0.3**	**AB 0.6**	

Table (9): Effect of some humic acid, effective microorganisms (E.M$_1$.) and weed control treatments on the percentages of N and P in the leaves of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Leaf N %									
	Humic acid and EM$_1$ treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**
b_1 Unweeded control	1.59	1.64	1.70	1.77	1.68	1.57	1.65	1.73	1.80	1.69
b_2 Mulching with black polyethylene sheets	2.07	2.14	2.22	2.30	2.18	2.06	2.14	2.22	2.30	2.18
b_3 Mulching with blue polyethylene sheets	1.97	2.08	2.15	2.22	2.11	1.95	2.03	2.10	2.18	2.07
b_4 Mulching with sawdust sheets	1.88	1.95	2.03	2.11	1.47	1.85	1.93	2.00	2.08	1.97
b_5 Chemical control with glyphosate	1.68	1.76	1.82	1.90	1.79	1.65	1.72	1.79	1.86	1.76
b_6 Hand hoeing	1.78	1.86	1.92	1.98	1.89	1.75	1.83	1.90	1.97	1.86
Mean (A)	1.83	1.91	1.97	2.05		1.81	1.88	1.96	2.03	
New L.S.D. at 5%		**A 0.05**	**B 0.07**	**AB 0.14**			**A 0.05**	**B 0.06**	**AB 0.12**	
	Leaf P %									
b_1 Unweeded control	0.11	0.14	0.16	0.18	0.15	0.11	0.13	0.15	0.17	0.14
b_2 Mulching with black polyethylene sheets	0.23	0.26	0.29	0.31	0.27	0.24	0.27	0.30	0.32	0.28
b_3 Mulching with blue polyethylene sheets	0.20	0.22	0.24	0.27	0.23	0.21	0.23	0.25	0.28	0.24
b_4 Mulching with sawdust sheets	0.18	0.20	0.23	0.24	0.15	0.19	0.22	0.25	0.27	0.23
b_5 Chemical control with glyphosate	0.14	0.16	0.18	0.21	0.17	0.15	0.18	0.21	0.24	0.20
b_6 Hand hoeing	0.16	0.19	0.22	0.26	0.21	0.16	0.19	0.23	0.27	0.21
Mean (A)	0.17	0.20	0.22	0.25		0.18	0.20	0.23	0.26	
New L.S.D. at 5%		**A 0.02**	**B 0.02**	**AB 0.04**			**A 0.02**	**B 0.04**	**AB 0.08**	

Table (10): Effect of some humic acid, effective microorganisms (E.M$_1$.) and weed control treatments on the percentages of K and Mg in the leaves of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Leaf K %									
	Humic acid and EM$_1$ treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**
b_1 Unweeded control	1.11	1.18	1.26	1.33	1.22	1.07	1.13	1.20	1.27	1.17
b_2 Mulching with black polyethylene sheets	1.43	1.50	1.58	1.66	1.54	1.44	1.50	1.57	1.64	1.54
b_3 Mulching with blue polyethylene sheets	1.35	1.41	1.48	1.56	1.45	1.37	1.44	1.50	1.55	1.47
b_4 Mulching with sawdust sheets	1.27	1.33	1.40	1.46	1.37	1.30	1.37	1.44	1.50	1.40
b_5 Chemical control with glyphosate	1.16	1.23	1.30	1.34	1.46	1.14	1.20	1.26	1.32	1.23
b_6 Hand hoeing	1.21	1.26	1.34	1.40	1.30	1.22	1.30	1.38	1.44	1.34
Mean (A)	1.26	1.32	1.39	1.44		1.26	1.32	1.39	1.45	
New L.S.D. at 5%		**A 0.04**	**B 0.05**	**AB 0.10**			**A 0.04**	**B 0.05**	**AB 0.10**	
	Leaf Mg %									
b_1 Unweeded control	0.49	0.55	0.61	0.68	0.58	0.59	0.65	0.71	0.78	0.68
b_2 Mulching with black polyethylene sheets	0.85	0.90	0.95	1.02	0.93	0.90	0.96	1.02	1.10	1.00
b_3 Mulching with blue polyethylene sheets	0.78	0.83	0.88	0.93	0.86	0.85	0.91	0.97	1.04	0.94
b_4 Mulching with sawdust sheets	0.71	0.77	0.83	0.88	0.58	0.80	0.86	0.92	0.99	0.89
b_5 Chemical control with glyphosate	0.56	0.63	0.70	0.76	0.66	0.66	0.72	0.78	0.84	0.75
b_6 Hand hoeing	0.64	0.69	0.75	0.81	0.72	0.71	0.76	0.83	0.90	0.80
Mean (A)	0.67	0.73	0.79	0.85		0.75	0.81	0.87	0.94	
New L.S.D. at 5%		**A 0.02**	**B 0.03**	**AB 0.06**			**A 0.03**	**B 0.04**	**AB 0.08**	

Table (11): Effect of some humic acid, effective microorganisms (E.M$_1$.) and weed control treatments on the leaf content of Zn and Fe (ppm) of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Leaf Zn (ppm)									
	Humic acid and EM$_1$ treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM$_1$	a_4 Both	**Mean (B)**
b_1 Unweeded control	41.1	44.1	47.1	50.0	45.6	42.0	45.0	48.0	51.0	46.5
b_2 Mulching with black polyethylene sheets	52.1	56.0	59.1	62.9	57.5	53.0	56.9	60.0	63.1	58.3
b_3 Mulching with blue polyethylene sheets	49.1	53.3	56.0	59.4	54.4	50.0	54.2	56.9	60.2	55.3
b_4 Mulching with sawdust sheets	46.3	49.3	51.9	54.0	36.9	47.2	50.2	52.8	54.9	51.3
b_5 Chemical control with glyphosate	42.2	46.0	48.2	51.5	47.0	43.1	47.0	49.2	52.4	47.9
b_6 Hand hoeing	44.1	48.2	50.0	52.0	48.6	45.0	49.1	50.9	53.0	49.5
Mean (A)	45.8	49.5	52.1	55.0		46.7	50.4	53.0	55.8	
New L.S.D. at 5%		**A 1.1**	**B 1.4**	**AB 2.8**			**A 1.2**	**B 1.3**	**AB 2.6**	
	Leaf Fe (ppm)									
b_1 Unweeded control	50.1	53.3	57.0	60.0	55.1	51.0	54.2	58.0	61.0	56.1
b_2 Mulching with black polyethylene sheets	79.2	82.5	86.0	90.0	84.4	80.2	83.5	87.0	91.0	85.4
b_3 Mulching with blue polyethylene sheets	72.0	76.0	80.0	83.0	77.8	73.0	77.0	81.0	84.0	78.8
b_4 Mulching with sawdust sheets	66.0	69.3	72.5	75.0	52.0	67.0	70.5	73.5	76.0	71.8
b_5 Chemical control with glyphosate	55.5	58.6	62.0	65.0	60.3	56.5	59.7	63.0	66.0	61.3
b_6 Hand hoeing	60.0	63.0	66.0	69.0	64.5	60.9	64.0	66.9	70.0	65.5
Mean (A)	63.8	67.1	70.6	73.7		64.8	68.2	71.6	74.7	
New L.S.D. at 5%		**A 1.1**	**B 1.3**	**AB 2.6**			**A 1.1**	**B 1.4**	**AB 2.8**	

Table (12): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on the leaf content of Mn and Cu (ppm) of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Leaf Mn (ppm)									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	56.3	60.0	62.5	65.0	61.0	57.1	60.0	63.0	66.0	61.5
b_2 Mulching with black polyethylene sheets	80.0	81.9	84.0	86.0	83.0	86.0	88.0	90.0	99.5	90.9
b_3 Mulching with blue polyethylene sheets	76.5	77.9	80.0	82.0	79.1	81.0	83.9	86.0	88.9	85.0
b_4 Mulching with sawdust sheets	70.0	72.0	74.0	76.1	54.0	77.9	80.0	82.0	85.0	81.2
b_5 Chemical control with glyphosate	61.5	63.0	65.0	67.5	64.3	61.2	64.0	76.0	70.0	65.6
b_6 Hand hoeing	64.1	66.9	70.0	72.0	68.3	70.0	73.0	67.0	80.0	74.8
Mean (A)	68.1	70.3	72.6	74.8		72.2	74.8	77.3	81.6	
New L.S.D. at 5%		**A 1.1**	**B 1.3**	**AB 2.6**			**A 1.0**	**B 1.1**	**AB 2.2**	
	Leaf Cu (ppm)									
b_1 Unweeded control	1.11	1.12	1.12	1.12	1.12	1.13	1.14	1.14	1.14	1.14
b_2 Mulching with black polyethylene sheets	1.11	1.12	1.12	1.12	1.12	1.13	1.14	1.14	1.14	1.14
b_3 Mulching with blue polyethylene sheets	1.11	1.13	1.14	1.14	1.13	1.14	1.14	1.14	1.14	1.14
b_4 Mulching with sawdust sheets	1.11	1.14	1.14	1.14	0.85	1.14	1.14	1.14	1.14	1.14
b_5 Chemical control with glyphosate	1.11	1.14	1.14	1.14	1.13	1.14	1.14	1.14	1.14	1.14
b_6 Hand hoeing	1.11	1.14	1.14	1.14	1.13	1.14	1.14	1.14	1.14	1.14
Mean (A)	1.11	1.13	1.13	1.13		1.14	1.14	1.14	1.14	
New L.S.D. at 5%		**A NS**	**B NS**	**AB NS**			**A NS**	**B NS**	**AB NS**	

Table (13): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on the percentage of berry setting and number of clusters per vine of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Berry setting %									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	6.5	8.0	9.5	11.0	8.8	7.1	8.6	10.0	11.9	9.4
b_2 Mulching with black polyethylene sheets	13.0	14.9	17.0	19.0	16.0	13.3	15.0	16.6	18.0	15.7
b_3 Mulching with blue polyethylene sheets	11.6	13.0	14.5	16.0	13.8	12.0	13.5	15.0	16.3	14.2
b_4 Mulching with sawdust sheets	10.4	11.6	13.0	14.3	8.8	10.6	12.0	13.4	15.0	12.8
b_5 Chemical control with glyphosate	8.1	9.2	10.3	12.0	9.9	8.3	10.0	11.3	13.0	10.7
b_6 Hand hoeing	9.2	10.5	12.0	13.4	11.3	9.4	10.6	12.0	14.0	11.5
Mean (A)	9.8	11.2	12.7	14.3		10.1	11.6	13.1	14.7	
New L.S.D. at 5%		**A 1.1**	**B 1.3**	**AB 2.6**			**A 1.0**	**B 1.1**	**AB 2.2**	
	No. of clusters/vine									
b_1 Unweeded control	24.0	25.0	25.0	25.0	24.8	24.0	25.0	26.0	27.0	25.5
b_2 Mulching with black polyethylene sheets	25.0	25.0	25.0	25.0	25.0	31.0	32.0	33.0	34.0	32.5
b_3 Mulching with blue polyethylene sheets	25.0	25.0	25.0	25.0	25.0	30.0	31.0	32.0	33.0	31.5
b_4 Mulching with sawdust sheets	25.0	25.0	25.0	25.0	18.8	29.0	30.0	31.0	32.0	30.5
b_5 Chemical control with glyphosate	24.0	25.0	25.0	25.0	24.8	26.0	27.0	28.0	29.0	27.5
b_6 Hand hoeing	25.0	25.0	25.0	25.0	25.0	28.0	29.0	30.0	31.0	29.5
Mean (A)	24.7	25.0	25.0	25.0		28.0	29.0	30.0	31.0	
New L.S.D. at 5%		**A NS**	**B NS**	**AB NS**			**A 1.0**	**B 2.0**	**AB 4.0**	

Table (14): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on the yield and cluster weight of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Yield/vine (kg.)									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	7.2	7.8	8.1	8.4	7.9	7.3	7.9	8.5	9.2	8.2
b_2 Mulching with black polyethylene sheets	9.4	9.7	9.9	10.2	9.8	11.8	12.5	13.3	14.1	12.9
b_3 Mulching with blue polyethylene sheets	9.0	9.3	9.6	9.9	9.2	11.0	11.8	12.5	13.3	12.2
b_4 Mulching with sawdust sheets	8.8	9.0	9.3	9.6	6.8	10.3	11.0	12.1	12.4	11.5
b_5 Chemical control with glyphosate	7.5	8.1	8.4	8.7	8.2	8.3	8.8	9.5	10.2	9.2
b_6 Hand hoeing	8.2	8.4	8.8	9.2	8.8	9.3	9.9	10.5	11.2	10.2
Mean (A)	8.4	8.7	9.0	9.3		9.7	10.3	11.1	11.7	
New L.S.D. at 5%		**A 0.3**	**B 0.3**	**AB 0.6**			**A 0.3**	**B 0.4**	**AB 0.8**	
	Cluster weight (g.)									
b_1 Unweeded control	301.1	313.0	325.0	335.0	318.5	305.0	316.0	327.0	340.0	322.0
b_2 Mulching with black polyethylene sheets	375.0	386.0	397.0	408.0	391.5	381.0	392.0	404.0	415.0	398.0
b_3 Mulching with blue polyethylene sheets	361.0	372.0	383.0	394.0	377.5	366.0	380.0	391.0	402.0	384.8
b_4 Mulching with sawdust sheets	350.0	361.0	372.0	382.0	270.8	356.0	366.9	378.0	389.0	376.5
b_5 Chemical control with glyphosate	313.0	324.0	335.0	346.0	329.5	318.0	329.0	340.0	351.0	334.5
b_6 Hand hoeing	326.0	336.0	350.0	366.0	344.5	331.0	340.0	351.0	362.0	372.5
Mean (A)	337.7	348.7	360.3	371.8		342.8	354.0	365.2	370.2	
New L.S.D. at 5%		**A 10.0**	**B 10.5**	**AB 21.0**			**A 9.0**	**B 9.9**	**AB 19.8**	

Table (15): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on the yield and cluster length and shoulder of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Cluster length (cm)									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	15.0	15.4	15.8	16.2	15.6	14.9	15.2	15.5	15.8	15.4
b_2 Mulching with black polyethylene sheets	16.7	16.9	17.3	17.6	17.1	16.9	17.2	17.5	17.8	17.4
b_3 Mulching with blue polyethylene sheets	16.4	16.7	16.9	17.2	16.8	16.7	17.0	17.3	17.6	17.2
b_4 Mulching with sawdust sheets	16.0	16.3	16.6	16.9	12.2	16.3	16.7	17.0	17.3	16.8
b_5 Chemical control with glyphosate	15.4	15.7	16.0	16.3	15.9	15.3	15.6	15.9	16.2	15.8
b_6 Hand hoeing	15.8	16.1	16.4	16.7	16.3	15.8	16.1	16.4	16.7	16.0
Mean (A)	15.9	16.2	16.5	16.8		16.0	16.3	16.5	16.8	
New L.S.D. at 5%		**A 0.2**	**B 0.3**	**AB 0.6**			**A 0.2**	**B 0.2**	**AB 0.4**	
	Cluster shoulder (cm)									
b_1 Unweeded control	8.0	8.3	8.6	9.0	8.5	7.9	8.2	8.5	8.8	8.4
b_2 Mulching with black polyethylene sheets	10.0	10.3	10.7	11.0	10.5	9.9	10.2	10.5	10.8	10.4
b_3 Mulching with blue polyethylene sheets	9.6	9.9	10.2	10.5	10.1	9.5	9.8	10.1	10.4	10.0
b_4 Mulching with sawdust sheets	9.2	9.5	9.8	10.1	7.1	9.1	9.4	9.7	10.0	9.6
b_5 Chemical control with glyphosate	8.4	8.7	9.0	9.3	8.9	8.3	8.6	8.9	9.2	8.8
b_6 Hand hoeing	8.8	9.1	9.4	9.8	9.3	8.8	9.2	9.5	9.8	9.3
Mean (A)	9.0	9.3	9.6	10.0		8.9	9.2	9.5	9.8	
New L.S.D. at 5%		**A 0.2**	**B 0.2**	**AB 0.4**			**A 0.3**	**B 0.2**	**AB 0.4**	

Table (16): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on the percentage of shot berries and berry weight of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Shot berries %									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	9.00	8.60	8.40	8.11	8.53	8.97	8.51	8.31	8.05	8.46
b_2 Mulching with black polyethylene sheets	6.00	5.81	5.61	5.51	5.73	5.99	5.79	5.60	5.49	5.72
b_3 Mulching with blue polyethylene sheets	6.41	6.20	6.00	5.91	6.13	6.50	6.17	5.99	5.71	6.09
b_4 Mulching with sawdust sheets	7.25	7.00	6.80	6.60	5.26	7.15	6.90	6.75	6.50	6.83
b_5 Chemical control with glyphosate	8.50	8.33	8.16	8.00	8.25	8.41	8.31	8.14	7.92	8.20
b_6 Hand hoeing	8.00	7.75	6.50	6.30	7.14	7.99	7.71	6.41	6.29	7.10
Mean (A)	7.53	7.28	6.91	6.74		7.50	7.23	6.87	6.66	
New L.S.D. at 5%		**A 0.06**	**B 0.07**	**AB 0.14**			**A 0.07**	**B 0.08**	**AB 0.06**	
	Berry weight (g.)									
b_1 Unweeded control	2.11	2.17	2.22	2.27	2.19	2.18	2.24	2.29	2.34	2.26
b_2 Mulching with black polyethylene sheets	2.85	2.90	2.96	3.01	2.93	2.92	2.98	3.04	3.09	3.01
b_3 Mulching with blue polyethylene sheets	2.64	2.71	2.77	2.82	2.74	2.60	2.79	2.86	2.69	2.78
b_4 Mulching with sawdust sheets	2.51	2.56	2.63	2.70	1.93	2.59	2.64	2.70	2.79	2.68
b_5 Chemical control with glyphosate	2.22	2.28	2.33	2.40	2.31	2.29	2.35	2.40	2.48	8.13
b_6 Hand hoeing	2.32	2.39	2.44	2.50	2.41	2.39	2.46	2.51	2.57	2.48
Mean (A)	2.44	2.50	2.56	2.62		2.50	2.58	2.61	6.51	
New L.S.D. at 5%		**A 0.05**	**B 0.06**	**AB 0.12**			**A 0.04**	**B 0.05**	**AB 0.10**	

Table (17): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on the longitudinal and equatorial of berry of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	Berry longitudinal (cm)									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	2.00	2.07	2.14	2.22	2.11	2.05	2.12	2.20	2.26	2.16
b_2 Mulching with black polyethylene sheets	2.41	2.48	2.55	2.62	2.52	2.40	2.47	2.55	2.63	2.51
b_3 Mulching with blue polyethylene sheets	2.95	2.42	2.50	2.56	2.61	2.33	2.40	2.46	2.52	2.43
b_4 Mulching with sawdust sheets	2.28	2.34	2.40	2.45	1.76	2.25	2.32	2.40	2.46	2.36
b_5 Chemical control with glyphosate	2.08	2.14	2.20	2.25	2.17	2.11	2.16	2.22	2.28	2.19
b_6 Hand hoeing	2.18	2.25	2.30	2.36	2.27	2.17	2.16	2.30	2.36	2.27
Mean (A)	2.32	2.28	2.35	2.41		2.28	2.27	2.36	2.42	
New L.S.D. at 5%		**A 0.04**	**B 0.05**	**AB 0.10**			**A 0.05**	**B 0.05**	**AB 0.10**	
	Berry equatorial (cm)									
b_1 Unweeded control	1.91	1.97	2.03	2.07	2.00	1.94	2.00	2.06	2.12	2.03
b_2 Mulching with black polyethylene sheets	2.27	2.33	2.40	2.46	2.37	2.29	2.35	2.42	2.50	2.39
b_3 Mulching with blue polyethylene sheets	2.20	2.26	2.33	2.37	2.29	2.22	2.28	2.34	2.40	2.31
b_4 Mulching with sawdust sheets	2.11	2.17	2.23	2.30	1.63	2.15	2.21	2.27	2.34	2.24
b_5 Chemical control with glyphosate	1.47	2.03	2.10	2.16	1.94	2.00	2.08	2.14	2.20	2.11
b_6 Hand hoeing	2.03	2.08	2.15	2.22	2.12	2.07	2.15	2.22	2.30	2.19
Mean (A)	2.00	2.14	2.21	2.26		2.11	2.18	2.24	2.31	
New L.S.D. at 5%		**A 0.04**	**B 0.05**	**AB 0.10**			**A 0.04**	**B 0.06**	**AB 0.12**	

Table (18): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on the percentage of total soluble solids and total acidity in the berries of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	T.S.S.%									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	17.5	18.0	18.5	19.0	18.3	17.4	17.9	18.4	18.9	18.2
b_2 Mulching with black polyethylene sheets	20.2	20.6	21.1	21.6	20.9	20.2	20.7	21.2	21.7	21.0
b_3 Mulching with blue polyethylene sheets	19.7	20.2	20.7	21.3	20.5	19.7	20.2	20.7	21.2	20.5
b_4 Mulching with sawdust sheets	19.1	19.6	20.1	20.6	14.7	19.0	19.6	20.1	20.6	19.8
b_5 Chemical control with glyphosate	18.0	18.5	19.0	19.5	18.8	17.9	18.4	19.0	19.5	18.7
b_6 Hand hoeing	18.6	19.1	19.7	20.1	19.4	18.5	19.0	19.6	20.1	19.3
Mean (A)	18.9	19.3	19.9	20.4		18.8	19.3	19.8	20.3	
New L.S.D. at 5%		**A 0.4**	**B 0.3**	**AB 0.6**			**A 0.3**	**B 0.3**	**AB 0.6**	
	Total acidity %									
b_1 Unweeded control	0.700	0.680	0.660	0.641	0.670	0.699	0.679	0.659	0.639	0.669
b_2 Mulching with black polyethylene sheets	0.581	0.561	0.541	0.522	0.551	0.582	0.562	0.542	0.522	0.552
b_3 Mulching with blue polyethylene sheets	0.600	0.580	0.560	0.540	0.570	0.600	0.580	0.560	0.540	0.570
b_4 Mulching with sawdust sheets	0.629	0.604	0.585	0.563	0.455	0.627	0.606	0.586	0.566	0.596
b_5 Chemical control with glyphosate	0.680	0.660	0.641	0.620	0.650	0.680	0.660	0.641	0.619	0.650
b_6 Hand hoeing	0.659	0.629	0.605	0.585	0.620	0.657	0.639	0.620	0.600	0.629
Mean (A)	0.642	0.619	0.599	0.579		0.641	0.621	0.601	0.581	
New L.S.D. at 5%		**A 0.017**	**B 0.018**	**AB 0.036**			**A 0.014**	**B 0.015**	**AB 0.030**	

Table (19): Effect of some humic acid, effective microorganisms (E.M_1.) and weed control treatments on T.S.S./acid and percentage of reducing sugars in the berries of Superior grapevines during 2014 and 2015 seasons.

Weed Control treatments (B)	2014					2015				
	T.S.S./acid									
	Humic acid and EM_1 treatments (A)									
	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**	a_1 Control	a_2 Humic acid	a_3 EM_1	a_4 Both	**Mean (B)**
b_1 Unweeded control	25.0	26.5	28.0	29.6	27.3	24.9	26.4	27.9	29.6	27.2
b_2 Mulching with black polyethylene sheets	34.8	36.7	39.0	41.4	38.0	34.7	36.8	32.2	41.6	36.3
b_3 Mulching with blue polyethylene sheets	32.8	34.8	38.3	39.4	36.3	32.8	34.8	37.0	39.3	36.0
b_4 Mulching with sawdust sheets	30.4	32.5	34.4	36.6	33.5	30.3	32.3	34.3	36.4	33.3
b_5 Chemical control with glyphosate	26.5	28.0	29.6	31.5	28.9	26.3	27.9	29.6	31.5	28.8
b_6 Hand hoeing	28.2	30.4	32.6	34.4	31.4	28.2	29.7	31.6	33.5	30.8
Mean (A)	29.6	31.5	33.7	35.5		29.5	31.3	32.1	35.3	
New L.S.D. at 5%		**A 1.1**	**B 1.2**	**AB 2.4**			**A 1.1**	**B 1.3**	**AB 2.6**	
	Reducing sugars %									
b_1 Unweeded control	14.9	15.4	15.9	16.4	15.7	15.0	15.5	16.0	16.4	15.7
b_2 Mulching with black polyethylene sheets	17.8	18.3	18.8	19.2	18.5	17.9	18.4	18.9	19.2	18.6
b_3 Mulching with blue polyethylene sheets	17.2	17.7	18.2	18.8	18.0	17.3	17.8	18.3	18.9	18.1
b_4 Mulching with sawdust sheets	16.6	17.1	17.6	18.1	12.8	16.7	17.2	17.7	18.2	17.5
b_5 Chemical control with glyphosate	15.5	16.0	16.4	16.8	16.2	15.5	16.1	16.5	16.9	16.3
b_6 Hand hoeing	15.9	16.4	16.8	17.2	16.6	16.0	16.5	16.9	17.2	16.7
Mean (A)	16.3	16.8	17.3	17.8		16.4	16.9	17.4	17.8	
New L.S.D. at 5%		**A**	**B**	**AB**			**A**	**B**	**AB**	

4. Discussion

The previous positive action of mulching the soil with plastic mulches on fruiting of grapevines might be attributed to their effects on increasing the efficiency of water consumption, controlling weeds, warming the soil, inhibiting the leaching of minerals from the soil and adjusting the soil moisture content and making the soil warmer earlier in the season, thus causes fruit crops to mature earlier and results in better fruit quality (**Oren, 1988**). Further benefits of organic mulches are reducing soil erosion and increasing soil organic matter and the activity of microflora. Coloured foil induces changes in the field

microclimate primarily affecting the light, temperature and air humidity conditions (**Tomasi *et al,* 2001**).

The beneficial effects of weed control methods on controlling weeds were supported by the results of **El- Shamma and Hassan (2001); Olmstead *et al* (2010) Erhart and Hartel, 2002 and Fredrikson *et al*., 2011).**

Humic acid acts as a soil conditioner and improves soil structure and fertility, root development, nutrient uptake, plant pigments, fertilizer retention, aeration of soil and water holding capacity and reduces soil erosion and soil pH (**Hayes and Wilson, 1997; Davis and Ghabbour, 1998 and Kabeel *et al,* 2008**). EM is capable for enhancing soil fertility, soil organic matter, soil aeration, water retention, cation exchange capacity, microflora activity, N fixation and plant pigments, lowering soil pH and controlling insects, pests and diseases (**Wani and lee, 1995; Wood *et al,* 1997 and Mickan and Muller, 2009**).

The positive effects of organic fertilizers on growth and fruiting of Superior grapevines were attributed to their effects on increasing soil organic matter, the availability of most nutrients, water use efficiency, biological cycles and soil fertility as well as solving soil and water salinity problems. Their higher own content of different nutrients as well as their effect as slow release N fertilizers could give another explanation (**Nijjar, 1985**).

Humic acid acts as a soil conditioner is responsible for improving soil structure and fertility, root development, nutrient uptake, plant pigments, fertilizer retention, aeration of soil and water holding capacity and reduces soil erosion and soil pH (**Hayes and Wilson, 1997; Davis and Ghabbour, 1998 and Kabeel *et al,* 2008**).

These results regarding the promoting effect of humic acid on growth and fruiting of Superior grapevines are in harmony with those obtained by **Abada (2009) and Abada *et al* (2010)** on Superior grapevines as well as **Abd El-Aziz (2011) and Mekawy (2012)** on Thompson seedless grapevines. The promoting effect of humic acid on the yield was supported by the results of **Saleh *et al* (2006)** on Thompson seedless grapevines as well as **Abada (2009) and Abada *et al* (2010)** on Superior grapevines. The promotion on cluster weight in response to application of humic acid was reported by **Ahmed *et al* (2012)** on Thompson seedless grapevines; **Mekawy (2012)** on Thompson seedless grapevines,. These results regarding the effect of humic acid on improving quality of Superior grapes was in harmony with those obtained by **Abd El- Aziz (2011); Ahmed *et al* (2012) and Mekawy (2012)** on Thompson seedless grapes.

EM is capable for enhancing soil fertility, soil organic matter, soil aeration, water retention, cation exchange capacity, microflora activity, N fixation and plant pigments, lowering soil pH and controlling insects, pests and diseases (**Wani and lee, 1995; Wood *et al,* 1997 and Mickan and Muller, 2009**). These benefits of EM surely reflected on enhancing growth and fruiting of Superior grapevines.

The promotive effect of EM on the yield of Superior grapevines was supported by the results of **Abada *et al* (2010)** on Superior grapevines; **El-Khafagy (2013)** on Superior and Flame seedless grapevines. The beneficial effect of EM_1 on fruiting of Superior grapevines was reported by **Joo *et al* (1999); Ahmed and Ibrahim – Asmaa (2009)** on Thompson seedless grapevines and **El- Khafagy (2013)** on Superior and Flame seedless grapevines. These findings relating with the effect of EM_1 on improving quality of the berries are in concordance with those obtained by; **Ahmed *et al* (2012)** on Ruby seedless grapes.

Soil mulching with black polyethylene sheets for two months in combined with supplying the vines with EM and humic acid each at 10 ml/vine gave satisfactory control of weeds and was responsible for improving yield and quality of the berries in Superior vineyards.

References

1. Abada, M. A. M. (2009): Reducing the amount of inorganic N fertilizers in Superior grape vineyard by using organic and biofertilizers and humic acid. Egypt. J. Agric. Res. 87(1) 17- 344.
2. Abada, M. A. M.; Ibrahim- Asmaa, A. and Bondok-Sawsan, A. (2010): How to reduce problems of soil irrigation water salinity in Superior vineyards?. Minufiya J. Agric. Res. Vol. 35 No. 4 (2): 1477 – 1497.
3. Abd El- Aziz, Y. Z. (2011): Response of Thompson seedless grapevines to application of organic fertilizer humic acid and some biofertilizers. Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.
4. Abd El- Kareem, A.M. (2014): The beneficial effects of biofertilization and weed control on fruiting of Superior seedless grapevines. Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.
5. Ahmed, F. F and Morsy, M. H. (1999): A new method for measuring leaf area in different fruit species. Minia. J. of Agric. Rec. & Dev.19: 97 – 105.
6. Ahmed, F. F. and Ibrahim- Asmaa, A. (2009): Reducing inorganic N fertilizer in Thompson seedless vineyard through application of EM and Seaweed extract. Minia J. of Agric. Res. & Dev., 29 (3): 355 – 369.
7. Ahmed, F. F.; Ragab, M. A.; Merwad, E. A. M. and Mekawy, A. Y. (2012): Improving productivity of Thompson seedless grapevine by application of some vitamins, humic acid and farmyard manure extract. Minia J. of Agric. Res. & Dev., 32 (3): 131 – 145.
8. Association of Official Agricultural Chemists (2000): Official Methods of Analysis (A.O.A.C), 12th Ed.

Benjamin Franklin Station, Washington D.C. U.S.A. pp. 490 – 510.
9. Cottenie, A.; Verloo, M.; Kiekens, L.; Velgle, G. and Amerlynuck, R. (1982): Chemical Analysis of Plant and Soil. 34 - 51. Laboratory of Analytical and Agroch. State Univ. Belgium, Gent.
10. Davis, G. and Ghabbour, E. A. (1998): Humic substances, structure properties and uses. Royal Soc. of Chemistry, Cambridge pp. 10 – 15.
11. El- Sehrawy, O. A. M. (2008): Influence of bio and organic fertilization on growth of Anna apple in the reclaimed land. Ph. D. Thesis Fac. of Agric. Shebin El- Kom El- Menofiya Univ.
12. El- Shamma, M. S. and Hassan. A. A. A. (2001): A comparative study of some weed control methods on Thompson seedless vines. Assiut J. of Agric.Sci. Vo1. 32 (1): 145 – 155.
13. El-Khafagy, H. A. E. (2013): Physiological study on productivity and quality of some grape varieties under bio- organic fertilization. Ph. D. Thesis, Environmental Studies & Res. Instit., Minufiya Univ.
14. Erhart, E., and W. Hartl (2002): Weed suppression in viticulture with mulch from shredded shrubs, coarse compost fraction and immature compost. Mitt. Klosterneuburg 52: 89 – 96.
15. Fadle, M. S. and Seri El- Dean, S. A. (1978): Effect of N Benzyl adenine on photosynthesis pigments and total sugars on olive seedlings grown under saline conditions. Res. Bull. 843, Fac. of Agric., Ain Shams Univ.
16. Farag, S. G. (2006): Minimizing mineral fertilizers in grapevines farms to the chemical residuals in grapes. M. Sc. Thesis, Institute of Environmental Studies Research, Ain Shams.
17. Fredrikson, L. P. Skinkis, A. and Peachey, E.d. (2011): Cover Crop and Floor Management Affect Weed Coverage and Density in an Establishing Oregon. Vineyard Hort Techno1ogy April 2011 21: 208 – 216.
18. Hayes, M. H. B. and Wilson, W. S. (1997): Humic substances, pests and Sludges, Health and Environmental Aspects Royal Soc. of Chemistry, Cambridge pp. 73.
19. Kabeel, H.; Abd El- atif, F. M. and Baza, M. S. M. (2008): Growth, fruiting and nutritional status of "Le-Conte" pear trees in response to mineral and humate fertilizers. Annals of Agric. Sci. Moshtohor, Vol. 46 (2): 139-156.
20. Kucukyumuk, C. and Kelen, M. (2010): The effects of some mulch applications and irrigation intervals on weed control in grafted vine production. Me Unarodni Simpozij Agronoma, 15-19 velja e 2010, Opatija, Hrvatska. Zbomik Radova pp. 1178.
21. Lane, J. H. and Eynon, L. (1965): Determination of reducing sugars by means of Fehling's solution with methylene blue as indicator. A.O.A.C. Washington D.C. U.S.A. pp. 490 – 510.
22. Mead, R.; Currow, R. N. and Harted, A. M. (1993): Statistical Methods in Agricultural and Experimental Biology. Second Ed. Chapman & Hall London. pp 10 – 20.
23. Mekawy, A. Y. H. (2012): Attempts for improving yield quantitively and qualitatively of Thompson seedless grapevines by application of some antioxidants with humic acid and farmyard manure extract. Ph. D. Thesis Fac. of Agric. Minia Univ., Egypt.
24. Mickan, S. Z. and Muller, T. (2009): Impact of effective microorganisms and other bio fertilizers on soil microbial characteristics. organic-matter decomposition and plant growth. J. Plant Nutr. Soil Sci. 172: 704 – 712.
25. Nijjar, G. S. (1985): Nutrition of Fruit Trees. Mrs Usah Raj. Kumar, for Kalyani Publishers, New Delhi India, pp. 283 – 302.
26. Olmstead, M. A., R. L. Wample, S. L. Greene, and J. M. Terara. (2001): Evaluation of potential cover crops for Island Pacific Northwest vineyards. Am. J. Enol. Vitic. 52 (4): 292 – 303.
27. Oren, Y. (1988): A new approach to weed control in orchards. Phytopaarasitica 16 (4) 386. Ministry Agric., Tel Aviv 61070, Israel (C.F. Hort. Abst. 60 (2): 1443).
28. Rangaswamy R (1995). Randomized Complete Block Design. In A Text Book of Agricultural Statistics. New Age International Publishers, pp 281-309.
29. Sandler, H. A.; Brock, P. E. and Vanden Heuvel, J. E. (2009): Effects of three reflective mulches on yield and fruit composition of coastal New England wine grapes. Am. J. Enol. Vitic. 60 (3): 332 – 338.
30. Summer, M.E. (1985): Diagnosis and Recommendation Integrated System (DRIS) as a Guide to Orchard Fertilization. Hort. Abst. 55 (8): 7502.
31. Tomasi, D.; Belvini, P.; Zago, A. and Costa, L. D. (2001): Effect of mulching and nitrogen fertilizer on root and above-ground plant development in a vineyard. In Formatore. Agrario. 28 (11): 129-139-6. Bolgna, Italy.
32. Von- Wettstein, R. V. (1957): hlorophyll- Lethale under submikrosjopische formilkechrel der plastiden celi, prp. Trop. Res. Amer. Soc. Hort. Sci. 20 pp. 427-433.
33. Wani, S.P. and Lee, K. K. (1995): Microorganisms as biological for sustainable agriculture In organic agriculture, theory and practices (ed.) P. K. Thampan, Peekay Tree Crops Development Foundation, Gandhi Nagar Cochin 682 – 220, p. 36 – 67.
34. Wilde, S. A.; Corey, R. B.; Layer, J. G. and Voigt, G. K. (1985): Soils and Plant Analysis for Tree Culture. 3rd Ed. Oxford and IBH publishing Co., New Delhi, India. pp. 529 – 546.
35. Wood, M. T.; Miles, R. and Tabora, P. (1997): EM Fermented Plant Extract and EM_1 for controlling pickleworm (*Diaphania nitidalis*) in organic cucumber. School of Natural Resources, Univ. of Missouri, USA and EARTH College. Limon. Costa Rica.