

Using Some Organic Manures and Em As a Partial Replacement of Mineral N Fertilizers in Superior Vineyards

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Abstract: During 2013 and 2014 seasons, Superior grapevines fertilized with N as 100 % inorganic N fertilizer or through 25 to 75% inorganic N fertilizer + 25 to 75% three organic manures namely poultry manure (2.5 % N); plant compost (2 % N) and farmyard manure (0.25% N) + 15 to 45 ml EM/ vine/ year. The merit was replacing inorganic N partially by using these organic manures and EM for improving yield lowering pollution and enhancing the efficiency of exportation to foreign markets. Growth characters, berry setting %, yield and cluster characters were remarkably improved with using N as 50% inorganic N + 50% organic manures + 30 ml EM/ vine/ year. Leaf pigments, various nutrients as well as physical and chemical characteristics of the berries were gradually improved owing to decreasing the percentages of the inorganic N from 100 to 25.0 and increasing the percentages of organic manure from 0.0 to 75% and levels of EM from 0.0 to 45 ml/ vine / year. Shot berries % was gradually reduced with decreasing percentages of inorganic N and increasing organic and biofertilization levels. The best results with regard to yield and quality of the berries were obtained due to treating the vines with N as 50% inorganic N + 50 % poultry manure + 30 ml EM/ vine / year Both nitrite and nitrate in the juice were substantially reduced in such promised treatment.

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1. Introduction

Recently, many trials were made for the use of many natural substances instead of chemicals for enhancing the efficiency of fruits exportation to foreign markets. Using organic manures and EM are considered the important replacement of these chemicals. Organic manures are responsible for enhancing soil fertility, water retention, organic matter, root development, availability of nutrients, fixation of N and secretion of vitamins and IAA (Cooke, 1966). EM contains more than 60 selected strains of effective and beneficial microorganisms. It is responsible for enhancing soil fertility and the release of most nutrients in the soil (Myint, 1999).

Previous studies showed that using EM and organic manures was very effective as a partial replacement of inorganic N fertilizers in improving yield and fruit quality of different grapevines cvs and at the same time reducing pollution (Abd El- Ghafar-Gehan, 2002; Ahmed *et al.*, 2003; Abd El- Hady, 2003; Shawky *et al.*, 2004; El- Shenawy and Stino, 2005; Mahran, 2005; Ibrahim- Asmaa, 2006; El-Salhy *et al.*, 2006, El- Khafagy, 2006 ; Ahmed-Ebtsam, 2007; Masoud, 2008 ; Ahmed *et al.*, 2008 ; Madian, 2010; Refaai, 2011; Ahmed *et al.*, 2011; El- Khafagy, 2013 and El-Wany, 2015).

The objective of this study was examining the effect of using organic manures and EM as a partial replacement of inorganic N fertilizers on fruiting of Superior grapevines.

2. Material and Methods

This study was carried out during 2013 and 2014 seasons on thirty uniform in vigour 10 - years old Superior grapevines grown in a private vineyard located at Matay district, Minia Governorate where the texture of the soil is clay, well drained and water table not less than two meters deep. All the selected vines are planted at 1.5 x 3 m apart. The chosen vines (30 vines) were pruned during the first week of January in both seasons using cane pruning method. The vines were trellised by Gable system. Vine load was 72 eyes for all the selected vines on the basis of 6 fruiting canes x 10 eyes plus 6 renewal spurs X two eyes. Surface irrigation system was followed using Nile water containing 160 ppm EC.

Mechanical, physical and chemical analysis of the tested soil were carried out at the start of the experiment according to the procedures of Black *et al.* (1965) and Chapman and Pratt (1987) the data are shown in Table (1).

Table (1): Analysis of the tested soil:

Constituents	Values
Particle size distribution:	
Sand %	10.0
Silt %	21.5
Clay %	68.5
Texture	Clay
pH(1:2.5 extract)	8.05
EC (1:2.5 extract) (dsm ⁻¹) 1 cm / 25°C.	1.03
O.M. %	1.88
CaCO ₃ %	2.55
Total N %	0.10
Available P (Olsen, ppm)	2.22
Available K (ammonium acetate, ppm)	400

Table (2): Analysis of the solid manure compost.

Parameters	Values
Cubic meter weight (kg.)	600.0
Moisture %	29.0
Organic matter %	30.7
Organic carbon %	28.56
pH (1: 2.5 extract)	27.25
EC (ds/ m) (1: 2.5 extract)	10.25
C/N ratio	13.95
Total N %	2.5
Total P %	1.12
Total K %	1.21
Total Ca %	1.25
Total Mg %	1.30
Total Fe (ppm)	18.5
Total Mn (ppm)	37.55
Total Zn (ppm)	43.22
Total Cu (ppm)	17.40

Table (3): Analysis of farmyard manure organic fertilizer

Parameters	Values
O.M. %	8.9
Total N %	0.25
P % (Olsen method)	0.5
K % (ammonium acetate)	1.6
pH (1: 2.5 extract)	3.3
Zn (ppm)	36.0
Fe (ppm)	15.5

Table (4): Analysis of chicken manure organic fertilizer

Parameters	Values
O.M. %	58.26
Organic carbon	27.90
pH (1: 2.5 extract)	10.25
E.C. (ds/m) (1: 2.5 extract)	5.9
Total N %	2.0
Total P %	1.12
Total K %	1.21
Total Fe (ppm)	18.5
Total Zn (ppm)	43.22

Except those dealing with the present treatments (all sources of N), all the selected vines (30 vines) received the usual horticultural practices which are commonly used in the vineyard.

This study included the following ten treatments from inorganic N, organic manures and EM:

1. Application of the suitable N (60 g N/ vine) via 100 % inorganic N (179.0 g ammonium nitrate / vine / year) alone.

2. Application of the suitable N via 75 % inorganic N (134.3 g ammonium nitrate / vine / year) + 25% plant compost (2 % N) (0.75 kg / vine / year) + 15 ml EM / vine / year.

3. Application of the suitable N via 75 % + 25 % farmyard manure (0.25 %) (6 kg / vine/ year) + 15 ml EM/ vine / year.

4. Application of the suitable N via 75 % inorganic N + 25% poultry manure (2.5) (600 g / vine / year).

5. Application of the suitable N via 50 % inorganic N (89.5 ammonium nitrate / vine/ year) + 50 % plant compost (1.5 kg/ vine/ year) + 30 ml EM / vine / year.

6. Application of the suitable N via 50 % inorganic N + 50 % farmyard manure (12 kg/ vine/ year)+ 30 ml EM / vine/ year.

7. Application of the suitable N via 50 % inorganic N + 50 % poultry manure (2.5 % N) (1.2 kg/ vine/ year) + 30 ml EM/ vine/ year.

8. Application of the suitable N via 25 % inorganic N (44.8 g ammonium nitrate / vine/ year) + 75% plant compost (2.25 kg / vine/ year) + 45 ml EM / vine/ year.

9. Application of the suitable N via 25 % inorganic N + 75% farmyard manures (18 kg / vine/ year) + 45 ml EM / vine/ year.

10- Application of the suitable N via 25% inorganic N + 75% poultry manure (1.8 kg / vine/ year)+ 45 ml EM / vine/ year.

Each treatment was replicated three times, one vine per each. Ammonium nitrate (33.5 % N) as a source of inorganic N was divided into three equal batches applied as 45% at growth start (1st week of March, 35% just after berry setting (mid of April) and 20% after harvesting (1st week of August). EM (1 ml contains 0.6×10^7 cells) were added once before growth start (1st week of Mar.) The three organic manures were added just after winter pruning (mid. of Jan.) in drenches around all sides of the vines 50 cm depth.

Randomized complete block design (RCBD) was followed where the experiment consisted of ten treatments, each treatment replicated three times, one vine per each.

During both seasons, the following parameters were recorded:

1- Vegetative growth characters namely main shoot length (cm.), leaf area (cm)² (**Ahmed and Morsy, 1999**), wood ripening coefficient, pruning weight per vine (kg.) and cane thickness (mm).

2- Leaf chemical composition namely chlorophylls a & b, total chlorophylls and total carotenoids (mg/ 100 g F.W (**Von- Wettstein, 1957 and Fadle and Seri El Deen, 1978**), nutrients namely N, P, K, Mg (as %) (**Black et al., 1956 Wilde et al., 1985, Bato et al., 1988 and Chapman and Pratt, 1987**).

3- Berry setting %, yield, number of clusters/ vine and cluster characters (weight (g) & length and width in cm).

4- Percentage of shot berries as well as physical and chemical characteristics of the berries namely berry weight (g.), longitudinal and equatorial (cm.), berry shape, T.S.S. %, total acidity % (as g tartaric acid / 100 ml juice), reducing sugars % (**Lane and Eynon, 1965 and A.O.A.C., 2000**), nitrate and nitrite (ppm) (**Sen and Donaldson, 1978**).

Statistical analysis was done using New L.S.D. at 5% for made all comparisons among different treatment means (**Mead et al., 1993**).

3. Results and Discussion

1- Growth characters:

Data in Table (5) clearly show that supplying the vines with N as 50 to 75% inorganic N plus 25 to 50% organic manures (poultry manure, plant compost and farmyard manure) + 15 to 30 ml EM/ vine/ year significantly stimulated the five growth characters namely main shoot length, leaf area, wood ripening coefficient, pruning wood weight per vine and cane thickness comparing with using inorganic N alone at 100% or 25.0 % with organic and biofertilization with EM. The best organic manures in enhancing these growth characters were poultry manure, plant compost and farmyard manure, in descending order. There was a significant reduction on these growth characters with using N as 25% inorganic N. The maximum values were recorded on the vines that supplied with N as 50% inorganic N + 50% poultry manure + 30 ml EM/ vine/ year. The vines received N as 25% inorganic N + 75% farmyard manure + 45 ml EM/ vine / year gave the lowest values. These results were true during both seasons.

2- Leaf chemical composition:

It is clear from the data in Tables (6 & 7) that fertilizing the vines with N as 25 to 75% inorganic + 25 to 75% organic manures+ 15 to 45 ml EM/ vine significantly enhanced chlorophylls a & b, total chlorophylls, total carotenoids, N, P, K and Mg in the leaves rather than application of N via 100% inorganic

N. The promotion on these plant pigments and nutrients was significantly associated with reducing the percentages of inorganic N from 100 to 25% and at the same time increasing the percentages of organic manures from 0.0 to 75% and levels of EM from 0.0 to 45 ml/ vine / year. The best organic manures in enhancing vine nutritional status in descending order were poultry manure, plant compost and farmyard manure. The maximum values were recorded on the vines that received N as 25% inorganic N + 75% poultry manure + 45 ml EM/ vine/ year. The vines that are inorganic fertilization alone gave the lowest values. These results were true during both seasons.

3- Berry setting %, yield and cluster characters:

Tables (8 & 9) show that supplying the vines with N as 50 to 75% inorganic N + 25 to 50 % organic manures + 15 to 30 ml EM/ vine / year significantly improved the percentage of berry setting, yield, number of clusters/ vine and cluster characters (namely weight, length and width) over the application of N as 25% or 100% inorganic N. Using organic manures namely poultry manure, plant compost and farmyard manure, in descending order significantly was responsible for improving berry setting % yield and cluster character. The maximum yield during both seasons (10.7 & 16.5 kg / vine) was recorded on the vines that fertilized with N as 50% inorganic + 50 % poultry manure + 30 ml EM / vine/ year. The vines that fertilized with N completely via inorganic N form produced 8.3 and 10.1 kg during both season, respectively. The percentage of increase on the yield due to using the previous promised treatment (50% inorganic N + 50% poultry manure + 30 ml EM/ vine/ year) over the check treatment (received N as 100% in organic N) reached 28.9 and 63.4 % during 2013 and 2014 seasons, respectively. These results were true during both seasons.

4- Percentage of shot berries:

Data in Table (10) clearly show that using N as 25 to 75% inorganic N + 25 to 75% organic manures+ 15 to 45 ml EM/ vine/ year significantly reduced shot berries % over the application of N as 100% inorganic. The reduction significantly was in proportional to the reduction on the percentages of inorganic N from 100 to 25% and at the same time increasing the percentages of organic manures from 0.0 to 75% and levels of EM from 0.0 to 45 ml EM/ vine/ year. The best organic manures in this respect was poultry manure. The worst results were recorded on the vines that received N as 100% inorganic N. The lowest values were recorded on the vines that supplied with N as 25% inorganic N + 75% poultry manure + 45 ml EM/ vine / year. These results were true during seasons.

5- Fruit quality:

Data in Tables (10 & 11) obviously reveal that using N as 25 to 75% inorganic N + 25 to 75% organic manures + 15 to 45 ml EM/ vine/ year significantly was very effective in improving quality of the berries in terms of increasing berry weight and dimensions (longitudinal and equatorial), T.S.S. % and reducing sugars and decreasing total acidity %, nitrite and nitrate in the juice comparing with using N as 100 % inorganic. There was a gradual and significant promotion on quality of the berries with reducing the percentages of inorganic N from 100 to

25% as well as increasing the percentages of organic manures from 0.0 to 75 % and levels of EM from 0.0 to 45 ml / vine/ year. The best organic manures in this respect were poultry manure, plant compost and farmyard manure, in descending order. The best results with regard to quality of the berries were obtained with using N as 25% inorganic N + 75% poultry manure + 45 ml EM/ vine / year. Unfavourable effects on fruit quality were attributed to using N completely via inorganic form. These results were true during both seasons.

Table (5): Effect of using some organic manures enriched with EM as a partial replacement of inorganic N fertilizer on some vegetative growth characters of Superior grapevines during 2013 and 2014 seasons.

N Management treatments	Main shoot length (cm.)		Leaf area (cm.)		Wood ripening coefficient		Pruning weight / wood (kg.) / vine		Cane thickness (mm)	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
1-N as 100% Inorg. N	225.7	228.7	205.7	208.0	0.75	0.73	1.79	1.80	7.89	8.09
2-N as 75 % Inorg. N + 25% P.C. + 15 ml EM/ vine	251.7	254.3	210.0	212.7	0.81	0.79	2.00	2.01	8.50	8.71
3-N as 75 % Inorg. N + 25 % F.Y.M. + 15 ml EM / vine	239.3	241.7	207.3	210.0	0.78	0.76	1.90	1.92	8.25	8.46
4-N as 75 % Inorg. N + 25% P.M. + 15 ml EM / vine	266.7	269.0	212.7	214.7	0.85	0.83	2.12	2.13	8.80	9.00
5-N as 50 % Inorg. N + 50 % P.C. + 30 ml EM/ vine	291.9	294.4	218.7	221.5	0.91	0.89	2.41	2.42	9.89	10.11
6-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	279.7	282.8	215.0	218.0	0.88	0.86	2.25	2.27	9.11	9.41
7-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	305.7	308.3	222.3	225.6	0.94	0.92	2.54	2.55	10.50	10.80
8-N as 25 % Inorg. N + 75 % P.C. + 45 ml EM/ vine	190.0	192.6	201.3	204.3	0.68	0.66	1.57	1.59	7.60	7.99
9-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	175.0	177.6	199.3	202.7	0.64	0.62	1.47	1.47	7.54	7.90
10-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	211	213.3	203.6	206.4	0.72	0.70	1.68	1.69	7.66	8.11
New L.S.D. at 5%	0.11	0.14	1.1	0.9	0.03	0.03	0.10	0.11	0.04	0.05

- P.C.= Plant compost (2 % N)

- P.M = Poultry manure 2 % N)

Table (6): Effect of using some organic manures enriched with EM as a partial replacement of inorganic N fertilizer on some leaf pigments of Superior grapevines during 2013 and 2014 seasons.

N Management treatments	Chlorophyll a (mg/ 100 g F.W.)		Chlorophyll b (mg/ 100 g F.W.)		Total chlorophylls (mg/ 100 g F.W.)		Total carotenoids (mg/ 100 g F.W.)	
	2013	2014	2013	2014	2013	2014	2013	2014
1-N as 100% Inorg. N	4.11	4.30	1.91	1.94	6.02	6.24	1.61	1.64
2-N as 75 % Inorg. N + 25% P.C. + 15 ml EM/ vine	4.39	4.58	2.09	2.12	6.48	6.70	1.91	2.00
3-N as 75 % Inorg. N + 25 % F.Y.M. + 15 ml EM / vine	4.22	4.44	1.99	2.02	6.21	6.46	1.81	1.90
4-N as 75 % Inorg. N + 25% P.M. + 15 ml EM / vine	4.71	4.92	2.19	2.22	6.90	7.14	2.11	2.20
5-N as 50 % Inorg. N + 50 % P.C. + 30 ml EM/ vine	5.29	5.80	2.44	2.48	7.73	8.28	2.29	2.38
6-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	5.00	5.56	2.33	2.37	7.33	7.89	2.20	2.29
7-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	5.61	5.72	2.55	2.59	8.16	8.31	2.41	2.50
8-N as 25 % Inorg. N + 75 % P.C. + 45 ml EM/ vine	6.00	6.15	2.81	2.85	8.81	9.00	2.66	2.75
9-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	5.84	6.00	2.67	2.70	8.51	8.70	2.54	2.63
10-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	6.29	6.33	2.95	3.00	9.24	9.33	2.77	2.88
New L.S.D. at 5%	0.11	0.12	0.04	0.05	0.07	0.08	0.06	0.07

- P.C.= Plant compost (2 % N)

- P.M = Poultry manure 2 % N)

Table (7): Effect of using some organic manures enriched with EM as a partial replacement of inorganic N fertilizer on the percentages of N, P, K and Mg in the leaves of Superior grapevines during 2013 and 2014 seasons.

N Management treatments	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %	
	2013	2014	2013	2014	2013	2014	2013	2014
1-N as 100% Inorg. N	1.60	1.63	0.16	0.17	1.11	1.13	0.52	0.55
2-N as 75 % Inorg. N + 25% P.C. + 15 ml EM/ vine	1.79	1.82	0.21	0.21	1.22	1.21	0.61	0.62
3-N as 75 % Inorg. N + 25 % F.Y.M. + 15 ml EM / vine	1.70	1.73	0.19	0.19	1.16	1.18	0.57	0.58
4-N as 75 % Inorg. N + 25% P.M. + 15 ml EM / vine	1.89	1.93	0.24	0.24	1.30	1.29	0.65	0.66
5-N as 50 % Inorg. N + 50 % P.C. + 30 ml EM/ vine	2.10	2.13	0.30	0.31	1.42	1.40	0.73	0.74
6-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	1.99	2.02	0.27	0.27	1.36	1.32	0.69	0.70
7-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	2.18	2.21	0.32	0.33	1.50	1.46	0.77	0.78
8-N as 25 % Inorg. N + 75 % P.C. + 45 ml EM/ vine	2.40	2.44	0.37	0.37	1.62	1.59	0.84	0.86
9-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	2.29	2.32	0.34	0.34	1.56	1.51	0.81	0.83
10-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	2.47	2.50	0.40	0.44	1.68	1.64	0.88	0.90
New L.S.D. at 5%	0.06	0.07	0.02	0.02	0.05	0.04	0.03	0.03

- P.C.= Plant compost (2 % N)

- P.M = Poultry manure 2 % N)

Table (8): Effect of using some organic manures enriched with EM as a partial replacement of inorganic N fertilizer on the percentage of berry setting, number of clusters / vine and yield / vine (kg.) of Superior grapevines during 2013 and 2014 seasons.

N Management treatments	Berry setting %		No. of clusters / vine		Yield/ vine (kg.)	
	2013	2014	2013	2014	2013	2014
1-N as 100% Inorg. N	7.5	8.1	23.0	28.0	8.3	10.1
2-N as 75 % Inorg. N + 25% P.C. + 15 ml EM/ vine	8.4	9.0	24.0	31.0	9.2	11.9
3-N as 75 % Inorg. N + 25 % F.Y.M. + 15 ml EM / vine	8.0	8.5	23.0	30.0	8.6	11.2
4-N as 75 % Inorg. N + 25% P.M. + 15 ml EM / vine	8.9	9.5	24.0	33.0	9.5	13.1
5-N as 50 % Inorg. N + 50 % P.C. + 30 ml EM/ vine	10.1	10.6	24.0	35.0	10.3	15.1
6-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	9.6	10.2	24.0	34.0	9.9	14.0
7-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	10.6	11.2	24.0	37.0	10.7	16.5
8-N as 25 % Inorg. N + 75 % P.C. + 45 ml EM/ vine	6.5	7.1	23.0	24.0	7.7	8.1
9-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	6.0	6.6	23.0	22.0	7.5	7.2
10-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	7.0	7.5	23.0	26.0	8.0	9.1
New L.S.D. at 5%	0.4	0.4	NS	2.0	0.2	0.4

- P.C.= Plant compost (2 % N)

- P.M = Poultry manure 2 % N)

Table (9): Effect of using some organic manures enriched with EM as a partial replacement of inorganic N fertilizer on the weight and dimensions (length & width) of cluster of Superior grapevines during 2013 and 2014 seasons.

N Management treatments	Average cluster weight (g.)		Average cluster length (cm.)		Average cluster width (cm.)	
	2013	2014	2013	2014	2013	2014
1-N as 100% Inorg. N	360.0	361.5	20.5	20.9	12.3	12.1
2-N as 75 % Inorg. N + 25% P.C. + 15 ml EM/ vine	383.0	385.0	21.8	22.2	12.7	12.6
3-N as 75 % Inorg. N + 25 % F.Y.M. + 15 ml EM / vine	372.0	373.7	21.1	21.5	12.5	12.4
4-N as 75 % Inorg. N + 25% P.M. + 15 ml EM / vine	396.0	347.5	22.5	23.0	12.9	12.8
5-N as 50 % Inorg. N + 50 % P.C. + 30 ml EM/ vine	430.0	431.5	24.0	24.4	14.0	13.9
6-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	411.0	412.9	23.1	23.5	13.5	13.4
7-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	444.6	446.0	24.6	25.0	14.3	14.2
8-N as 25 % Inorg. N + 75 % P.C. + 45 ml EM/ vine	336.0	338.0	19.5	19.9	11.8	11.7
9-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	325.0	327.0	19.0	19.0	11.5	11.4
10-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	347.0	349.0	20.0	20.9	12.0	11.9
New L.S.D. at 5%	11.0	10.0	0.4	0.5	0.2	0.2

- P.C.= Plant compost (2 % N)

- P.M = Poultry manure 2 % N)

Table (10): Effect of using some organic manures enriched with EM as a partial replacement of inorganic N fertilizer on the percentage of shot berries as well as averages berry weight, longitudinal and equatorial and berry shape of Superior grapevines during 2013 and 2014 seasons.

N Management	Shot berries		Av. Berry weight (g.)		Av. Berry longitudinal (cm)		Av. Berry equatorial (cm)		Berry shape index value	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
1-N as 100% Inorg. N	8.11	8.00	5.00	5.04	2.18	2.20	1.99	2.01	1.10	1.09
2-N as 75 % Inorg. N + 25% P.C. + 15 ml EM/ vine	7.61	7.50	5.71	5.75	2.28	2.30	2.05	2.07	1.11	1.11
3-N as 75 % Inorg. N + 25 % F.Y.M. + 15 ml EM / vine	7.90	7.80	5.30	5.36	2.23	2.25	2.02	2.05	1.10	1.10
4-N as 75 % Inorg. N + 25% P.M. + 15 ml EM / vine	7.00	6.90	5.91	5.95	2.33	2.35	2.09	2.11	1.11	1.11
5-N as 50 % Inorg. N + 50 % P.C. + 30 ml EM/ vine	6.00	5.91	6.30	6.35	2.45	2.47	2.16	2.18	1.13	1.13
6-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	6.50	6.40	6.11	6.15	2.40	2.41	2.13	2.15	1.13	1.12
7-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	5.60	5.50	6.46	6.50	2.50	2.55	2.18	2.20	1.15	1.16
8-N as 25 % Inorg. N + 75 % P.C. + 45 ml EM/ vine	4.00	3.90	6.89	6.93	2.60	2.63	2.28	2.30	1.14	1.14
9-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	5.00	4.90	6.59	6.63	2.55	2.57	2.25	2.28	1.13	1.13
10-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	3.41	3.31	7.25	7.29	2.64	2.65	2.33	2.36	1.13	1.12
New L.S.D. at 5%	0.25	0.26	0.14	0.15	0.04	0.05	0.03	0.03	0.02	0.02

- P.C.= Plant compost (2 % N)

- P.M = Poultry manure 2 % N)

Table (11): Effect of using some organic manures enriched with EM as a partial replacement of inorganic N fertilizer on some chemical characteristics of the berries of Superior grapevines during 2013 and 2014 seasons.

N Management	T.S.S. %		Total acidity %		Reducing sugars %		Juice nitrate (ppm)		Juice nitrite (ppm)	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
1-N as 100% Inorg. N	18.0	17.9	0.719	0.715	16.2	16.5	3.6	3.4	2.4	2.5
2-N as 75 % Inorg. N + 25% P.C. + 15 ml EM/ vine	18.6	18.7	0.670	0.663	16.8	17.1	3.0	2.8	1.9	2.0
3-N as 75 % Inorg. N + 25 % F.Y.M. + 15 ml EM / vine	18.3	18.4	0.695	0.688	16.5	16.8	3.3	3.1	2.1	2.2
4-N as 75 % Inorg. N + 25% P.M. + 15 ml EM / vine	19.0	19.1	0.646	0.639	17.1	17.4	2.7	2.4	1.7	1.8
5-N as 50 % Inorg. N + 50 % P.C. + 30 ml EM/ vine	19.6	19.7	0.595	0.588	17.6	18.0	2.0	1.8	1.2	1.3
6-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	19.3	19.4	0.620	0.613	17.3	17.6	2.4	2.1	1.5	1.6
7-N as 50 % Inorg. N + 50 % F.Y.M. + 30 ml EM/ vine	20.0	20.1	0.573	0.566	18.0	18.3	1.7	1.5	1.0	1.1
8-N as 25 % Inorg. N + 75 % P.C. + 45 ml EM/ vine	20.6	20.7	0.527	0.520	18.6	19.0	1.1	1.0	0.5	0.6
9-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	20.3	20.4	0.550	0.543	18.3	18.6	1.4	1.3	0.8	0.9
10-N as 25 % Inorg. N + 75 % F.Y.M. + 45 ml EM/ vine	21.0	21.1	0.503	0.494	19.0	19.3	0.7	0.6	0.2	0.3
New L.S.D. at 5%	0.3	0.3	0.021	0.022	0.3	0.3	0.3	0.3	0.2	0.2

- P.C.= Plant compost (2 % N)

- P.M = Poultry manure 2 % N)

4. Discussion:

The positive merits of using organic manures and the biofertilizer EM on growth, vine nutritional status, yield and quality of the berries might be attributed to the following reasons:

1-Organic and biofertilization effectively enhance water retention, saving irrigation water, soil aggregation, soil aeration cation exchange, availability of different nutrients, antioxidants, natural hormones such as IAA, GA₃ and cytokinins, soil fertility, vitamins B, N fixation, soil organic matter, root development and enzymes such as nitrogenase (Cook, 1966, Dahama, 1999 and David, 2002).

2- They are responsible for reducing soil pH, soil salinity, soil pathogens and release of most nutrients (Dalbo, 1992 and Davis and Ghabbour, 1998).

These results are in concordance with those obtained by Abd El- Ghafar – Gehan (2002); Ahmed *et al.*, (2003); Abd El- Hady (2003) ; Shawky *et al.*, (2004); El- Shenawy and Stino (2005); Mahran (2005); Ibrahim – Asmaa (2006); El- Salhy *et al.*, (2006); El- Khafagy (2006); Ahmed – Ebtsam (2007); Masoud, (2008); Ahmed *et al.*, (2008); Madian (2010); Refaai (2011); Ahmed *et al.*, (2011) and El- Khafagy, (2013).

Conclusion:

Carrying out N fertilization via 50% inorganic N + 50% poultry manure + 30 ml EM/ vine proved to be very effective in improving productivity of Superior grapevines and at the same time reducing pollution of juice with both nitrate and nitrite

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