

Reducing the Amount of Mineral Nitrogen Fertilizers for Red Globe Grapevines by Using Different Sources of Organic Fertilizers

Abd El-Wahab, M.A.

Viticulture Res. Dept., Hort. Res. Instit., Agric. Res. Center, Giza, Egypt

Corresponding author: mohamedabdelaziz2003@yahoo.com

Abstract: This investigation was conducted for three successive seasons (2009, 2010 and 2011) in a private vineyard located at El-Khatatba, Menoufiya governorate; on mature Red Globe grapevines to study the possibility of reducing the amount of mineral nitrogen fertilizers for Red Globe grapevines by using different sources of organic fertilizers. The chosen vines were five years old, grown in a sandy loam soil, spaced at 2 X 3 meters apart, irrigated by the drip system, and cane-pruned and trellised by the Spanish Parron system. Ammonium sulphate 20.5% was added as a source of mineral fertilization. Organic fertilizers (compost and chicken manure) were applied either in the form of individual or mixed at 1:1 ratio on the basis of organic manure content of nitrogen. Thirteen treatments were applied as follows: 100%mineral nitrogen (control), 75%mineral nitrogen+ 25%compost, 75%mineral nitrogen + 25%chicken manure, 75% mineral nitrogen + 25%mixed manure, 50%mineral nitrogen + 50%compost, 50% mineral nitrogen + 50%chicken manure, 50% mineral nitrogen + 50%mixed manure, 25% mineral nitrogen + 75%compost, 25% mineral nitrogen + 75%chicken manure, 25%mineral nitrogen + 75%mixed manure, 0%mineral nitrogen + 100%compost, 0% mineral nitrogen + 100%chicken manure and 0% mineral nitrogen + 100%mixed manure. The results revealed the possibility of using organic nitrogen fertilizers as a partial substitute of mineral nitrogen fertilizers. This study indicated that application of 50%mixed manure included compost and chicken manure combined with application of 50%mineral nitrogen fertilizer was the best management system for achieving the best yield with its components as well as the best physical properties of bunches, improving the physical and chemical characteristics of berries, reducing nitrate and nitrite content of berries and ensuring the best vegetative growth parameters, leaf chlorophyll and leaf mineral content of Red Globe grapevines.

[Abd El-Wahab, M.A. **Reducing the Amount of Mineral Nitrogen Fertilizers for Red Globe Grapevines by Using Different Sources of Organic Fertilizers.** Journal of American Science 2011;7(8):810-819] (ISSN: 1545-1003). <http://www.americanscience.org>.

Keywords: Grape, Red Globe, Mineral, Nitrogen, Fertilizer, Compost, and Chicken manure

1. Introduction

Fertilization is one of the most important cultural practices carried out during the growing season, especially nitrogen fertilization. Nitrogen is one of the major plant nutrients, being a part of protein, enzymes, amino acids, polypeptides and many other biochemical compounds in plant system i.e. encouraging cell division and the development of meristematic tissue (Nijjar, 1985 and Mengel and Kirkby, 1987).

One of the most important problems facing grape growers concerning the use of mineral nitrogen fertilizers is the high cost of the manufactured fertilizers needed for grapevines. Besides, the excess of mineral nitrogen fertilizers causes a major pollution of ground water with nitrate. Nitrogen fertilizer causes an accumulation of harmful residual substances, such as nitrate and nitrite in berries and leaves of grapevines (Ibraheem, 1994 and Montasser et al., 2003).

Organic fertilization is another option for supplying macro and micro nutrients necessary for plant growth (Harhash and Abdel-Nasser, 2000 and Elhaggag et al., 2004). In addition, the organic materials improve soil structure, aeration, and retention of moisture and reduce soil pH (Yagodin, 1984; EL-Nagar, 1996 and Nassar, 1998).

The possibility of using the organic fertilization for increasing growth and improving nutritional status of grapevines was approached by many researchers (Zhu and Zhu, 2000; Guo et al., 2000; Kassem and Marzouk, 2002; Hussein et al., 2005 and Omar, 2005).

The ultimate goal of this study was achieving the possibility of reducing the amount of mineral nitrogen fertilizers by using different sources of organic fertilizers (compost, chicken manure and mixed compost and chicken manure) for Red Globe grapevines.

2. Material and Methods

This investigation was conducted for three successive seasons (2009, 2010 and 2011) in a private vineyard located at El-Khatatba, Menoufiya governorate; on mature Red Globe grapevines to study the possibility of reducing the amount of mineral nitrogen fertilizers for Red Globe grapevines by using different sources of organic fertilizers. The chosen vines were five years old, grown in a sandy loam soil, spaced at 2 X 3 meters apart, irrigated by the drip system, and cane-pruned and trellised by the Spanish Parron system. The vines were pruned during the last week of December for the three seasons of the study so as to maintain a load of 72buds/vine (6canes X 12buds/vine). The vineyard was fertilized at the rate of 60 units nitrogen/Feddan.

Ammonium sulphate 20.5% as a source of mineral fertilization was added at three times: 25% was added at the beginning of bud burst, 50% after fruit set and 25% after harvest.

Organic fertilizers (compost and chicken manure) were applied either in the form of individual or Mixed Manure at 1:1 ratio on the basis of organic manure content of nitrogen. Organic fertilizers were applied once in the soil at the second week of January of each season.

The physical and chemical properties of the experimental soil, compost and chicken manure are shown in Table (1).

The normal horticultural practices were applied to all Red Globe vineyards, except those dealing with nitrogen fertilization treatments.

Two hundred and sixty uniform vines were chosen. Each five vines acted as a replicate and each four replicates were treated by one of the following treatments.

Thirteen treatments were applied as follows:

- 1) 100% Mineral Nitrogen (control)
- 2) 75% Mineral Nitrogen + 25% Compost
- 3) 75% Mineral Nitrogen + 25% Chicken Manure
- 4) 75% Mineral Nitrogen + 25% Mixed Manure
- 5) 50% Mineral Nitrogen + 50% Compost
- 6) 50% Mineral Nitrogen + 50% Chicken Manure
- 7) 50% Mineral Nitrogen + 50% Mixed Manure
- 8) 25% Mineral Nitrogen + 75% Compost
- 9) 25% Mineral Nitrogen + 75% Chicken Manure
- 10) 25% Mineral Nitrogen + 75% Mixed Manure
- 11) 0% Mineral Nitrogen + 100% Compost
- 12) 0% Mineral Nitrogen + 100% Chicken Manure
- 13) 0% Mineral Nitrogen + 100% Mixed Manure

The following parameters were adopted to evaluate the tested treatments:-

Representative random samples of 6 bunches/vine were harvested at maturity when TSS in berry juice reached about 16-17%

according to Tourky *et al.*, (1995). The following characteristics were determined:

1. Yield and physical characteristics of bunches:

Yield/vine (kg) was determined as number of bunches/vine X average bunch weight (g). Also, average bunch weight (g), bunch length and width (cm) were determined.

2. Physical characteristics of berries:

Average Berry weight (g), average berry size (cm^3) and average berry dimensions (length and diameter) (cm) were determined.

3. Chemical characteristics of berries:

Total soluble solids in berry juice (TSS%) were determined by a hand refractometer and total titratable acidity was calculated as tartaric acid (%) (A.O.A.C. 1985). Hence TSS /acid ratio and total anthocyanin of the berry skin (mg/100g fresh weight) according to Husia *et al.*, (1965) were calculated. Nitrate (NO_3) and Nitrite (NO_2) were determined according to the method of Sen and Donaldson (1978).

4. Some characteristics of vegetative growth

- 1- Average shoot diameter (cm).
- 2- Average shoots length (cm).
- 3- Average number of leaves/shoot.
- 4- Average leaf area (cm^2) of the apical 5th and 6th leaves using a CI-203- Laser Area-meter made by CID, Inc., Vancouver, USA.
- 5- Total leaf area/vine (m^2) was determined by multiplying average number of leaves/shoot by average leaf area then by the number of shoots per vine.

5. Leaf total chlorophyll and mineral content

1-Leaf content of total chlorophyll was measured by using nondestructive Minolta chlorophyll meter SPAD 502 of the 5th and the 6th leaves (Wood *et al.*, 1992).

2-Leaf content of total nitrogen (%) (Pregl, 1945), phosphorus (%) (Snell and Snell 1967) and potassium (%) (Jackson, 1967) were determined.

• Statistical analysis:

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

3. Results and Discussion

1. Yield and physical characteristics of bunches:

Data in (Table, 2) show that the yield and its components of Red Globe grapevines were greatly affected by mineral and organic fertilizers in the three seasons of this study.

The highest value of yield was obtained with vines receiving 75% mineral nitrogen fertilizer + 25% organic fertilizer followed in a descending order by 100% mineral nitrogen fertilizer in the first season. However, in the second and third seasons, data revealed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest values followed in a descending order by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100% organic fertilizer recorded the lowest values in the all seasons of the study.

With respect to number of bunches/vine, it is obvious that no significant differences could be detected among fertilizer treatments in the first season. While, in the second and third seasons, results showed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest values followed in a descending order by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100% organic fertilizer recorded the lowest values in the three seasons of this study.

As for the effect of fertilizer treatments on physical characteristics of bunches i.e. (bunch weight, bunch length and bunch width), it was

noticed that vines receiving 75% mineral nitrogen fertilizer + 25% organic fertilizer recorded the highest values for these parameters followed in a descending order by 100% mineral nitrogen fertilizer in the first season. However, in the second and third seasons, data revealed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest values followed in a descending order by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100% organic fertilizer recorded the lowest values in the three seasons of this study.

As regards type of organic fertilizers, it is obvious that the mixed manure recorded the highest values, followed in a descending order by chicken manure, while compost recorded the lowest values in the three seasons of this study.

The beneficial effects of using organic fertilizers along with mineral nitrogen fertilizer on increasing yield and bunch weight & length could be due to their effect on providing vines with their requirements from different nutrients at a longer time as well as their effect on increasing the availability of nutrients in the soil for uptake by plants and enhancing the nutritional status of the vines in favour of yield and cluster weight (Nijjar, 1985).

Table (1): Physical and chemical properties of the soil, compost and chicken manure

	Soil	Compost	Chicken Manure
Sand (%)	72.1	-	-
Silt (%)	2.6	-	-
Clay (%)	25.3	-	-
Texture	Sandy loam	-	-
Weight of m³ (kg)	-	450	520
Moisture content (%)	-	21	24
PH	7.65	7.72	7.79
Field capacity (%)	19.5	-	-
Ca Co₃ (%)	0.7	-	-
EC (Mmhos/cm)	1.52	1.83	1.92
Organic matter (%)	1.7	47.3	58.9
Organic carbon (%)	0.79	27.3	28.5
N (%)	0.32	1.74	1.93
C/N ratio	2.47	15.69	14.77
P (%)	0.09	0.73	0.57
K (%)	0.52	0.96	0.82

Table (2):Effect of organic and mineral nitrogen fertilizers on yield/vine and physical characteristics of bunches in Red Globe grapevines in 2009, 2010 and 2011 seasons

Characteristics Treatments	Yield/vine (kg)			Average number of bunches			Average bunch weight (g)			Average bunch length (cm)			Average bunch width (cm)		
	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
100% Mineral Nitrogen (Control)	17.32	18.79	20.95	21.8	24.1	26.6	794.5	779.7	787.7	21.7	21.7	22.1	14.1	13.8	14.2
75% Mineral Nitrogen + 25% Compost	17.70	19.07	21.29	22.0	24.1	26.7	804.5	791.2	797.4	21.8	21.8	22.3	14.3	14.0	14.2
75% Mineral Nitrogen + 25% Chicken Manure	17.81	19.47	21.86	22.1	24.2	26.9	805.7	804.5	812.8	21.9	22.0	22.3	14.4	14.0	14.3
75% Mineral Nitrogen + 25% Mixed Manure	18.11	19.88	22.06	22.3	24.4	27.0	812.2	814.6	817.0	22.2	22.1	22.4	14.6	14.1	14.5
50% Mineral Nitrogen + 50% Compost	16.11	20.25	22.71	21.5	24.5	27.2	749.2	826.6	835.1	21.4	22.3	22.6	13.7	14.3	14.6
50% Mineral Nitrogen + 50% Chicken Manure	16.81	20.57	23.07	21.7	24.6	27.3	774.8	836.3	844.9	21.4	22.4	22.7	13.8	14.4	14.7
50% Mineral Nitrogen + 50% Mixed Manure	17.02	20.93	23.35	21.7	24.9	27.5	784.4	840.5	849.2	21.5	22.6	22.9	14.0	14.6	15.0
25% Mineral Nitrogen + 75% Compost	15.27	17.50	19.63	21.1	23.8	26.2	723.9	735.4	749.3	21.1	21.3	21.7	13.3	13.4	13.9
25% Mineral Nitrogen + 75% Chicken Manure	15.36	17.65	19.79	21.2	23.8	26.4	724.4	741.6	749.7	21.1	21.5	21.8	13.5	13.5	13.9
25% Mineral Nitrogen + 75% Mixed Manure	15.73	17.95	20.06	21.4	23.9	26.4	735.1	750.9	758.6	21.2	21.5	22.0	13.5	13.7	14.0
0% Mineral Nitrogen + 100% Compost	14.31	16.22	18.04	20.8	23.3	25.8	687.8	696.1	699.4	20.6	20.9	21.4	12.9	13.1	13.4
0% Mineral Nitrogen + 100% Chicken Manure	14.78	16.87	18.78	20.9	23.5	25.9	707.0	718.0	725.0	20.8	21.0	21.5	13.0	13.2	13.6
0% Mineral Nitrogen + 100% Mixed Manure	14.88	17.18	19.27	20.9	23.6	26.1	712.1	727.8	738.4	20.9	21.2	21.5	13.2	13.2	13.7

new L.S.D. at 0.05 =

0.43 0.35 0.27 N.S. 0.3 0.2 4.9 4.2 4.1 0.5 0.2 0.1 0.4 0.2 0.1

The results is this concern go in line with Darwish et al. (1996) on Roomy Red grapevines, Harhash and Abd El-Nasser (2000) on King Ruby grapevines, Abd EL-Hameed and Rabeea (2005) on Superior seedless grapevines and Belal (2006), who indicated that adding 60 units organic nitrogen from any source + 20 units mineral nitrogen/feddan gave the highest increase of cluster weight and yield/vine in Thompson seedless grapevines.

2. Physical characteristics of berries:

The results presented in (Table, 3) revealed that all physical characteristics of berries i.e. average berry weight, average berry size, average berry length and average berry diameter were significantly affected by the conducted

treatments in the three seasons of the study. It was found that vines receiving 75% mineral nitrogen fertilizer + 25% organic fertilizer recorded the highest values of these parameters followed in a descending order by 100% mineral nitrogen fertilizer in the first season. However, in the second and third seasons, data revealed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest values followed in a descending order by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100% organic fertilizer recorded the lowest values in the three seasons of this study.

Table (3): Effect of organic and mineral nitrogen fertilizers on physical characteristics of berries in Red Globe grapevines in 2009, 2010 and 2011 seasons

Characteristics Treatments	Average berry weight (g)			Average berry size (cm ³)			Average berry length (cm)			Average berry diameter (cm)		
	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
100% Mineral Nitrogen (Control)	8.69	8.51	8.82	8.42	8.24	8.52	2.89	2.87	2.92	2.81	2.79	2.84
75% Mineral Nitrogen + 25% Compost	8.78	8.64	8.91	8.53	8.35	8.60	2.92	2.89	2.93	2.85	2.80	2.85
75% Mineral Nitrogen + 25% Chicken Manure	8.93	8.79	9.06	8.67	8.48	8.73	2.94	2.89	2.94	2.86	2.82	2.86
75% Mineral Nitrogen + 25% Mixed Manure	8.97	8.85	9.12	8.70	8.53	8.79	2.97	2.92	2.94	2.90	2.85	2.87
50% Mineral Nitrogen + 50% Compost	8.38	8.94	9.28	8.13	8.67	8.98	2.83	2.94	2.98	2.76	2.86	2.90
50% Mineral Nitrogen + 50% Chicken Manure	8.43	9.12	9.39	8.17	8.83	9.08	2.86	2.97	2.99	2.78	2.90	2.91
50% Mineral Nitrogen + 50% Mixed Manure	8.56	9.15	9.43	8.29	8.88	9.16	2.88	3.01	3.02	2.80	2.93	2.94
25% Mineral Nitrogen + 75% Compost	7.99	8.18	8.51	7.72	7.87	8.18	2.77	2.81	2.85	2.69	2.73	2.76
25% Mineral Nitrogen + 75% Chicken Manure	8.06	8.21	8.46	7.79	7.89	8.13	2.80	2.82	2.87	2.73	2.74	2.80
25% Mineral Nitrogen + 75% Mixed Manure	8.12	8.26	8.52	7.84	7.92	8.18	2.82	2.85	2.90	2.73	2.78	2.82
0% Mineral Nitrogen + 100% Compost	7.78	7.95	8.11	7.55	7.69	7.82	2.68	2.71	2.77	2.60	2.64	2.69
0% Mineral Nitrogen + 100% Chicken Manure	7.86	8.01	8.23	7.61	7.74	7.93	2.70	2.74	2.79	2.63	2.65	2.73
0% Mineral Nitrogen + 100% Mixed Manure	7.94	8.12	8.38	7.68	7.83	8.07	2.73	2.76	2.82	2.66	2.68	2.75

new L.S.D. at 0.05 =

0.05 0.03 0.04 0.1 0.05 0.06 0.05 0.04 0.03 0.05 0.03 0.02

Mixed manure as a source of organic fertilizers was recorded the best as compared to chicken manure and compost in the three seasons of this study.

The positive effect of organic fertilizer treatments on berry weight and size may be attributed to the increase of organic matter content and improvement of the structure and physical properties of the soil (Gamal, 1992).

These results are in agreement with those obtained by Ahmed et al., (2000) on Flame seedless grapevines, Harhash and Abd EL-Nasser (2000) on flame seedless and Belal (2006) who indicated that 60 units organic nitrogen + 20 units mineral nitrogen gave the highest values of cluster length, berry length and berry width as compared with the other treatments, especially in case of using mineral nitrogen alone.

3. Chemical characteristics of berries:

As shown in (Table, 4), it is apparent that all berry chemical properties i.e. total soluble solids, titratable acidity, TSS/acid ratio, anthocyanin and nitrate and nitrite content of berries were

significantly affected by fertilizers treatments in all seasons of this study.

The highest values of total soluble solids, TSS/acid ratio and anthocyanin and the lowest values of acidity were obtained with vines receiving 75% mineral nitrogen fertilizer + 25% organic fertilizer followed by 100% mineral nitrogen fertilizer in the first season. However, in the second and third seasons, data revealed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest values followed by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100% organic fertilizer recorded the lowest values of total soluble solids, TSS/acid ratio and anthocyanin and the highest values of acidity in the three season of this study.

Mixed manure as a source of organic fertilizers was recorded the best as compared to chicken manure and compost in the three seasons of this study.

Table (4): Effect of organic and mineral nitrogen fertilizers on chemical characteristics of berries in Red Globe grapevines in 2009, 2010 and 2011 seasons

Characteristics	TSS (%)			Acidity (%)			TSS/acid ratio			Total anthocyanin (mg/100g F.W.)			Nitrate (mg/kg F.W.)			Nitrite (mg/kg F.W.)		
Treatments	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
100% Mineral Nitrogen (Control)	16.3	16.4	16.5	0.58	0.58	0.56	28.1	28.3	29.5	24.3	24.5	25.7	17.88	18.37	18.56	1.83	1.87	1.89
75% Mineral Nitrogen + 25% Compost	16.4	16.4	16.6	0.58	0.58	0.55	28.3	28.3	30.2	24.6	24.6	26.3	14.65	15.40	15.61	1.46	1.52	1.54
75% Mineral Nitrogen + 25% Chicken Manure	16.6	16.5	16.7	0.57	0.57	0.54	29.1	28.9	30.9	25.3	25.1	27.6	12.88	13.37	13.56	1.40	1.44	1.45
75% Mineral Nitrogen + 25% Mixed Manure	16.7	16.6	16.7	0.56	0.56	0.53	29.8	29.6	31.5	25.9	25.7	27.7	10.58	10.97	11.02	1.32	1.36	1.39
50% Mineral Nitrogen + 50% Compost	16.1	16.6	16.8	0.61	0.55	0.53	26.4	30.2	31.7	22.6	26.3	28.0	9.86	10.19	10.32	0.79	0.73	0.82
50% Mineral Nitrogen + 50% Chicken Manure	16.2	16.7	17.0	0.60	0.55	0.52	27.0	30.4	32.7	23.1	26.5	28.8	9.60	9.70	9.90	0.74	0.69	0.77
50% Mineral Nitrogen + 50% Mixed Manure	16.3	16.8	17.1	0.59	0.54	0.51	27.6	31.1	33.5	23.7	27.4	29.7	9.08	9.27	9.37	0.71	0.64	0.73
25% Mineral Nitrogen + 75% Compost	15.9	16.1	16.4	0.63	0.61	0.58	25.2	26.4	28.3	21.3	22.6	24.4	8.52	8.72	8.82	0.25	0.23	0.27
25% Mineral Nitrogen + 75% Chicken Manure	16.0	16.2	16.5	0.62	0.61	0.57	25.8	26.6	28.9	22.0	22.7	25.1	7.80	8.10	8.50	0.22	0.19	0.25
25% Mineral Nitrogen + 75% Mixed Manure	16.1	16.3	16.5	0.61	0.60	0.56	26.4	27.2	29.5	22.5	23.3	25.6	7.17	7.28	7.42	0.17	0.15	0.18
0% Mineral Nitrogen + 100% Compost	15.7	15.9	16.2	0.67	0.64	0.60	23.4	24.8	27.0	20.3	21.1	22.9	5.31	5.43	5.51	0.09	0.07	0.10
0% Mineral Nitrogen + 100% Chicken Manure	15.8	16.0	16.3	0.65	0.63	0.59	24.3	25.4	27.6	20.4	21.6	23.8	4.71	4.79	4.83	0.08	0.07	0.09
0% Mineral Nitrogen + 100% Mixed Manure	15.8	16.1	16.3	0.64	0.62	0.58	24.7	26.0	28.1	21.0	22.3	24.2	4.47	4.52	4.54	0.06	0.04	0.07
new L.S.D. at 0.05 =	0.3	0.1	0.2	0.0	0.01	0.01	0.9	0.7	0.8	1.1	0.9	0.7	5.41	5.69	5.81	0.75	0.72	0.78

Table (5): Effect of organic and mineral nitrogen fertilizers on morphological characteristics of vegetative growth in Red Globe grapevines in 2009, 2010 and 2011 seasons

Characteristics	Average shoot diameter (cm)			Average shoot length (cm)			No. of leaves/shoot			Average leaf area (cm2)			Total leaf area/vine (m2)		
	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
100% Mineral Nitrogen (Control)	1.03	1.04	1.09	177.1	177.3	183.5	28.3	27.3	28.9	187.7	187.2	189.9	26.6	25.5	27.4
75% Mineral Nitrogen + 25% Compost	1.05	1.05	1.11	178.4	179.8	185.9	28.9	28.0	29.5	189.0	189.7	192.3	27.3	26.5	28.4
75% Mineral Nitrogen + 25% Chicken Manure	1.09	1.05	1.13	180.7	181.3	187.3	29.1	28.7	30.1	191.6	191.2	193.7	27.8	27.5	29.2
75% Mineral Nitrogen + 25% Mixed Manure	1.13	1.07	1.14	181.8	183.8	189.7	29.8	29.3	30.6	192.8	193.6	196.0	28.7	28.4	30.0
50% Mineral Nitrogen + 50% Compost	0.99	1.11	1.17	171.2	185.3	191.1	27.0	29.5	30.8	181.0	194.8	197.1	24.4	28.7	30.3
50% Mineral Nitrogen + 50% Chicken Manure	0.99	1.13	1.18	173.5	187.8	193.5	27.0	30.5	31.6	183.6	197.3	199.5	24.8	30.1	31.5
50% Mineral Nitrogen + 50% Mixed Manure	1.02	1.16	1.22	174.8	189.1	194.7	27.6	31.3	32.3	185.2	198.4	200.5	25.6	31.1	32.4
25% Mineral Nitrogen + 75% Compost	0.96	1.01	1.05	163.1	170.5	175.4	25.1	26.1	27.7	174.4	179.3	182.0	21.9	23.4	25.2
25% Mineral Nitrogen + 75% Chicken Manure	0.97	1.01	1.06	166.6	172.3	178.7	25.3	26.7	28.3	176.0	182.4	185.3	22.2	24.4	26.2
25% Mineral Nitrogen + 75% Mixed Manure	0.98	1.02	1.08	165.4	173.0	177.8	25.9	27.3	28.9	176.8	181.6	184.2	22.9	24.8	26.6
0% Mineral Nitrogen + 100% Compost	0.93	0.97	1.02	155.4	160.0	167.7	23.5	24.8	25.9	163.7	171.4	174.1	19.3	21.2	22.6
0% Mineral Nitrogen + 100% Chicken Manure	0.94	0.99	1.03	156.8	164.3	170.5	24.1	25.4	26.8	168.2	174.4	175.7	20.3	22.2	23.6
0% Mineral Nitrogen + 100% Mixed Manure	0.96	0.99	1.05	159.7	168.7	172.0	24.7	25.9	27.2	172.5	175.8	178.5	21.3	22.8	24.3
new L.S.D. at 0.05 =	0.05	0.03	0.04	1.5	1.3	1.2	1.1	0.7	0.6	1.3	1.1	0.9	1.2	0.8	0.7

This result may be due to that organic fertilizers are rich in their content of macro and

micro elements which led to enhance in photosynthesis, this means that more sugar

(glucose) is available for growth and fruit ripening (Keller et al., 1998).

These results are in accordance with Harhash and Abd EL-Nasser (2000) and Belal (2006) who found the gradual increasing of organic nitrogen doses to 60 units with decreasing the dose of mineral nitrogen to 20 units gave the highest significant increase of TSS %, TSS/acid ratio and lowest significant decrease of total acidity of Thompson seedless grapevines.

With respect to nitrate and nitrite content of berries, it is obvious that nitrate and nitrite content of berries were significantly decreased by reducing the amount of mineral nitrogen fertilizer. The highest values of nitrate and nitrite content of berries was obtained with vines receiving 100% mineral nitrogen fertilizer followed in a descending order by 75% mineral nitrogen fertilizer + 25% organic fertilizer. While, vines receiving 100%, 75% and 50% organic fertilizer recorded the lowest values in the three seasons of this study.

Concerning type of organic fertilizers, it is obvious that the mixed manure recorded the lowest values, followed in an ascending order by chicken manure, while compost recorded the highest values in the three seasons of this study.

This may be ascribed to that using organic fertilizers are often considered as a desirable nitrogen source because the nitrogen is in the mineralization immobilization cycle longer and thus is more slowly available (Hailberg and Keeney, 1993). Moreover, the use of organic manure (as slow release for nitrogen) induced a further reduction in N₀₃-N accumulation in the plant compared with mineral nitrogen (as fast release for nitrogen) EL-Sisy (2000).

The obtained data are in agreement with those reported by Harhash and Abd EL-Nasser (2000) and Belal (2006), who reported that the interactions of all combinations between organic nitrogen plus mineral nitrogen doses gave a significant decrease in nitrate and nitrite content in the juice of berries as compared with mineral nitrogen alone for Thompson Seedless grapevines.

4. Some characteristics of vegetative growth

Results presented in (Table, 5) revealed that vegetative growth parameters (shoot diameter, shoot length, number of leaves per shoot, leaf area, and total leaf area/vine) were significantly affected by the applied fertilizers in the three seasons of the study. It was found that vines receiving 75% mineral nitrogen fertilizer + 25%

organic fertilizer recorded the highest values of these parameters followed in a descending order by 100% mineral nitrogen fertilizer in the first season. However, in the second and third seasons, data revealed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest values followed in a descending order by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100% organic fertilizer gave the lowest values in this respect.

Mixed manure as a source of organic fertilizers was recorded the best as compared to chicken manure and compost in the three seasons of this study.

The beneficial effect of organic fertilizers on leaf area of plants could be related to the improvement of physical conditions of the soil, providing energy from microorganisms activity, increasing nutrient supply and, improving the efficiency of macro elements as well as its ability to meet some micronutrient requirements (Cook, 1982; Tisdale et al., 1985; Kolble et al., 1995 and EL-Nagar, 1996).

The data go in line with those reported by Abou-Taleb (2004) on pecan trees and Belal (2006), who indicated that application of 60 units organic nitrogen + 20 units mineral nitrogen/feddan significantly increased leaf area as compared with the other applied treatments.

5. Leaf total chlorophyll and mineral content

As shown in (Table, 6), it is obvious that leaf content of total chlorophyll and percentages of total nitrogen, phosphorus and potassium were significantly affected by fertilizer treatments in the three seasons of this study.

With respect to leaf total chlorophyll content, it was found that vines receiving 75% mineral nitrogen fertilizer + 25% organic fertilizer recorded the highest values followed by 100% mineral nitrogen fertilizer in the first season. However, in the second and third seasons, data revealed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest one followed by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100% organic fertilizer recorded the lowest values in the three seasons of this study.

As regards type of organic fertilizers, it is obvious that the mixed manure recorded the

highest values, followed in a descending order by chicken manure, while compost recorded the lowest values in the three seasons of this study.

The beneficial effect of organic fertilizers in increasing total chlorophyll may be due to more uptakes of nutrients such as nitrogen, magnesium and iron which are involved in chlorophyll formation as mentioned by Harhash and Abd EL-Nasser (2000).

The obtained results are in agreement with those reported by Belal (2006), who found that using different doses from organic manure and mineral N fertilizers significantly increased total chlorophyll in the leaves, the highest values were obtained from using 60 units of organic fertilizer + 20 units of mineral nitrogen per feddan.

Concerning the effect of fertilizers on leaf mineral content, it is apparent that vines receiving 75% mineral nitrogen fertilizer + 25% organic fertilizer were the most efficient in nitrogen, phosphorous and potassium uptake followed by 100% mineral nitrogen fertilizer in the first season. However, in the second and third seasons, data revealed that vines receiving 50% mineral nitrogen fertilizer + 50% organic fertilizer recorded the highest one followed by 75% mineral nitrogen fertilizer + 25% organic fertilizer then 100% mineral nitrogen fertilizer + 0% organic fertilizer. On the other hand, vines receiving 0% mineral nitrogen fertilizer + 100%

organic fertilizer recorded the lowest values in the three seasons of this study.

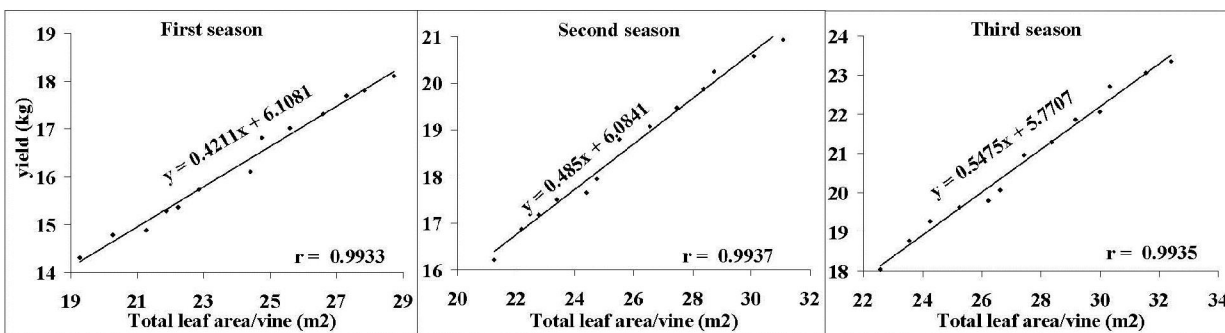
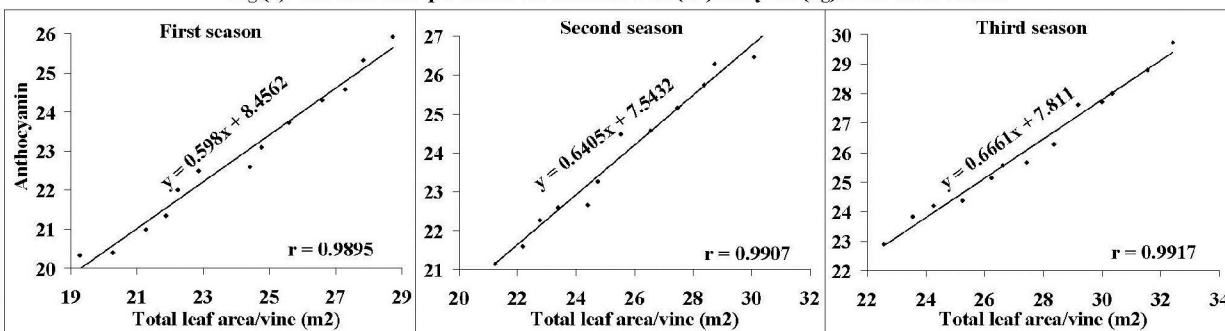
Mixed manure as a source of organic fertilizers was recorded the best as compared to chicken manure and compost in the three seasons of this study.

The improving effect of organic fertilizers on leaf content of nitrogen, phosphorus and potassium can be attributed to their influence manifested in increasing the organic matter in the soil (Nijjar, 1985) which by its turn increases the soil water holding capacity, which improves the solubility and consequently the availability of nutrients (Zaid and Kriem, 1992; EL-Kassas et al., 1997 and Nasser, 1998). Also, the addition of organic manures leads to the production of humates which can be exchanged for adsorbed anions (Cook, 1982).

The results in this respect are in accordance with those of Darwish et al. (1996) on Roomy Red grapevines, Harhash and Abd EL-Nasser (2000) on Flame seedless grapevines, Abd EL-Hameed and Rabeea (2005) on Superior grapevines and Belal (2006) who mentioned that adding 60 units organic nitrogen from any source + 20 units mineral nitrogen/feddan gave the highest values of N, P and K content in the leaf petioles as compared with the other treatments used in Thompson seedless grapevines.

Table (6):Effect of organic and mineral nitrogen fertilizers on leaf total chlorophyll and mineral content in Red Globe grapevines in 2009, 2010 and 2011 seasons

Characteristics Treatments	Leaf total chlorophyll content (SPAD)			Leaf nitrogen content (%)			Leaf phosphorus content (%)			Leaf potassium content (%)		
	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
100% Mineral Nitrogen (Control)	37.61	37.92	38.82	2.08	2.08	2.19	0.39	0.37	0.39	1.60	1.61	1.66
75% Mineral Nitrogen + 25% Compost	38.30	38.40	39.20	2.12	2.09	2.22	0.40	0.38	0.40	1.63	1.63	1.67
75% Mineral Nitrogen + 25% Chicken Manure	38.80	38.80	39.50	2.14	2.11	2.25	0.41	0.38	0.41	1.65	1.65	1.68
75% Mineral Nitrogen + 25% Mixed Manure	39.50	38.85	39.65	2.17	2.14	2.27	0.43	0.40	0.42	1.68	1.65	1.69
50% Mineral Nitrogen + 50% Compost	36.37	40.10	40.90	1.98	2.15	2.28	0.37	0.41	0.43	1.55	1.71	1.74
50% Mineral Nitrogen + 50% Chicken Manure	36.70	40.40	41.30	1.98	2.19	2.31	0.37	0.43	0.44	1.56	1.72	1.76
50% Mineral Nitrogen + 50% Mixed Manure	37.40	41.20	41.90	2.03	2.21	2.34	0.38	0.44	0.46	1.59	1.75	1.79
25% Mineral Nitrogen + 75% Compost	34.80	36.60	37.30	1.90	1.98	2.10	0.33	0.35	0.38	1.47	1.54	1.57
25% Mineral Nitrogen + 75% Chicken Manure	35.13	37.09	38.09	1.91	2.03	2.14	0.34	0.36	0.38	1.48	1.56	1.61
25% Mineral Nitrogen + 75% Mixed Manure	36.00	37.60	38.10	1.94	2.05	2.17	0.35	0.36	0.39	1.53	1.60	1.62
0% Mineral Nitrogen + 100% Compost	33.70	34.26	36.06	1.80	1.91	1.99	0.30	0.33	0.35	1.42	1.45	1.52
0% Mineral Nitrogen + 100% Chicken Manure	34.19	35.13	35.83	1.83	1.92	2.03	0.32	0.34	0.37	1.44	1.48	1.51
0% Mineral Nitrogen + 100% Mixed Manure	34.51	36.06	36.96	1.87	1.96	2.06	0.33	0.34	0.37	1.46	1.52	1.56
new L.S.D. at 0.05 =	0.83	0.74	0.59	0.0	0.01	0.02	0.04	0.01	0.02	0.05	0.03	0.02

Fig (1): The relationship between the total leaf area (m²) and yield (kg) in the three seasonsFig (2): The relationship between the total leaf area (m²) and anthocyanin (mg/100g F.W.) of berry skin in the three seasons

Data illustrated in Figures (1 & 2) indicated the existence of a highly positive correlation between total leaf area per vine (m²) and yield (kg) and between total leaf area per vine (m²) and anthocyanin content of berry skin (mg/100g F.W.) in the three seasons.

From the foregoing results, it can be concluded that there is a possibility of using organic nitrogen fertilizers as a partial substitute of mineral nitrogen fertilizer. However, this study confirmed that application of 50% Mixed Manure organic fertilizers included compost and chicken manure combined with application of 50% mineral nitrogen fertilizer was the best management system for achieving the best yield with its components as well as the best physical properties of bunches, improving the physical and chemical characteristics of berries, reducing nitrate and nitrite content of berries and ensuring the best vegetative growth parameters, leaf chlorophyll and mineral content of Red Globe grapevines.

4. References

1. Association of Official Agricultural Chemists (1985): Official Methods of Analysis Published by A.O.A.C., Benjamin Franklin Station, Washington DC, USA.
2. Abd EL-Hameed, H.M. and Rabeea, M. (2005): Adjusting the best proportion of mineral, organic and biofertilizers for Superior grapevine5 Minia J. Agric. Res. Develop., 25(5): 863-882.
3. Abou-Taleb, S.A. (2004): Effect of cattle manure and reducing mineral fertilizer on growth, fruit quality and nutrient content of pecan trees. Annals Agric. Sci., Moshtohor, 42(3): 1197-1214.
4. Ahmed, F.F.; Abd Elaal, A.H. and Au, M.A. (2000): A comparative study for using farmyard manure and filter mud on Flame seedless grapevines growing in sandy soil. The 2nd Scientific Conference of Agric. Sci. Assiut.
5. Belal, E.A. (2006): Effect of some kinds of fertilizers on yield and quality of Thompson Seedless grapevines (*Vitis vinifera*, L.). Ph.D. Thesis, Fac. of Agric., Mansoura Univ.
6. Cook, G.W. (1982): Fertilizing for maximum yield, 3rd ed. Collens Professional and Technical Books, pp. 465.
7. Darwish, O.H.; L.F. Hanna and M.A. Maatouk (1996): Enhancing the availability of phosphorus as rock phosphate for Roomy Red grapevines by some materials. Fourth Arabic Conf. for Horticulture Crops, EL-Minia, Egypt.
8. EL-Kassas H.L.; Abou.Hadid A.F. and Eissa, N.M.H. (1997): Effect of different organic manures on the yield and elemental composition of Sweet pepper plant grown in sandy soils. Egypt. J. Appl. Sci., 12(3):262-281.
9. EL-Nagar, E.M. (1996): Effect of applying some organic residues to sand calcareous soils on growth

- and composition of some plants. M.Sc. Thesis, Fac. of Agric., Mansoura Univ.
10. EL-Sisy, L.M.H. (2000): Assessing the pollution caused by excessive nitrogen fertilization, J. Agric. Sci, Mansoura Univ., 25(11): 7297-7313.
 11. Gamal, A.A. (1992): Effect of soil conditioners on soil properties and plant yield. M.Sc. Thesis, Fac. Agric. AL-Azhar Univ., Egypt.
 12. Guo, B.; Yang, J.; Lu, R. and Yu, S. (2000): Effect of Komix on the growth and fruiting of Red Fuji apple variety. J. of Fruit Sci., 17 (1): 73-75.
 13. Hallberg, G.R. and Keerley, D.R. (1993): Nitrate, Alley, William A., ed. Regional Ground-water Quality Van Nostrand Reinhold, New York, p. 297-322.
 14. Harhash, M.M. and Abd EL-Nasser (2000): Effect of organic manures in combination with elemental sulphur on soil physical and chemical characteristics, yield, fruit quality, leaf water contents and nutritional status of Flame seedless grapevines. J. Agric. Sci. Mansoura Univ., 25(5): 2819-2837.
 15. Husia, C. L.; B. S. Luh and C. D. Chichester (1965): Anthocyanin in free stone peach. J. Food Science, 30: 5-12.
 16. Hussien, A.M.; El-Maghraby, T.A.; Sherif, H.M. and El-Shal, S.A. (2005): Effect of liquid organic fertilization techniques on yield and chemical composition of pear and apricot trees grown in sandy soils at South Tahrir province. Fayoum J. Agric. Res. & Dev., 19 (2): 224-238.
 17. Ibraheem, T. (1994): Water pollution. Part I. Science and Life Series. Egyptian Organization for Books, Cairo, Egypt. PP. 58-61. (In Arabic).
 18. Jackson, M.L. (1967): Soil Chemical Analysis. Printice-Hall Inc. Englewood Cliffs-N.S.
 19. Kassem, H.A. and Marzouk, H.A. (2002): Effect of organic and/or mineral nitrogen fertilization on the nutritional status, yield and fruit quality of Flame Seedless grapevines grown in calcareous soils. J. adv. Res. 7(3): 117 -126.
 20. Keller, M.; Arnink, K.J. and Hrazdina, G. (1998): Interaction of nitrogen availability during bloom and light intensity during veraison. 1. Effect on grapevine growth, fruit development and ripening. Am. J. Enol. & Vitic., 49: 333-340.
 21. Kolbe, H.; Neineke, H.S. and Zhang, W.L. Zhang (1995): Differences in organic and mineral fertilization on potato tuber yield and chemical composition compared to model calculation. Agriobiol. Res., 48(1): 63-73.
 22. Mengel, K. and Kirkby, E.A. (1987): Principles of plant Nutrition. 4th ed., International Potash Institute, Pem, Switzerland, p. 687.
 23. Montasser, A.S.; N. EL-Shahat; G.F. Ghobreial and M.Z. EL-Wodoud (2003): Residual effect of nitrogen fertilization on leaves and fruits of Thompson seedless grapes. J. Environ. Sci., 6(2): 465-484.
 24. Nasser, L.N. (1998): Utilization of the municipal cabbage (MG) as a soil amendment Alex. J. Agric. Res., 43(3): 31 7-332.
 25. Nijjar, G.S. (1985): Nutrition of Fruit Trees. Kalyani Publishers New Delhi, India, 320 p.
 26. Omar, A.H. (2005): Fertilization of Thompson Seedless vines with mineral and organic sources of nitrogen. J. Agric. Sci., Mansoura Univ., 30 (12): 7855-7862.
 27. Pregl, F. (1945): Quantitative Organic Micro-Analysis. 4th Ed. J. and A. Churchill, Ltd., London.
 28. Sen, N.P. and Donaldson, B. (1978): Improved colorimetric method for determining nitrate and nitrite. Food J. Assoc. of Anal. Chem. 16 (6):1389-1395.
 29. Snedecor, G. W. and Cochran, W.G. (1980): Statistical Methods. 7th ed., The Iowa State Univ. Press. Ames, Iowa, U.S.A., pp. 593.
 30. Snell, F.D. and Snell, C.T. (1967): Colorimetric Method of Analysis. D. van Nestrant Company Inc., P. 551-552.
 31. Tiadale, S.L.; Nelson, W.I. and Beaton, I.D. (1985): Soil fertility and fertilizers, 4th ed. Macmillan Publishing Company, A division of Macmillan Inc., New York, pp. 754.
 32. Tourky, M.N.; EL-Shahat, S.S. and Rizk, M.H. (1995): Evaluation of some new grape cultivars in relation to growth, yield, berry quality and storage life. J. Agric. Sci., Masoura Univ., 20(12): 5153-5167.
 33. Wood, C.W., Reeves, D.W. and Himelrick, D.G. (1992): Relationships between chlorophyll meter readings and leaf chlorophyll concentration. N status and crop yield. A review: Proc. Agro. Soc. N.Z. 23: 1-9.
 34. Yagodin, B.A. (1984): Agricultural Chemistry, vol. 2, Mir Pub. Moscow.
 35. Zaid, M.S. and Kriem, H.M. (1992): Effect of sugar cane wastes and sulphur on some properties and nutrients uptake by maize plants in sandy soil. J. Agric. Sci., Mansoura Univ., 17(1): 181 -1 88.
 36. Zhu, R.F. and Zhu, R.F. (2000): Effect of (Opal) HA-202 liquid fertilizers on the growth and fruiting of pears trees. South China Fruits, 29 (2): 43.