

Impact of Using Some Organic Manures Tea via Spray and Soil versus Mineral N Fertilizers for Improving Berries Colouration, Yield and Quality of Flame Seedless Grapes

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Abstract: This study was undertaken during 2016 and 2017 seasons to examine the effect of using nitrogen (50 g/vine/year) as 100 % inorganic and 25 to 75 % inorganic nitrogen plus 25-75 % tea of compost, poultry and pigeon manures applied via spray and soil on growth, vine nutritional status, yield, berries colouration %, and quality of Flame seedless grapes. Growth aspects, yield, berry setting % and cluster parameters were gradually stimulated with reducing the percentage of inorganic N from 100 to 50% and increasing the percentage of the three organic manures tea from 0.0 to 50% applied via spray or soil. Reducing percentage of inorganic N from 50 to 25% even with application of tea organic manures at 75% caused an obvious decline on these parameters. Pigments and NPK in the leaves, berries colouration % and quality parameters except total acidity, nitrite and nitrate were gradually enhanced with reducing inorganic N percentages from 100 to 25% and at the same time increasing the percentages of organic manures tea applied via spray and soil from 0 to 75%. Spray application of the three organic manures tea materially was superior than using via soil. For promoting growth, berry setting and yield of Flame seedless grapevines grown under Minia region conditions, it is necessary to fertilize the vines with N (50 g/vine/year) through 50 % inorganic N+ 50% pigeon manure tea via spray. The recommendation for obtaining good quality was consisted from the application of N via 25% inorganic N+ 75% pigeon tea via spray. This recommendation saved about 25 to 50% chemical fertilizers and protected the environment from pollution with nitrite and nitrate.

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Keywords: Flame seedless grapevines, inorganic N, tea of compost, poultry, pigeon manures, growth, yield, berries colouration, berries quality.

1. Introduction

Clean cultivation is suggested to be one possibility to restore the natural conditions and it has become in the last few decades a positive alternative to chemical fertilizers. It was achieved by using organic fertilizers.

Organic fertilization would permit a reduction in the use of agrochemicals. The positive action of these nature biostimulants are attributed to their higher own content of different nutrients, vitamins B, antibiotics, amino acids, organic matter, organic acid, and natural hormones such as IAA, GA₃ and cytokinins as well as its positive action on reducing soil pH and enhancing N fixation (Mengel and Kirkby, 1987; Simon *et al.*, 1999 and Arutjumjan, 1999).

Previous studies showed that using organic manures as a partial replacement of inorganic N were found to adjust the suitable nitrogen as well as improve growth, berries colouration, yield and quality of the grapes (Madian, 2010, Abd El-Hameed *et al.*, 2010; Refaai, 2011; Ahmed *et al.*, 2011, El- Wany, 2015; Abdel Raheem *et al.*, 2015; Aly-Samar, 2016; Sedky, 2016 and Tony, 2016).

The main target of this study was examining the effect of tea compost, poultry and pigeon manures via

sprays or soil as partial replacements of inorganic N fertilizers in Flame seedless vineyards. Selecting the best proportion of inorganic N fertilizer and some organic fertilizers namely tea of compost, poultry and pigeon manures resulted higher production is considered another target.

2. Material and Methods

This study was carried out during the two consecutive seasons of 2016 and 2017 on 114 uniform in vigour own-rooted 13-years old Flame seedless grapevines grown in a private vineyard located at Tanda Village, Malawy district, Minia Governorate where the soil texture is clay and well drained and water table is not less than two meters deep. The chosen vines are planted at 2 x 3 meters apart. Short pruning system was followed at the first week of Jan. leaving 72 eyes per vine (on the basis of 20 fruiting spurs x 3 eyes plus six replacement spurs x two eyes) using Gabel shape supporting system. Surface irrigation system was followed using Nile water.

The main target of this study was examining the effect of tea compost, poultry and pigeon manures via sprays or soil as partial replacements of inorganic N fertilizers in Flame seedless vineyards. Selecting the

best proportion of inorganic N fertilizer and some organic fertilizers namely tea of compost, poultry and pigeon manures resulted higher production is considered another target.

Except those dealing with the present treatments all the selected vines (114 vines) received the usual horticultural practices which are common used in the vineyard including the application of 150 kg calcium superphosphate (15.5 % P₂O₅) and 300 kg potassium sulphate (48 % K₂O) per one feddan. Phosphate fertilizer was added once with F.Y.M. Potassium fertilizer was added twice just before blooming and after berry setting. The other horticultural practices were carried out as usual.

1. Soil analysis:

Soil is classified as silty clay in texture with water table depth not less than two meters deep. The results of orchard soil analysis according to **Davis and Ferites (1970)** and **Wilde *et al.*, (1985)** are given in **Table (1)**.

Table (1): Mechanical, physical and chemical analysis of the tested vineyard soil:

Constituents	Values
Particle size distribution	
Sand %	11.9
Slit %	10.1
Clay %	78.0
Texture %	Clay
pH (1:2.5 extract)	7.5
E.C. (1: 2.5 extract) ppm	250
O.M. %	1.8
CaCO ₃ %	2.25
Total N%	0.09
Available P (Olsen method, ppm)	4.9
Available K (ammonium acetate, ppm)	488.5
EDTA extractable micronutrients (ppm):	
Fe	3.3
Mn	2.9
Zn	4.0
Cu	0.4

2. Experimental work:

This study including the following 19 treatments from inorganic N and organic fertilizers:

1. Application of the suitable N (50 g N/ vine) via 100 % inorganic N (149.3 g ammonium nitrate /vine / year) alone.

2. Application of the suitable N via 75 % Inorganic N (111.9 g ammonium nitrate/ vine/ year) alone + 25% compost tea via spray (625 g/vine/year).

3. Application of the suitable N via 75 % Inorganic N + 25% poultry tea via spray (500 g/vine/year).

4. Application of the suitable N via 75 % Inorganic N + 25% pigeon tea via spray (250 g/vine/year).

5. Application of the suitable N via 75 % Inorganic N + 25% compost tea via soil (625 g/vine/year).

6. Application of the suitable N via 75 % Inorganic N + 25% poultry tea via soil (500 g/vine/year).

7. Application of the suitable N via 75 % Inorganic N + 25% pigeon tea via soil (250 g/vine/year).

8. Application of the suitable N via 50 % Inorganic N (74.6 g ammonium nitrate/ vine/ year) alone + 25% compost tea via spray (1250 g/vine/year).

9. Application of the suitable N via 50 % Inorganic N + 50% poultry tea via spray (1000 g/vine/year).

10. Application of the suitable N via 50 % Inorganic N + 50% pigeon tea via spray (500 g/vine/year).

11. Application of the suitable N via 50 % Inorganic N + 50% compost tea via soil (1250 g/vine/year).

12. Application of the suitable N via 50 % Inorganic N + 50% poultry tea via soil (1000 g/vine/year).

13. Application of the suitable N via 50 % Inorganic N + 25% pigeon tea via soil (500 g/vine/year).

14. Application of the suitable N via 25 % Inorganic N (37.3 g ammonium nitrate/ vine/ year) alone + 75% compost tea via spray (1875 g/vine/year).

15. Application of the suitable N via 25 % Inorganic N + 75% poultry tea via spray (1500 g/vine/year).

16. Application of the suitable N via 25 % Inorganic N + 75% pigeon tea via spray (750 g/vine/year).

17. Application of the suitable N via 25 % Inorganic N + 75% compost tea via soil (1875 g/vine/year).

18. Application of the suitable N via 25 % Inorganic N + 75% poultry tea via soil (1500 g/vine/year).

19. Application of the suitable N via 25 % Inorganic N + 75% pigeon tea via soil (750 g/vine/year).

Each treatment was replicated three times, two vines per each (114 vines for all treatments). Ammonium nitrate at all levels was added at three

unequal batches as 40% at the first week of Mar., 35% at the middle of Apr. and 25% at two weeks later (1st weeks of May). The three organic manure tea added via soil were applied once at the middle of January during both seasons. These organic manures added via foliage spraying were sprayed at three dates of applications at growth start (middle of March); just after fruit setting (middle of April) and three weeks later (first week of May). The three organic manures tea were prepared by weighing 10-40 kg of tested manures + 750 g molase + 10.09 sodium chloride + 55.09 magnesium sulphate per 100 liters water and left stand for three days. Then was agitated continuously and was used in the fourth day (according to **Ryan 2003**). Triton B as a wetting agent at 0.05% was added to all organic manures applied via spray. Spraying was done till runoff. Analysis of poultry and pigeon manure tea as well as compost tea is shown in Tables (2 and 3).

Table (2): Analysis of the tea of pigeon and poultry manure fertilizers.

Parameters	Values	
	Pigeon manure Tea	Poultry manure tea
O.M. %	55.0	58.26
Organic carbon	30.0	27.90
pH (1: 2.5 extract)	8.1	10.25
E.C. (ds/m) (1: 2.5 extract)	4.0	5.9
Total N %	5.0	2.5
Total P %	2.5	1.12
Total K %	20.0	1.21
Total Fe (ppm)	29.0	18.5
Total Zn (ppm)	51.0	43.22
Total Mn (ppm)	22.0	16.6

Table (3): Analysis of plant 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 (dsm^{-1}) (1: 2.5 extract)	10.25
C/N ratio	14.28
Total N %	2.0
Total P %	1.02
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

3. Experimental design:

A randomized complete block design was followed where this experiment included nineteen treatments each replicated three times, two vines per each.

4. Various measurements:

4.1. Measurements of vegetative growth characteristics:

At the 2nd of May during both seasons, twenty mature leaves from the opposite side to the basal clusters on the shoots were picked for calculating the leaf area using the following equation outlined by **Ahmed and Morsy (1999)**.

$$\text{Leaf area (cm}^2\text{)} = 0.45 (0.79 \times \text{diameter } 2) + 17.77.$$

The average leaf area was recorded. Average main shoot length (cm) was recorded as a result of measuring the length of ten shoots per vine (cm) and the average shoot length was recorded. Number of leaves per shoot was also recorded. Dynamic of wood ripening coefficient was calculated by dividing the length of the ripened part of shoot that had brownish colour by the total length of the shoots (green colour) in the ten shoots/ vine (middle of Oct.) according to **Bouard (1966)**. Weight of pruning's (kg./ vine) was recorded just after carrying out pruning by weighing the removal one year old wood (1st week of Jan.). Average cane thickness (cm) was estimated in the five basal internodes of the ten canes per vine by using a Vernier caliper.

4.2. Measurements of leaf pigments:

Fresh leaves of each vine were cut into small pieces and a known sample (0.5g) from each sample was taken, homogenized and extracted using 25% acetone with the assistance of little amounts of Na_2CO_3 and clean sand. Filtration was washed several times with acetone till the filtrate was colorless. Acetone was used as a blank. In the filtrates, the optical density was determined using spectrophotometer at the wave length of 662, 644 and 440 nm to determine chlorophylls a and b and total carotenoids respectively. The following equations were used for determination of these plant pigments according to **Von- Wettstein (1957) and Hiscox and Israelstam, (1979)**.

$$\text{Chl.a} = (9.784 - E_{622}) - 0.99 - E_{644} = \text{mg/l}$$

$$\text{Chl.b} = (21.426 - E_{644}) - (4.65 - E_{662}) = \text{mg/l}$$

$$\text{Total carotenoids} = (4.965 \times E_{440} - 0.268) \text{ (chlorophyll a + chlorophyll b)}$$

Where **E** = optical density at a given wave length. Calculations were estimated as mg/100 g F.W.

4.3. Measurements of leaf contents of N, P and K:

Petioles of the same leaves that were taken for measuring the leaf area according to **Summer, 1985 and Balo et al., (1988)** were washed several times with water and distilled water and then oven dried at 70°C and grounded, then 0.5 g weight of

each sample was digested using H₂SO₄ and H₂O₂ until clear solution (**Chapman and Pratt, 1975**). In the digested solutions, the following nutrients were determined:

1- Percentage of N by the modified microkjeldahle method as described by **Wilde et al., (1985)**.

2- Percentage of P by using Olsen method as reported by **Chapman and Pratt (1975)**.

3- Percentage of K by using Flame photometer as outlined by **Peach and Tracey (1968)**.

4.4. Measurements of berry setting %:

It was calculated by caging five clusters / vine in perforated paper bags before blooming stage. The bags were removed at the end of berry setting stage. The number of attached and dropped berries as well as total number of flowers per vine were recorded (dropped + attached berries). Percentage of berry setting was estimated by dividing number of attached berries by total number of flowers per cluster and multiplying the product by 100.

4.5. Measurements of yield as well as physical and chemical characteristics of the berries:

When T.S.S./ acid in the control treatment reached 25:1, clusters were harvested (**Weaver, 1976**). The yield of each vine was recorded in terms and number/vine of cluster was recorded. Five clusters per each vine were taken for determination of the following physical and chemical characteristics of the berries:

- 1- Cluster weight (g)
- 2- Cluster dimensions (length and shoulder in cm).
- 3- Percentage of colouration by dividing number of red berries by total number of berries and multiplying the product by 100.
- 4- Average berry weight (g.) and dimensions (longitudinal and equatorial (in cm).
- 5- Percentage of total soluble solids in the juice by using handy refractometer.
- 6- Percentage of total acidity in the juice (as g tartaric acid/100 ml juice) by titration against 0.1 N NaOH using phenolphthalein indicator (**A.O.A.C., 2000**).
- 7- The ratio between T.S.S. and acid.
- 8- The percentage of reducing sugars in the juice (**Lane and Eynon, 1965**) as described by **A.O.A.C. (2000)**.
- 9- Total anthocyanins (mg/100g F.W) (**Fulcki and Francis, 1968**).
- 10- Nitrite and nitrate in the juice (ppm) (**Ridnour-Lisa et al., 2000**).

5. Statistical analysis:

Statistical analysis was done and the different treatment means were compared using new L.S.D. at

5% (**Snedecor and Cochran, 1980 and Mead et al., 1993**).

3. Results and Discussion

1-Vegetative growth characteristics:

It is clear from the obtained data in Table (4) that using N as 50 to 75% inorganic N plus 25 to 50% tea of the three organic manures (compost, poultry and pigeon) applied via spray or soil significantly stimulated the all growth traits namely main shoot length, number of leaves/shoot, leaf area, wood ripening coefficient, pruning wood weight and cane thickness compared with using N as 25% inorganic N plus 75% foliar or soil addition of any one of the three organic manures tea or N was added as 100% inorganic N. The stimulation on these growth aspects was significantly related to the reduction of inorganic N percentages from 100 to 50% and the same time increasing the percentages of the three organic manures tea from 0.0 to 50%. Using the tea of the three manures at 25 to 75% of N through spray was significantly superior than using these organic manures via soil in enhancing these growth aspects. The best organic manures in stimulating these growth aspects were compost, poultry and pigeon, in ascending order. Using N at 100% inorganic N significantly surpassed the application of N via 25 % inorganic plus 75% organic manures (compost, poultry and pigeon) applied via spray or via soil in enhancing these growth characteristics. A significant reduction on these growth traits was observed when N was added via 25% inorganic plus any one of the three organic manures tea at 75% via both methods. Significant differences on these growth parameters were observed among the nineteen treatments. The maximum values of main shoot length (**127.0 & 127.8 cm**), number of leaves/shoot (**27.0 & 27.0 leaf**), leaf area (**133.6 & 134.5 cm²**), wood ripening coefficient (**0.94 & 0.93**), pruning wood weight (**2.16 & 2.18 kg**) and cane thickness (**1.63 & 1.60 cm**) were recorded on the vines that fertilized with N as 50% inorganic N+ 50 % pigeon via spray during both seasons, respectively. Vines received N as 25% inorganic N plus 75% compost tea applied via soil gave the lowest values. These results were true during both seasons.

2- Leaf chemical composition:

One cane state from the obtained data in Table (5) that using N as 25 to 75% inorganic N plus 25 to 75% any organic manure tea (compost, poultry and pigeon) via spray or soil significantly enhanced chlorophylls a & b, total carotenoids and percentages of N, P and K in the leaves relative to the vines that received N completely via inorganic N (100% inorganic N). There was a gradual and significant promotion on these leaf chemical components with reducing the percentages of inorganic N from 100 to

25% and the same time increasing the percentages of the three organic manures tea (compost, poultry and pigeon) from 0.0 to 75%. The best organic manures in improving these chemical components of the leaves were compost, poultry and pigeon, in ascending order. Using the investigated organic manures via spray was significantly superior than using them via soil in enhancing the nutrients. The maximum values of chlorophyll a (4.41 & 4.47 mg/1.0 g FW), chlorophyll a (1.98 & 2.10 mg/1.0 g FW), total carotenoids (1.98 & 2.02 mg/1.0 g FW), N (2.65 & 2.70%), P (0.194 & 0.203%) and K (2.12 & 2.12%) were observed on the vines that fertilized with N as 25% inorganic N+ 75 % pigeon tea applied via spray during both seasons, respectively. The minimum values of these plant pigments and nutrients were observed on the vines received N completely via inorganic N. These results were true during both seasons.

3- Percentage of berry setting, yield and cluster aspects:

It is revealed from the obtained data in Table (6) that supplying the vines with N as 50 to 75% inorganic N plus 25 to 50% tea of any organic manure (compost, poultry and pigeon) tea applied via spray and soil significant promotion on the percentage of berry setting, yield expressed in weight and number of clusters/ vine and cluster weight, length and shoulder of Flame seedless grapevines relative to using N as 100% inorganic N or when N was applied as 25% plus 75% any organic manures tea applied via soil or spray. The promotion on these parameters was significantly associated with reducing the inorganic N percentages from 100 to 50% and the same time increasing the percentages of the three organic manures tea from 0.0 to 50%. Using any organic manure via spray was significantly superior than using these organic manures via soil in improving berry setting%, yield and cluster aspects (weight, length and shoulder). Application of organic manures namely compost, poultry and pigeon at 25 to 75% via both methods, in ascending order was significantly very effective in improving berry setting%, yield and cluster aspects. A significant reduction was observed on berry setting, yield and cluster aspects when N was applied at 25 % inorganic plus 75% any organic manures tea applied via spray or via soil. Using N via 100% inorganic N was significantly preferable than using N as 25% + 75% any organic manures (compost, poultry and pigeon) tea via soil or spray in improving berry setting%, yield and cluster aspects. The maximum berry setting (**19.6 & 19.8%**), yield expressed in weight (**9.9 & 15.3 kg**) and cluster weight (**430.0 & 436.0 g**) were observed on the vines that fertilized with N as 50% inorganic N+ 75 % pigeon manure tea applied via spray during both seasons, respectively. The vines received N as 100%

inorganic N alone gave yield/ vine reached **8.6 and 9.1 kg** during both seasons, respectively. The lowest values of berry setting%, yield and cluster aspects were recorded on the vines that received N as 25 % inorganic plus 75% compost tea applied via. Number of clusters per vine was unaffected significantly in the first season of study. Similar results were announced during both seasons.

4- Percentage of berries colouration

The listed data in Table (7) obviously reveal that using N as 25 to 75% inorganic N plus 25 to 75% any organic manure tea (compost, poultry and pigeon) via spray or soil significantly enhanced berries colouration% relative to the vines that received N completely via inorganic N (100% inorganic N). There was a gradual and significant promotion on percentage of berries colouration with reducing the percentages of inorganic N from 100 to 25% and the same time increasing the percentages of the three organic manures tea (compost, poultry and pigeon) from 0.0 to 75%. The best organic manures in improving this parameter were compost, poultry and pigeon, in ascending order. Using the investigated organic manures via spray was significantly superior than using them via soil in enhancing berries colouration%. The maximum berries colouration (**80.9 & 82.3%**) was recorded on the vines that fertilized with N as 25% inorganic N+ 75 % pigeon tea applied via spray during both seasons, respectively. The minimum values of percentage of berries colouration were observed on the vines received N completely via inorganic N. These results were true during both seasons.

5- Physical and chemical characteristics of the berries

It is clear from the obtained data in Tables (7 & 8 & 9) that varying N management had significant effect on both physical and chemical characteristics of the berries. Using N as 25 to 75% inorganic N plus 25 to 75% any organic manure (compost, poultry and pigeon) tea applied via spray or soil was significantly very effective in improving quality of the berries in terms of increasing berry weight and dimensions, T.S.S%, reducing sugars %, T.S.S/acid and total anthocyanins and decreasing total acidity %, nitrite and nitrate in the berries relative to using N completely via inorganic N (100% inorganic N). The promotion on berries quality was significantly correlated with reducing the percentages of inorganic N from 100 to 25% and at the same time increasing the percentages of the three organic manures tea from 0.0 to 75% applied via soil or spray. The best organic manures in enhancing berries quality were compost, poultry and pigeon, in ascending order. Spraying the tea of these organic manures (compost, poultry and pigeon) was significantly favourable than using these

organic manures via soil in enhancing quality of the berries. The best results with regard to quality of the berries were recorded on the vines that supplied with N as 25% inorganic N + 75% pigeon tea applied via spray. Under such promised treatment, the minimum values of nitrate (1.96 & 1.64 ppm) and nitrite (0.71 &

0.63) were observed during both seasons, respectively. Unfavourable effects on quality of the berries were observed on the vines that fertilized with N as 100% inorganic N. Similar results were announced during both seasons.

Table (4): Effect of using compost, poultry manure and pigeon manure applied via spray or via soil at different proportions as partial replacement of inorganic N on some vegetative growth characteristics of Flame seedless grapevines during 2016 and 2017 seasons

Treatments	Main shoot length (cm.)		Number of leaves/shoot		Leaf area (cm ²)		Wood ripening coefficient		Pruning wood weight / vine (kg.)		Cane thickness (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
N as 100 % inorg.	112.3	113.0	18.0	18.0	120.0	120.9	0.86	0.85	1.51	1.50	1.27	1.26
N as 75% inorg.+ 25% compost tea via spray	119.2	120.0	22.0	22.0	126.0	127.0	0.90	0.89	1.79	1.80	1.53	1.50
N as 75% inorg.+ 25% poultry tea via spray	121.0	121.8	23.0	23.0	127.0	128.5	0.91	0.90	1.86	1.87	1.54	1.51
N as 75% inorg.+ 25% pigeon tea via spray	122.3	123.0	24.0	24.0	129.0	129.9	0.92	0.91	1.93	1.95	1.55	1.52
N as 75% inorg.+ 25% compost tea via soil	113.5	114.2	19.0	19.0	121.5	122.4	0.87	0.86	1.59	1.60	1.33	1.30
N as 75% inorg.+ 25% poultry tea via soil	116.8	117.6	20.0	20.0	123.0	123.8	0.88	0.87	1.65	1.66	1.40	1.37
N as 75% inorg.+ 25% pigeon tea via soil	118.0	118.8	21.0	21.0	124.5	125.5	0.89	0.88	1.72	1.73	1.47	1.44
N as 50% inorg.+ 50% compost tea via spray	128.3	129.0	28.0	29.0	135.1	136.0	0.95	0.95	2.27	1.29	1.70	1.67
N as 50% inorg.+ 50% poultry tea via spray	129.4	130.2	29.0	30.0	136.7	137.6	0.95	0.94	2.40	2.42	1.71	1.68
N as 50% inorg.+ 50% pigeon tea via spray	131.8	132.5	30.0	32.0	138.2	139.0	0.96	0.95	2.51	2.52	1.77	1.73
N as 50% inorg.+ 50% compost tea via soil	124.0	124.8	25.0	25.0	130.4	131.3	0.93	0.96	2.01	2.03	1.61	1.57
N as 50% inorg.+ 50% poultry tea via soil	125.3	126.0	26.0	26.0	131.9	133.9	0.94	0.93	2.10	2.12	1.62	1.59
N as 50% inorg.+ 50% pigeon tea via soil	127.0	127.8	27.0	27.0	133.6	134.5	0.94	0.93	2.16	2.18	1.63	1.60
N as 25% inorg.+ 75% compost tea via spray	108.2	109.0	15.0	15.0	115.5	116.4	0.79	0.78	1.31	1.33	1.08	1.05
N as 25% inorg.+ 75% poultry tea via spray	110.0	110.8	16.0	16.0	117.0	117.9	0.80	0.79	1.37	1.39	1.14	1.11
N as 25% inorg.+ 75% pigeon tea via spray	111.1	111.8	17.0	17.0	118.5	119.4	0.82	0.81	1.44	1.46	1.20	1.17
N as 25% inorg.+ 75% compost tea via soil	104.6	105.4	12.0	12.0	111.0	111.9	0.67	0.66	1.11	1.13	0.89	0.86
N as 25% inorg.+ 75% poultry tea via soil	105.8	106.0	13.0	13.0	112.5	113.5	0.71	0.71	1.18	1.20	0.95	0.92
N as 25% inorg.+ 75% pigeon tea via soil	107.1	108.0	14.0	14.0	113.9	115.0	0.75	0.75	1.25	1.27	1.01	0.98
New L.S.D. at 5%	1.1	0.9	1.0	1.0	1.4	1.1	0.04	0.05	0.06	0.05	0.06	0.05

Table (5): Effect of using compost, poultry manure and pigeon manure applied via spray or via soil at different proportions as partial replacement of inorganic N on the leaf chemical components of Flame seedless grapevines during 2016 and 2017 seasons

Treatments	Chlorophyll a (mg/1 g FW)		Chlorophyll b (mg/1 g FW)		Total carotenoids (mg/1 g FW)		Leaf N %		Leaf P %		Leaf K %	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
N as 100 % inorg.	3.11	3.05	1.05	1.10	1.06	1.02	1.61	1.59	0.111	0.109	1.09	1.11
N as 75% inorg.+ 25% compost tea via spray	3.36	3.41	1.25	1.29	1.26	1.29	1.86	1.90	0.133	0.136	1.35	1.38
N as 75% inorg.+ 25% poultry tea via spray	3.42	3.48	1.31	1.36	1.32	1.35	1.92	1.97	0.135	0.138	1.41	1.44
N as 75% inorg.+ 25% pigeon tea via spray	3.50	3.55	1.36	1.41	1.40	1.43	1.97	2.02	0.138	0.141	1.47	1.51
N as 75% inorg.+ 25% compost tea via soil	3.16	3.21	1.09	1.14	1.10	1.13	1.67	1.72	0.120	0.123	1.15	1.18
N as 75% inorg.+ 25% poultry tea via soil	3.22	3.27	1.15	1.20	1.15	1.18	1.72	1.77	0.124	0.127	1.21	1.24
N as 75% inorg.+ 25% pigeon tea via soil	3.30	3.35	1.20	1.26	1.20	1.23	1.80	1.84	0.128	0.131	1.27	1.31
N as 50% inorg.+ 50% compost tea via spray	3.76	3.82	1.61	1.67	1.63	1.66	2.16	2.20	0.159	0.162	1.69	1.72
N as 50% inorg.+ 50% poultry tea via spray	3.82	3.88	1.67	1.72	1.66	1.70	2.23	2.28	0.164	0.168	1.74	1.77
N as 50% inorg.+ 50% pigeon tea via spray	3.94	3.99	1.72	1.78	1.69	1.72	2.30	2.35	0.171	0.175	1.79	1.82
N as 50% inorg.+ 50% compost tea via soil	3.60	3.66	1.42	1.47	1.46	1.50	1.99	2.04	0.143	0.146	1.53	1.56
N as 50% inorg.+ 50% poultry tea via soil	3.66	3.72	1.50	1.56	1.52	1.56	2.05	2.10	0.150	0.153	1.60	1.63
N as 50% inorg.+ 50% pigeon tea via soil	3.70	3.75	1.55	1.60	1.60	1.64	2.10	2.16	0.155	0.158	1.64	1.67
N as 25% inorg.+ 75% compost tea via spray	4.20	4.25	1.91	1.96	1.90	1.93	2.52	2.58	0.180	0.183	2.00	2.04
N as 25% inorg.+ 75% poultry tea via spray	4.30	4.36	1.95	2.01	1.95	1.98	2.58	2.63	0.188	0.191	2.06	2.10
N as 25% inorg.+ 75% pigeon tea via spray	4.41	4.47	1.98	2.10	1.98	2.02	2.65	2.70	0.194	0.203	2.12	2.12
N as 25% inorg.+ 75% compost tea via soil	4.01	4.06	1.80	1.86	1.74	1.78	2.35	2.40	0.176	0.180	1.84	1.87
N as 25% inorg.+ 75% poultry tea via soil	4.11	4.16	1.83	1.88	1.80	1.84	2.41	2.46	0.182	0.186	1.90	1.93
N as 25% inorg.+ 75% pigeon tea via soil	4.12	4.18	1.87	1.92	1.84	1.87	2.46	2.51	0.188	0.191	1.94	1.97
New L.S.D. at 5%	0.04	0.03	0.02	0.03	0.03	0.04	0.05	0.04	0.002	0.003	0.04	0.05

Table (6): Effect of using compost, poultry manure and pigeon manure applied via spray or via soil at different proportions as partial replacement of inorganic N on the percentage of berry setting, yield (kg) as well as cluster weight and dimensions of Flame seedless grapevines during 2016 and 2017 seasons

Treatments	Berry setting %		No. of Clusters/vine		Yield/vine (kg)		Cluster weight (g)		Cluster length (cm)		Cluster shoulder (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
N as 100 % inorg.	12.0	11.4	23.0	24.0	8.6	9.1	375.0	380.0	21.3	20.9	12.1	11.9
N as 75% inorg.+ 25% compost tea via spray	14.4	14.6	23.0	28.0	9.2	11.4	401.0	406.0	23.6	23.8	13.3	13.5
N as 75% inorg.+ 25% poultry tea via spray	15.0	15.1	23.0	28.0	9.2	11.4	402.0	407.0	24.1	24.3	13.7	14.0
N as 75% inorg.+ 25% pigeon tea via spray	15.6	15.6	23.0	28.0	9.3	11.5	403.0	410.0	24.6	25.0	14.0	14.3
N as 75% inorg.+ 25% compost tea via soil	12.6	12.7	23.0	26.0	8.9	10.1	385.0	390.0	22.0	22.4	12.4	12.7
N as 75% inorg.+ 25% poultry tea via soil	13.2	13.3	23.0	27.0	9.0	10.6	390.0	394.0	22.5	22.8	12.7	13.0
N as 75% inorg.+ 25% pigeon tea via soil	13.8	14.0	23.0	27.0	9.0	10.7	392.0	397.0	23.0	23.3	13.0	13.3
N as 50% inorg.+ 50% compost tea via spray	18.1	18.2	23.0	33.0	14.1	14.2	426.0	431.0	26.7	26.4	15.9	16.2
N as 50% inorg.+ 50% poultry tea via spray	19.0	19.1	23.0	34.0	9.8	14.7	427.0	433.0	27.2	27.6	16.5	16.8
N as 50% inorg.+ 50% pigeon tea via spray	19.6	19.8	23.0	35.0	9.9	15.3	430.0	436.0	28.0	28.3	16.8	17.1
N as 50% inorg.+ 50% compost tea via soil	16.2	16.3	24.0	30.0	9.9	12.6	414.0	419.0	25.1	25.3	14.4	14.7
N as 50% inorg.+ 50% poultry tea via soil	16.8	17.0	23.0	30.0	9.5	12.6	415.0	420.0	25.6	26.0	14.7	15.0
N as 50% inorg.+ 50% pigeon tea via soil	17.5	17.7	23.0	32.0	9.6	13.5	416.0	421.0	26.2	26.5	15.0	15.3
N as 25% inorg.+ 75% compost tea via spray	10.0	10.2	23.0	22.0	8.3	8.0	360.0	364.0	19.7	20.2	11.0	11.3
N as 25% inorg.+ 75% poultry tea via spray	10.6	10.8	23.0	23.0	8.3	8.4	362.0	366.0	20.2	20.5	11.4	11.7
N as 25% inorg.+ 75% pigeon tea via spray	11.2	11.4	23.0	23.0	8.4	8.5	365.0	370.0	20.7	21.0	11.7	12.0
N as 25% inorg.+ 75% compost tea via soil	8.1	8.3	22.0	20.0	7.5	6.9	341.0	346.0	18.1	18.4	10.1	10.4
N as 25% inorg.+ 75% poultry tea via soil	8.7	8.9	22.0	22.0	7.6	7.7	346.0	351.0	18.6	19.1	10.4	10.8
N as 25% inorg.+ 75% pigeon tea via soil	9.3	9.5	22.0	22.0	7.7	7.8	351.0	356.0	19.1	19.4	10.7	11.
New L.S.D. at 5%	0.6	0.5	NS	2.0	0.3	0.5	8.1	7.9	0.5	0.4	0.3	0.2

Table (7): Effect of using compost, poultry manure and pigeon manure applied via spray or via soil at different proportions as partial replacement of inorganic N on the percentage of berry colouration as well as berry weight and dimensions of Flame seedless grapevines during 2016 and 2017 seasons

Treatments	Berry colouration %		Berry weight (g)		Berry longitudinal (cm)		Berry equatorial (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100 % inorg.	64.1	63.9	3.11	3.12	2.30	2.28	2.04	2.00
N as 75% inorg.+ 25% compost tea via spray	66.7	68.0	3.26	3.30	2.50	2.51	2.17	2.20
N as 75% inorg.+ 25% poultry tea via spray	67.4	68.7	3.30	3.34	2.54	2.55	2.21	2.24
N as 75% inorg.+ 25% pigeon tea via spray	68.1	69.4	3.35	3.39	2.58	2.59	2.25	2.28
N as 75% inorg.+ 25% compost tea via soil	64.7	66.0	3.15	3.20	2.34	2.35	2.07	2.10
N as 75% inorg.+ 25% poultry tea via soil	65.4	66.7	3.19	3.24	2.39	2.40	2.10	2.12
N as 75% inorg.+ 25% pigeon tea via soil	66.0	67.4	3.22	3.26	2.44	2.46	2.14	2.14
N as 50% inorg.+ 50% compost tea via spray	71.9	73.3	3.51	3.55	2.76	2.78	2.40	2.43
N as 50% inorg.+ 50% poultry tea via spray	73.0	74.4	3.57	3.61	2.82	2.83	2.43	2.46
N as 50% inorg.+ 50% pigeon tea via spray	73.6	75.0	3.64	3.68	2.87	2.89	2.47	2.50
N as 50% inorg.+ 50% compost tea via soil	69.1	70.4	3.41	3.45	2.62	2.64	2.29	2.31
N as 50% inorg.+ 50% poultry tea via soil	69.9	71.4	3.44	3.48	2.66	2.67	2.34	2.36
N as 50% inorg.+ 50% pigeon tea via soil	70.5	71.9	3.48	3.52	2.71	2.72	2.37	2.40
N as 25% inorg.+ 75% compost tea via spray	77.1	78.5	3.99	4.04	3.03	3.04	2.61	2.64
N as 25% inorg.+ 75% poultry tea via spray	79.2	80.6	4.11	4.16	3.06	3.08	2.65	2.67
N as 25% inorg.+ 75% pigeon tea via spray	80.9	82.3	4.17	4.21	3.10	3.12	2.69	2.71
N as 25% inorg.+ 75% compost tea via soil	74.3	75.7	3.71	3.76	2.94	2.96	2.52	2.55
N as 25% inorg.+ 75% poultry tea via soil	75.0	76.4	3.80	3.86	2.97	2.99	2.55	2.57
N as 25% inorg.+ 75% pigeon tea via soil	75.6	77.0	3.87	3.92	3.00	3.04	2.58	2.60
New L.S.D. at 5%	0.5	0.6	0.03	0.02	0.03	0.04	0.02	0.03

Table (8): Effect of using compost, poultry manure and pigeon manure applied via spray or via soil at different proportions as partial replacement of inorganic N on some chemical parameters of the berries of Flame seedless grapevines during 2016 and 2017 seasons

Treatments	T.S.S %		Total acidity %		Reducing sugars %	
	2016	2017	2016	2017	2016	2017
N as 100 % inorg.	16.9	17.0	0.675	0.676	14.9	14.4
N as 75% inorg.+ 25% compost tea via spray	17.8	18.3	0.605	0.604	15.8	16.0
N as 75% inorg.+ 25% poultry tea via spray	18.1	18.6	0.590	0.589	16.0	16.2
N as 75% inorg.+ 25% pigeon tea via spray	18.3	19.0	0.570	0.569	16.2	16.4
N as 75% inorg.+ 25% compost tea via soil	17.1	17.3	0.660	0.659	15.1	15.3
N as 75% inorg.+ 25% poultry tea via soil	17.3	17.6	0.645	0.645	15.3	15.5
N as 75% inorg.+ 25% pigeon tea via soil	17.5	18.0	0.631	0.630	15.5	15.8
N as 50% inorg.+ 50% compost tea via spray	19.4	20.3	0.514	0.513	17.2	17.5
N as 50% inorg.+ 50% poultry tea via spray	19.7	20.6	0.501	0.499	17.5	17.8
N as 50% inorg.+ 50% pigeon tea via spray	20.0	20.9	0.483	0.481	17.7	18.0
N as 50% inorg.+ 50% compost tea via soil	18.6	19.3	0.555	0.553	16.5	16.7
N as 50% inorg.+ 50% poultry tea via soil	18.8	19.6	0.540	0.539	16.8	17.0
N as 50% inorg.+ 50% pigeon tea via soil	19.1	20.0	0.527	0.526	17.0	17.2
N as 25% inorg.+ 75% compost tea via spray	21.2	22.0	0.460	0.459	19.0	19.2
N as 25% inorg.+ 75% poultry tea via spray	21.5	22.3	0.458	0.457	19.2	19.5
N as 25% inorg.+ 75% pigeon tea via spray	21.8	22.6	0.449	0.448	19.5	19.5
N as 25% inorg.+ 75% compost tea via soil	20.4	21.0	0.480	0.479	18.1	18.3
N as 25% inorg.+ 75% poultry tea via soil	20.7	21.3	0.477	0.476	18.5	18.7
N as 25% inorg.+ 75% pigeon tea via soil	21.0	21.6	0.475	0.474	18.7	19.0
New L.S.D. at 5%	0.2	0.3	0.013	0.011	0.2	0.2

Table (9): Effect of using compost, poultry manure and pigeon manure applied via spray or via soil at different proportions as partial replacement of inorganic N on some chemical parameters of the berries of Flame seedless grapevines during 2016 and 2017 seasons

Treatments	T.S.S/acid		Total anthocyanins (mg/100g FW)		Nitrite (ppm)		Nitrate (ppm)	
	2016	2017	2016	2017	2016	2017	2016	2017
N as 100 % inorg.	25.0	25.1	14.8	15.0	2.91	2.84	6.91	6.95
N as 75% inorg.+ 25% compost tea via spray	29.4	30.3	19.1	19.3	2.32	2.24	6.11	6.00
N as 75% inorg.+ 25% poultry tea via spray	30.7	31.6	20.1	20.4	2.21	2.14	6.00	5.59
N as 75% inorg.+ 25% pigeon tea via spray	32.1	33.4	21.3	21.5	2.10	2.03	5.84	5.73
N as 75% inorg.+ 25% compost tea via soil	25.9	26.3	15.9	16.1	2.71	2.63	6.80	6.69
N as 75% inorg.+ 25% poultry tea via soil	26.8	27.3	17.0	17.2	2.62	2.33	6.70	6.59
N as 75% inorg.+ 25% pigeon tea via soil	27.7	28.6	18.1	18.3	2.52	2.45	6.59	6.49
N as 50% inorg.+ 50% compost tea via spray	37.7	39.6	25.7	26.0	1.71	1.65	4.30	4.20
N as 50% inorg.+ 50% poultry tea via spray	39.3	41.3	26.8	27.0	1.50	1.41	4.10	4.00
N as 50% inorg.+ 50% pigeon tea via spray	41.4	43.5	28.0	28.3	1.32	1.24	3.80	3.70
N as 50% inorg.+ 50% compost tea via soil	33.5	34.9	22.4	22.7	2.00	1.91	5.62	3.52
N as 50% inorg.+ 50% poultry tea via soil	34.8	36.4	23.5	23.8	1.91	1.85	5.11	6.01
N as 50% inorg.+ 50% pigeon tea via soil	36.2	38.0	24.6	25.0	1.81	1.75	4.80	4.69
N as 25% inorg.+ 75% compost tea via spray	46.1	47.9	34.0	34.3	0.90	0.83	2.60	2.49
N as 25% inorg.+ 75% poultry tea via spray	46.9	47.9	35.5	35.9	0.80	0.71	2.40	2.29
N as 25% inorg.+ 75% pigeon tea via spray	48.6	50.4	37.1	37.4	0.71	0.63	1.90	1.64
N as 25% inorg.+ 75% compost tea via soil	42.5	43.8	29.0	29.4	1.22	1.15	3.41	3.31
N as 25% inorg.+ 75% poultry tea via soil	43.4	44.7	30.1	30.4	1.10	1.03	3.21	3.11
N as 25% inorg.+ 75% pigeon tea via soil	44.2	45.6	31.9	32.2	1.00	0.91	2.90	2.77
New L.S.D. at 5%	0.9	1.0	1.0	0.8	0.06	0.08	0.09	0.10

4. Discussion:

The previous promoting action of organic manures on growth and fruiting of Flame seedless grapevines can be mainly attributed to the essential

roles of organic fertilizers (Simon *et al*, 1999; Bonanzinga *et al*, 2001; David, 2002; Doran *et al*, 2003; and Chen *et al*, 2004) in reducing soil-borne pathogens, problems of salinity, soil pH, leaching

process and soil erosion and enhancing the production of growth promoting substances i.e. IAA, GAs and cytokinins, root development. In addition, organic manures as well as EMI are known to increase nutrients availability and uptake, soil organic matter and microbial activity, soil aggregation and aeration, permeability of soil and water holding capacity. Moreover, these organic and biofertilizers are known to enhance nutrient transport, photosynthesis process, fixation of N, water uptake, vitamins B, solubility of most nutrients, soil workability, resistance to drought, buffering property of the soil, formation of heavy metal complexes, breaking of hazard chemicals, biosynthesis of estrate, formation of hummus, tolerance to drought and temperature extremes, the release of various nutrients, oxidation of sulphur complexes and converting insoluble sulphur to soluble one. Another important effect is their positive role in root development, enhancing enzymes such as nitrogenase, antibiotics, and soil cation exchange. These beneficial effects of organic fertilization surely reflected on enhancing growth characteristics, soil fertility, plant pigments and vine nutritional status, consequently caused an obvious increase in C/N in favour of enhancing fruiting status. Moreover, the increase in berry setting, number of clusters per vine and cluster weight resulted from these biostimulants surely reflected on improving the yield/vine. The great promotion on the biosynthesis and translocation of carbohydrates due to using these amendments could result in advancing maturity and improving quality of the berries.

In addition, the great control on the uptake of N by the vines due to using organic fertilization surely reflected on reducing the accumulation of both nitrites and nitrates in the berries. Thus, the application of these results would lower environmental pollution (**Fraguas and Silva, 1998**).

The negative effects of using N at higher levels on the yield might be attributed to its effect on enhancing growth at the expense of fruiting state as well as the badly effects on the C/N which reflected on depression leaf bud transformation to reproductive state. The slow release of organic manures and high solubility of inorganic N could explain why the trees suffer from N deficiency under lower rates of N (**Mengel et al., 2001**).

In addition, the findings of the recent studies provide further support for the results of this study. Both fruiting and berry quality aspects were improved in response to organic fertilization in comparison to inorganic fertilization alone as previously reported by (**Madian, 2010; Abd El – Hameed et al., 2010; Refaai, 2011; Ahmed et al., 2011, El- Wany, 2015; Abdel Raheem et al., 2015; Aly-Samar, 2016; Sedky, 2016 and Tony, 2016**).

Conclusion:

For promoting growth, berry setting and yield of Flame seedless grapevines grown under Minia region conditions, it is necessary to fertilize the vines with N (50 g/vine/year) through 50 % inorganic N+ 50% pigeon manure tea via spray. The recommendation for obtaining good quality was consisted from the application of N via 25% inorganic N+ 75% pigeon tea via spray. This recommendation saved about 25 to 50% chemical fertilizers and protected the environment from pollution with nitrite and nitrate.

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