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EFFECT OF DIFFERENT SOURCES OF ORGANIC FERTILIZERS AS A PARTIAL SUBSTITUTE FOR MINERAL NITROGEN FERTILIZER OF WILLIAMS BANANA

Hosam El-Dein, A. S. and E. S. Boshra
Hort. Res. Ins., Agric. Res. Center, Giza, Egypt.

ABSTRACT

This investigation was undertaken for two seasons 2005/2006 and 2006/2007 on Williams cultivar grown in loamy soil in a private orchard at Badaway, near Mansoura, Dakahlia governorate. Treatments included in the experiment were : the recommended nitrogen rate in the mineral form (ammonium nitrate 33 % N) as the control, 50 % mineral N + 50 % town refuse, 25 % mineral N + 75 % town refuse, 50 % mineral N + 50 % cattle manure and 25 % mineral N + 75 % cattle manure. Pseudostem length, circumference, suckers length, circumference, number of green leaves/ plant, finger length, diameter, size, weight, percentage of pulp, weight of bunch and hand, chlorophylls A and B in the finger peel, total carbohydrates, nitrate and nitrite in finger pulp and leaf mineral content (NPK) were monitored each season (2005/06 and 2006/07).

The application of nitrogen requirements in the form of organic manure (cattle manure followed by town refuse at 75 % + 25 % mineral N) gave a good results in respect to the most of studied characters in comparison with the treatments which received the amount of nitrogen from mineral source only. Generally, increasing the rates of organic manure up to 75 % + 25 % mineral N, the obtained results were improved particularly the yield, fruit quality and vegetative properties.

The highest nitrate and nitrite residues in the finger pulp were observed in mineral N fertilization alone, whereas the lowest values were gained from compost treatments (organic manure).

INTRODUCTION

Banana is considered one of the most important commercial and popular fruits in Egypt. It is well known that banana needs large amounts of fertilizers especially nitrogen. Banana growers use some mineral fertilizers such as ammonium sulphate or nitrate and urea as a source of nitrogen because of their high content of nitrogen as well as their high solubility. Application of these chemical fertilizers to the soil causes some problems especially when accompanied with unbalanced program.

It is well known that the nitrogenous fertilizers are lost via nitrate reduction, denitrification and ammonia volatilization. Moreover, some nitrogenous fertilizer can be leached to the under ground water causing environmental pollution. The polluting of the soil and water resulted from their leached chemical fertilizers into the soil, which transferred through the plants to the human and causes serious diseases. Consequently, it has drown the attention of researchers and banana growers to use the organic fertilizers as well as would safe for human, animal and environment. Thus, its using avoided this pollution and reduced the costs of fertilizers (Rizk & Shafeek, 2000 and Montasser *et al.*, 2003).

Therefore, this investigation was carried out to throw some light on using farmyard manure and compost of Mansoura town refuse as organic nitrogen sources in combination with mineral nitrogen source to reduce mineral nitrogenous fertilizer for Williams banana plants. The final goal is to produce a healthy product less pollinated with chemical fertilizers.

MATERIALS AND METHODS

This investigation was carried out during two successive seasons of (2005/2006) and (2006/2007) on Williams cultivar (*Musa cavendishi*, L.) grown in loamy soil in a private orchard at Badaway, near Mansoura, Dakahlia governorate. The plants were about three years spaced at 3 x 3 meters apart, similar in growth, free from any diseases and in good physical condition as possible. The results of the experimental soil analysis are shown in Table (1).

Table (1) : Chemical analysis of the orchard soil.

Character	Value	Character	Value
T.S.S	0.15	SO_4^{--}	0.60
EC mm hos/cm	0.47	Ca^{++}	0.80
pH	7.9	MG^{++}	0.60
HCO_3^-	0.60	Na^+	0.50
Cl^-	0.8	NPK %	0.4, 0.5, 0.3

Soil sample was taken at the beginning of March 2005 at depth of 0-60 cm and analyzed chemically.

Sixty shoots of Williams banana plants were chosen and devoted to study the effect of organic nitrogen (Town refuse compost and cattle manure) as a partial substitute for mineral nitrogen on vegetative growth, yield and yield components as well as leaf mineral contents and fruit quality of Williams banana plants.

The experiment was set in a completely randomized block design with three replicates, each replicate was presented by four holes, which each hole contained two plants for yielding in the current season and two plants for yielding in the following season.

Two types of organic manure were used namely, farmyard manure (FYM) and compost Mansoura town refuse (M.T.R). The control plants received the same nitrogen treatment as (560 g/plant/year) according to the recommendation of Horticulture Research Institute, Ministry of Agriculture, Egypt. Table (2) shows some characteristics of organic manure used in the present study.

The experimental plants received different combinations of both mineral nitrogen and organic fertilizers from farmyard manure (FYM) or Mansoura town refuse (MTR) compost. The treatments used were as follows:

1- Control (the recommended N rate in the mineral form 75 kg/feddan yearly).
2- 50 % mineral N + 50 % FYM (cattle manure).
3- 25 % mineral N + 75 % FYM (cattle manure).

4- 50 % mineral N + 50 % Compost MTR (town refuse).
5- 25 % mineral N + 75 % Compost MTR (town refuse).

Ammonium nitrate (33 % N) as a source of mineral nitrogen fertilizer was divided into seven equal doses yearly and added monthly from April till October.

Organic manure (FYM and compost MTR) were applied superficially and digged in the soil at the first week of December of each season.

Table (2) : Analysis of the used organic fertilizers (on dry weight basis).

Characters / Contents	Farmyard manure (FYM)	Compost (MTR)
O.M. %	25.30	44.82
Total nitrogen %	1.03	1.05
C %	14.68	25.99
C/N ratio	14 : 1	24 : 1
P %	0.35	0.19
K %	1.93	0.91
pH	7.5	7.8
Humidity %	25.7	21.4
Fe (ppm)	5019	3281
Mn (ppm)	444	528
Zn (ppm)	500	549

The following determinations were carried out :

*** Vegetative growth :**

a) Pseudostem length (cm).
b) Pseudostem circumference (cm).
c) Suckers length (cm).
d) Suckers circumference (cm).
e) Number of green leaves/plant.

Fruit harvested date was estimated when the top hands have turned slightly yellow according to Van Loesecke (1950). At harvest, samples of each replicate were collected and transported to the laboratory to determine the physical and chemical properties :

A- Physical properties :

1- Average finger length and diameter (cm).
2- Average finger size (ml^3).
3- Average finger weight (g).
4- Percentage of pulp in the finger.
5- Average weight of bunch and hand in (kg).

B- Chemical properties :

Samples from the fresh peel and dried pulp were taken to determine the following :

1- Chlorophylls A and B in the finger peel were determined according to Wettstein (1957).

2- Total carbohydrates was determined in the pulp of fruits as gm/100 gm dry weight by using the calorimetric method as described by Dubois *et al.*, (1956).
3- Nitrate and nitrite in fruit in fruit pulp were determined according to Singh, (1988).
4- Leaf mineral content : leaf samples from each individual plants were taken 15 cm strip from each side of the midrib in the middle of blade of the third leaf from the top of the plant at shooting stage as recommended by Hewitt, (1955) and Bhargava and Reddy, (1992) and used for determined N, P and K by using the following methods :

(a) Total nitrogen was determined by using the micro-kjeldahl method as described by Pregl (1945).
(b) Phosphorus was determined by using the method of Chapman and Pratt (1961).
(c) Potassium was determined by using a flame photometry according to the method of Brown and Lilleland (1946).

Statistical analysis :

The data obtained were statistically analyzed according to Snedecor and Cochran (1980) using LSD test at 0.05.

RESULTS AND DISCUSSION

Vegetative growth :

1- Pseudostem length and circumference :

Table (3) shows clearly that the application of mineral nitrogen alone (control) gave higher value of pseudostem length followed by using cattle manure at 50 % or 75 % + mineral nitrogen at 50 % or 25 %, than the other treatments which received 25 or 50 % mineral nitrogen plus 50 % or 75 % from town refuses in both experimental seasons.

Concerning the effect of treatments on pseudostem circumference of Williams banana plants, the results presented in Table (3) indicated that the addition of N in the form of organic manure " town refuse " at 50 % or 75 % plus mineral N at 50 % or 25 % showed that significant increase in pseudostem circumference of plants in comparison with the other treatments used in the two seasons of study.

The increasing of pseudostem length of banana plants could be due to the role of application of organic manure as well as the role of mineral nitrogen fertilizer and their effects, it could be attributed to the role of N-fixing bacteria which supplied the soil and plants by the available nitrogen to absorb and it use of metabolism in the plant. The obtained results are in agreement with the findings of Dibut Alivarez *et al.* (1996) on banana cvs. Giant Cavendish, Tiwary *et al.*, (1998) and Soliman (2001) on banana and guava seedlings. Furthermore, the increase in circumference of Williams banana plants as a result of increasing in organic fertilizer (town refuses) level could be due to the role of organic manure and its effect directly and indirectly of

the availability of nutrients in the soil as well as the improving and increasing the uptake of them.

These results are in harmony with those obtained by Ahmed Bahy EL-Deen, (2002) on banana plants cv. Williams.

Table (3): Effect of different sources of organic fertilizers and mineral nitrogen on pseudostem length and circumference (cm) of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Pseudostem length (cm)			Pseudostem circumference (cm)		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	297.7	290.7	294.2	92.7	92.0	92.4
50% N + 50% T. Refuse	291.3	254.0	272.7	91.0	89.7	90.4
25% N + 75% T. Refuse	290.0	281.7	285.9	90.7	88.3	89.5
50% N + 50% Cattle manure	296.7	289.3	293.0	94.0	92.3	93.2
25% N + 75% Cattle manure	295.0	287.3	291.2	93.0	92.7	92.9
L.S.D at 5 %	4.61	2.57	----	2.17	2.32	----

2- Suckers length and circumference :

Data in Table (4) show that the highest values of sucker length and circumference in both seasons were obtained with the treatment which fertilized by the recommended N in the form of mineral N (control) followed by 25 % N + 75 % cattle manure and 50 % N + 50 % cattle manure compared with the other treatments used. The differences between these treatments were not significant. Whereas, the application of 50 or 25 % N + 50 or 75 % town refuses decreased the suckers length and circumference significantly than the other treatments used in the two studied seasons.

Table (4): Effect of different sources of organic fertilizers and mineral nitrogen on suckers length and circumference (cm) at harvest of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Suckers length (cm)			Suckers circumference (cm)		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	132.3	131.0	131.7	62.3	62.3	62.3
50% N + 50% T. Refuse	127.7	130.0	128.9	57.3	59.7	58.5
25% N + 75% T. Refuse	123.7	129.3	126.5	60.0	58.0	59.0
50% N + 50% Cattle manure	130.7	131.0	130.9	59.7	61.0	60.4
25% N + 75% Cattle manure	133.7	129.0	131.4	63.0	61.3	62.2
L.S.D at 5 %	3.17	2.96	----	3.27	1.21	----

The increasing in suckers length and circumference which resulted from mineral or organic nitrogen fertilization might be due to the role of nitrogen in cell division and enlargement as a main constituent of protoplasm, (Devlin and Witham, 1983).

3- Number of green leaves/plant :

The obtained results in Table (5) indicated that the application of organic nitrogen (cattle manure or town refuses) plus mineral N at 50 or 25 % to banana plants increased the number of green leaves/plant in the first and second season compared with using mineral nitrogen only (control). Moreover, the application of cattle manure plus mineral N increased the number of green leaves/plant than using town refuses. This increment could be attributed to the effect of nitrogen such as producing new tissues, its role as one of the essential elements needed by the plants and as it is a main constituent of amino protein, chlorophyll, nucleic protein and of invetase enzyme which serve in cell division and sugars transformation during respiration activity.

These results are in harmony with those reported by Jeeva *et al.*, (1988), Gubbuk *et al.*, (1993), Smith (1994), Dibut-Alvarez *et al.*, (1996) and Ahmed Bahy EL-Deen (2002) on banana plants.

Table (5): Effect of different sources of organic fertilizers and mineral nitrogen on number of green leaves/plant of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Number of green leaves/plant		
	2005/06	2006/07	Mean
Mineral N (control)	10.3	11.3	10.8
50% N + 50% T. Refuse	11.3	12.3	11.8
25% N + 75% T. Refuse	11.7	11.7	11.7
50% N + 50% Cattle manure	12.0	12.3	12.2
25% N + 75% Cattle manure	12.7	11.7	12.2
L.S.D at 5 %	1.21	0.86	----

Physical properties :

1- Finger length, diameter and size :

It is clear from Table (6) that both of mineral nitrogen only and organic fertilization (cattle manure) at 50 % + 50 % mineral nitrogen increased finger length, diameter and size than the other treatments used during the two seasons of the study.

Table (6): Effect of different sources of organic fertilizers and mineral nitrogen on finger length, diameter and size (cm) of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Finger length (cm)			Finger diameter (cm)			Finger size (cm)		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	21.9	21.2	21.6	3.9	3.5	3.7	93.4	92.4	92.9
50% N + 50% T.Refuse	20.3	20.2	20.3	3.4	3.2	3.3	92.4	90.9	91.7
25% N + 75% T. Refuse	20.6	19.7	20.2	3.3	3.1	3.2	91.4	89.9	90.7
50% N + 50% Cattle manure	21.7	21.2	21.5	3.5	3.6	3.6	93.5	92.3	92.9
25% N + 75% Cattle manure	20.7	21.2	21.0	3.1	3.4	3.3	91.4	91.6	91.5
L.S.D at 5 %	1.23	0.89	----	0.35	0.20	----	1.54	1.07	----

Whereas, using town refuse at 50 or 75 % plus mineral nitrogen gave the lowest values in this respect compared with the other applications used. Similarly, were found by Abd EL-Rahman (2007) on grapevines.

2- Finger weight :

From Table (7) the obtained data indicated that the plants fertilized with mineral N only (control) and 50 % N + 50 % cattle manure were more effective concerning the finger weight than the other treatments used during the two seasons. On the other hand, the treatment which received 25 % N + 75 % town refuse gave the lowest values of finger weight in comparison with the other treatments used in both experimental seasons. The increasing in finger weight may be due to the increase in production of promoting endogenous and enhancement of nutrient uptake (Saber and Gomaa, 1993) in addition to the role of nitrogen on productivity of banana plants (Nijjar, 1985).

3- The percentage of pulp in the finger :

Results in Table (7) revealed that the percentage of pulp in the finger of Williams banana plants significantly increased by the application of organic manure with mineral N compared with application mineral N alone (control) in both seasons. Moreover, the treatment which received 75 % from the nitrogen requirements in the form of organic manure (cattle manure) plus 25 % N mineral showed higher percentage of pulp in the fingers compared with the other treatments used. Whereas, the plants which fertilized with mineral N only (control) gave the lowest values in this respect.

The data declared that values of percentage of pulp in the fingers were varied with increasing the rate of organic fertilizers in both seasons.

These results are confirmed with the findings of Ahmed Bahy EL-Deen (2002) on Williams banana plants.

Table (7): Effect of different sources of organic fertilizers and mineral nitrogen on finger weight (g) and pulp percentage of finger of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Finger weight (g)			Percentage of pulp in the finger		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	93.7	92.5	93.1	58.9	60.6	59.8
50% N + 50% T. Refuse	92.2	90.8	91.5	60.0	61.4	60.7
25% N + 75% T. Refuse	91.5	89.9	90.7	60.0	62.6	61.3
50% N + 50% Cattle manure	93.7	92.2	93.0	61.6	62.7	62.3
25% N + 75% Cattle manure	91.8	91.5	91.7	62.9	63.5	63.2
L.S.D at 5 %	1.14	0.71	----	1.01	0.84	----

4- Bunch weight (kg) :

It is clear that bunch weight significantly increased by using both of mineral N only or mineral N at 50 % + cattle manure at 50 % compared with the other applications used in both seasons (Table 8). Whereas, the lowest

weight of bunch (27.6 and 27.7 kg) were obtained from using (25 % N + 75 % town refuse) and (50 % N + 50 % town refuse) as mean of two seasons, respectively. The effect of the treatments on bunch weight could be attributed to their effect on the average weight of finger (Table 7).

These results are almost in agreement with those of Abd EL-Naby (2000) on Maghrabi banana plants and Geetha & Nair (2000) on banana cv. Nendran.

5- Hand weight (kg) :

Concerning the effect of different sources of organic fertilizers and mineral nitrogen on hand weight of Williams banana plants during 2005/2006 and 2006/2007 seasons, data in Table (8) show the same trend to those obtained for bunch weight. The effect of mineral N and organic manure (cattle manure) on the weight of hand could be attributed to its role on the availability of elements as a constituent of proteins and other compounds which produce the new tissues through their role as constituents of the nucleic acid DNA and RNA. In addition to the role of organic manure which increased the soil content of IAA and cytokinins and stimulated the plant growth Lie *et al.*, (1998).

Table (8): Effect of different sources of organic fertilizers and mineral nitrogen on bunch and hand weight (kg) of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Bunch weight (kg)			Hand weight (kg)		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	29.0	28.2	28.6	3.3	3.1	3.2
50% N + 50% T. Refuse	27.9	27.4	27.7	2.9	2.9	2.9
25% N + 75% T. Refuse	27.6	27.5	27.6	2.8	2.9	2.9
50% N + 50% Cattle manure	28.8	28.4	28.6	3.2	3.2	3.2
25% N + 75% Cattle manure	28.1	27.2	27.7	3.0	2.9	3.0
L.S.D at 5 %	0.51	0.63	----	0.17	0.10	----

Chemical properties :

1- Leaf nitrogen, phosphorus and potassium contents :

Results in Table (9) revealed that increasing the rates of organic manure (cattle manure) and town refuse was associated with a gradual and significant increase in the percentage of nitrogen, phosphorus and potassium in the leaves of Williams banana plants in both experimental seasons. Furthermore, the treatment (25 % N + 75 % cattle manure) was the superior treatment in this respect in comparison with any other treatments.

The increasing in leaf mineral content (N, P and K) could be due to the more availability of these nutrients for absorption by the roots as well as the effect of organic manure (cattle manure and town refuse) which contain N, P and K and as well as other elements (Table 2).

These results are in the line with those of Fernandez-Falcon *et al.*, (1998), Tiwary *et al.*, (1999) and Ahmed Bahy EL-Deen (2002) on banana.

Table (9): Effect of different sources of organic fertilizers and mineral nitrogen on the leaf contents of nitrogen, phosphorus and potassium of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	N (%)			P (%)			K (%)		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	2.8	2.9	2.9	0.15	0.17	0.16	2.1	2.2	2.2
50% N + 50% T. Refuse	2.6	2.9	2.8	0.17	0.18	0.18	2.3	2.0	2.2
25% N + 75% T. Refuse	2.6	3.1	2.9	0.18	0.19	0.19	2.5	2.2	2.4
50% N + 50% Cattle manure	2.8	3.1	3.0	0.19	0.20	0.20	2.4	2.2	2.3
25% N + 75% Cattle manure	2.7	3.2	3.0	0.19	0.21	0.20	3.0	2.3	2.7
L.S.D at 5 %	0.13	0.17	—	0.02	0.03	—	0.02	0.01	—

2- Chlorophyll A and B in the peel :

From Table (10) it is clear that all organic fertilization used increased the values of both chlorophyll A and B in the finger peel of Williams banana than the control (mineral nitrogen) during the two seasons. Moreover, the application of cattle manure at 75 % + 25 % mineral N gave the highest increase in this respect compared with the control and the other treatments used. Whereas, using mineral N only gave the lowest values of chlorophyll A and B than the other treatments used.

The effect of organic manure on increasing chlorophyll in the peel of finger could be explained in the light of the role of potassium in combination with N and P in this organic fertilization (Haung *et al.*, 1992).

Table (10): Effect of different sources of organic fertilizers and mineral nitrogen on peel content of chlorophyll A and B (mg/g fresh weight) of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Chlorophyll A (mg)			Chlorophyll B (mg)		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	0.17	0.18	0.18	0.16	0.16	0.16
50% N + 50% T. Refuse	0.17	0.19	0.18	0.17	0.17	0.17
25% N + 75% T. Refuse	0.18	0.20	0.19	0.18	0.18	0.18
50% N + 50% Cattle manure	0.18	0.21	0.20	0.19	0.18	0.19
25% N + 75% Cattle manure	0.19	0.22	0.21	0.20	0.18	0.19
L.S.D at 5 %	0.01	0.02	----	0.03	0.01	----

3- Total carbohydrates in the pulp (%) :

Data presented in Table (11) indicated that the percentage of total carbohydrate in the pulp was increased with increasing the rates of organic manure and decreasing the mineral N from 100 % till 25 % in both studied seasons. The results also showed that the treatments which received the nitrogen in the form of organic manure (cattle and town refuse at 50 or 75 %) significantly increased the percentage of total carbohydrates in the pulp compared with the other treatments used in both seasons.

Table (11): Effect of different sources of organic fertilizers and mineral nitrogen on pulp content of total carbohydrates of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Total carbohydrates % in pulp		
	2005/06	2006/07	Mean
Mineral N (control)	1.9	1.8	1.9
50% N + 50% T. Refuse	2.2	2.0	2.1
25% N + 75% T. Refuse	2.4	1.9	2.2
50% N + 50% Cattle manure	2.3	2.1	2.2
25% N + 75% Cattle manure	2.6	2.1	2.3
L.S.D at 5 %	0.13	0.23	----

Moreover, the treatment which received (25 % mineral N + 75 % cattle manure) had the highest percentage of total carbohydrates in the pulp of fingers than the other applications used. The effect of organic manure on increasing the percentage of total carbohydrates, could be due to the role of nitrogen in increasing leaf area per plant and its physiological effects in the synthesis and activating the enzymes that involved in photosynthesis process (Nijjar, 1985). These results are in harmony with those found by Tiwary *et al.*, (1998) on banana.

4- Nitrate and nitrite residues in the pulp (ppm) :

It is clear from data in Table (12) that mineral nitrogen fertilizer alone resulted in higher values of residues of nitrate and nitrite in pulp of banana fingers compared with the other treatments used in both seasons. It is obvious that the continuous application of organic nitrogen source (cattle manure or town refuse) is important to reduce the nitrate and nitrite residues of banana plants. Fingers from mineral nitrogen fertilizer only gave the highest values of nitrate and nitrite content which recorded 3.52, 3.32 of nitrate and 1.36, 1.43 ppm of nitrite for 2005/2006 and 2006/2007 seasons, respectively. The other treatments from cattle manure or town refuse with mineral N showed lower values in this respect. It is well known that nitrate is easily formed from mineral nitrogen whereas, it is slowly formed from organic nitrogen (Ibrahim, 1994).

Table (12): Effect of different sources of organic fertilizers and mineral nitrogen on pulp content of nitrate and nitrite of Williams banana plants during 2005/2006 and 2006/2007 seasons.

Treatments	Nitrate content (ppm)			Nitrite content (ppm)		
	2005/06	2006/07	Mean	2005/06	2006/07	Mean
Mineral N (control)	3.52	3.32	3.42	1.36	1.43	1.40
50% N + 50% T. Refuse	2.93	2.75	2.84	0.86	0.86	0.86
25% N + 75% T. Refuse	1.97	1.81	1.89	0.47	0.53	0.50
50% N + 50% Cattle manure	2.75	2.54	2.65	0.53	0.65	0.59
25% N + 75% Cattle manure	1.64	1.46	1.55	0.43	0.47	0.45
L.S.D at 5 %	0.19	0.21	----	0.04	0.03	----

It is healthy to consume banana with lower nitrate and nitrite content. The acceptable daily intake (ADI) of nitrate and nitrite in the European countries which man can daily consume is 5 $mgkg^{-1}$ and 0.07 $mgkg^{-1}$, respectively, of his weight (Abdel Hameed, 1999). These results go in line with those of Omar (2005), Rizk (2006) and Abd EL-Rahman (2007) on grapes.

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تأثير إستخدام مصادر مختلفة من الأسمدة العضوية كبديل جزئي للأسمدة النيتروجينية المعدنية علي نبات الموز الوليامز.

أحمد سعد حسام الدين و إيهاب سعد بشرى

قسم بحوث الفاكهة الإستوائية – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة

أجرى هذا البحث خلال سنتي ٢٠٠٥ / ٢٠٠٦ و ٢٠٠٦ / ٢٠٠٧ لدراسة تأثير إستخدام مصادر مختلفة من الأسمدة العضوية كبديل جزئي للأسمدة النيتروجينية المعدنية علي نبات الموز الوليامز منزرعة في مزرعة خاصة بقرية بدواي مركز المنصورة محافظة الدقهلية. وتضمنت المعاملات التسميد بالنيتروجين بالجرعات الموصي بها جميعها من مصدر معدني فقط وهو نترات الأمونيوم ٣٣ ٪ كمقارنة للتسميد بنسب مختلفة من السماد العضوي (مخلفات المدن بنسب ٥٠ ٪ مع ٥٠ ٪ نيتروجين معدني ، ٧٥ ٪ مخلفات + ٢٥ ٪ نيتروجين معدني) وكذلك سماد المزرعة مع النيتروجين المعدني بنفس النسب المذكورة. وقد تم دراسة النمو الخضري ويشمل طول ومحيط الساق والسرطانات (الخلفات) وعدد الأوراق الخضراء للنبات وطول وقطر وحجم ووزن الإصبع والنسبة المئوية للب في الأصابع – وكذلك وزن الكفوف والسوباطات ، كما تم تقدير الكلوروفيل أ ، ب في قشرة الثمار والكربوهيدرات الكلية والمتبقي من النترات والنيتريت في لب الثمار وكذلك محتوي الأوراق من النيتروجين والفوسفور والبوتاسيوم خلال موسمي التجربة.

وقد أظهرت النتائج:

أن إستخدام النيتروجين في صورة عضوية (مخلفات المدن أو سماد المزرعة) بنسب ٧٥ ٪ ، ٢٥ ٪ بالإضافة إلي الباقي من مصدر معدني أعطي أفضل نتائج معظم الصفات المدروسة عن نباتات المقارنة التي سمدت بالنيتروجين المعدني فقط .

وعموما يمكن القول أنه في مثل ظروف هذه الدراسة فإن زيادة نسبة السماد العضوي حتي ٧٥٪ مع النيتروجين المعدني حتي ٢٥٪ أعطي أفضل نتائج من حيث المحصول وصفات وجودة الثمار والنمو الخضري . وأظهرت النتائج أن أعلي مستوي من النيترات والنيتريت المتبقي في الثمار كانت مع إستخدام النيتروجين المعدني فقط ، بينما أقل نسب من هذه المواد كان في النباتات التي سمدت بنسب أعلي من النيتروجين العضوي وهذا ما يجعلها آمنة وصحية للإستهلاك الآدمي.