RESPONSE OF WILLIAMS BANANA PLANTS TO ORGANIC FERTILIZATION AND POTASSIUM SOLUBILIZING BACTERIA

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ABSTRACT

This study was carried out during 2007 and 2008 seasons to study the effect of fertilization with organic and Biofertilizers on vegetative growth and leaf mineral content of young Williams banana plants in the experimental farm of Horticusslture Department, Faculty of Agriculture, Ain Shams University, Cairo, Egypt.

The experiment included three levels of organic fertilization as a compost El- Neel (K1= 9, K2= 13.5, K3= 18 g actual K/ plant / year) and three level of Biofertilizers (B1=zero, B2= 50 ml, B3=100ml of one local strain of *Bacillus circulans* /plant/year) in a factorial experiment.

The results indicated that K2 or K3 as the organic fertilizaters and B2 or B3 as a Biofertilizers and K2 B2, K2B3, K3 B2 or K3 B3 as the interaction between them gave the best results of vegetative characters and leaf mineral content.

Key words: Banana plant, Williams banana, organic fertilization, biofertilizers, *Bacillus circulans*, vegetative growth and leaf mineral content.

INTRODUCTION

Banana has a great economic importance as one of the most popular fruits in Egypt and for its high nutritive value. Banana plays an important role in tropical economics as a cash export and as complementary food in local sets. In Egypt, the total cultivated area of Banana in 2007 was about 58,572 fed. and produced about 945,429 ton.(M.A.L.R.,2007).

Biofertilizers are microbial inoculants (preparations containing living micro organisms) which enhance production by improving the nutrient supplies and their crop availability. There are a number of inoculants with possible practical application in crops where it can serve as useful components such inoculants may help in increasing crop productivity by increasing biological N fixation (BNF) (Saber, 1993).Availability or uptake of nutrients through solubilization or increasing absorption, stimulation of plant growth through hormonal action or antibiosis or by decomposition of organic residues (Wani & lee, 1995).

Organic nitrogen fertilizers have many advantages supplying the plants with some essential macro and micronutrients which improving fertility of sandy soils, reducing the various wastes, controlling and partially checking the application of chemical fertilizers, depressing the pollution occurring in our environment, facilitating the availability and uptake of most nutrient to the plants (Nijjar, 1985).

Recently, research work is oriented to evaluate biofertilization as a new method for plant nutrition. In biofertilization, some living microorganisms such as bacteria and fungi are used to improve soil fertility (Marschner, 1988).

Bacillus circulans has been reported as plant growth promoting rhizobacteria (PGPRs). It was reported to increase crop yield of several crops such as maize and rice (Hameeda *et al*., 2006).

Thus, the main goal of this research is to study the effect of both organic and biofertilizers on vegetative growth and leaf mineral content of young Williams banana plants.

MATERIALS AND METHODS

The present study was conducted throughout two successive seasons (2007 and 2008) on young banana plants (*Musa Cavendishii* cv. "Williams Hybrid") to investigate the effect of organic fertilization and Biofertilizers on vegetative growth and leaf mineral content of Williams banana plants.

In each season, Young plants with 3-4 leaves produced by *in vitro* culture technique were selected for uniformity and one plant was planted in the last week of March in plastic pots (35 cm in diameter and 25 cm in length were filled with washed sand (about 20 kg/pot) with tap water for several times in the experimental farm, Department

of Horticulture, Faculty of Agriculture, Ain Shams Univ., Shoubra El-Kheima, Cairo, Egypt.

The study involved three levels of organic fertilization as compost El-Neel (K1=9, K2=13.5 and K3 = 18 g actual K /plant/ year) and three levels of Biofertilizers as silicate bacteria (B1=zero, B2=50 ml and B3= 100 ml /plant /year) in a factorial experiment in a randomized complete block design with nine treatments were arranged. Each treatment was replicated five times with one plant per plot for each.

The amounts of organic fertilization was applied as compost El-Neel were 1.29, 1.93 and 2.57 Kg. in the first season and 0.82, 1.23 and 1.64 Kg. in the second season and added as soil surface application in the first week of April in each season. The analysis of compost El –Neel is shown in Table (1).

Table (1): Compositional analysis of compost El-Neel used in this experiment.

Character	First season	Second season	Character	First season	Second season
PH	7.6	7.5	**K%**	0.7	1.1
EC(ds/m)	3.2	5.2	**Ca%**	3.9	4.0
Ca Co_3%	5	4	**Mg%**	0.5	0.8
Organic matter%	47	30	**Fe ppm**	47	45
N%	1.60	1.42	**Zn ppm**	81	80
P%	0.20	0.40	**Mn ppm**	32	30

Biofertilizer was composed of liquid culture of a local strain of *Bacillus circulans* containing 7x10^8 cell/ml. Treatment was applied at a rate of 0, 50 and 100ml/pot after organic application.

After planting, young banana plant (three full expanded leaves) were irrigated every other day with tap water at the rate of one liter per plant.

At the end of growing season in early October of each season, vegetative growth and leaf mineral content were determined as follows:.

Vegetative growth:

Height and circumference of pseudostem, number of green leaves per plant and leaf area of the third leaf from the top of the plant was calculated by multiplying the product of length and width of the blade by the factor 0.8 (Murray, 1960).

Chemical analyses:

In early October of each season, a sample from the middle part of the third leaf from the top of each plant was taken by cutting about 10 cm wide stripes from both sides of the midrib as recommended by Hewitt (1955) for nutrient analysis. The samples were washed with tap water and rinsed with distilled water then oven dried at 60-70°c until a constant weight and estimated the dry weight percentage. Dried samples were ground by means of stainless steel rotary knife mill then digested according to method of Jackson (1967) and the digested solutions were used to determine each of nitrogen, phosphorus, potassium and calcium & magnesium as percent of dry matter by using the methods of Pregl (1945), Truog & Meyer (1929), Brown & Lilleland (1946) and Chapman &Pratt (1961), respectively. Iron, zinc and manganese were determined as part per million by using the methods of Piper (1958).

Microbiological determination:

Sample of rhizosphere soil was taken at one month interval for microbial count enumeration during the time of experiment.

All obtained data were statistically analyzed by using the analysis of variance (Snedecor and Cochran, 1980). Means were differentiated by Duncan's multiple range test at 5% level (Duncan, 1955).

RESULTS AND DISCUSSION

1- Effect on vegetative growth

a- Pseudostem height:

Results in Table (2) clearly indicated that pseudostem height was insignificantly affected by organic fertilization in the two seasons. However, increasing the rate of organic fertilization gradually increased pseudostem height in the second season. In the first season, the medium organic K level obtained the highest value when

compared with the above mentioned treatment. The low and high organic fertilization levels gave similar results from the statistical stand point.

Regarding biofertilizer, pseudostem height was significantly affected with biofertilizer in the first season but not in the second one.

Table (2) Effect of organic and biofertilizer rates on some vegetative growth parameters of Williams banana plants during 2007and 2008 seasons

G actual K /plant/year	(2007) season				(2008) season			
	Biofertilizer K ml/plant/year				Biofertilizer K ml/plant/year			
	Pseudostem height (cm)							
	Zero B1	50 B2	100 B3	Mean	Zero B1	50 B2	100 B3	Mean
9 K1	58.00 abc	63.67 a	55.00 bc	**58.89 A**	45.67 a	41.67 a	50.0 a	**45.78A**
13.5 K2	65.67 a	64.0 a	58.67 abc	**62.78 A**	41.00 a	51.67 a	52.33 a	**48.33A**
18 K3	65.00 a	61.00 ab	51.33 c	**59.11 A**	50.67 a	48.0 a	51.67 a	**50.11A**
Mean	**62.89 A**	**62.89A**	**55.00 B**		**45.78 A**	**47.11 A**	**51.33A**	
	Pseudostem circumference(cm)							
9 K1	11.67 a	13.33 a	13.00 a	**12.67 A**	15.0 a	12.33 bc	15.0 a	**14.11A**
13.5 K2	14.00 a	13.67 a	12.00 a	**13.22 A**	12.00 c	14.67 a	15.0 a	**13.89A**
18 K3	13.67 a	12.67 a	13.00 a	**13.11 A**	14.33 ab	14.33 ab	14.67 a	**14.44A**
Mean	**13.11 A**	**13.22 A**	**12.67 A**		**13.78 A**	**13.78 A**	**14.89A**	
	Number of green leaves/plant							
9 K1	9.67 c	9.67 c	10.00 bc	**9.78 B**	7.33 a	6.33a	6.00 a	**6.56 A**
13.5 K2	10.33abc	10.00 bc	10.67abc	**10.33AB**	6.33 a	7.00 a	7.00 a	**6.78 A**
18 K3	11.33 a	11.00 ab	10.33abc	**10.89 A**	6.67 a	6.67 a	6.67 a	**6.67 A**
Mean	**10.44 A**	**10.22 A**	**10.33 A**		**6.78 A**	**6.67 A**	**6.56 A**	
	Leaf area (cm^2)							
9 K1	1010 bc	982 bcd	843 cd	**945 A**	712 a	827 a	730 a	**756 A**
13.5 K2	1156 b	856 cd	934 bcd	**982 A**	705 a	885 a	812 a	**801 A**
18 K3	1401 a	1017 bc	733 d	**1050 A**	876 a	747 a	891 a	**838 A**
Mean	**1189 A**	**952 B**	**837 B**		**764 A**	**820 A**	**811 A**	
	Dry wt %.							
9 K1	19.31 a	20.60 a	20.38 a	**20.10 A**	20.00 a	20.38 a	19.19 a	**19.85A**
13.5 K2	21.26 a	21.65 a	20.27 a	**21..06 A**	18.84 a	18.10 a	21.14 a	**19.36A**
18 K3	20.54 a	20.86 a	18.80 a	**20.07 A**	19.10 a	20.85 a	19.04 a	**19.66A**
Mean	**20.37 A**	**21.03 A**	**19.81 A**		**19.31 A**	**19.78 A**	**19.79A**	

In each season, means of each of K, B or KxB having the same letter (S) are not significantly different at 5% level

Pseudostem height increased gradually by increasing the rate of biofertilizer in the second season. In the first season, the highest values were obtained by the low and medium rates of biofertilizer whereas the lowest value was obtained by the high level.

The interaction between organic and biofertilizer was significant on pseudostem height in the first season only. The highest values were obtained by K2 B1 and K2 B3 in the first and second season, respectively. The lowest significant values were achieved by K3B3 and K2B1 in the first and second season, respectively.

b- Pseudostem circumference:

Pseudostem circumference did not significantly affected by organic fertilization or biofertilizer in both seasons. However, the highest values were obtained with the medium and high rates but the lowest values were obtained by the low and medium rates of organic fertilization in the first and second season, respectively.

The highest values were obtained with B2 and B3 in the first and second season, respectively. On the other hand, the high level of biofertilizer slightly decreased pseudostem circumference in the first season but the lowest values were obtained with low and medium levels in the second season.

The interaction between organic and biofertilizer showed significant effect on pseudostem circumference in the second season only. The highest values were obtained with K2 B1, K2B3 but the lowest values were shown by K1 B1 and K2B1 in the first and second seasons, respectively.

C-Number of green leaves per plant:

Number of green leaves per plant in the first season only was significantly affected with organic fertilization. Increasing the rate of organic fertilization increased number of green leaves gradually and the highest value was obtained by the high level. On the contrary, number of green leaves was slightly decreased by the high rate in the second season.

Regarding biofertilizer, number of green leaves did not significantly affected in both seasons. However, number of green leaves slightly increased by the low level in both seasons but the medium or high levels gave slightly decreased in the first and second seasons, respectively.

The interaction between organic fertilization and biofertilizer was significantly affected the number of green leaves in the first season only. The highest values were obtained with K3 B1 in the first season and K1 B1 in the second one whereas the lowest values were resulted by K1 B1or K1B2 and K1 B3 in the first and second season, respectively.

d- Leaf area:

As shown in Table (2), leaf area of the third full expanded leaf from the top of the young Williams banana plants was not significantly affected with organic fertilization in both seasons. However, Increasing the rate of organic fertilization increased leaf area gradually in both seasons and the highest value was obtained by the high level (K3).

Regarding the biofertilizer, leaf area in the first season was affected significantly by biofertilizer only. However, the highest values were obtained with the low and medium rates of biofertilizer in the first and second season, respectively (B1 or B2) but the lowest values were obtained by the high and low rates (B3 or B1) in the first and second season, respectively.

The interaction between organic and biofertilizer had a significant effect on leaf area in the first season only. The highest values were obtained by K3B1and K3 B3 but the lowest values were obtained with K3B3 and K2B1 in the first and second season, respectively. Other treatments were more or less similar from the statistical stand point.

e- Dry weight percentage of leaf sample:

Results in Table (2) indicated that the percentage of dry weight in the first and second seasons was not affected significantly with organic, biofertilizer and the interaction between them.

From the aforementioned results, it seems that the promising treatments were K2 or K3 as organic fertilization and B2 or B3 as biofertilizer as well as K2 B2 or K2B3 as the interaction between them which gave the highest value of vegetative characters.

The obtained results are in harmony with those reported by Debut *et. al.* (1996) who found that plant height, number of leaves and pseudostem diameter were improved after 6 months for .Giant

Cavendish and after 3 months for Burro treated with *Azotobacter chroococcum* inoculation at 20 liters /ha.

Also, Tiwary *et.al*, (1998) found that the inoculation with *Azospirillum* for plants receiving 50% of the recommended N dose resulted the maximum plant height and leaf area of banana cv. Giant.

Abd El-Naby (2000) found that using banana compost enriched with 50 or 25% chemical fertilizer (NPK) + sulfur improved the vegetative growth of Maghrabi banana.

II – Effect on leaf mineral content:

a- Effect on macronutrients:

1- Nitrogen

Results of Table (3) clearly indicated that nitrogen percentage in the blade of the third leaf from the top of Williams banana plants was significantly affected with organic fertilization in the two seasons. Increasing organic fertilization rates up to the medium level K2 significantly increased nitrogen content but the lowest value was obtained with the low level of organic fertilization (K1) in both seasons.

Regarding biofertilizer, data of the first and second season revealed that nitrogen content was significantly affected by biofertilizer. Nevertheless, the highest values were obtained by B1 in the first season and B1or B3 in the second season but the high or medium rates (B3 orB2) gave the lowest values in the first and second season, respectively.

The interaction between organic and biofertilizer was significantly affected the nitrogen content in the two seasons. The highest value was obtained by K2 B1 but the lowest value was obtained with K1B21in in both seasons.

2-Phosphorus:

Phosphorus content in the two seasons was significantly affected by the organic fertilization. The highest value was obtained by the medium level (K2) followed in a decreasing order by the low and high levels in both seasons.

Regarding biofertilizer, phosphorus content was affected significantly with biofertilizer in the first and second seasons. In the first season, increasing biofertilizer rate up to (K2) increased phosphorus content significantly but the high rate of biofertilizer(K3)

gave the lowest significant value. In the second season, the highest values were obtained by the (K1) or (K2) but the lowest significantly value was gained by the (K3) of phosphorus content.

Table (3): Effect of organic and biofertilizer rates on some macronutrients in leaves of "Williams" banana plants during 2007 and 2008 seasons.

G actual K /plant/year	(2007) season				(2008) season			
	Biofertilizer K ml/plant/year				Biofertilizer K ml/plant/year			
	N%							
	Zero B1	50 B2	100 B3	Mean	Zero B1	50 B2	100 B3	Mean
9 K1	2.00 b	1.68 b	1.80 b	1.83 B	2.07bcd	1.75d	1.80 cd	1.87 C
13.5 K2	2.65 a	2.08 b	1.83 b	2.19 A	2.57 a	2.50ab	2.53 ab	2.53 A
18 K3	1.92 b	1.83 b	1.77 b	1.84 B	2.10abcd	2.23abc	2.40 ab	2.24 B
Mean	2.18 A*	1.87 B*	1.80 B*		2.24 A*	2.16A	2.24 A*	
	P%							
9 K1	0.21 c	0.25 bc	0.30 b	0.25 B	0.18 b	0.17 b	0.20 b	0.18 B
13.5 K2	0.27 b	0.50 a	0.25 bc	0.34 A	0.19 b	0.32 a	0.17 b	0.23 A
18 K3	0.33 b	0.17 c	0.22 c	0.24 B	0.25 ab	0.12 b	0.15 b	0.17 B
Mean	0.27 B*	0.31 A*	0.26 B*		0.21 A*	0.20 A*	0.17 B*	
	K%							
9 K1	2.92 abc	2.82 abcd	2.33 cd	2.69 AB	2.90 ab	2.85 ab	2.63 b	2.79 B
13.5 K2	2.36 bcd	1.79 d	2.56 bcd	2.23 B	2.63 b	3.07 ab	3.18 ab	2.96 AB
18 K3	1.94 cd	3.38 ab	3.75 a	3.02 A	2.93 ab	3.22 a	3.27 a	3.14 A
Mean	2.41 A*	2.66 A*	2.88 A*		2.82 A*	3.04 A*	3.02 A*	
	Ca%							
9 K1	2.42 d	3.05 abc	2.77 c	2.74 C	2.42 abc	2.77 abc	2.15 c	2.45 A
13.5 K2	3.19 ab	3.40 a	2.92 bc	2.95 B	2.37 bc	2.82 abc	3.17 a	2.78 A
18 K3	3.07 abc	2.87 bc	2.92 bc	3.17 A	2.95 ab	2.57 abc	3.02 ab	2.84 A
Mean	2.89 B*	3.11 A*	2.87 B*		2.58 A*	2.72 A*	2.78 A*	
	Mg%							
9 K1	1.04 ab	1.01 ab	1.01 ab	1.02 A	0.94 a	1.02 a	1.09 a	1.02 A
13.5 K2	1.03 ab	1.09 a	1.04 ab	1.05 A	1.05 a	0.98 a	1.20 a	1.08 A
18 K3	1.15 a	0.92 b	1.01 ab	1.03 A	1.23 a	1.17 a	1.07 a	1.16 A
Mean	1.07 A*	1.02 A*	1.00 A*		1.07 A*	1.06 A*	1.12 A*	

In each season, means of each of K, B or KxB having the same letter (S) are not significantly different at 5% level.

On the other hand, phosphorus content in leaves was significantly affected with the interaction between organic fertilization and biofertilizer in the two seasons. The highest value was obtained by K2B2 in the two seasons but the lowest values were achieved by K3B3, K1B1, K3B2 and K1B2, K3B3, K3B2 in the first and second season, respectively.

3-Potassium:-

Potassium content was significantly affected with organic fertilization in both seasons. The highest value was obtained by K3 in both seasons but the lowest values were resulted with K1 and K2 in the first and second season, respectively.

Regarding biofertilizer, Potassium content had no significant affect in both seasons. However, Potassium content slightly increased by increasing biofertilizer rates in the first season but the lowest value was obtained by B1 in both seasons.

The interaction between organic and biofertilizer was significantly affected leaf potassium content in both seasons. The highest values were obtained by K3B3 in the first season and K3B2, K3B3 in the second season but the lowest values were obtained by K2B2 and K2B1,K1B3 in the first and second seasons, respectively.

4- Calcium:

Calcium content was significantly affected by the organic fertilization in the first season only. Increasing organic fertilization rates increased calcium content gradually in both seasons and the highest value was obtained with the high level of organic nitrogen (K3) but the lowest value was gained by K1.

Regarding biofertilizer, calcium content was significantly affected with biofertilizer in the first season only and the highest value was obtained by the medium rate (B2). In the second season, calcium content was slightly increased gradually by increasing biofertilizer rates.

The interaction between organic and biofertilizer was significantly affected leaf calcium content. The highest value was obtained by K2B2 and K2B3 but the lowest value was shown with K1B1and K1B3 in the first and second season, respectively.

5-Magnesium:

Data in Table (3) showed that magnesium content did not significantly affected by organic fertilization or biofertilizer in both seasons. However, the highest values were obtained with the medium and high rates in the first season but the lowest value was results by the low rate of organic fertilization in the two seasons.

On the other hand, increasing biofertilizer rates slightly decreased magnesium content gradually in the first season and no particular trend was detected in the second one.

The interaction between organic and biofertilizer was significantly affected on the magnesium content in the first season only. The highest value was obtained by K3B1, K2B2 and K3B1, K2B3 but the lowest values were shown with K3B2 and K1B1 in the first and second season, respectively.

b- Effect on micronutrients:

1-Iron:

Data in Table (4) revealed that iron content did not significantly affected by organic fertilization in the two seasons. The highest values were obtained with K2 and K1, but K3 and K2 gave the lowest value in the first and second season, respectively.

Nevertheless, biofertilizer affected significantly the iron content in the first season only. However, the highest values were obtained by B1and B3 in the first and second season, respectively. Increasing biofertilizer rates decreased iron content gradually in the first season but no particular trend was detected between iron content and biofertilizer rates in the second one.

The nteraction between organic and biofertilizer was significantly affected the iron content in the two seasons. The highest significant values were obtained with K1B1, K3B2 and K3B3, K1B2 but the lowest values were resulted by K3B3 and K3B2 in the first and second seasons, respectively.

2- Zinc:

Results of Table (4) clearly indicated that zinc content behaved similarly as the iron content whereas there were no significant differences among organic fertilization treatments in the two seasons. The highest zinc content was obtained by K1 and K2 in the first and

second seasons, respectively, but the lowest value was obtained with K3 in both seasons.

Regarding biofertilizer, zinc content was affected significantly with biofertilizer in the first season only. Zinc content increased significantly with B2 in the first season but slightly decreased gradually by increasing biofertilizer level in the second season.

The interaction between organic and biofertilizer had significant effect on zinc content in both seasons. The highest values were obtained by K3B2 and K2B1 but the lowest value was achieved with K3B3 and K1B1 or K3B2 in the first and second season, respectively.

3-Manganese:

Manganese content in the first and second season was not affected significantly with organic fertilization and biofertilizer. However, manganese content slightly increased as affected by increasing organic fertilization but slightly decreased as affected by increasing biofertilizer in the second season and no particular trend was detected in the first one.

The interaction between organic and biofertilizer significantly affected the manganese content in the second season only. Nevertheless, the highest values were obtained by K2B3and K2B1 but the lowest value was shown with K3B3 and K1B1 in the first and second seasons, respectively.

Therefore, it could be concluded from the previously mentioned results of the two seasons that treatment with K2 orK3 as organic fertilization and B2 or B3 as biofertilizer as well as K2B2, K2B3, K3B2 K3B3 as the interaction between them gave the highest leaf mineral content.

These results may be attributed to that organic and biofertilizer help to facilitating the availability and uptake of most nutrients to the plants (Nijjar, 1985).

Results of organic and biofertilizer are in agreement with those obtained by Abd El-Naby (2000) who found that both farmyard manure (FYM) and banana compost under 100% chemical fertilizer alone or in combination with sulfur gave high contents of N, P and K in leaves, while banana compost under 50-75% chemical fertilizer +sulfur produced leaves which had high contents of micronutrients (Fe, Zn and Mn) of Maghrabi banana.

Table (4): Effect of organic and biofertilizer rates on some micronutrients in leaves of "Williams" banana plants during 2007 and 2008 seasons.

G actual K /plant/year	(2007) season				(2008) season			
	Biofertilizer K ml/plant/year				Biofertilizer K ml/plant/year			
	Fe (ppm)							
	Zero B1	50 B2	100 B3	Mean	Zero B1	50 B2	100 B3	Mean
9 K1	834 a	543 cd	666 abc	**681 A**	581 ab	814 a	698 ab	**698 A**
13.5 K2	775 ab	783 ab	562 bcd	**707 A**	670 ab	594 ab	568 ab	**611 A**
18 K3	756 abc	821 a	394 d	**657 A**	667 ab	434 b	824 a	**642 A**
Mean	**788 A**	**716 A**	**541 B**		**640 A**	**614 A**	**696 A**	
	Zn (ppm)							
9 K1	38 ab	45 a	40 ab	**41 A**	33 b	44 ab	34 ab	**37 A**
13.5 K2	41 ab	44 ab	31 ab	**38 A**	55 a	41 ab	37 ab	**44 A**
18 K3	45 a	46 a	21 b	**37 A**	45 ab	33 b	34 ab	**37 A**
Mean	**41 AB**	**45 A**	**31 B**		**44 A**	**39 A**	**35 A**	
	Mn (ppm)							
9 K1	81 a	68 a	61 a	**70 A**	55 b	77 ab	79 ab	**70 A**
13.5 K2	74 a	75 a	86 a	**78 A**	115 a	81 ab	62 ab	**86 A**
18 K3	65 a	55 a	51 a	**57 A**	106 ab	88 ab	73 ab	**89 A**
Mean	**73 A**	**66 A**	**66 A**		**92 A**	**82 A**	**71 A**	

In each season, means of each of K, B or KxB having the same letter (S) are not significantly different at 5% level

Moreover, Abd El-Naby and Gomaa(2000) noticed that fertilization of Maghrabi banana plants with banana compost at 50% chemical fertilizer + sulfur combined with chicken manure gave the highly significant leaf content of N,P,K and Zn with mediocre significant content for Fe, Mn and Cu.

Microbiological determination:

Results in tables (5 and 6) show that total microbial count and *B. circulans* count increased with time of experiment until the 5th month after which no significant increase was detected. Results also show that levels of organic fertilizer had proportional effect of microbial count and applying with the high rate of organic fertilization had the maximum influence on total and bacilli count in the banana rhizosphere.

Table (5) Total microbial count (x10^6) in the rhizosphere of Williams Banana plant as a function of organic fertilizer and biofertilizer levels.

Treatments Actual gram K/plant	BioFert (ml)	Time of plantation (month)						
		0	1	2	3	4	5	6
9	0	3	9	27	40	61	65	62
	50	5	15	45	66	89	102	95
	100	5.8	18	54	82	119	126	121
13.5	0	4	13	39	58	85	95	91
	50	5.5	18	54	82	121	138	132
	100	6	21	63	95	142	165	155
18	0	2.8	9	27	42	64	74	71
	50	4.6	15	45	68	106	115	110
	100	6.2	24	72	105	155	165	155

Table (6) *Bacillus cirulans* count (x10^5) in the rhizosphere of Williams Banana plant as a function of organic fertilizer and biofertilizer levels

Treatments Actual gram K/plant	BioFert (ml)	Time of plantation (month)						
		0	1	2	3	4	5	6
9	0	1.5	4	11	19	35	39	37
	50	2.5	6.1	16	45	52	60	56
	100	4	8	58	74	67	74	71
13.5	0	1.6	4.1	22	34	51	61	58
	50	3	7	26	38	75	85	81
	100	3.6	8.5	50	68	92	105	89
18	0	1.6	4.2	12	21	38	42	41
	50	2.8	6.5	56	52	68	75	72
	100	4.1	10	60	84	92	105	95

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إستجابة نباتات الموز وليامز للتسميد العضوى والبكتريا الميسرة للبوتاسيوم

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اجريت هذه الدراسه خلال موسمي 2007 و 2008 لدراسة تأثير التسميد العضوي والحيوي علي النمو الخضري والمحتوي المعدني لاوراق نباتات الموز الوليامز بكلية الزراعة – جامعة عين شمس.

واشتملت التجربة ثلاث مستويات من التسميد العضوي في صورة كمبوست احتوت علي بوتاسيوم صافي (بو$_1$ = 9 و بو$_2$ = 13,5 و بو$_3$ = 18 جم بوتاسيوم / نبات / سنه) وثلاث مستويات من التسميد النتروجيني الحيوي (ب$_1$ = صفر و ب$_2$ = 50 مل و ب$_3$ = 100 مل من لقاح الباسيلس سيركيولانس / نبات / سنه) في تجربه عامليه .

اظهرت النتائج أن المعاملة بو$_2$ ، بو$_3$ من التسميد العضوي وكذلك ب$_2$ ، ب$_3$ من التسميد الحيوي والتفاعل بينهما بو$_2$ ب$_2$ ، بو$_2$ ب$_3$ ، بو$_3$ ب$_2$ ، بو $_3$ ب$_3$ اعطت افضل النتائج لكل من القياسات الخضرية وكذلك المحتوي المعدني للاوراق..