

GROWTH, LEAF NUTRIENT CONTENT AND YIELD OF BANANA CV. GRAND NAIN UNDER OPTIMIZED NUTRITION Nofal, O. A.

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ABSTARCT

Possible influences of suggested optimized nutrition on growth, leaf nutrient contents and yield of banana cv. Grand Nain were studied using a field experiment at Gharbia Governorate, Egypt, in two successive seasons, 2001 and 2002.

Soil physical and chemical characteristics as well as nutrient status in plants were determined. Growth aspects, yield and its components were also determined.

The results indicated occurrence of micronutrients deficiency as well as the imbalance of nutrients in plants. The modified recommendations showed that plant height, pseudostem girth and No. of leaves/plant positively affected, and the leaf nutrient content, in general, increased over the control. The increase in the yield of banana cv. Grand Nain was associated with the increase in No. of fingers/hand, No. of hands/branch and weight of hands/bunch. It be concluded that optimized nutrition may enhance growth, leaf nutrient content and can yield of banana.

INTRODUCTION

The problem of yield production in banana was investigated by Ghanta and Mitra (1993); Kumar and Jayakumar (2001); Enrique *et al.*, (2001). A decline in soil fertility is often cited as one of the causes of the declining production (Smithson *et al.*, 2001). It is generally accepted that with an increase of mineral nutrient inputs, the incremental yield increase per unit of nutrient is continuously declining. Reasons for this are related to crops, yield potentials as well as environmental factors (Zhou *et al.*, 2001). No consideration is given to specific fertilizer recommendation according to soil testing and leaf analysis (El-Fouly, 1995).

The need to optimize fertilizer use has become necessary to aquire nutrients balance without negative effect on the environment, at the same time to cover the crop requirements from different nutrients (Wallace, 1980 and El-Bendary *et al.*, 1992). This work was initiated to study the effect of suggested optimized nutrition on growth, leaf nutrient content and yield of banana.

MATERIALS AND METHODS

In seasons 2001 and 2002, at a private orchard situated at Met Gazzal Village, Tanta district, Gharbia governorate, two experiments were conducted to investigate the optimized nutrition on growth and yield components of banana cv. Grand Nain. The experimental work started on the second and third rattoons. The distances were 3 x 2 meters apart. They were thinned to leave three ratoon for fruiting in the following seasons beside the mother plants that would give the crop of the current season.

A representative soil sample was taken during the first season before the basic fertilizers addition and analyzed for physico-chemical characteristics (Table 1).

Table (1): Soil characters and nutrient contents in banana experimental site

Character	Value
Sand %	35.7
Silt %	29.3
Clay %	35
Texture (Bauyoucos, 1954)	clay loamy
pH (1 soil : 2.5 water) (Jackson, 1973)	8.3 H
E.C (1 soil : 2.5 water) (mmhos/cm) (Jackson, 1973)	0.35 L
CaCO ₃ % (Black, 1965)	1.97 L
O.M. % (Walkley and Black, 1934)	0.87 L
Macronutrients (mg/100g soil)	
Total N (Allen, 1953)	28.5 L
Available P (Olsen, <i>et al.</i> , 1954)	1.47 M
Available K (Jackson, 1973)	14.6 L
Available Ca (Jackson, 1973)	48.6 L
Available Mg (Jackson, 1973)	78.9 M
Available Na (Jackson, 1973)	61.3 H
Micronutrients (mg/kg soil)	
Available Fe (Lindsay and Norvell, 1978)	13.0 M
Available Mn (Lindsay and Norvell, 1978)	8.1 L
Available Zn (Lindsay and Norvell, 1978)	1.83 M
Available Cu (Lindsay and Norvell, 1978)	2.27 H

L : Low, M : Medium, H : High

All the control trees in the two seasons received the amounts of different fertilizers according to the farmer practices, however, the treated trees in the first season received the amounts of different fertilizers depending to the results of soils testing, however, in second season, the trees received the amounts of fertilizers according to the results of leaf analysis. The organic manure and superphosphate fertilizers were added as one dose on Dec. Nitrogen and potassium into eight doses, added on Mar., Apr., May., Jun., Jul., Aug., Sep., Oct. as ammonium sulphate and potassium sulphate, respectively in the two seasons. The micronutrients foliar application were added as Wuxal Sus. Mn in first season and Wuxal Sus. Zn in second season in chelated forms, which were split into four doses, added on Jun., Jul., Aug., and Oct. (Table 2). The experiment was carried out with three replications and two treatments. In each treatments, a population of 16 plants were maintained.

The following vegetative growth aspects were measured after the emergence of the inflorescence.

1. Plant height (m)
2. Pseudostem girth (cm)
3. No. of leaves (plant⁻¹)

Girth of pseudostem was measured at a 30cm height from the base. A transverse band 20 cm wide per plant was cut from the central part of the third full sized leaf below the inflorescence and prepared for chemical analysis according to Chapman and Part (1961).

Bunches of banana were picked at the 5th week of November when fingers reached the full matured stage. Bunch weight (kg) and hands weight/bunch (kg) at this stage were recorded. Also, No. of hands/bunch and No. of fingers/hand were registered before ripening (Table 4). The values were evaluated according to Ankerman and Large (1974).

All the obtained data were tabulated and statistically analyzed according to Snedecor and Cochran (1967).

Table (2) : Doses of different fertilizers (control and recommendations)

Fertilizer/Fed.	2001		2002	
	Control	Recommendation	Control	Recommendation
Nitrogen Manure (m ³)	50	60	50	60
Nitrogen-N (kg) (NH ₄) ₂ SO ₄	405 units	605 units	405 units	550 units
Phosphore P ₂ O ₅ (kg) - Superphosphate	60 units	60 units	60 units	60 units
Potassium K ₂ O (kg) - Potassium sulphate	405 units	664 units	405 units	832.5 units
Micronutrients (foliar)				
- Wuxal sus Mn* (kg)	-	3	-	-
- Wuxal sus Zn** (kg)	-	-	-	3
Sulfur (kg)	-	300	-	400

* Wuxal Sus Mn : 1.5% Fe + 4.5 % Mn + 3.0 % Zn + 14 % N (chelated)

** Wuxal Sus Zn : 1.37 % Fe + 2.7 % Mn + 4.0 % Zn + 14.0 N (chelated)

RESULTS AND DISCUSSION

Data in Table (1) reveal that the soil analysis had poor feeding power according to the tentative values of soil characteristics and available macro and micronutrients in soil as mentioned by Ankerman and Large (1974).

Values in Tables (3 and 4) show that using the specific fertilizer recommendation by increasing O.M, N and K with P doses accompanying sulfur soil application as well as micronutrients foliar application gave a good effect on growth characters and yield parameters. These results confirm those found by Nofal *et al.*, (1999). Sillanpaa (1982), reported the hindering effect of soil having high pH on micronutrients uptake by crop plants in Egypt. Thus, correction of micronutrients deficiency through the roots (Wittwer and Bukovac, 1969) and to consequent increase in the uptake of N, P, K and Mg. These recommendations led to improvement of the nutritive status of leaves (Fig. 1). Meanwhile, Al-Roussan (1995) mentioned that sulfur addition led to a decrease in the soil pH and increase in the solubility of hardly soluble soil minerals. Micronutrients compounds, and consequently, the availability of these elements increased leading to cm increase in yield. On the other hand, the increase in the yield may be attributed to the increase in No. of fingers/hand, No. of hands/bunch and weight of hands/bunch. However, Ahmed *et al.*, (1998) attributed the increase in the yield of Williams cv. to the increase in both number and weight of hands.

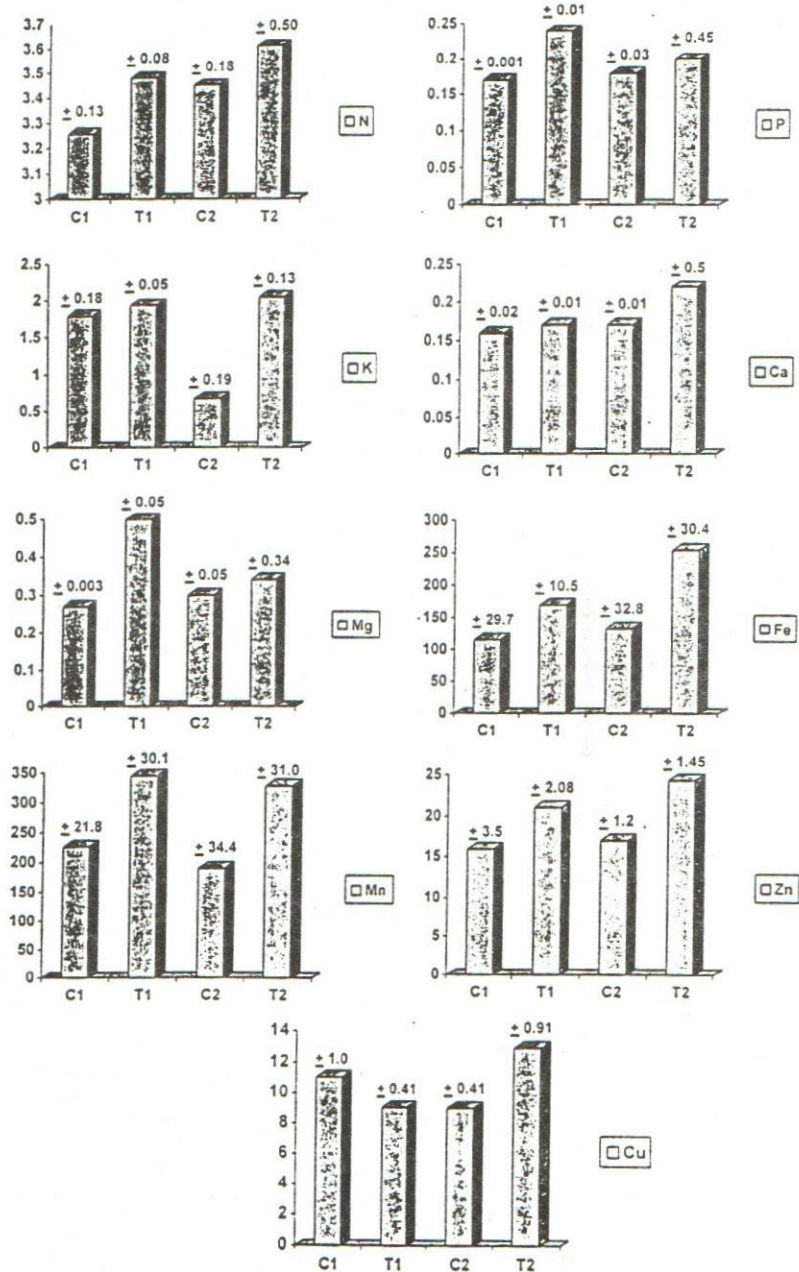


Fig. (1) : Influence of optimized nutrition on leaf nutrient content of banana cv. Grand Nain

Table (3) : Influence of optimized nutrition on growth parameters of banana cv. Grand Nain).

Season	Treatment	Plant height (m)		No. of leaves (plant ⁻¹)		Pseudostem girth (cm)	
		Mean	+SD	Mean	+SD	Mean	+SD
2001	C ₁	4.00	+ (0.29)	9.75	+ (0.48)	62.5	+ (3.23)
	T ₁	4.94	+ (0.22)	10.3	+ (0.48)	66.8	+ (1.38)
2002	C ₂	4.13	+ (0.22)	10.0	+ (0.41)	65.3	+ (0.80)
	T ₂	5.68	+ (0.20)	11.3	+ (0.25)	68.0	+ (2.68)

C : control T : treated

Table (4) : Influence of optimized nutrition on yield parameters of banana cv. Grand Nain.

Season	Treatment	No. of hands per bunch		No. of finger per hand		Bunch weight (kg)		Hands weight/ bunch (kg)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
2001	C ₁	11.0	± (1.23)	21.5	± (2.10)	23.8	± (2.40)	2.07	0.22
	T ₁	13.8	± (1.03)	22.0	± (0.82)	25.8	± (0.48)	2.80	0.07
2002	C ₂	12.0	± (0.41)	21.8	± (0.86)	24.0	± 1.36	2.00	0.09
	T ₂	14.8	± (0.48)	33.0	± (1.30)	27.8	± 1.93	2.06	0.04

C : control T : treated

The results presented give evidence that disorders in the balance between elements in the nutrient medium resulted in manifested deficiencies and a decrease in plant growth which reflect on the yield production of banana. This problem could be improved by using optimizing nutrition with considerable macro and micronutrients based on the results of soil tests and plant analysis.

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نمو ومحتوى الورقة الغذائي ومحصول الموز صنف جرانند ناين تحت التغذية المرشدة
أسامة أنور نوفل
قسم تغذية النبات - المركز القومي للبحوث - الدقي - جيزة

تم دراسة التأثيرات الممكنة للتغذية المرشدة على نمو ومحتوى الورقة الغذائي ومحصول الموز صنف جرانند ناين في تجربة حقلية في محافظة الغربية - مصر - في موسمين متتاليين ٢٠٠١-٢٠٠٢.

ولقد قدرت الصفات الطبيعية والكيمائية للتربة وكذلك الحالة الغذائية للنباتات. كما قيست صفات النمو والمحصول ومكوناته.

أكدت النتائج حدوث نقص للعناصر الصغرى وكذلك عدم التوازن الغذائي للنبات. أظهرت التوصية المعدلة التأثير الإيجابي على طول النبات وقطر الساق الكاذبة وعدد الأوراق للنبات، كما زاد بصفة عامة محتوى الورقة الغذائي عن الكنترول، ولقد سجلت الزيادة في محصول الموز صنف جرانند ناين تلازما مع الزيادة في عدد الصوابع للكف وعدد الكفوف للسباطة ووزن الكفوف للسباطة.

ويمكن التوصية بأن التغذية المرشدة ربما تزيد من نمو ومحتوى الورقة الغذائي ومحصول الموز.