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EFFECT OF ORGANIC AND BIOFERTILIZATION AS A PARTIAL SUBSTITUTE FOR INORGANIC FERTILIZATION ON FRUITING OF GRANDNAINE BANANA PLANTS

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ABSTRACT

Grandnaine banana plants received during ٢٠٠٨/ ٢٠٠٩ and ٢٠٠٩/ ٢٠١٠ seasons, the suitable N (٣٠٠ g/ plant) as ١٠٠٪ from inorganic, organic or biofertilizer, (٨٠٪ inorganic + ١٠٪ organic + ١٠٪ organic) (٦٠٪ inorganic + ٢٠ % organic + ٢٠ % bio) (٤٠٪ inorganic + ٣٠% organic + ٣٠ % bio) or (٢٠ % inorganic + ٤٠ % organic + ٤٠ % bioform) as a trial for reducing the amount of inorganic N fertilizer. The sources of inorganic, organic and biofertilizers of nitrogen were ammonium sulphate , compost and Minia Azotene, respectively.

Results showed that decreasing the percentages of inorganic N fertilizer from ١٠٠ to ٦٠ % and in the same time increasing the percentages of both organic and biofertilizers from ٠.٠ to ٢٠ % of the suitable rate of N was accompanied with enhancing in growth characters namely, height and girth of pseudostem and leaf area. Also, the percentages of N, P and K in the leaf, weights of bunch, hand and finger, total soluble solids, reducing and total sugars. But

was responsible for reducing starch, total acidity, nitrite and nitrate contents in the pulp compared with using N completely via each source. Using the suitable N completely via inorganic, organic or biofertilization had unfavourable effects. Using N at percentages lower than ٦٠٪ out of the suitable N gave unacceptable effects. Nitrate or nitrite contents of the pulp was greatly reduced with using organic and biofertilization alone or when the three sources of N were applied together as compared with using N completely via inorganic form.

For producing organic Grandnaine banana fruits as well as improving yield quantitively and qualitively, its is preferable to fertilize plants with ٣٠٠ N / plant as ٦٠٪ inorganic, ٢٠٪ organic and ٢٠٪ biofetilizer.

INTRODUCTION

Generally, N fertilization is considered an important and limiting factor for growth and productivity of different banana cvs. Recently, many trials were carried out to adjust and select the amount of mineral N that should be added to fruit orchards to protect the environment from dangerous pollution (Nijjar, ١٩٨٥). Pollution is one of the most problems that affect human health especially when the edible part of the plant is polluted with any of the pollutants. In this respect, using mineral N fertilizers cause accumulation of harmful residual substances like $NO_٢$ and $NO_٣$ in the pulp of the fruits. On the other hand, pollution is considered the major problems that faces the exportation process. The question is how to produce more save fruits for human health through the use of chemical fertilizers. Continuous application of organic and biofertilizers is promising in the long run of bananas, as sources of organic matter, essential nutrients, amino acids, natural hormones, antibiotics and B vitamins. Also, improving both physical and chemical characters of the soil (Nijjar, ١٩٨٥ and Kannaiyan, ٢٠٠٢).

Grandnaine banana cultivar is considered a prime and popular banana cv due to its higher bunch weight, larger hands and fingers

(Stover and Simmonds, ١٩٨٧). Fruiting area and the total production of banana fruits in Egypt according to ٢٠٠٨ statistics reached ٥٦٥٠٨ feddans and ١٠٦٢٤٥٣ metric ton fruits, respectively.

Many authors previously mentioned that adjusting the amount of N as well as using the suitable amount of N via inorganic, organic and biofertilizers sources were very beneficial in enhancing growth and fruiting of different banana cvs as compared with using mineral N alone (Ahmed *et al.,* ١٩٩٦ and ١٩٩٧ ; El- Shamaa, ٢٠٠١; Soliman, ٢٠٠١; Kamel, ٢٠٠٢; Abd El- Monaem- Eman and Radwan, ٢٠٠٣; Hammam *et al.,* ٢٠٠٣; Ahmed *et al.,* ٢٠٠٣; Hammam, ٢٠٠٣; Roshdy , ٢٠٠٤; Gobara, ٢٠٠٤; El- Shenawi and Hassouna, ٢٠٠٤ ; El- Sawy, ٢٠٠٥; Sayed- Shren, ٢٠٠٤ and El- Shenawi *et al.,* ٢٠٠٨).

The target of this study was reducing the amount of inorganic N fertilizer by using organic and biofertilization to avoiding pollution and improving yield and fruit quality of Grandnaine banana.

MATERIALS AND METHODS

This study was carried out during two consecutive seasons of ٢٠٠٨/ ٢٠٠٩ and ٢٠٠٩/ ٢٠١٠ seasons on the third and fourth rations of Grandnaine banana cv. in a private orchard located at Itsa village , Minia Governorate. Soil of the orchard is silty clay with a water table depth not less than two meters deep. Analysis of the tested soil was made according to the procedures outlined by Wilde *et al.,* (١٩٨٥) and the data are shown in Table ١.

Table ١ : Physical and chemical analysis of the tested soil

Constituents	Values
Sand %	٢٢.٠
Silt %	٥٥.٩
Clay %	٢٢.١

Texture grade	Silty clay
E.C. (mmhos. ١cm/ ٢٥°C)	٠.٤٠
O.M. %	٢.٠
$CaCO_3$ %	١.٥٢
Total N %	٠.١٠
Available P (Olsen method) ppm	٦.٠
Available K (ammonium acetate) ppm	٤١١

Regular management except N fertilization in all sources in the orchard was carried out as usual.

The present experiment involved seven treatments as follow:-

١-Using the suitable N (٣٠٠ g N / plant) completely via inorganic N source namely ammonium sulphate ٢٠.٦٪ N (١.٤٥٦ kg per each plant).

٢-Using the suitable N as ٨٠٪ inorganic (١.١٦٥ kg ammonium sulphate) + ١٠ % organic (١.٥ kg compost) + ١٠٪ / bio (٣٠ g Minia Azotene) per each plant.

٣-Using the suitable N as ٦٠٪ inorganic (٠.٨٧٥ kg ammonium sulphate) + ٢٠ % organic namely compost / ٢٪ N + (٢٠ % bio) (٦٠ g Minia Azotene) per each plant.

٤-Using the suitable N as ٤٠٪ inorganic (٠.٥٨٥ kg ammonium sulphate) + ٣٠ % organic (٤.٥ kg compost) + ٣٠ % / bio (٩٠ g Minia Azotene) per each plant.

٥-Using the suitable N as ٢٠٪ inorganic (٠.٢٩٥ kg ammonium sulphate + ٤٠ % inorganic (٦.٠ kg compost) + ٤٠٪ bio (١٢٠ g Minia Azotene) per each plant.

٦-Using the suitable N completely via organic (١٥.٠ kg compost) per each plant.

٧- Using the suitable N completely via bioform/ ٣٠٠ g Minia Azotene) per each plant.

Each treatment was replicated three times, one stool per each replicate (٢١ stools for the third ratoons and the same number for the fourth ones). Inorganic N namely ammonium sulphate (٢٠.٦٪ N) was splitted into ١٤ equal batches and added twice per reach month for months started on April and ended on October during each season. Compost was added once at the second week of Jan. Minia Azotene biofertilizer was added once at the second week of March by making digs around each plant and putting the specific amount of Minia Azotene. Digs were subjected to irrigation afterwards. Organic source (compost, ٢٪ N) was added in digs ١٥ cm depth around each plant and covered with soil after the addition.

Complete randomized block design was adopted for the present experiment.

After the emergence of the inflorescence (٣rd week of July for both the third and fourth ratoons), the following growth characters were measured.

a) Pseudostem height (cm) was measured from the soil surface up to the petiole of the last emerged leaf.
b) Girth of pseudostem (cm) in the base, middle and top of pseudostem was recorded then the average was calculated.
c) Leaf area was recorded according to the equation reported by Ahmed and Morsy (١٩٩٩):

$$LA\ (m^2) = ٠.٦٧\ (L \times W) + ١٠٧.١٥$$

which L = leaf length (cm) and W = leaf width (cm).

Leaf mineral content:

Leaf samples were taken from the third upper leaf in the descending leaves from the top of the plant after bunch shooting in the last week of August in both seasons (Hewitt, ١٩٥٥). Samples were oven dried at ٧٠°C and digested. The clear digestion was quantitatively transferred to ١٠٠ ml volumetric flask. In this solution, the following nutrients were determined according to Wilde *et al.*, (١٩٨٥).

a) Total N was determined by using micro- Kjeldahl method.
b) Phosphorus was determined by using Olsen method.
c) Potassium was determined by using flame photometer.

Yield and fruit quality:

Bunch of each plant was picked when the fingers reached three quarter stage. Before artificial ripening weights of bunch and hand were recorded. Six hands were taken from the base, middle and distal end of bunch as a composite sample for different characters. The chosen hands were wrapped with newspaper and arranged in closed wooden boxes with a glass surface to achieve artificial ripening and after the fingers were ripened, the following physical and chemical characters were determined:

a) Finger weight (g.)
b) Percentages of starch, total soluble solids, total and reducing sugars and total acidity (as g malic acid /١٠٠ g pulp). (A.O.A.C., ١٩٩٥).
c) Nitrate and nitrite content (ppm) in the pulp were determined according to the procedures that outlined by Ridnour- Liza *et al.*, (٢٠٠٠).

The obtained data were statistically analyzed according to the methods of Mead *et al.*, (١٩٩٣) and the differences between various treatment means were compared using new L.S.D. test at ٥٪ .

RESULTS AND DISCUSSIONS

Effect of inorganic, organic and biofertilization on some growth characters:

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Data in Table ٢ clearly show that the three growth characters of Grandnaine banana plants were significantly affected by varying the percentages of inorganic, organic and biofertilziation.

Table ٢: Effect of inorganic, organic and biofertilization on the pseudostem height (cm.), pseudostem girth (cm.) and the leaf area (m^2) of Grandnaine banana plants during ٢٠٠٨/ ٢٠٠٩ and ٢٠٠٩/ ٢٠١٠ seasons.

Treatment	Pseudostem height (cm.)		Pseudostem girth (cm.)	
	٢٠٠٨/ ٢٠٠٩	٢٠٠٩/ ٢٠١٠	٢٠٠٨/ ٢٠٠٩	٢٠٠٩/ ٢٠١٠
١٠٠٪ inorg.	٢٠٩.٢	٢١٣.٣	٨٣.٣	٨٢.٧
٨٠٪ inorg. + ١٠٪ org. + ١٠٪ bio.	٢١١.٩	٢١٥.٠	٨٥.٢	٨٤.٠
٦٠٪ inorg. + ٢٠٪ org. + ٢٠٪ bio.	٢١٥.٠	٢١٧.٠	٨٧.٠	٨٦.٠
٤٠٪ inorg. + ٣٠٪ org. + ٣٠٪ bio.	٢٠٦.٣	٢٠٩.٢	٨١.٢	٨٨.٢
٢٠٪ inorg. + ٤٠٪ org. + ٤٠٪ bio.	٢٠٤.٦	٢٠٧.٠	٧٩.٠	٨١.٠
١٠٠ % organic (org.)	٢٠١.٣	٢٠٤.٩	٧٧.٧	٧٩.٠
١٠٠٪ biofertilization (bio)	١٩٩.٠	٢٠٢.٣	٧٦.١	٧٧.٣
New L.S.D. at ٥٪	١.٧	٢.٠	١.١	١.٠
	Leaf area (m^2)		Leaf N %	
١٠٠٪ inorg.	١.٢٧	١.٢٤	٢.٦٠	٢.٥٩
٨٠% inorg. + ١٠٪ org. + ١٠٪ bio.	١.٣٧	١.٣٥	٢.٧٠	٢.٦٩
٦٠٪ inorg. + ٢٠٪ org. + ٢٠٪ bio.	١.٥٠	١.٤٥	٢.٧٨	٢.٨١
٤٠٪ inorg. + ٣٠٪ org. + ٣٠٪ bio.	١.١٧	١.١٤	٢.٥٠	٢.٥١
٢٠٪ inorg. + ٤٠٪ org. + ٤٠٪ bio.	١.٠٧	١.٠٤	٢.٤٣	٢.٤٣
١٠٠ % organic (org.)	١.٩٧	٠.٩٤	٢.٣٧	٢.٣٧
١٠٠٪ biofertilization (bio)	٠.٨٦	٠.٨٤	٢.٢٩	٢.٣١

New L.S.D. at ٥٪	٠.١٠	٠.٠٩	٠.٠٦	٠.٠٥

Inorg. = inorganic (Ammonium sulphate , ٢٠.٦ % N)

Org. = organic (Compost , ٢ % N)

Bio. = bioform (Minia Azotene)

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Using the suitable rate of N (٣٠٠ g/ plant) through ٦٠ to ٨٠ % inorganic N plus ١٠ to ٢٠ % organic and biofertilization significantly improved these growth characters compared with using N completely via the three sources or using inorganic N at percentages lower than ٦٠٪ of the suitable N. Application of the suitable N as ١٠٠٪ inorganic form was preferable than using N completely via organic or bioforms as well as when inorganic N was added at percentages lower than ٦٠٪. The maximum values were recorded on the plants that received N as ٦٠ % inorganic + ٢٠ % organic + ٢٠ bioform. Biofertilization alone gave the minimum values. These results were true in both ٢٠٠٨/ ٢٠٠٩ and ٢٠٠٩/ ٢٠١٠ seasons.

These results are in harmony with those obtained by Gobara (٢٠٠٤) , El- Sawy (٢٠٠٥) and El- Shenawi *et al.*, (٢٠٠٨).

Effect of inorganic, organic and biofertilization on leaf chemical composition:

It is evident from Tables ٢ and ٣ that using the suitable N via ٦٠- ٨٠ % inorganic N + ١٠-٢٠ %, organic and biofertilization significantly succeeded in enhancing percentages of N in the leaf compared with using N as ١٠٠٪ inorganic, organic or bioform or using inorganic N at percentages lower than ٦٠٪. Fertilizing the plants with N via ٦٠٪ inorganic + ٢٠ organic + ٢٠ bio gave the maximum values of N in the leaf. The minimum values of N were recorded on plants received N as ١٠٠ % biofertilization. Concerning the effect of the present treatments on the percentages of P and K in the leaves revealed that using organic and biofertilizers either singly or in combined with inorganic form significantly enhanced percentages of P and K in the leaf as compared with using N completely via inorganic source (١٠٠٪ inorganic). Using the suitable N through ٦٠٪ inorganic +

٢٠ % organic + ٢٠ bioform gave the highest values. The minimum values were detected on plants fertilized with inorganic N alone. Similar trend was observed during both seasons.

The results of Kamel (٢٠٠٢); Abd El- Monaem- Eman and Radwan (٢٠٠٣); Hammam (٢٠٠٣) and Roshdy (٢٠٠٤) supported the present results.

Effect of inorganic, organic and biofertilization on weights of bunch and hand.

Data in Table ٣ clearly show that varying the proportions of N sources had significant effect on weights of bunch and hand. Using the suitable N completely via inorganic form was preferable in improving weights of bunch and hand as compared with using N completely via organic or bioforms as well as when inorganic N was added at ٢٠ to ٤٠ % of the suitable N.

Table ٣: Effect of inorganic, organic and biofertilization on the percentages of P and K in the leaves, bunch weight (kg.) and hand weight (kg.) of Grandnaine banana plants during ٢٠٠٨/ ٢٠٠٩ and ٢٠٠٩/ ٢٠١٠ seasons.

Treatment	Leaf P %		Leaf K %	
	٢٠٠٨/ ٢٠٠٩	٢٠٠٩/ ٢٠١٠	٢٠٠٨/ ٢٠٠٩	٢٠٠٩/ ٢٠١٠
١٠٠٪ **inorg.**	٠.٢٧	٠.٢٤	١.٧٠	١.٦٨
٨٠٪ **inorg.** + ١٠٪ **org.** + ١٠٪ **bio.**	٠.٤٦	٠.٤٧	٢.٢٥	٢.٢٢
٦٠٪ **inorg.** + ٢٠٪ **org.** + ٢٠٪ **bio.**	٠.٥٠	٠.٥٢	٢.٣٥	٢.٣١
٤٠٪ **inorg.** + ٣٠٪ **org.** + ٣٠٪ **bio.**	٠.٣٩	٠.٣٧	٢.٠٥	٢.٠٨
٢٠٪ **inorg.** + ٤٠٪ **org.** + ٤٠٪ **bio.**	٠.٣٦	٠.٣٤	١.٩٦	١.٩٩
١٠٠ **% organic (org.)**	٠.٣٣	٠.٣١	١.٨٨	١.٨٩
١٠٠٪ **biofertilization (bio)**	٠.٣٠	٠.٢٨	١.٨٠	١.٧٩

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New L.S.D. at ٥٪	٠.٠٢	٠.٠٢	٠.٠٦	٠.٠٧
	Bunch weight (kg.)		**Hand weight (kg.)**	
١٠٠٪ inorg.	١٦.١	١٧.٠	٢.٤١	٢.٦٠
٨٠٪ inorg. + ١٠٪ org. + ١٠٪ bio.	١٨.٩	١٩.٠	٢.٧٥	٢.٨٠
٦٠٪ inorg. + ٢٠٪ org. + ٢٠٪ bio.	٢٢.٣	٢٣.٠	٢.٩٩	٣.١٠
٤٠٪ inorg. + ٣٠٪ org. + ٣٠٪ bio.	١٤.٠	١٤.٥	٢.٢٢	٢.٤٥
٢٠٪ inorg. + ٤٠٪ org. + ٤٠٪ bio.	١٢.٠	١١.٩	٢.١٠	٢.٣٠
١٠٠ % organic (org.)	١٠.٠	٩.٩	١.٩٩	٢.١٥
١٠٠٪ biofertilization (bio)	٨.٠	٧.٧	١.٩٠	٢.٠٠
New L.S.D. at ٥٪	١.٨	٢.٠	٠.٠٩	٠.١٠

Inorg. = inorganic (Ammonium sulphate , ٢٠.٦ % N)

Org. = organic (Compost , ٢ % N)

Bio. = bioform (Minia Azotene)

There was a gradual promotion on weights of bunch and hand with decreasing the percentages of inorganic N from ١٠٠ to ٦٠ % and at the same time increasing the percentages of both organic and biofertilizers from ١٠ to ٢٠٪. Fertilizing the plants with N through ٦٠ % inorganic + ٢٠ % organic + ٢٠ % bioform effectively maximized weights of bunch (٢٢.٣ and ٢٣.٠ kg) and hand (٢.٩٩ and ٣.١٠ kg) during both seasons. The minimum values of bunch weights (٨.٠ and ٧.٧ kg) as well as hand (١.٩٠ and ٢.٠٠ kg) were recorded when the plants biofertilized only with Minia Azotene. These results were true in both seasons.

Similar results were reported by Ahmed *et al.*, (١٩٩٦); El-Shamaa (٢٠٠١), Kamel (٢٠٠٢); Ahmed *et al.*, (٢٠٠٣) and El- Sawy (٢٠٠٥).

Effect of inorganic, organic and biofertilization on some physical and chemical characters of the fruits.

Obtained data in Tables ٤ and ٥ show that varying N sources had significant effect on quality of the fruits. Using the optimum rate of N (٣٠٠ g/ plant) as ٦٠ to ٨٠ % organic plus ١٠ to ٢٠ % or bio fertilizers significantly improved fruit quality in terms of increasing finger weight, total soluble solids and reducing sugars and decreasing total acidity and starch as compared with using N completely via inorganic, organic and bio fertilizers or using inorganic N at percentages lower than ٦٠٪ even with using organic and biofertilizers.

Organic or biofertilization when each was applied alone had significant and promotive effect on fruit quality as compared with using inorganic fertilization. Unacceptable effect on fruit quality was observed when N was applied as ١٠٠٪ inorganic. Organic fertilization was favourable than biofertilization in this respect. The best results with regard to fruit quality were obtained when the plants received a program of N fertilization consisted from ٦٠٪ inorganic + ٢٠ % organic + ٢٠٪ biofertilizers. These results were true during both seasons.

These results are almost the same with those obtained by Gobara (٢٠٠٤); El Shenawi and Hassouna (٢٠٠٤) and Sayed- Shren (٢٠٠٤).

Table ٤: Effect of inorganic, organic and biofertilization on finger weight (g.) and percentages of starch, total soluble solids and reducing sugars of Grandnaine banana plants during ٢٠٠٨/ ٢٠٠٩ and ٢٠٠٩/ ٢٠١٠ seasons.

Treatment	Finger weight (g.)		Starch %	
	٢٠٠٨/	٢٠٠٩/	٢٠٠٨/	٢٠٠٩/

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	٢٠٠٩	٢٠١٠	٢٠٠٩	٢٠١٠
١٠٠٪ **inorg.**	٩٣.٨	٩٦.٢	١.٥	١.١
٨٠٪ **inorg. +** ١٠٪ **org. +** ١٠٪ **bio.**	١٢٠.٠	١٢٢.٠	١.٢	١.٠
٦٠٪ **inorg. +** ٢٠٪ **org. +** ٢٠٪ **bio.**	١٢٤.٠	١٢٥.٠	١.٠	٠.٨
٤٠٪ **inorg. +** ٣٠٪ **org. +** ٣٠٪ **bio.**	١١١.٠	١٠٧.٠	١.٨	١.٤
٢٠٪ **inorg. +** ٤٠٪ **org. +** ٤٠٪ **bio.**	١٠٥.٩	١٠٨.٠	١.٨	١.٦
١٠٠ **% organic (org.)**	١٠١.٠	١٠٤.٠	١.٨	١.٨
١٠٠٪ **biofertilization (bio)**	٩٧.٠	١٠٠.٠	٢.٠	٢.١
New L.S.D. at ٥٪	٣.٠	٢.٨	٠.٢	٠.٢
	T.S.S. %		**Reducing sugars %**	
١٠٠٪ **inorg.**	١٧.٥	١٨.٠	٦.٨	٦.٧
٨٠٪ **inorg. +** ١٠٪ **org. +** ١٠٪ **bio.**	٢٠.٤	٢٠.٠	٨.٧	٩.٠
٦٠٪ **inorg. +** ٢٠٪ **org. +** ٢٠٪ **bio.**	٢٠.٨	٢٠.٣	٩.١	٩.٣
٤٠٪ **inorg. +** ٣٠٪ **org. +** ٣٠٪ **bio.**	١٩.٥	١٩.٥	٨.٠	٨.٢
٢٠**% inorg. +** ٤٠٪ **org. +** ٤٠٪ **bio.**	١٩.١	١٩.٢	٧.٦	٧.٨
١٠٠ **% organic (org.)**	١٨.٨	١٨.٨	٧.٣	٧.٤
١٠٠٪ **biofertilization (bio)**	١٨.٣	١٨.٥	٧.٠	٧.١
New L.S.D. at ٥٪	٠.٣	٠.٣	٠.٢	٠.٢

Inorg. = inorganic (Ammonium sulphate , ٢٠.٦ % N)

Org. = organic (Compost , ٢ % N)

Bio. = bioform (Minia Azotene)

Table ٥: Effect of inorganic, organic and biofertilization on percentage of total sugars and total acidity as well as pulp content of nitrate and nitrite (ppm) of Grandnaine banana plants during ٢٠٠٨/ ٢٠٠٩ and ٢٠٠٩/ ٢٠١٠ seasons.

Treatment	Total sugars %		Total acidity %	
	٢٠٠٨/ ٢٠٠٩	٢٠٠٩/ ٢٠١٠	٢٠٠٨/ ٢٠٠٩	٢٠٠٩/ ٢٠١٠
١٠٠٪ inorg.	١٤.٥	١٤.٦	٠.٥٩٩	٠.٥٨٠
٨٠٪ inorg. + ١٠٪ org. + ١٠٪ bio.	١٧.٧	١٨.٠	٠.٤٠٠	٠.٤٤٨
٦٠٪ inorg. + ٢٠٪ org. + ٢٠٪ bio.	١٨.٤	١٨.٦	٠.٤١٨	٠.٤٢٩
٤٠٪ inorg. + ٣٠٪ org. + ٣٠٪ bio.	١٦.٨	١٧.٠	٠.٥٠٢	٠.٤٩٢
٢٠٪ inorg. + ٤٠٪ org. + ٤٠٪ bio.	١٦.١	١٦.٥	٠.٥٣٠	٠.٥١١
١٠٠ % organic (org.)	١٥.٦	١٦.٠	٠.٥٦٠	٠.٥٤٠
١٠٠٪ biofertilization (bio)	١٥.١	١٥.٢	٠.٥٩١	٠.٥٦٢
New L.S.D. at ٥٪	٠.٤	٠.٥	٠.٠٢٠	٠.٠١٨
	Nitrate (ppm)		Nitrite (ppm)	
١٠٠٪ inorg.	٧.١١	٦.٠٠	٤.٥٥	٥.٦١
٨٠٪ inorg. + ١٠٪ org. + ١٠٪ bio.	٣.٠٠	٢.٩٠	١.٤٠	٠.٤١
٦٠٪ inorg. + ٢٠٪ org. + ٢٠٪ bio.	٢.٢٥	٢.٤٠	١.٢٢	٠.٢٥
٤٠٪ inorg. + ٣٠٪ org. + ٣٠٪ bio.	٢.٠٠	٢.٠٠	١.٠٠	٠.٩٠
٢٠٪ inorg. + ٤٠٪ org. + ٤٠٪ bio.	١.٩٠	١.٦٢	٠.٤٠	٠.٨٠
١٠٠ % organic (org.)	١.٥٠	١.٤١	٠.٨٠	٠.٦٧
١٠٠٪ biofertilization (bio)	١.٣٠	١.٢٨	٠.٦٧	٠.٥١
New L.S.D. at ٥٪	٠.١٥	٠.٢٠	٠.٠٥	٠.٠٦

Effect of organic and biofertilization on Banana plants

Inorg. = inorganic (Ammonium sulphate , ٢٠.٦ % N)

Org. = organic (Compost , ٢ % N)

Bio. = bioform (Minia Azotene)

Effect of inorganic, organic and biofertilization on pulp contents of nitrate and nitrite

Varying N sources caused significant effect on nitrate and nitrite content of the pulp. Using organic and biofertilizers either singly or in combined with inorganic form significantly reduced nitrate and nitrite content compared with using N completely via inorganic form. The reduction in nitrate and nitrite was associated with decreasing inorganic and at the same time increasing both organic and biofertilizer percentages.

The minimum values of nitrate (١.٣٠ and ١.٢٨ ppm) and nitrite (٠.٦٧ and ٠.٥١ ppm) were recorded on the pulp of fingers that harvested from plants received N completely via biofertilizers in both seasons, respectively. Supplying the plants with N as ١٠٠٪ inorganic form gave the maximum values of nitrate (٧.١١ and ٦.٠٠ ppm) and nitrite (٤.٥٥ and ٥.٦١ ppm) during both seasons, respectively.

The previous positive action of organic and biofertilizers on fruiting of Grandnaine banana plants might be attributed to one or more of the following points (Nijjar, ١٩٨٥ and Kannaiyan, ٢٠٠٢).

١-They enhance soil fertility .

٢-They stimulate the availability of nutrients and N fixation.

٣-They secret various natural hormones and antibiotics.

As a conclusion, supplying Grandnaine banana plants with N at ٣٠٠ g/ plant in the form of inorganic N at ٦٠ %, organic at ٢٠٪ and bioform at ٢٠٪ is suggested to be beneficial for improving yield and fruit quality and at the same time reducing at the lower extent the pollution occurred by nitrate and nitrite in the fruit pulp.

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تأثير التسميد العضوى والحيوى كبديل جزئى للتسميد الغير عضوى على الإثـمار فى الموز الجراندنان

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خلال موسمى ٢٠٠٨/٢٠٠٩ ، ٢٠٠٩/٢٠١٠ تم تسميد نباتات الموز الجراندنان بالكمية المناسبة من النيتروجين وهى ٣٠٠ جرام للنبات على اساس ١٠٠% سماد غير عضوى ، ١٠٠ % سماد عضوى ، ١٠٠% سماد حيوى ، ٨٠% سماد غير عضوى + ١٠ % سماد عضوى + ١٠ % سماد حيوى ، ٦٠% سما غير عضوى + ٢٠ % سماد عضوى + ٢٠% سماد حيوى ، ٤٠% سماد غبر عضوى + ٣٠ % سماد عضوى + ٣٠ % سماد حيوى أو ٢٠% سماد غير عضوى + ٤٠ % سماد عضوى + ٤٠ % سماد حيوى كمحاولة لتقليل كمية السماد النيتروجينى الغير عضوى وكانت مصادر التسميد الغير عضوى والعضوى والحيوى هى سلفات الامونيوم والكمبوست والمنيا ازوتين على التوالى.

أشارت نتائج الدراسة انه بنقص النسبة المئوية من السماد النيتروجينى الغير عضوى من ١٠٠ الى ٦٠% وفى نفس الوقت زيادة النسبة المئوية لكلا من الاسمدة العضوية والحيوية من صفر الى ٢٠% من الكمية المناسبة من النيتروجين كان هناك تحسن في صفات النمو الخضرى وهى ارتفاع ومحيط الساق الكاذب ومساحة الورقة والنسب المئوية للنيتروجين والفوسفور والبوتاسيوم فى الورقة ووزن السوباطة والكف والصباع والنسبة المئوية للمواد الصلبة الذائبة الكلية والسكريات الكلية والمختزلة كما أدى الى نقص محتوى اللب من الحموضة الكلية والنشا والنترات والنيتريت وذلك بالمقارنة باستخدام النيتروجين كاملا فى اى صورة.

وكانت هناك تأثيرات غير مرغوبة عند استخدام النيتروجين فى الصورة العضوية او الحيوية بنسبة ١٠٠% كذلك ادى استخدام النيتروجين بنسبة تقل عن ٦٠% فى الصورة الغير عضوية الى تاثيرات غير مقبولة.

كان محتوى اللب من النترات والنيتريت يميل الى النقصان الواضح عند استخدام النيترجين فى الصورة العضوية او الحيوية فقط أو عند استخدام المصادر الثلاثة معاً وذلك بالمقارنة باستخدام النيتروجين كاملا فى الصورة الغير عضوية.

لآجل انتاج ثمار عضوية من الموز الجراندنان بالاضافة الى تحسين كمية المحصول كما ونوعا فانه يكون من المفضل تسميد نباتات الموز الجراندنان بمعدل ٣٠٠ جرام نيتروجين للنبات على اساس ٦٠ % سماد غير عضوى + ٢٠% سماد عضوى + ٢٠% سماد حيوى.