SELECTING THE OPTIMUM AMOUNT OF ORGANIC, MINERAL AND BIOFERTILIZERS RESPONSIBLE FOR MAXIMIZING THE PRODUCTIVITY OF BALADY GUAVA TREES

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ABSTRACT

The effect of supplying Balady guava trees with N at 400 g/tree from mineral source, filter cake mud and Bio Azotene in various percentages on leaf area, total chlorophylls, total carbohydrates, percentages of N, P, K and Mg, yield and fruit quality was studied during 2004 and 2005 seasons. Nitrogen at the fixed rate namely 400 g/tree was applied either completely from mineral (ammonium sulphate), filter cake mud (2% N) and Bio Azotene sources or in various proportions of each.

Results showed that combined application with N through mineral, filter cake mud and Bio Azotene was effective in improving leaf area, total chlorophylls, total carbohydrates, percentages of N, P, K and Mg in the leaves, yield and fruit quality compared to using each source lower than 50% out of the recommended N. Application of N completely via organic or biofertilizer form caused a reduction in the above-mentioned traits compared to using N completely via mineral source. Application of Bio Azotene alone was favourable than using filter cake mud in this connection.

Generally, fertilizing Balady guava trees with N at 400 g/tree in the form of 972 g ammonium sulphate + 5.0 kg filter cake mud + 12.5g Bio Azotene/ tree gave satisfactory promoted yield and fruit quality of guava trees.

Key words: Guava trees, mineral fertilization, ammonium sulphate, Organic fertilization filter cake mud and Biofertilization (Bio Azotene).

INTRODUCTION

Application of organic and biofertilizers in guava orchards is a production system largely excludes the use of chemical fertilizers. Using organic or biofertilizers is accompanied with producing organic fruits and juice. Any effort aimed to produce higher yield and improve fruit quality of guava will be appreciated.

Optimization of N fertilization and application with suitable amount of organic and biofertilizers, was accompanied with stimulating growth and nutritional status of the trees **(Giglinejsvil and Maladze, 1968; Subba-Rao, 1989; Jones and Parker, 1989; Bayhob, 1990; Subba-Rao *et al*., 1993 and Mansour and Ahmed, 1993)**. The beneficial effect of these fertilizers on growth and nutritional status was extended to enhance production **Ahmed *et al*., 1995a and 1995b; Author and Ferguson, 1995; Wani and Lee, 1995; Boutrous *et al*., 1995a and 1995b; El-Sayed, 1996; Author *et al*., 1996; Author and Upadhyaya, 1996 and Upadhyaya, 1996)**. Combined application mineral and bio fertilization recorded the best results of citrus fruit quality and yield rather than using each alone **(Author *et al*., 1997; Ouyang and Ouyang, 1998; Tachibana and Yohata, 1998; El-Kobbia, 1999; Author *et al*., 1999; Obreza and Ozores, 2000 and Ebrahiem and Mohamed, 2000)**. It is worth to mention that adjusting the amount of these fertilizers was beneficial for improving production of citrus and other fruit crops **(Kannaiyan, 2002; Fouad – Amera *et al*., 2002; Abo El-Komsan and Ebrahiem, 2002a and 2002b; Ebrahiem *et al*., 2002; Mohamed and Gobara, 2004, Shaarawy, 2005 and Mansour *et al*., 2005)**.

This study aimed to examine the effect of mineral, organic and biofertilizers on growth and fruiting of guava trees as well as to select the best combination of these three fertilizers responsible for obtaining an economical yield and good fruit quality.

MATERIALS AND METHODS

This study was conducted during 2004 and 2005 seasons on 48 uniform in vigour 15 years old selected Balady guava trees in a private orchard situated at Girga district, Sohag Governorate, Egypt, where the soil is sandy and well drained with a water table not less than 2 meters deep. Tree spacing was 5 × 5 m apart.

Soil analysis was carried out according to **Chapman and Pratt (1962)** and the obtained data are shown in Table (1).

Table (1): Analysis of the tested soil.

Constituents	Values
Sand %	85.00
Silt %	5.00
Clay %	10.00
Texture grade	Sandy
PH (1:2.5 extract)	8.00
E.C (mmhos / cm / 25 ^{o}C)	1.70
O.M. %	0.33
Total $CaCO_3$ %	2.00
Total N %	0.02
Available K (PPm)	150.00
Total P % available P (PPm)	3.7

The applied treatments in this study were:

1. Application recommended rate of N (R.R.) (i.e., 400g/ tree) completely via mineral source, i.e., 1944 g ammonium sulphate (A.S.) (20.6 % N).
2. Application with R.R. completely via organic source (filter cake mud at 20 Kg /tree).
3. Application with R.R. completely via Bio fertilizer (Bio Azotene at 50 g/ tree).
4. Application with 75% R.R. via mineral source (1458 g A.S. / tree) + 5.0 kg filter cake mud.
5. Application with 75% R.R. via mineral source (1458 g A.S./tree) + 12.5g Bio Azotene /tree.
6. Application with 75% R.R. via mineral source (1458 g A.S./tree) + 2.5 kg filter cake mud /tree) + 6.25 g Bio Azotene /tree.
7. Application with 50% R.R. via mineral source (972g A.S./ tree) + 10 kg filter cake mud / tree).
8. Application with 50% R.R. via mineral source (972g A.S./tree) + 25g Bio Azotene /tree .
9. Application with 50% R.R. via mineral source (972g A.S./tree) + 5 kg filter cake mud / tree + 12.5 g Bio Azotene /tree.

10. Application with 25% R.R. via mineral source (486g A.S./tree) + 15 kg filter cake mud / tree .
11. Application with 25% R.R. via mineral source (486 g A.S./tree) + 37.5 g Bio Azotene /tree.
12. Application with 25% R.R. via mineral source (486 g A.S./tree) + 7.5 kg filter cake mud /tree + 18.75 g Bio Azotene /tree.

Each treatment was replicated four times, two trees per each using. completely randomized block design. All the experimental trees received the recommended rate of N (R.R.) namely 400 g/tree according to **Mofyah (2002).** The sources of mineral, organic and biofertilizers are ammonium sulphate (20.6% N), Filter cack mud (2.0% N) and Bio Azotene, respectively. filter cake mud is an organic fertilizer locally produced as by-product of sugar cane Manufacture. It contains about 2.0% N and other nutrients. Bio Azotene is a commercial biofertilizer locally produced by Soil and Water Research Institute, Agricultural Research center. It contains the live cells of symmetric Azotobacter species which is capable to N_2 fixation about 10: 15 Kg in feddan/ annum.

Table (2): Analysis of the filter cake mud according to Chapman and Pratt (1962).

Constituents	**PH**	**EC**	**OM%**	**C/N ratio %**	**Total N%**	**Total P_2o_5 %**	**Total K_2O %**
Values	6.2	6.51	56.5	20.12	2.3	2.51	0.31

A random sample consist of 10 gm from filter cake mud was taken and oven dried at 70ºC till constant weight then the chemical composition were determined according to **Chapman and Pratt (1962)** and the obtained data are shown in Table (2)**.**

Bio Azotene was mixed with moist sand and added to the soil holes around the trunk of each tree and was directly irrigated after covering the holes with soil. Ammonium sulphate was added at three equal batches in the first weeks of feb., April and June. Filter cake mud and bio Azotene were added once at the first week of Jan. and another at the first week of March, respectively. All horticultural practices except N fertilization were followed as usual.

Twenty Mature leaves aged five months and situated about 1.5 meters high from the ground were taken randomly from the trees of each replicate to measure their area (cm^2) according to **Ahmed and Morsy (1999)** and to determine their content of total carbohydrates percentage (according to **Smith *et al.,* 1956)** and percentages of N, P, K and Mg on dry weight basis (according to **Wilde *et al.,* 1985)**. Total chlorophylls as mg/100 g fresh weight of leaves was also determined according to methods outlined in **A.O.A.C. (1985)**.

Yield was harvested and determined as kg/ tree at the second week of August in both seasons. twenty fruits/tree were taken randomly to determine the average fruit weight (g), dimensions of fruit height and diameter in cm, of total soluble solids %, total and reducing sugars % and total acidity in fruit juice (expressed as g citric acid/100 ml juice) according to **A.O.A.C. (1985)**. Ascorbic acid content as mg/100 ml juice was also determined using 2,6-dichlorophenol endophenol **(A.O.A.C., 1985)**.

All The obtained data were tabulated and statistically analysed according to Gomez and Gomez (1984) using New L.S.D. test at 5 % level.

RESULTS AND DISCUSSION

1. Leaf area :

Data in Table (3) clearly show that application of the recommended rate of N (R.R.), i.e., 400 g N/tree through the different combinations of the three rowces, namely, mineral (ammonium sulphate), organic (filter cake mud) and biofertilizer (Bio-Azotene) significantly improved the leaf area than application of N compellation of the three sources of N alone.

However, application of the R.R. of N in the form of Bio-Azotene was better than that of filter cake mud alone. Application of the Bio Azotene fertilizer with the mineral source surpassed the application of filter cake mud with mineral source. The promotion on the leaf area was associated with decreasing the percentage of mineral source till 50 % and increasing the amount of Bio Azotene and filter cake mud. Reducing the percentage of mineral source from 50 to 25% of the R.R. significantly decreased the leaf area compared to using the higher percentage of mineral N with the other two sources. The maximum values (96.9 and 105.0 cm^2) of leaf area in both seasons were recorded from trees received the R.R. of N through 50 % mineral (972 g A.S.) + 5.0 kg filter cake mud + 12.5 g Bio Azotene / tree. Fertilizing the trees with R.R. of N completely via organic source (20 kg filter cake mud /tree) produced the minimum values (71.1 and 74.5 cm^2) in both seasons. These results are in agreement with those obtained by **Ahmed *et al*., (1995a), El-Sayed (1996), Ebrahiem and Mohamed (2000), Shaarawy (2005) and Mansour *et al*., (2005).**

2. Leaf chemical compositions :

It is obvious from the Tables (3 & 4) that total carbohydrates and total chlorophylls as well as percentages of N, P. K and Mg in the leaves were significantly higher in all Balady guava trees received the R.R. of N via any of the different combinations comparing with each source alone. Completely application of the R.R. via organic (filter mud) or bio sources (Bio Azotene) caused significant reduction in all chemical composition parameters compared to all other treatments. However, application of Bio Azotene alone had higher values rather than application of filter cake mud only. Stimulating effects of these nutrients were associated with the decrease in the percentage of mineral source till 50% and increasing the amount of Bio Azotene and filter cake mud. The values tended to reduce significantly with decreasing the percentage of mineral N source to 25% of the R.R. even with the higher amounts of organic and biofertilizers. The highest values were detected by trees received the R.R. of N via 972 g A.S. + 5.0 kg filter cake mud + 12.5 g Bio Azotene / tree. The minimum values were detected in the trees fertilized with N completely via filter cake mud at 20 kg/ tree. The present results are in harmony with those presented by **Fouad *et al*., (2002), Ebrahiem *et al*., (2002), Mansour *et al*., (2005) and Shaarawy (2005).**

3. Yield / tree:

Data in Table (4) clearly show that the yield/tree of Balady guava trees was significantly improved by fertilizing the trees with N at R.R. through 50-75% mineral source beside filter mud and Bio Azotene comparing with each source alone. Application of R.R of N completely via Bio Azotene at 50 g / tree was better than filter cake mud in this respect.

Table (3): Effects of mineral, organic and biofertilization on leaf area, leaf total carbohydrates, leaf total chlorophylls and leaf N% of Balady guava trees during 2004 and 2005 seasons.

Mineral, organic and biofertilization treatments	Leaf area (cm^2)		Leaf total carbohydrates	
	2004	2005	2004	2005
1944 g of A.S / tree	76.2	81.1	15.8	15.9
20 kg F.M / tree	71.1	74.5	14.9	15.0
50 g B.A. / tree	73.0	76.6	15.3	15.4
1458 g A.S. + 5.0 kg F.M/tree	79.0	92.2	17.1	18.4
1458 g A.S + 12.5g B.A/tree	82.3	95.0	17.4	18.8
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A./tree	86.3	97.5	17.8	19.3
972 g of A.S. + 10.0 kg F.M/tree	90.0	99.0	18.1	19.5
972 g of A.S + 25.0 g B.A/tree	93.5	102.0	18.4	20.0
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	96.9	105.0	18.7	20.4
486 g A.S + 15.0 kg F.M/tree	78.5	84.0	16.2	16.3
486 g of A.S + 37.5 g B.A/tree	79.9	86.0	16.5	16.6
486 g of A.S + 7.5 kg F.M + 18.75 g B.A/tree	80.9	89.2	17.6	16.9
New L.S.D at 5 %	1.1	1.2	0.3	0.3
-	**Leaf total chlorophylls**		**Leaf N %**	
1944 g of A.S / tree	2.3	2.4	1.29	1.26
20 kg F.M / tree	1.9	1.8	1.21	1.18
50 g B.A / tree	2.1	2.1	1.25	1.21
1458 g of A.S + 5.0 kg F.M / tree	4.1	4.4	1.48	1.41
1458 g of A.S + 12.5 g B.A / tree	4.4	4.7	1.52	1.46
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A/tree	4.8	4.9	1.55	1.52
972 g of A.S + 10.0 kg F.M / tree	5.1	5.2	1.60	1.59
972 g of A.S + 25.0 g B.A / tree	5.4	5.4	1.66	1.62
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	5.5	5.7	1.66	1.66
486 g of A.S + 15.0 kg F.M/tree	2.5	2.7	1.35	1.30
486 g of A.S + 37.5 g B.A/tree	2.8	3.0	1.40	1.33
486 of A.S + 7.5 kg F.M + 18.75 g B.A/tree	3.1	3.3	1.43	1.34
New L.S.D at 5 %	0.2	0.2	0.03	0.03

A.S. = Ammonium sulphate
B.A. = Bio Azotene
F.M. = filter cake mud

Decreasing the percentage of mineral source from 100 to 50% with increasing the amount of both filter cake mud and Bio Azotene was significantly accompanied by improving the yield. In this respect, Bio Azotene plus mineral source was favourable than filter cake mud alone in increasing the yield. Significant reduction in yield was recorded as a result of decreasing the percentage of mineral N source from 50 to 25% of the R.R. even under application of organic or biofertilizers. Fertilizing the trees with the R.R. of N 50% mineral source (972 g A.S./tree) + 5.0 kg filter mud + 12.5g Bio Azotene/ tree was considered to be the most promising treatment responsible for producing an economical yield. Under such promising treatment, yield per tree reached 86.0 and 79.0 Kg in both seasons, respectively. The minimum yield (50.0 and 50.5 Kg/tree) in the two seasons, respectively were recorded from trees received the R.R. completely via filter cake mud (organic form) at a rate of 20 Kg/tree. These results go in line with those obtained by **Upadhyaya (1996), El-Kobbia (1999), Fouad *et al*., (2002), Ebrahiem *et al*., (2002) and Mansour *et al*., (2005).**

Table (4): Effects of mineral, organic and biofertilization on percentages of P, K and Mg and the yield / tree (kg) of Balady guava trees during 2004 and 2005 seasons.

Mineral, organic and biofertilization treatments	Leaf P%		Leaf K%	
	2004	2005	2004	2005
1944 g of A.S / tree	0.11	0.09	1.08	0.05
20 kg F.M / tree	0.07	0.07	1.02	1.00
50 g B.A. / tree	0.09	0.09	1.05	1.02
1458 g A.S. + 5.0 kg F.M/tree	0.21	0.19	1.23	1.22
1458 g A.S + 12.5g B.A/tree	0.24	0.22	1.27	1.25
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A./tree	0.27	0.25	1.32	1.28
972 g of A.S. + 10.0 kg F.M/tree	0.27	0.28	1.31	1.32
972 A.S + 25.0 g B.A/tree	0.30	0.31	1.36	1.36
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	0.33	0.34	1.41	1.43
486 g A.S + 15.0 kg F.M/tree	0.14	0.12	1.12	1.09
486 g of A.S + 37.5 g B.A/tree	0.17	0.14	1.16	1.14
486 g of A.S + 7.5 kg F.M + 18.75 g B.A/tree	0.19	0.17	1.19	1.18
New L.S.D at 5 %	0.02	0.02	0.03	0.03
	Leaf Mg %		**Yield / tree (Kg)**	
1944 g of A.S / tree	0.25	0.21	60.0	55.8
20 kg F.M / tree	0.21	0.17	50.0	50.5
50 g B.A / tree	0.23	0.19	53.0	52.0
1458 g of A.S + 5.0 kg F.M / tree	0.38	0.38	71.5	66.0
1458 g of A.S + 12.5 g B.A / tree	0.41	0.42	73.0	69.0
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A/tree	0.44	0.47	75.6	71.5
972 g of A.S + 10.0 kg F.M / tree	0.49	0.52	77.0	73.0
972 g of A.S + 25.0 g B.A / tree	0.55	0.60	81.0	76.0
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	0.60	0.66	86.0	79.0
486 g of A.S + 15.0 kg F.M/tree	0.28	0.25	62.0	59.0
486 g of A.S + 37.5 g B.A/tree	0.31	0.29	65.0	61.5
486 of A.S + 7.5 kg F.M + 18.75 g B.A/tree	0.35	0.33	68.0	64.0
New L.S.D at 5 %	0.02	0.03	1.8	1.9

A.S. = Ammonium sulphate B.A. = Bio Azotene F.M. = filter cake mud

4. Fruit quality :

Data presented in Tables (5 & 6) show clearly that application of R.R. (400 gN/ tree) via the combination of the three sources significantly improved fruit quality in terms of increasing fruit weight and dimensions, total soluble solids %, total and reducing sugars % and ascorbic acid content and in decreasing total acidity % comparing with the use of N completely via any source. Completely application of mineral source was preferable in enhancing physical fruit quality rather than using organic or biofertilizer source. Supplying N via Bio Azotene alone was beneficial in improving fruit quality rather than using filter cake mud alone. The promotion on fruit quality was associated with decreasing the percentage of mineral source from 100 to 25% along with organic and biofertilizers. The best results with regard to fruit quality were obtained by fertilizing Balady guava trees with N at 400 g/tree via 486.0 g ammonium sulphate + 7.5 kg filter cake mud + 18.75 g Bio Azotene/tree. In most cases unacceptable fruit quality was recorded from trees received N in the mineral form only in both studied seasons.

Table (5): Effects of mineral, organic and biofertilization on some physical and chemical characters of Balady guava trees during 2004 and 2005 seasons.

Mineral, organic and biofertilization treatments	Fruit weight (g)		Fruit hight (Cm)	
	2004	2005	2004	2005
1944 g of A.S / tree	94.0	92.0	5.3	5.4
20 kg F.M / tree	70.1	66.5	5.0	4.9
50 g B.A. / tree	82.0	80.0	5.2	5.2
1458 g A.S. + 5.0 kg F.M/tree	106.0	107.0	6.2	6.2
1458 g A.S + 12.5g B.A/tree	108.0	111.0	6.4	6.4
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A./tree	109.0	113.0	6.6	6.6
972 g of A.S. + 10.0 kg F.M/tree	109.0	108.0	6.8	6.4
972 A.S + 25.0 g B.A/tree	110.0	112.0	7.1	6.6
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	112.0	115.0	7.3	6.9
486 g A.S + 15.0 kg F.M/tree	105.0	106.0	5.5	5.6
486 g of A.S + 37.5 g B.A/tree	108.0	107.0	5.7	5.8
486 g of A.S + 7.5 kg F.M + 18.75 g B.A/tree	109.0	110.0	5.9	6.0
New L.S.D at 5 %	11.0	12.0	0.2	0.2
	Fruit diameter (Cm)		**T.S.S %**	
1944 g of A.S / tree	4.8	4.7	9.1	9.3
20 kg F.M / tree	4.4	4.2	9.5	9.6
50 g B.A / tree	4.6	4.4	9.7	9.9
1458 g of A.S + 5.0 kg F.M / tree	5.6	5.6	10.0	10.1
1458 g of A.S + 12.5 g B.A / tree	5.8	5.8	10.3	10.3
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A/tree	6.0	6.0	10.6	10.5
972 g of A.S + 10.0 kg F.M / tree	6.2	6.4	10.9	10.9
972 g of A.S + 25.0 g B.A / tree	6.4	6.0	11.3	11.3
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	6.6	6.2	11.6	11.6
486 g of A.S + 15.0 kg F.M/tree	5.0	5.0	11.9	11.9
486 g of A.S + 37.5 g B.A/tree	5.2	5.2	12.2	12.2
486 of A.S + 7.5 kg F.M + 18.75 g B.A/tree	5.4	5.5	12.8	12.7
New L.S.D at 5 %	0.2	0.2	0.2	0.2

A.S. = Ammonium sulphate B.A. = Bio Azotene F.M. = filter cake mud

Similar findings were obtained by **El-Sayed (1996), Abo El-Komsan and Ebraheim (2002b), Ebrahiem *et al*., (2002), Mohamed and Gobara (2004), Shaarawy (2005) and Mansour *et al*., (2005).**

The beneficial effects of organic and biofertilizers on stimulating the microflora populations, activity of enzymes, natural hormones and availability of nutrients could explain their positive action on growth and fruiting of the trees. The beneficial effects of these biofertilizers in enhancing the biological fixation of N and soil fertility considered another factor **(Nijjar, 1985 and Kannaiyan, 2002).**

As a conclusion, it is recommended use N at 400 g/ tree through 972 g ammonium sulphate + 5.0 kg filter cake mud + 12.5 g Bio Azotene / tree to obtain an economical yield of Balady guava trees with better fruit quality,

Table (6): Effects of mineral, organic and biofertilization on some chemical characters of Balady guava trees during 2004 and 2005 seasons.

Mineral, organic and biofertilization treatments	Total sugar %		Reducing suger %	
	2004	2005	2004	2005
1944 g of A.S / tree	7.1	7.2	5.5	5.3
20 kg F.M / tree	7.3	7.4	5.7	5.5
50 g B.A. / tree	7.9	7.9	5.9	5.7
1458 g A.S. + 5.0 kg F.M/tree	8.3	8.2	6.1	5.9
1458 g A.S + 12.5g B.A/tree	8.7	8.5	6.3	6.1
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A./tree	9.2	8.9	6.6	6.4
972 g of A.S. + 10.0 kg F.M/tree	9.9	9.3	6.9	6.6
972 A.S + 25.0 g B.A/tree	10.5	9.6	7.1	6.9
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	11.0	9.9	7.3	7.1
486 g A.S + 15.0 kg F.M/tree	11.4	10.9	7.6	7.4
486 g of A.S + 37.5 g B.A/tree	11.6	11.3	7.8	7.6
486 g of A.S + 7.5 kg F.M + 18.75 g B.A/tree	11.9	11.6	8.1	7.8
New L.S.D at 5 %	0.2	0.2	0.2	0.2
	Total acidity %		**Vitamin C (mg /100ml juice)**	
1944 g of A.S / tree	0.791	0.794	66.9	68.0
20 kg F.M / tree	0.768	0.774	69.2	70.1
50 g B.A / tree	0.740	0.750	71.3	71.5
1458 g of A.S + 5.0 kg F.M / tree	0.718	0.727	74.0	73.2
1458 g of A.S + 12.5 g B.A / tree	0.692	0.701	78.0	78.0
1458 g of A.S + 2.5 kg F.M + 6.25 g B.A/tree	0.671	0.670	81.0	82.0
972 g of A.S + 10.0 kg F.M / tree	0.650	0.648	84.0	83.5
972 g of A.S + 25.0 g B.A / tree	0.630	0.625	86.0	88.0
972 g of A.S + 5 kg F.M + 12.5 g B.A/tree	0.610	0.601	90.0	90.0
486 g of A.S + 15.0 kg F.M/tree	0.581	0.570	91.6	92.0
486 g of A.S + 37.5 g B.A/tree	0.559	0.548	94.0	94.9
486 of A.S + 7.5 kg F.M + 18.75 g B.A/tree	0.530	0.528	96.0	95.5
New L.S.D at 5 %	0.021	0.020	1.0	1.1

A.S. = Ammonium sulphate B.A. = Bio Azotene F.M. = filter cake mud

REFERENCES

Abo El-Komsan, E.A. and Ebrahiem, T.A. (2002a): Integrated nutrient management for Valencia orange trees grown on Troyer citrange and sour orange 1- Behaviour of growth, flowering, fruit setting and nutritional status of trees. Proc. Minia 1st Conf. for Agric. and Environ. Sci., Minia, Egypt. March 22 (2): 2177-2198.

Abo El-Komsan, E.A. and Ebrahiem, T.A. (2002b): Integrated nutrient management for Valencia orange trees grown on Troyer citrange and sour orange. 2- Yield and fruit quality. Proc Minia 1st Conf. for Agric. and Environ. Sci. Minia Egypt. March 22 (2): 2199-2211.

Ahmed, F.F. and Morsy, M. H. (1999): A new method for measuring leaf area in different fruit species. Minia J. of Agric. Res. and Develop. 19:97-105.

Ahmed, F.F.; El-Sayed, M.A.; Eshbah, H.M. and Abd El-Moumen, M.R. (1995a): Physiological studies on the effect of some insect pollination and fertilization with phosphorus and magnesium on Balady mandarin trees (*Citrus reticulata Blanco*). 2- The effect on leaf area and its chemical composition, flowering, fruit set and preharvest fruit dropping. J. Agric. Sci. Mansoura Univ. 20 (4): 1713-1729.

Ahmed, F.F.; El-Sayed, M.A.; Elshbah, H.M. and Abd El-Moumen, M. R. (1995b): Physiological studies on the effect of some insect pollination and fertilization with phosphorus and magnesium on Balady mandarin trees (*Citrus reticulata Blanco*). 3- The effect on yield and fruit quality. J. Agric. Sci. Mansoura Univ. 20 (4): 1730-1744.

Association of Official Agricultural Chemists (1985): Official Methods of Analysis **(A.O.A.C.)** 12th ed. Benjamin Farnklin Station, Washington, D.C. U.S.A., pp. 490- 510.

Author, S. and Ferguson, J.J. (1995): Growth and yield of bearing and non-bearing citrus trees fertilized with fresh and processed chicken manure. Proceedings of Florida State, Hort. Soc. 107: 29-32.

Author, S. and Upadhyaya, R. C. (1996): Response of mandarin (*Citrus reticulata*) to manure and fertilizer in Sikkin. J. of Hill Research, 9 (1): 135-138.

Author, S. and Wang, G.C. (1998): Experiment of fertilizing for Satsuma mandarin. South China Fruits, 27: 221.

Author, S. and Azhankiamavalan, R. S.; Thangara, T. and Muthumanickam, D. (1996): Studies on the superphosphate enriched FYM on yield and quality of mandarin in Shevroy. South Indian Hort. 44 (5/6): 124-127.

Author, S.; Chen, Y.H.; Wang, J.R. and Wang, Z.M. (1999): Cultured techniques for obtaining early high production of 4 late orange cultivars. South China Fruits, 28(1): 10-11.

Author, S.; Zhang, Q.G.; Zhang, J. and Zhang, J.S. (1997): Effect of complex mineral fertilizers on the improvement of citrus production and fruit quality. China Fruits, 4: 52.

Author, S.; Zhang, Q.G.; Zhang, J. and Zhang, J.S. (1997): Effect of complex mineral fertilizers on the improvement of citrus production and fruit quality. China Fruits, 4:52.

Boutrous, B.N.; El-Shamaa, M.S. and Saad, R.N. (1995a): Field application of vesciular var. mycorrhizal fungi and element sulphur to reduce calcareous soil problem, for lime orchard. Egypt. J. Appl. Sci. 10(1): 153-164.

Boutrous, B.N.; El-Shamaa, M.S.; El-Barki, S. and Saad, R.N. (1995b): Improvement of growth and nutritional status of lime grown in calcareous soil. Egypt Appl Sci., 10(5): 858-870.

Byra-Reddy, M.S.; Krishna, N.L.; Basker, V. and Bagyaraj, D.J. (1994): Status of mycorrhizal association in some tropical tree species. J. Soil Biol. Ecol. 14: 51-57.

Chapman, H.D. and Pratt, P.E. (1962): Methods of Analysis for Soils, Plant and Water. Calif. Univ. Division of Agric. Sci. pp. 10-25.

Ebrahiem, T.A. and Mohamed, G.A. (2000): Response of Balady mandarin trees growing on sandy soil to application of filter mud and Farmyard manure. Assiut. J. of Agric. Sci. 31(5): 55-69.

Ebrahiem, T.A.; Abo-El-Komsan, E.E. and Saad-Allah, M.H. (2002): Effect of the different levels of nitrogen and potassium on growth, yield and fruit quality of Balady lime trees (*Citrus auratifolia Swingle*). Minia J. of Agric. Res. and Develop. 22(4): 465-482.

El-Kobbia, A.M. (1999): Response of Washington Navel orange to organic fertilizer Biohumus and cattle manure application. Alex. J. of Agric. Res. 44 (2): 199-207.

El-Sayed, A.I. (1996): Response of some fruit seedlings to soil inoculation with mycorrhizal fungi. M. Sc. Thesis Fac. Agric. Moshtohor, Zagazig. Univ.

Fouad, A.A,, A.; Khalil-Fekrya, H.; Mansour, A.E.M. and Shaaban, E.A. (2002): Studies on the effect of organic nitrogen and / or mineral nitrogen, phosphorus and potassium fertilizers on the yield and fruit quality of Washington Navel orange trees. Proc. Minia 1st Conf. For Agric. & Environ. Sci. Minia, Egypt. Mar. 25-78 Vol. 22 No. 4 1797-1800.

Giglinejsvil, P.L. and Maladze, Z.E. (1968): The effect of various forms of organic fertilizers on yield and quality of mandarin fruit. Hort. Sci. 38(3): 6405.

Gomez, K.A. and Gomez, A.A. (1984): Statistical Procedures for Agriculture Research. John Wiley and Sons, New York. pp. 20-40.

Jones, W.W and Parker, E.R. (1989): Effect of N, P and K fertilizers and organic materials on composition of Navel orange juice. Proc. Amer. Soc. Hort. Sci. 253: 91-102.

Kannaiyan, S. (2002): Biotechnology of Biofertilizers. Alpha Sci. Inter. Ltd P.O. Box 4067 Pangbourne AG8 Bull, M.K pp. 1-375.

Mansour, A.E.M and Ahmed, F.F. (1993): The beneficial effects of some organic fertilizers for Balady mandarins (*Citrus reticulate Blanco*). Minia First Conf. for Hort. Crops, 1355-1360.

Mansour, A.E.M.; Ahmed, F.F. and Mohamed, A.Y. (2005): Effect of bio and organic source of N as partial substitute for mineral fertilizer on fruiting of Sewy date palms. Egypt J. Agric. Res. 2(2): 611-630.

Mayhob, M.A. (1990): Effect of nitrogen fertilization on vegetative growth characters, yield and quality of Balady mandarins. PhD Thesis Fac. Agric., Minia Univ., Egypt.

Moftah, R.T. (2002): Physiological studies on fertilization of Balady guava. M.Sc. Thesis Fac. Agric., Minia Univ., Egypt.

Mohamed, G.A. and Gobara, A.A. (2004): Response of Sewy date palms grown under new valley conditions to organic, bio and mineral fertilization. Minia J. of Agric. Res. & Develop. 24(3): 397-414.

Nijjar, F.S. (1985): Nutrition of Fruit Trees. Mrs Usha Raji, Kumar, Kalyani, New Delhi India, pp. 10-20.

Obreza, T.A. and Ozores, H.M. (2000): Management of organic amendments in Florida citrus production system 59th Annual Meeting of the Soil Crop. Sci. Soc. of Florida Sarasota U.S.A. 22-24 Sept. Soil and Crop Sci. Soc. of Florida 59: 22-27.

Orphanos, P.I.; Krentos, V.D. and Loizides, P.A. (1986): Effect of N, P and K fertilizing and sheep manure on yield and quality of Valencia orange. Miscellaneous reports, Agric. Res. Institute. Cyprus. N. 28, pp. 11.

Ouyang, G. and Ouyang, G.S. (1998): Experiment of fertilizing for Satsuma mandarin. South China Fruits, 27: 2, 21.

Shaarawy, A.M.A. (2005): Response of Balady lime trees to organic and biofertilization. Minia J. of Agric. Res. & Develop. 25(1): 1-18.

Smith, F.; Gilles, A.; Hamitone, J.K. and Godess, P.A. (1956): Colorimetric methods for determination of sugars and related substances. Anal. Chem. 28: 325-328.

Subba-Rao, N.S. (1989): Biofertilizers in Agriculture. Oxford & IBH Company, New Delhi. pp. 1-786.

Subba-Rao, N.S.; Venkateraman, G.S. and Kannaiyan, S. (1993): Biological Nitrogen Fixation. Indian Council Agric. Res. New Delhi, p. 112.

Tachibana, S. and Yohata, S. (1998): Effect of organic matter and nitrogen fertilizer applications on fruit quality of Satsuma mandarin in a high density planting. J. of Japanese Soc. for Hort. Sci. 7 (5): 671-676.

Upadhyaya, R.C. (1996): Response of mandarin (*Citrus reticulata*) to manure and fertilizer in Sikkin. J. of Hill Research, 9 (1): 135-138.

Wani, S.P. and Lee, K.K. (1995): Microorganisms as biological inputs for sustainable agriculture. In Organic Agriculture, Theory and Practices. (Ed.) P.K. Thampan, Peekay Tree crops development Foundation, Gandhi Nagar-Cochin 682-220, pp. 36-76.

Wilde, S.A.; Corey, R.B.; Layer, J.G. and Voigt, G.K. (1985): Soils and Plant Analysis for Tree Culture. 3rd Ed. Oxford and IBH publishing Co., New Delhi, India, 529-546.

تحديد الجرعة المناسبة من الأسمدة المعدنية النيتروجينية والحيوية والعضوية اللازمة لتعظيم إنتاجية أشجار الجوافة البلدي

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تم دراسة تأثير تسميد أشجار الجوافة البلدية بالنيتروجين بمعدل ٤٠٠ جرام للشجرة في صوره (سلفات النشادر) ومصدر عضوي (طينة المرشحات) ومصدر حيوي (بيو ازوتين أو بكتريا الازوتوباكتر) بنسب مختلفة علي مساحة الورقة، الكلوروفيل الكلي، الكربوهيدرات الكلية، النسب المئوية للنيتروجين، الفوسفور، البوتاسيوم، الماغنسيوم في الاوراق، والمحصول وخصائص الجودة للثمار وذلك خلال موسمي ٢٠٠٤ و ٢٠٠٥. ولقد تم إضافة النيتروجين (٤٠٠ جرام) للشجرة إما كلية من خلال مصدر معدني (سلفات النشادر)، طين المرشحات (٢% نيتروجين تقريبا) أو بيوآزوتين أو بنسب مختلفة من هذه المصادر.

ولقد أشارت نتائج الدراسة إلى أن الاستخدام المشترك للسماد النيتروجيني في الصورة المعدنية مع سماد طينة المرشحات والبيوآزوتين كان فعالا في تحسين مساحة الورقة والكلوروفيل الكلي والكربوهيدرات الكلية والنسب المئوية للنيتروجين والفوسفور والبوتاسيوم والماغنسيوم في الأوراق، والمحصول وخصائص الجودة للثمار وذلك بالمقارنة باستخدام كل مصدر بمفرده . وكان هناك نقص في الصفات تحت الدراسة عند استخدام المصدر المعدني بنسبة أقل من ٥٠% من الكمية الموصى بها من النيتروجين. وكان استخدام المصدر

العضوي أو المصدر الحيوي بمفرده قد أدى إلى نقص في هذه الصفات مقارنـة باستخدام المصدر المعدني فقط ولقد تفوق استخدام المصدر الحيوي مقارنة باستخدام المصدر العضوي في هذا الشأن.

ومن بيانات التجربة يمكن التوصية بتسميد أشجار الجوافة البلدي المثمرة بالنيتروجين بمعدل ٤٠٠ جرام للشجرة في صورة سلفات النشادر (٩٧٢ جم) + ٥ كجم طين المرشحات + ١٢.٥ جرام بيوأزوتين لكل شجرة حيث أدي ذلك إلي الحصول علي افضل النتائج الخاصة بكمية المحصول وجودة الثمار.