RESPONSE OF EGYPTIAN MANDARIN TREES TO DIFFERENT NITROGEN FERTILIZATION SOURCES UNDER KALUBIA GOVERNORATE CONDITIONS.

Journal

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J. Biol. Chem. Environ. Sci., 2009, Vol. 4(3): 1-20
www.acepsag.org

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ABSTRACT

This trial was carried out during the two successive seasons (2005 and 2006) on 25 years old Egyptian Mandarin trees budded on sour oronge rootstock grown in loamy soil. The trees were fertilized with nitrogen at 1000 g/tree in different organic sources (cattle, chicken and compost) alone or enriched with biofertilizer application. Fruit set %, fruit drop %, yield / tree, fruit quality and leaf mineral content were determined in both seasons. The obtained results showed that fertilizing trees with mineral and organic N sources accompanied with biofertilizer or organic source as chicken or cattle manure at 75 % with biofirtilizer as well as 100 % without biofirtilizer significantly increased fruit set, yield as number of fruits and weight Kg/ tree , fruit quality and leaf mineral content. So, it seems that yield and fruit quality of Egyptian Mandarin trees could be improved by fertilizing with 75% mineral (N) 3.6kg ammonium sulfate +25% (N) organic fertilization 14.5 kg cattel manure+ 0.5 kg biofirtilizer as micropen, or 75 % as chicken or cattle manure + 0.5 kg micropen.

Key words: Mineral, Organic, Biofertilizer, Egyptian Mandarin, Fruit quality and leaf mineral content.

INTRODUCTION

Application of organic fertilizers in citrus orchard is a production system avoids or largely excludes the use of synthetic chemical fertilizers. It depends on using recycled animal manure and arm residues to produce compost for enhancing biological cycles, improving soil fertility and avoiding all forms of pollution that may result from conventional agricultural techniques.The use of organic materials as nitrogen source is being considered the best management practice for nitrogen management because organic N is released to the plant more gradually than water soluble inorganic N fertilizer (Nijjar, 1985). Biofertilizer 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).

It has been reported that growth, yield and fruit quality of citrus were greatly improved by the application of organic N fertilizers aside from mineral N forms (Ouyang & Ouyang 1998; Ebrahiem & Mohamed, 2000; Obreza & Ozores, 2000, Fouad-Amera *et al*. 2002 and Gamal & Ragab, 2003).

The objective of this study was to demonstrate the effect of different organic fertilization sources on fruit set %, fruit drop %, yield, fruit quality and leaf mineral content.

MATERIALS AND METHODS

This study was initiated during 2005 and 2006 seasons on 25 years old Egyptian mandarin trees (*Citrus reticulata, L.*) budded on sour orange rootstock (*Citrus aurantium, L.*) and planted at 5 x 5 meters under basin irrigation system. The selected trees were at the "off" year, going to "on"year bearing in 2004 and 2005 seasons. The trees are grown in a private orchard located at El-Kalubia Governorate Egypt. The texture of the tested soil is loam. Physical and chemical properties of the soil at a level of (0.0- 30 cm) and (30-60 cm) were determined according to Wilde *et al*., (1985) and data are shown in Table (1).

Table 1: Physical and chemical analysis of experimental soil.

Physical analysis								
Soil depth	Sand %	Silt %	Clay %	Texture	pH	EC(ds/m)	CaCo3 %	Organic matter %
0 – 30 cm	10.8	44	45.2	loam	8.4	0.5	1.2	1.6
30 – 60 cm	12.8	44	43..2	loam	8..4	0.4	2	1.1
Chemical analysis								
Soil depth	N%	P%	K %	Ca %	Mg %	Fe (ppm)	Zn (ppm)	Mn(ppm)
0 – 30 cm	0.13	0.6	0.9	4.2	1.1	7.8	3.4	3.2
30 – 60 cm	0.10	0.6	0.6	3.4	0.9	5.5	2.4	1.8

The recommended level of N fertilization by Ministry of Agriculture is 1000 g N / tree / year in both organic and mineral forms as100% rate.

The experiment included the following nine treatments:

1- Control (75% mineral N + 25 % N (cattle manure source)).

2- 100 % N (cattle manure source).

3- 100 % N (chicken manure source).

4- 100 % N (compost source).

5- 75 % N (cattle manure) + micropen at 0.5 kg/tree.

6- 75 % N (chicken manure) + micropen at 0.5 kg/tree.

7- 75 % N (compost) + micropen at 0.5 kg/tree.

8- 75 % mineral N + 25% N (cattle manure) + micropen at 0.5 kg/tree.

9- 56.2 % mineral N +18.8 % N (cattle manure) + micropen at 0.5 kg/tree.

The experiment was set in a randomized complete block design with three replicates and two trees per each.

The analyses of organic fertilizers were used as cattle manure, chicken manure and compost El –Neel are shown in table (2).

The biofertilizer micropen was produced by the General Organization for Agriculture Equilization Food (GOAEF), Ministry of Agriculture Egypt. based on 0.5 kg / tree peatmos mixed with soil holes around the trunk of the tree and was directly irrigated after covering the holes with soil.

Table 2: Compositional analysis of Cattle manure, Chicken manure and compost El-Neel.

Character	Cattle manure		Chicken manure		Compost El-Neel	
	First season	Second season	First season	Second season	First season	Second season
pH	8.5	9	10.2	8.8	7.6	7.5
EC (ds / m)	12	8.6	16.1	6.8	3.2	5.2
CaCO3 %	3.2	4	17.5	15	5	4
Organic matter %	31.5	25	28.5	27.1	47	30
N %	1.72	1.60	1.30	1.40	1.60	1.42
P %	0.7	0.6	1.1	0.5	0.2	0.4
K%	1.3	1.5	2.2	1.8	0.7	1.1
Ca %	4.4	4.5	3.8	4	3.9	4
Mg %	0.5	0.4	0.6	0.7	0.5	0.8
Fe ppm	25.8	47.6	78.5	77	47	45
Zn ppm	6.3	4.9	83.2	25.3	84.7	80
Mn ppm	11.1	32.2	32.6	28.4	32.2	30

Each of different organic manure sources were added in the first week of January and mineral nitrogen as ammonium sulphate (20.6 % N) was added at three equal batches in the first week of March, May and August. All horticultural practices were carried out as usual.

Fruit set and fruit drop were estimated as follows.

$$\text{Fruit set (\%)} = \frac{\text{No. of fruitlets}}{\text{No. of flowers}} \times 100$$

$$\text{Fruit drop (\%)} = \frac{\text{No. of dropped fruits}}{\text{No. of initial set fruitlets}} \times 100$$

Fifty mature leaves, seven months old from non fruiting and non flushing shoots in the spring growth cycle were selected according to Nijjar (1985) and taken at random in the 1st week of September. The leaf content of N, P, K, Ca, Mg, Zn, Fe and Mn on dry weight basis were determind according to Jones & Embleton (1969).

Leaf samples were dried and ground them digested using sulphoric acid and oxygen peroxide according to Jackson, (1958).

Total nitrogen was determined by modified MicroKjeldahl procedure according to Pregl (1945). P (%) was estimated as described by Chapman & Pratt, (1961).K (%) Flamephotometerically determined according to Brown & Lilleland, (1946). Ca (%), Mg (%), Fe, Zn and Mn (ppm) were determined by using Perkin Elmer Atomic absorption spectrophotometer Model 305 B (Piper, 1958).

At harvest time, color break under the experimental conditions (the mid of December for both seasons), the yield expressed in weight (Kg) and number of fruits per tree was recorded then a random sample of fruits (20 fruits from each tree) was picked to determine the some physical and chemical properties as average Fruit weight (g), Fruit volume(ml), Fruit height (cm), Fruit diameter (cm), pulp weight (g), peel weight (g),Juice volume(ml) and Juice %, Then in the juice ,S.S.C %, titratable acidity % , SSC/ acid ratio and L. ascorbic acid were determined according to the methods outlined in A.O.A. C. (1985).

All the obtained data were statistically analysed according to Snedecor & Cochran, (1980). The means were separated by Duncan's multiple range test Duncan, (1955).

RESULTS AND DISCUSSION

1-Effect on fruit set and fruit retention percentages

As shown in Table (3&4) different studied treatments failed to affect initial fruit set in the first season, where it ranged betwen 80 – 90% .In general percentage of retained fruits decreased sharply in the first two dates as well as the last two dates. This is clearly shown in most of the studied treatments. Such findings is due to June drop in the first intervals (15/5 & 1/6) and to the preharvest drop in the last intervals (1/12 & 15/ 12).

As for the second season (2006) data revealed that trees fertilized with 100 % N in the compost form achieved the significantly lowest initial fruit set %. Other studied treatments did not different significantly.

Percentage of retained fruits at biweekly intervals during the second season behaved as shown in the first one.

These results are reconciled with those obtaned by Lohar *et al*, (1996), Abou Sayed-Ahmed (1997),El-Kobbia (1999),Tawfiek & Gamal(2000)and Abd El-Naby*et al* (2004).

Table 3: Effect of different nitrogen fertilization sources on initial fruit set and retained fruit% of Egyptian mandarin in 2005 season.

Treatments	Initial fruit set%	% of retained fruit														
	1/5	15/5	1/6	15/6	1/7	15/7	1/8	15/8	1/9	15/9	1/10	15/10	1/11	15/11	1/12	15/12
Controll 75% mineral (N) +25% (N) cattle manure	80.4a	30.5a	16.4a	15.4a	15.4a	15.4a	15.4a	15.4a	11.2a	12.8a	8.5a	8.5a	8.5a	6.0 a	4.2a	1.9a
100%(N) cattle manure	87.0a	26.6a	14.4a	14.4a	14.4a	14.4a	14.4a	14.4a	12.8a	12.1a	9.2a	10.1a	10.7a	6.0a	4.5a	1.8a
100 %(N) chicken manure	88.1a	19.1a	7.9a	7.2a	7.2a	7.2a	7.2a	7.2a	7.2a	6.2a	5.2a	5.2a	5.2a	3.9a	3.2a	2.3a
100 % (N) compost	89.6a	24.0a	7.2a	6.8a	6.8a	6.8a	6.8a	6.8a	6.6a	5.7a	4.3a	4.3a	4.3a	4.0a	2.9a	1.9a
75 % (N) cattle manure + micropen	87.7a	18.0a	7.6a	7.2a	7.2a	6.4a	6.4a	6.4a	6.1a	5.4a	4.2a	3.2a	3.2a	2.8a	2.6a	1.5a
75 % (N) chicken manure + micropen	88.9a	34.8a	7.0a	6.9a	6.9a	6.9a	6.9a	6.9a	6.9a	6.6a	5.6a	5.6a	5.6a	5.4a	5.5a	1.8a
75 % (N) compost + micropen	90.8a	21.2a	8.0a	7.7a	7.7a	7.7a	7.7a	7.7a	7.0a	6.6a	5.7a	3.1a	3.1a	3.1a	3.1a	3.1a
control + micropen	90.7a	20.5a	7.4a	7.0a	7.0a	7.0a	7.0a	7.0a	6.4a	5.7a	5.0a	5.0a	5.0a	5.0a	4.2a	4.2a
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	88.0a	20.9a	8.4a	7.5a	7.5a	7.5a	7.5a	7.5a	7.1a	6.2a	6.3a	6.3a	6.3a	5.3a	45a	3.2a

Means having the same letter(s) within a column are not significantly different at 5 % level.

Table 4: Effect of different nitrogen fertilization sources on initial fruit set and retained fruit% of Egyptian mandarin in 2006 season.

Treatments	Initial fruit set%	% of retained fruit														
	1/5	15/5	1/6	15/6	1/7	15/7	1/8	15/8	1/9	15/9	1/10	15/10	1/11	15/11	1/12	15/12
Control 75% mineral (N) +25% (N) cattle manure	81.6ab	29.2a	14.5 a	13.8a	13.8a	13.8a	13.8a	13.0a	11.9a	13.9a	8.8a	8.4a	8.4a	6.0a	4.4a	1.5ab
100%(N) cattle manure	83.8ab	21.2a	13.0 a	13.0a	13.0a	13.0a	13.0a	13.0a	10.3a	9.6a	7.1a	7.1a	7.0a	5.7a	3.7a	1.4ab
100 %(N) chicken manure	88.4a	21.4a	9.6a	9.0a	9.0a	9.0a	8.7a	8.7a	7.3a	6.4a	6.3a	6.1a	6.1a	5.0a	2.8a	1.3ab
100 % (N) compost	71.4b	17.2a	6.0a	6.0a	6.0a	6.0a	6.0a	6.0a	5.6a	4.5a	3.5a	3.5a	3.5a	3.2a	2.0a	1.4ab
75 % (N) cattle manure + micropen	86.1a	19.8a	7.2a	7.2a	7.2a	7.2a	7.0a	7.0a	7.0a	6.3a	6.1a	6.1a	6.1a	4.3a	2.9a	1.0ab
75 % (N) chicken manure + micropen	85.6a	29.5a	6.3a	6.3a	6.3a	6.3a	6.3a	6.3a	6.3a	6.1a	5.7a	5.4a	5.4a	5.1a	4.7a	1.6ab
75 % (N) compost + micropen	85.9a	23.1a	8.4a	7.2a	7.2a	7.2a	6.9a	6.9a	6.7a	6.3a	6.1a	3.8a	3.8a	3.0a	2.5a	1.3ab
control + micropen	86.4a	17.9a	6.9a	6.9a	6.9a	6.9a	6.7a	6.7a	6.5a	5.8a	6.0a	5.7a	5.7a	4.2a	3a	3a
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	88.3a	23.4a	9.1a	8.2a	8.2a	8.2a	8.2a	8.2a	7.2a	6.0a	5.6a	5.6a	5.3a	4.1a	3.2a	1.4ab

Means having the same letter(s) within a column are not significantly different at 5 % level .

2- Effect on fruit drop.

Tables (5 and 6) illustrate the effect of different studied N ferlilization treatments on fruit drop % at biweakly intervals begining with May 15th until Dec 15th in both seasons. In general no siganificant differences were detected between the studied treatments in both seasons and all over the considered intervals.

Meanwhile, the percentage of fruit drop increased steadily from May 15th up to Dec. 15th but one can notice two peaks of fruit drop whears the first one which refered to june drop and the second one was in Sept 1st and extended to Dec 15th which refered to the preharvest fruit drop.

June drop mainly due to the unfavourable weather conditions especially high temperature and low relative humiditily in addition to wind velocity (Lohar *et al*, 1996; Tawfiek & Gamal, 2000 ;Saleem *et al*, 2005 and Zaied *et al*, 2006).

Preharvest fruit drop in mainly due to the decrease in the endogenous hormones level especially auxins and gibberalens (Abd El-moneim *et al*, 2007 and Nawaz *et al*, 2008).

3-Effect on yield:

Results presented in Table (7) indicated that using micropen with the trees received organic and mineral nitrogen at 100 % then 75% from the recommended rate of N for trees gave the highest fruit number and yield. The minimum values 51-53 Kg / tree which recorded with using 75 %N Cattle manure + micropen in the first season and 100% compost in the second one without any differences between them.

The beneficial effects of optimum rate of organic manures and also micropen enhancing growth and nutrition status of the trees was reflected improving growth.

Similar results were obtained by Giglinejsvil & Maladze (1968) and Gamal & Ragab (2003) who Found that supplying Balady mandarin trees growing in sandy soil with 750 g N/ tree in the form of 1,82 Kg ammonium sulphate and 52 Kg farmyard manure was necessary for maximizing yield and improving fruit quality for mandarin.

These results were in line with those reported by Ebrahiem & Mohamed (2000), Helail *et al* (2003 b) who found that poultry manure

Table 5: Effect of different nitrogen fertilization sources on fruit drop %of Egyptian mandarin during 2005 season

Treatments	Fruit drop %														
	15/5	1/6	15/6	1/7	15/7	1/8	15/8	1/9	15/9	1/10	15/10	1/11	15/11	1/12	15/12
Control 75% mineral (N) +25% (N) cattle manure	61.1a	79.2a	80.5a	80.5a	80.5a	80.5a	80.5a	85.7a	85.7a	89.2a	89.2a	89.2a	92.3a	94.6a	97.6a
100%(N) cattle manure	69.3a	83.3a	83.3a	83.3a	83.3a	83.3a	83.3a	85.2a	85.2a	88.3a	88.3a	88.3a	93.0a	94.8a	97.8a
100 %(N) chicken manure	78.2a	90.9a	91.7a	91.7a	91.7a	91.7a	91.7a	91.7a	91.7a	94.0a	94.0a	94.0a	95.5a	96.3a	97.3a
100 % (N) compost	72.5a	91.6a	92.2a	92.2a	92.2a	92.2a	92.2a	92.3a	92.3a	95.0a	95.0a	95.0a	95.4a	96.6a	97.8a
75 % (N) cattle manure + micropen	79.4a	90a	91a	91a	92.6a	92.6a	92.6a	92.9a	92.9a	95.1a	96.2a	96.2a	96.7a	96.9a	98.2a
75 % (N) chicken manure + micropen	61.0a	92.1a	92.3a	92.3a	92.4a	92.3a	92.3a	92.3a	92.3a	93.7a	93.7a	93.7a	93.9a	94.3a	97.6a
75 % (N) compost + micropen	76.4a	91.1a	91.4a	91.4a	91.4a	91.4a	91.4a	92.2a	92.2a	93.5a	96.5a	96.5a	96.5a	96.5a	96.5a
control + micropen	77.4a	91.6a	92.1a	92.1a	92.1a	92.1a	92.1a	92.8a	92.8a	94.3a	94.3a	94.3a	94.3a	94.5a	95.1a
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	76.3a	90.3a	91.3a	91.a	91.3a	91.3a	91.3a	91.8a	91.8a	92.7a	92.7a	93.9a	93.9a	94.8a	96.2a

Means having the same letter(s) within a column are not significantly different at 5 % level.

Table 6: Effect of different nitrogen fertilization sources on fruit drop % of Egyptian mandarin during 2006 season

Treatments	Fruit drop %														
	15/5	1/6	15/6	1/7	15/7	1/8	15/8	1/9	15/9	1/10	15/10	1/11	15/11	1/12	15/12
Control 75% mineral (N) +25% (N) cattle manure	63.9a	82.0a	82.9a	82.9a	82.9a	82.9a	83.2a	85.2a	85.5a	89.0a	89.6a	89.6a	91.8a	94.5a	98.2ab
100%(N) cattle manure	74.1a	84.0a	84.0a	84.0a	84.0a	84.0a	84.0a	87.3a	87.3a	91.2a	91.2a	91.4a	92.8a	95.4a	98.1ab
100 %(N) chicken manure	75.6a	89.0a	89.7a	89.7a	90.0a	90.0a	90.0a	91.6a	91.6a	92.7a	92.9a	92.9a	94.0a	96.7a	97.8bc
100 % (N) compost	74.5a	91.7a	91.7a	91.7a	91.7a	91.7a	91.7a	92.4a	92.4a	95.2a	95.2a	95.2a	96.2a	97.2a	98.0ab
75 % (N) cattle manure + micropen	76.8a	91.5a	91.5a	91.5a	91.7a	91.7a	91.7a	91.7a	91.7a	92.8a	92.8a	92.8a	94.6a	96.5a	97.8bc
75 % (N) chicken manure + micropen	65.4a	92.5a	92.5a	92.5a	92.5a	92.5a	92.5a	92.5a	92.5a	93.2a	93.6a	93.6a	93.6a	94.4a	98.0ab
75% (N) compost + micropen	72.9a	90.1a	91.6a	91.6a	92.0a	92.0a	92.0a	92.2a	92.2a	92.8a	95.5a	95.5a	95.1a	97.0a	98.4ab
control + micropen	78.9a	91.9a	91.9a	91.9a	92.1a	92.1a	92.1a	92.4a	92.4a	92.9a	93.3a	93.3a	94.0a	96.5a	97.3c
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	74.7a	90.0a	91.0a	91.0a	91.0a	91.0a	91.0a	92.3a	92.3a	93.9a	93.9a	94.1a	95.3a	96.3a	98.5a

Means having the same letter(s) within a column are not significantly different at 5 % level .

proved to be the most efficient manure sources in enhancing tree fruiting for mandarin and Washington navel orange trees respectively.

Table7: Effect of different nitrogen fertilization sources on yield of Egyptian mandarin trees during 2005 & 2006 seasons.

Treatments	Number of fruits / tree		Yield(Kg) / tree	
	2005	2006	2005	2006
Control 75% mineral (N) +25% (N) cattle manure	536bc	671ab	62bc	69b
100%(N) cattle manure	591bc	425f	64b	57de
100%(N) organic (chicken manure)	601b	499def	59bc	59cd
100%(N) organic (compost)	635b	473ef	64b	51e
75% (N) cattle manure + micropen	476c	590bcd	53c	65bc
75%(N) chicken manure + micropen	588bc	495def	64b	57de
75%(N) compost + micropen	551bc	545bcd	54c	60cd
control + micropen	806a	751a	82a	92a
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	518bc	633bc	67b	72b

Means having the same letter(s) within a column in each season are not significantly different at 5 % level

4-Effect on some physical properties:

Results mentioned in Table (8) indicated that weight, volume, dimeter of fruit also as well as peel weight and juice % were signficantly affected by different organic fertilization sources in the two seasons and no particular trend was observed in the two seasons .However, the highst values for most physical proparties were obtained by trees received 100 % or 75 % as organic manure without or with micropen but no differences between them or the control. These results are agree in with those obtained by Azhakiamanavalan *et al*, (1996), Abd El-Naby *et al* (2004); Abd El-Migeed *et al* (2007) and Mansour & Shaaban (2007).

Table 8: Effect of different nitrogen fertilization sources on some physical properties of Egyptian mandarin fruits during 2005 & 2006 seasons

Treatments	Fruit weight (g)		Fruit volume (ml)		Fruit height (cm)		Fruit diameter (cm)		Pulp weight (g)		Peel weight (g)		Juice volume (ml)		Juice (%)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Control 75% mineral (N) +25% (N) cattle manure	117.3ab	105.0b	148.0ab	129.3b	3.4cd	3.5b	5.0ab	5.1b	76.8ab	65.0a	40.5ab	40.0ab	38.6a	28.8a	26.1ab	22.2a
100%(N) cattle manure	111.2ab	135.5a	146.6ab	203.3a	4.5a	5.0a	5.5a	6.7a	70.5ab	85.4a	40.7ab	50.1a	33.8a	26.3a	23.0b	12.9c
100 %(N) chicken manure	100.0b	120.5ab	126.0b	174.0ab	3.6bcd	6.0a	5.1ab	7.0a	64.0b	72.8a	36.0b	47.7ab	33.4a	24.4a	26.5ab	14.0bc
100 % (N) compost	100.8b	108.9b	129.3b	142.0b	3.5bcd	5.8a	5.1ab	6.8a	65.4b	66.2a	35.4b	43.0ab	33.4a	27.2a	25.8ab	19.1ab
75 % (N) cattle manure + micropen	112.2ab	111.4ab	142.6b	144.7b	3.7bc	5.2a	5.2ab	6.8a	74.6ab	72.8a	37.6b	38.6b	36.5a	29.3a	25.6ab	20.2ab
75 % (N) chicken manure + micropen	110.4ab	117.2ab	140.0b	171.7ab	3.4cd	5.6a	5.1ab	7.0a	72.4ab	72.2a	38.0b	45.0ab	37.3a	24.6a	26.6ab	14.3bc
75% (N) compost + micropen	98.1b	111.4ab	126.0b	156.0ab	3.0d	4.9a	4.7b	6.5a	62.2b	69.0a	35.9b	42.4ab	35.1a	26.8a	27.8ab	17.2abc
control + micropen	129.6a	124.0ab	172.0a	180.0ab	4.0ab	6.1a	5.5a	7.2a	83.4a	75.8a	46.2a	50.6a	41.3a	25.4a	24.0ab	14.1bc
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	102.4b	117.0ab	133.6b	169.3ab	3.7bc	5.8a	5.2ab	7.1a	64.4b	71.4a	38.0b	45.6ab	39.3a	27.6a	29.4a	16.3abc

Means having the same letter(s) within a column in each season are not significantly different at 5 % level .

5-Effect on some chemical properties:

S.S.C. % (table 9) was affected significantly by different studied treatments in both seasons and raised from season to season. However , the highst value was obtained by trees received 75 % N as cattle manure + micropen followed in decreasing order by 100 % N as chicken manure without any significant between them in the first season but the lowest significant value was trees received 75 % N as organic and mineral with micropen . In the secand season, the lowest significant value was obtained by 75 % N as organic and mineral with micropen than any other treatment except 75 % N as chicken manure + micropen.

Table 9: Effect of different nitrogen fertilization sources on some chemical properties of Egyptian mandarin fruits during 2005 & 2006 seasons.

Treatments	Soluble Solids Content (%)		Titratable acidity (%)		SSC/ acid ratio		L.ascorbic acid (mg\100ml juice)	
	2005	2006	2005	2006	2005	2006	2005	2006
Control 75% mineral (N) +25% (N) cattle manure	11.0b	11.4a	0.9b	0.8bc	11.8abc	13.2abc	40.6abc	42.3b
100%(N) cattle manure	11.1b	11.4a	0.9b	0.9bc	11.5c	12.6abc	39.6bc	38.6cd
100%(N) (chicken manure)	11.2ab	11.6a	1.6a	1.9a	6.9d	6.0d	43.3a	42.3b
100%(N) (compost)	11.0b	11.2a	0.9b	1.0b	11.8bc	11.2c	42.6a	44.3a
75% (N) cattle manure + micropen	11.5a	11.7a	0.9b	0.8bc	12.3abc	14.1abc	39.6bc	39.6c
75%(N) chicken manure + micropen	11.1b	11.1ab	0.9b	0.9bc	11.5c	12.3bc	35.3d	37.0e
75%(N) compost + micropen	11.1b	11.2a	0.8bc	0.7c	13.4ab	15.3a	38.0cd	38.0de
control + micropen	11.1b	11.4a	0.9b	0.8bc	12.3abc	14.3ab	42.0ab	43.0ab
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	10.5c	10.4b	0.7c	0.8bc	13.8a	13.0bc	36.3d	34.3f

Means having the same letter(s) within a column in each season are not significantly different at 5 % level

Regarding titratable acidity, the highest significant value was obtained by treatment with 100 % N as chicken manure in both seasons than any other treatments whears the least value for acidity was obtained by treatment with 75 % N from recommended rate and treatment with 75 % compost + micropen in the first and second seasons , respectively .

Regarding SSC / acid ratio, the highest significant values were obtained with cattle manure and mineral plus micropen in the first season and treatment with 75 % compost plus micropen in the second one.

Regarding L. Ascorbic acid, treatment with 100 % N as chicken or compost and control plus micropen gave the highest significant value in the first season but trees received 100 % compost gave the highst significant value of L ascorbic in the secand one. On the other hand, the least significant value was obtained by 75 % N as cattle and mineral plus micropen in both seasons. These results coincide well with those obtained by Azhakiamanavalan *et al* (1996), Ebrahiem & Mohamed (2000), Abd El-Naby *et al* (2004), Abd El-Migeed *et al* (2007) and Mansour & Shaaban (2007) and they reported that the best results with regard to yield and fruit quality of balady mandarin trees grown in a sandy soil were obtained with the use of filter mud at a rate of 120 g N tree (6.0 kg) tree to be added via any mineral N source For mandarin and Washington Navel orange, respectively.

6- Effect on leaf mineral content:

Results presented in Table 10 indicated that all treatments significantly affected on leaf mineral content in both seasons. The highest values for nitrogen and phosphorus content were obtained by trees wich received with mineral and organic or 75 % cattle manure with micropen and ranged between 2.6 – 2.8 or 2.4 – 2.5 for N and 0.14 – 0.15 or o.12 – 0.13 for P in both seasons without any differences between them in the first season only .

Potassium, calcium and iron content in leaves were the optimum rang in all treatments according to Jones & Embleton, (1969) and ranged between 0.8 – 1.9 % , 4.1 – 5.8 % and 83 – 133 ppm for K , Ca and Fe , respectively . However, the least values were obtained by treatments 100 % chicken manure, 75 % compost + micropen and 75 % N for recommended rate at mineral and organic for K , Ca , and Fe , respectively.

On the other hand, all treatments showed more or less similar values for Mg, Zn and Mn to the optimum level and the ranged between 0.17 – 0.34 % Mg, 21 – 32 ppm Zn and 15 – 33 ppm Mn in both seasons .In general , the highest values were obtained by trees

Table 10 : Effect of different nitrogen fertilization sources on leaf mineral content of Egyptian mandarin during 2005 & 2006 seasons.

Treatments	N %		P %		K %		Ca %		Mg %		Fe ppm		Zn ppm		Mn ppm	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Control 75%mineral (N) +25% (N) cattle manure	2.4abc	2.3cd	0.14ab	0.14a	1.9a	1.9a	5.5cd	5.8a	0.25dc	0.29ab	121.0a	133.0a	25.7ab	31.9a	32.5a	32.9a
100%(N) cattle manure	2.1cd	2.1e	0.11bc	0.10c	1.2b	1.2c	5.1e	5.4b	0.32a	0.28b	96.3b	100.0b	23.9b	27.6b	27.6b	24.9bc
100%(N)chicken manure	2.3bcd	2.3c	0.14ab	0.11c	0.8c	1.0d	5.6bc	5.1c	0.22fe	0.28b	95.3b	90.3cd	25.2ab	28.1b	26.9bc	25.6bc
100% (N) *compost*	2.1cd	2.1e	0.11bc	0.11c	1.0bc	1.0d	5.7ab	5.2c	0.23de	0.25b	91.0c	93.0c	20.3d	25.3c	24.0d	24.2bc
75%(N) cattle manure + micropen	2.5ab	2.4b	0.12abc	0.13b	1.0bc	1.0d	5.3e	5.2c	0.20f	0.19c	89.0c	90.0cd	22.3c	24.8c	25.8c	22.0c
75 % (N) *chicken manure* + micropen	2.1cd	2.1e	0.10c	0.10c	1.0bc	1.0d	5.1e	5.1c	0.30b	0.17c	83.6d	85.3e	22.1c	27.7b	26.0c	29.8ab
75 % (N) *compost + micropen*	2.1cd	2.1e	0.11bc	0.14a	1.0bc	1.0d	4.1f	5.1c	0.27c	0.25b	85.0d	86.6de	15.1e	23.8c	23.7d	14.5d
control + micropen	2.6a	2.8a	0.15a	0.14a	1.9a	1.9a	5.8a	5.8a	0.27c	0.19c	123.0a	133.0a	26.2a	32.4a	31.5a	31.4a
18.8% (N) cattle manure + 56.2 % mineral (N)+ micropen	2.1cd	2.2d	0.12abc	0.12b	1.6a	1.6b	5.5d	5.2c	0.18g	0.34a	83.3d	84.0e	20.8cd	24.3c	24.3d	21.3c
*Optimum levels**	*2.4-2.6*		*0.12-0.16*		*0.7-1.09*		3-5.5		*0.26-0.6*		*60-120 ppm*		25-100		25-200	

* **Leaf analysis standard according to Jones & Embleton (1969).**

Means having the same letter(s) within a column in each season are not significantly different at 5 % level.

received mineral and organic fertilization with or without biofirtilizer followed in decreasing order ckicken manure at 100 % or 75 % + biofertilizer .

The important role of organic manures especially when applied at the optimum level increasing the availability of nutrients through reducing soil pH as well as the reduction in loss of nutrients through drainage water this could explain the present results.

Gamal & Ragab (2003) reported that combined application of N in all inorganic and organic ratios was considerably very effective in stimulating the leaf area N, P, K, Zn, Fe and Mn in leaves of balady mandarin. Similar results reported by Giglinejsvil & maladze (1968), Wassel *et al* (2000),He *et al* (2000), Helail *et al* (2003a) and Abd El-Naby *et al* (2004) for mandarin and Washington Navel orange tree respectively.

REFERENCES

Abd El-Migeed, M. M. M.; M. M. S. Saleh and E. A. M. Mostafa (2007). The beneficial effect of minimizing mineral fertilization on Washington Navel orange trees by using organic and biofertilizers. World Journal of Agricultural Sciences 3 (1) : 80 – 85.

Abd El-Moneim, E.A.A.;M.M.M Abd El-Migeed and O.M.M.Ismail (2007): GA3 and zinc sprays for improving yield and fruit quality of Washington Navel orange trees growen under sandy soil conditions.Res.Jagric.&Biol.Sci,3(5):498-503.

Abd El-Naby, S. K. M.; E. E. A. A. Abd El-Moneim and A. S. E. Abd-Alla (2004). Effect of source and date of organic manure applicatioin on growth, yield, fruit quality and mineral content of Washington Navel orange trees grown in sandy soil. Minufiya J. Agric. Res., 2 (29) : 515 – 540.

Abou Sayed-Ahmed, T. A. (1997). Growth and fruiting of Baladi mandarin trees in relation to some soil fertilization treatments in sandy soil. 2- Leaf and root response to the applied treatments. Zagazig J. Agric. Res., 24 (6) : 1049 – 1063.

A.O.A.C. (1985). Association of Official Agricultural Chemists. Official methods of analysis 15 th ed. Published by A.O.A.C. Washington, D. C., USA.

Azhakiamanavalan, R. S.; T. Thangaraj and D. Muthumanicham (1996): Studies on the superphosphate enriched FYM on yield and quality of mandarin sheoroys. South Indian Hort. 44: 5-6, 124 - 127.

Brown, J. D. and D. Lilleland (1946). Rapid determination of potassium and sodium in plant material and soil extract by flame photometer. Proc. Amer. Soc. Hort. Sci. Vol. (48) : 331 - 346.

Chapman, H.D. and P.E. Pratt (1961). Methods of Analysis for Soil, Plant and Water. Davis Agric. Sci. Pull Office Calif. Univ. 220 - 308.

Duncan, D. B. (1955). Multiple ranges and multiple tests. Biometrics, 11: 1 - 42.

Ebrahiem T. A. and G.A. Mohamed (2000): Response of Baladi mandarin trees growing on sandy soil to application of filter mud on farmyard manure.Assuit, J. of Agri. Sci. 2000. 31. 5.55-69.

El-Kobbia, A. M. (1999): Response of Washington Navel orange to organic fertilizer biohomus and cattle manure application. Alexandria Journal of Agicultural Research, 44 (2) : 199 – 207 .

Fouad- Amera; A.E.M Mansour and E. A. Shaabn (2002): Studies on the effect of organic nitrogen, phosphorous and potassium fertilizers on the yield and fruit quality of Washington Navel orange trees. Proc minia 1st conf. for arric. & envirn. Sci, Minia, Egypt, March 25-28, 2002 pp- 1799 -1806.

Gamal, A. M. and M. A. Ragab. (2003): Effect of organic manure source its rate on growth, nutritional status of the tree and productivity of Balady mandarin trees. Assuit J. of Agri. Sci. Vol. 34, No.6. pp.253-264.

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

He,Z.L.;A.K.Alva;D.V.Calvert;Y.C.Li;P.J.Stoffella and D.J.Banks (2000):Nutrient availability and changes in microbial biomass of organic amendments during field inclubation compost.Sci.and utilization,8:4,2,3.302(c.f CAB Abst.2002-0115).

Helail, B. M.; Y. N. Gobran and M. H. Moustafa (2003 a): Study on the effect of organic manure source, method of organic manure application and biofertilizers on 1- Tree growth and leaf mineral content of Washington Navel orange trees. Egypt. J. Appl. Sci., 18 (4A) : 270 – 296.

Helail, B. M.; Y. N. Gobran and M. H. Moustafa (2003 b): Study on the effect of organic manure source, method of organic manure application and biofertilizers on 2- Fruiting and fruit quality of Washington Navel orange trees. Egypt. J. Appl. Sci., 18 (4A) : 297 – 320.

Jakson, M. L. (1958). Soil chemical Analysis, Constable.Ltd. Co, London.pp.498.

Jones,w.w., and T.w. Embleton (1969) : Development and current status of citrus leaf analysis as guide to fertilization in california . Proceeding first international citrus symposium , Vol . 3:1669 – 1671

Lohar, D. P.; K. Budahok; and P.P. Sudebi (1996): Orchard soil moisture conservation and fruit drop studies in mandarin orange (Citrus ret: culata Blanco) during 1993/94. Working papurlunide regional Agri.; Research center. 1995, No. 95 -62, 30 pp.

Mansour,A.E.M and E.A.Shaaban (2007) : Effect of different sources of mineral N applied with organic and biofertilizers on fruiting of Washington Navel orange trees.j.of Applied Sci. Resarch,3(8):764-769.

Nawaz,M.A.;W.Ahmed;S.Ahmed and M.Mumtazkhan (2008):Role of growth regulators on preharvest fruit drop, yield and quality in Kinnow mandarin. Pak.J.Bot. 40 (5):1971-1981.

Nijjar,G.S.(1985):Nutrition of fruit trees Mrs.usha Raji Kumar, Kilyany, new Delhi, India pp.10-20.

Obreza, T.A. and Ozores , M. H.(2000). Management of organic amendments in Florida citrus production systems, Fifty-Ninth Annual meeting of the soil and Crop Sci. Soc. Of Florida, Sarasota, Florida, USA, 22-24 Sept. 1999. Proceedings-soil and crop Sci. Soc. Of Florida. 59:22-27.

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

Piper, C.S. (1958) . Soil and Plant Analysis.Inter,Sci-Pub.,Inc.New York,360-370.

Pregl, F. (1945). Quantitative organic micro-analysis. 4th ed. J.A. Churchill, Ltd, London.

Saber, S. M. (1993). The use of multistrain biofertilizer in agriculture. Theory and practice. Proc. Sixth International Symposium on Nitrogen Fixation with Non – Legumes, Ismailia, Egypt, p. 61.

Saleem, B.A., K.Ziaf,M.Farooq and W.Ahmed(2005): fruit set and drop patterns as affected by type and dose of fertilizer application in Mandarin Cultivar (*citrus retiuculata Blanco)* .Int. J. Agri. Biol., Vol. 7, No. 6. pp:962-965.

Snedecor, G. A. and Cochran, W. G. (1980). Statistical Methods. Oxford and J. B. H. Bub Com. 7 th Edition.

Tawfiek , A. E. and A.M. Gamal (2000): Response of Balady mandarin trees growing on sandy soil to application of filter mud and farmyard manure. Assiut j. of Agri. Sci. Vol. 8, No. 3:55-69.

Wani,S.P. and K.K. Lee (1995): Microorganisms as biological inputs for sustainable agriculture in organic agriculture crops. Development Foundation ,Gandahi Nagar-Cochin 682-220,pp.36-76.

Wassel, A.M.; F.F. Ahmed and T.A. Ebrahiem (2000):Nitrogen better managment for high yield and qualityof Balady mandarin trees grown in sandy soil. The 2nd Sci. Conf. Of Agric.Sci.Assiut Univ. (Oct 28-30) Vol.1:293-300.

Wilde, S. A.; R. B.Corey; J. G. Lyer and G. K. Voigt (1985). Soil and Plant Analysis for Tree Culture. Oxford and IBH Publishing Co., New Delhi,p.142 India.

Zaied, N.S., S.A.A.Khafagy and M.A.Saleh (2006): Effect of nitrogen and potassium fertilization on vegetative growth,fruit set and quality of Washington Navel orange trees. J. of. Applied. Sci. Rec.,2 (11):851.

استجابة أشجار اليوسفي المصري للتسميد بمصادر مختلفة من النيتروجين تحت ظروف محافظة القليوبية

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تم إجراء هذه التجربة خلال موسمي 2005 و 2006 على أشجار اليوسفى المصرى عمر 25 سنة والمطعومة على أصل النارنج فى تربة طينية تم تسميدها بالنيتروجين بمعدل 1000 جرام / شجرة بمصادر عضوية مختلفة (ماشية و دواجن و كمبوست) بمفردها أو مع إضافة السماد الحيوى وذلك من خلال تأثيرها على نسبة العقد و نسبة التساقط و المحصول وجودة الثمار و محتوى الأوراق من العناصر .

أوضحت النتائج التى تم الحصول عليها أن تسميد الأشجار بمصادر النيتروجين المعدنى والعضوى مع التسميد الحيوى وكذلك التسميد العضوى بسماد الدواجن أو الماشية بمعدل 75% مع التسميد الحيوى أو 100 % بدون التسميد الحيوى ادى الى زيادة معنوية لكل من نسبة العقد والمحصول وعدد الثمار والوزن وجودة الثمار والمحتوى المعدنى فى الأوراق وعلى ذلك يمكن زيادة محصول وتحسين جودة ثمار اليوسفى المصرى عن طريق التسميد بمعدل 75 % نيتروجين معدنى (3.6 كجم سلفات أمونيوم) + 25 % نيتروجين تسميد عضوى (14.5 كجم سماد ماشية) +0.5 كجم سماد حيوى فى صورة ميكروبين أو استخدام سماد الدواجن أو الماشية بمعدل 75 % مع إضافة السماد الحيوى 0.5 كجم ميكروبين للشجرة فى السنة .