Using of Natural Raw Material Mixture and Magnetite Raw (Magnetic Iron) as Substitute for Chemical Fertilizers in Feeding "Le Conte" Pear Trees Planted in Calcareous Soil

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ABSTRACT

The present work was carried out during 2008 and 2009 years to investigate the possibility of utilization of natural raw mineral mixture (NRMM) and magnetite raw (magnetic iron) as a substitute for chemical fertilizers for feeding "Le Conte" pear trees planted in calcareous soil.The trial was conducted in Nubaria area El –Bohira Governorate.Trees were 7 years old, budded on communis rootstock and spaced at 4x5 m.apart. Eight treatments beside the control were used [4 NRMM treatments +4NPK treatments], all treatments, except the control were received magnetite raw as follows: 250, 500, 750, and1000gm /tree.

The comparison among NRMM and NPK treatments cleared the following points:

- **NPK treatments significantly increased shoot diameter in both studied years and shoot length in the first year only, while the differences for shoot number and leaf area were not statistically significant NPK treatments also, significantly enhanced leaf total chlorophyll (SPAD) in 2009.**
- **NPK treatments induced high significant leaf N% in both studied seasons and leaf K% and P% in 2008 only.**
- **NRMM treatments significantly increased leaf Mn and Zn in both growing seasons, while NPK treatments significantly enhanced leaf Fe in the two years.**
- **NPK treatments induced significant high fruit yield/tree in the two seasons; meanwhile the differences between NPK and NRMM treatments for fruit quality were not statistically significant.**
- **Increasing the applied rate of magnetite raw/tree significantly increased vegetative growth, leaf total chlorophyll, leaf mineral composition, yield and fruit quality.**
- **Fruit analysis revealed that the heavy metals (cobalt, nickel and lead) were in the permissible limits.**
- **The cost of the NPK treatments was nearly twice the cost of NRMM treatments. Using natural raw mineral mixture and magnetite raw as a substitute for chemical fertilizers for feeding "Le Conte" pear trees were reasonable but it needs more studies.**

INTRODUCTION

Deciduous fruit trees and "Le Conte" pear trees as well, need essential elements in order to complete its life cycle with high production of good quality; these elements must be found essential for a wide range of higher plant species. The status of essential mineral nutrients in plant tissue, when properly understood, provides a useful tool for the growers, because the amount of each element in the plant determines plant performance. To be in proper balance and intensity for maximum yield, each element should be with specified concentration limits. Below these limits, there is a deficiency of the element, above them, there is an excess, possibly even a toxic excess. Soil tests, including determination of base saturation (Ca, Mg, K, Na), are of value for estimating nutrient availability and adverse pH (alkaline) or salt content. But since leaves are the important synthesis centers of plants, tests of leaves more nearly reflect the nutritional status of a plant than do tests made on soil. Because of, these essential elements must be found in sufficient quantity, and no other element can completely substitute for it, we need fertilizers to have fruit trees of good growth and productivity. On the other side, the financial, healthy and agricultural policy directs from not too long time to fertilize the soil and the product without harming the environment or the human's health. Studies carried out by the developed countries in the environment and in the general health field have approved that traditional methods in fertilization that depend basically and for a long time on chemical fertilizers have got side effects on the soil and the environment, eventually on human because of the diseases caused by them. As results of chemical fertilizers misuse, the nature of the agricultural land is changed and exhausted. Therefore,the alternative use of natural elements compound with organic manure fertilizers are improve the soil physical, chemical and properties, as well as, increased nutrient availability (Helail et al.,2003). For keeping in touch with the policy of providing substituents for the importing fertilizers that have good qualities with competing prices, Al-Ahram Company for Mining introduced the high quality Egyptian product that approved its high

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efficacy for ten years in different kinds of soils that subdue to periodical check. This lead to a great effect on demanding to use the Egyptian product by many farms, owners and many companies of clean and organic agriculture around Egypt. In order to reduce the dependence on imported potash, feldspar a potash mineral, contains 11.25% K_2O and there fore it could be a potential k-source for crop production (Badr, 2006). On the other side, applying organic manures in calcareous soils are very important method for providing the plants with their nutritional requirements without having an undesirable impact on the environment).

Thus, the present work was imposed to study the using of natural raw mineral mixture and magnetite raw (Magnetic iron) as substitute for feeding "Le Conte" pear trees planted in calcareous soil. The main target is to produce a suitable fruit yield of good quality with reducing the cost without harming the environment or the human's health.

MATERIALS AND METHODS

The present study was carried out during two successive seasons, (2007– 2008) and (2008– 2009), on 7 years old "Le Conte" pear trees (*Pyrus communis* L.x *Pyrus pyrifolia* N.)on Pyrus communis rootstock planted in calcareous soil in a private orchardS at Nubaria area El-Bohira Governorate. Some physical and chemical analyses of the experimental soil is illustrated in Table (1).

Chemical analysis of the natural raw mineral mixture was done at the ministry of petroleum, the Egyptian Mineral, Resources Authority, central laboratories sector, on 22/11/2007. Table (3) illustrated the chemical analysis of natural raw mineral mixture.

The treated trees were spaced at 4×5 m. apart and were healthy and similar in their vigor, as possible, and were under flood irrigation. The selected trees (54 trees) were received the following treatments: Table (4).

A-Vegetative growth measurements:

Four main branches as uniform as possible were selected at the four cardinal points of each tree, tagged and the average of the current shoot number on the selected branch was counted , their length and diameters were measured on the first of November , leaf area was determined in mid July, using leaf area meter (Model Cl-203, CID, Inc, USA).

B-Leaf chemical contents determination:

1. Determination of leaf total chlorophyll content:

Leaf total chlorophyll content was determined by using MTNOLOTA CHLOROPHYll METER SPAD-502 (Minolta camera co. LTD JAPAN).

Ten readings were taken on ten leaves (the fourth leaf of the new shoot) of each experimental tree on mid June. The readings were taken at the middle of leaf blade (Westwood, 1988).

2. Determination of leaf mineral composition:

To determine leaf chemical status, samples of twenty mature leaves were collected at random, at the beginning of July in the two years of study. The leaves were washed several times with tap water, rinsed three times in distilled water, and then dried at 70-80 C in an electric air-drying oven. The dried leaves of each sample were ground in a porcelain mortar to avoid contamination with any minerals; 0.3 gm from the ground dried material of each sample was digested with H_2O_2 and H_2So_4 according to Evenhuis and Dewaard (1980). Suitable aliquots were then taken for mineral determination. Total nitrogen and phosphorus were determined colorimetrically according to Evenhuis (1976), and Murphy and Riely (1962), respectively. Potassium was determined against a standard, using Air Propane Flame Photometer (Chapman and Pratt, 1961). Calcium and magnesium were measured, using, versinate method (Chang and Bray, 1951) and iron, manganese and Zinc by a Perkin–Elmer Atomic Absorptoion Spectrophotometer model 305-B. The concentrations of N, P, K,Ca and Mg were expressed as percent, while those of iron, manganese and zinc were expressed as parts per million (ppm), on dry weight basis

C-Determination of yield and fruit quality:

Analysis of mature fruit was carried out when fruits of control attained maturity according to stands recorded by El-Azzouni et al.1975.

The total yield of each studied tree was determined as weight, in (kgs) at the harvest time in August of both studied years. Twenty mature fruits from each studied tree were taken at random for determining fruit quality.

Table 1. Some physical and chemical analysis of the experimental soil

Texture	pH	EC Ds/m	Total $CaCO_3$	O.M.	Total N %	Soluble Ca	Cation Mg	Mg/L K	Soluble HCO_3	Anion Cl	(meq/1) SO_4
Sandy loam	8.4	1.16	31.25	0.55	0.015	8.2	4.5	1.9	5.5	3.8	5.6

Table 2. Chemical analysis of the organic manure (cattle manure)

Component	N %	P %	K %	O.M %
Cattle manure	1.08	0.9	0.6	14

Table 3. Chemical analysis of the natural raw mineral mixture

Component	SiO_2 %	TiO_2 %	Al_2O_3 %	Fe_2O_3 %	MnO %	MgO %	CaO %	Na2O %	K2O %	P2O5 %	Cl %	So3 %	L.O.I %
	36.15	0.76	7.80	4.88	0.72	3.07	13.45	1.92	4.37	8.14	0.56	5.38	9.01

Component	V ppm	Cr Ppm	Co Ppm	Ni Ppm	Cu Ppm	Zn Ppm	Rb Ppm	Sr Ppm	Y Ppm	Zr Ppm	Nb Ppm	Mo Ppm	Sn Ppm	Ba ppm	La Ppm	Yb Ppm	Hf Ppm	Ta Ppm	Pb Ppm
	248.1	339.4	17.5	25.8	17.8	3082.0	46.0	246.2	< 1.5	54.5	5.7	2.4	2.5	545.0	14.7	3.9	2.7	4.4	1104.0

X-Ray Laboratory

Table 4. The studied treatments

No.	Treatments/ Tree
T 1	- 1.5 kg NRMM* + 1 kg A.S** + 15 kg cattle manure at December + 250 gm magnetite - 1.5 kg NRMM + 1 kg A.S at June
T 2	- 1.5 kg NRMM + 1 kg A.S + 15 kg cattle manure at December + 500 gm magnetite - 1.5 kg NRMM + 1 kg A.S at June
T 3	- 1.5 kg NRMM + 1 kg A.S + 15 kg cattle manure at December + 750 gm magnetite - 1.5 kg NRMM + 1 kg A.S at June
T 4	- 1.5 kg NRMM + 1 kg A.S + 15 kg cattle manure at December + 1000 gm magnetite - 1.5 kg NRMM + 1 kg A.S at June
T 5	- 15 kg (Mixture of cattle manure + N,B,K,Mg and S)*** + 2 kg super phosphate triple + 250 g magnetite at December - 1 kg A.S after fruit set + 1 kg A.S at May + 1 kg A.S at August - 3/4 Kg potassium sulphate at the first irrigation and 3/4 kg potassium sulphate at June.
T 6	- 15 kg (Mixture of cattle manure + N,P,K,Mg and S)*** + 2 kg super phosphate triple + 500 g magnetite at December - 1 kg A.S after fruit set + 1 kg A.S at May + 1 kg A.S at August - 3/4 Kg potassium sulphate at the first irrigation and 3/4 kg potassium sulphate at June.
T 7	- 15 kg (Mixture of cattle manure + N,P,K,Mg and S)*** + 2 kg super phosphate triple + 750 g magnetite at December - 1 kg A.S after fruit set + 1 kg A.S at May + 1 kg A.S at August - 3/4 Kg potassium sulphate at the first irrigation and 3/4 kg potassium sulphate at June.
T 8	- 15 kg (Mixture of cattle manure + N,P,K,Mg and S)*** + 2 kg super phosphate triple + 1000 g magnetite at December - 1 kg A.S after fruit set + 1 kg A.S at May + 1 kg A.S at August - 3/4 Kg potassium sulphate at the first irrigation and 3/4 kg potassium sulphate at June.
T 9 (Control)	- 15 kg (Mixture of cattle manure + N,P,K,Mg and S)*** + 2 kg super phosphate triple . - 1/2 kg A.S after fruit set + 1/2 kg A.S at May + 1/2 kg A.S at August. - 375 potassium sulphate at the first irrigation and 375 kg potassium sulphate at June.

*NRMM = Natural Raw Mineral Mixture.
** A.S = Ammonium Sulphate.
***Mixture of Cattle Manure + N,P,K,Mg and S= 1 m3 Cattle Manure + 10 kg super phosphate triple + 5 kg Ammonium Sulphate + 5 kg Potassium Sulphate + 2.5 kg Magnesium Sulphate + 2.5 kg Agricultural Sulpher .

In each sample, fruit weight was recorded as (gm), fruit dimensions [length and diameter in (cm)], firmness was determined according to Magness and Taylor (1925) pressure tester using a 5/16" plunger. Total soluble solids (TSS%) in juice were determined using a hand refractometer and the acidity percentage was determined according to AOAC (1980). Total sugar content % was determined according to Woodman (1941). At the end of the trial some fruit mineral composion was determined, by X-Ray laboratory.

The obtained data throughout the two studied growing seasons were statistically analyzed according to Sendecor and Cochran (1990) and L.S.D test at 0.05 levels was used for comparison between treatments.

RESULTS

Vegetative growth:

The vegetative growth of"Le Conte"pear trees (shoot length, diameter, and number and leaf area) in 2008 and 2009 are shown in Table (5). The data revealed that T8 significantly induced the highest values in both years followed by T7, T4 and T5, respectively, (except for shoot length, T4 came before T7). The lowest effects were noticed in control trees.

Leaf mineral composition:

Tables (6&7) indicated that the highest levels of leaf N,P,K,Ca and Fe were obtained from trees under T8 followed by T7, T4 and T6 while T4 induced the highest leaf Mn and Zn followed by T3, T8, T7, T2,

Table 5. Effect of studied treatments on shoot length, diameter, number of new shoot per main branch and leaf area of "le Conte" pear trees during 2008 and 2009 seasons

Parameters	Shoot length cm		Shoot diameter cm		No. of new shoot per main branch		Leaf area cm^2	
Treatments	**2008**	**2009**	**2008**	**2009**	**2008**	**2009**	**2008**	**2009**
T 1	48.33	51.28	0.92	0.96	12.21	13.14	22.12	23.14
T 2	53.79	60.34	0.95	1.10	13.16	14.17	24.14	25.16
T 3	55.88	65.18	0.99	1.16	15.14	15.28	27.33	29.12
T 4	62.46	69.56	1.21	1.24	15.48	15.44	27.16	29.24
T 5	50.36	54.62	0.97	1.00	12.72	13.35	23.28	24.26
T 6	56.78	63.44	1.12	1.14	14.33	15.17	25.36	26.32
T 7	59.52	68.72	1.20	1.26	15.26	15.76	28.12	30.21
T 8	65.24	71.26	1.26	1.32	16.25	16.55	29.16	31.44
Control	44.66	46.14	0.86	0.93	10.44	11.52	21.18	21.28
L.S.D at 0.05 level	1.919	0.671	0.0369	0.037	1.163	1.014	1.491	1.219

Table 6. Effect of studied treatments on leaf, N , P , K , Ca and Mg content of "le Conte" pear trees during 2008 and 2009 seasons

Parameters	N %		P %		K %		Ca %		Mg %	
Treatments	**2008**	**2009**	**2008**	**2009**	**2008**	**2009**	**2008**	**2009**	**2008**	**2009**
T 1	1.98	1.99	0.15	0.16	1.00	1.15	0.95	0.97	0.21	0.22
T 2	1.99	2.00	0.16	0.17	1.00	1.18	0.95	0.98	0.22	0.23
T 3	2.10	2.10	0.16	0.17	1.10	1.20	0.96	0.98	0.22	0.23
T 4	2.12	2.14	0.17	0.18	1.16	1.20	0.97	0.99	0.22	0.23
T 5	1.99	2.12	0.16	0.17	1.16	1.19	0.96	0.98	0.23	0.23
T 6	2.12	2.16	0.18	0.18	1.18	1.20	0.97	0.99	0.24	0.24
T 7	2.16	2.20	0.18	0.18	1.19	1.20	0.99	1.00	0.24	0.24
T 8	2.18	2.24	0.19	0.19	1.20	1.20	1.00	1.00	0.25	0.25
Control	1.85	1.86	0.14	0.12	1.00	0.90	0.90	0.88	0.20	0.18
L.S.D at 0.05 level	0.03669	0.037	0.0218	0.023	0.0369	0.037	0.0362	0.037	0.025	0.029

Table 7. Effect of studied treatments on leaf, Fe, Mn, Zn and total content of "le Conte" pear trees during 2008 and 2009 seasons

Parameters	Fe ppm		Mn ppn		Zn ppn		Total leaf chlorophy II (SPAD)	
Treatments	2008	2009	2008	2009	2008	2009	2008	2009
T 1	65.35	68.49	52.32	54.22	15.24	19.28	33.68	35.12
T 2	72.28	79.23	59.36	60.26	16.18	22.20	35.16	36.18
T 3	85.26	92.21	65.18	64.32	18.20	22.24	35.41	36.92
T 4	98.18	100.26	68.24	69.36	19.22	23.26	36.18	37.22
T 5	68.21	75.28	48.22	50.18	14.16	16.14	35.22	35.86
T 6	77.22	93.32	55.26	58.16	14.20	18.18	25.88	35.51
T 7	99.26	112.24	56.24	62.24	15.18	20.22	36.18	39.12
T 8	108.24	116.18	59.30	65.28	15.22	22.26	36.55	42.21
Control	55.35	48.16	33.16	28.18	13.16	11.18	33.18	34.12
L.S.D at 0.05 level	3.09	3.58	1.72	1.79	1.79	1.42	1.140	1.839

T1 and T5, meanwhile, the lowest levels were found in control trees in both years. Statistical analysis revealed that the differences were significant for N in both years and for P and K in the second year.

Leaf total chlorophyll content (SPAD):

Data in Table (7) illustrated that trees under T8 induced the highest total leaf chlorophyll content (SPAD) followed by T7, T4, &T3 in the two studied years. The significance between differences was clear in the second year.

Fruit yield:

Table (9) indicated that T8 & T7 (also T4 in 2008 only) induced the highest fruit yield / tree followed by T6, T3& T2, while control trees induced the lowest effect in both years.

Fruit quality:

Physical and chemical properties are shown in Tables (8&9). The differences between NPK and NRMM treatments were not statistically significant.

Fruit mineral composition:

Data in Table(11) indicated that according to significantly, the treatments could be arranged as the following descending order: T4> T3 >T8 > control >T2 &T1 and T7 >T6 &T5 for Co and T4>T3>T2&T1>T8, T7, control T6&T5 for Ni

Effect of magnetite raw treatments:

The obtained data cleared that increasing the applied rate of magnetite raw/tree significantly increased vegetative growth, leaf mineral composition, leaf total chlorophyll, and yield and fruit quality in the two seasons (combined with NRMM or NPK treatments).

DISCUSSION

The obtained data indicated that natural raw mineral mixture (NRMM) treatments significantly reduced shoot length in 2008 and shoot diameter in both years as compared with NPK treatments. Meanwhile, shoot number and leaf area in both seasons and leaf total chlorophyll (SPAD) in 2008 were not significantly affected Table (10). That may be mean limit differences between the studied treatments. As for leaf mineral content data in Table (10) cleared that NPK treatments significantly enhanced leaf N &Fe in both studied years and leaf P &K% in 2008 than did NRMM treatments. On the other side, NRMM treatments significantly enhanced leaf Mn & Zn in the two seasons. Moreover, data approved that NPK treatments significantly increased yield/ tree (kg) by 5.9% and6.7% in 2008 and 2009 ,respectively, than did NRMM treatments ,Meanwhile, fruit quality parameters (except TSS% in2009) were not significant .Many investigators supported these findings, Badr, 2006, reported that could be used ,feldspar a potash mineral, which contain 11.25%K2O in feeding plant. In addition, Abdel Rahman et al., 2009, mentioned that natural elements compound application significantly increased navel orange tree vegetative growth, fruit-set percentage tree yield and yield efficiency. As for positive effects of magnetite combined with NRMM or NPK treatments on the studied parameters, they are in line with those reported by Milewski, 2006. who mentioned that he used magnetic water and magnetite in the soil to stimulate the growth of plants. Data in Table(11) indicated that NRMM applications significantly enhanced fruit cobalt (Co) and nickel (Ni) as compared with NPK applications, while the differences were not significant for fruit lead (Pb) in both years of study .However, the results revealed that the concentrations of these heavy metals were in the permissible limits .These data are supported with those found by El-Seginy and Attala, 1999.who reported that leaf lead (Pb) of unpolluted pear trees planted in greenhouse was 2.37(ppm) & 2.61(ppm), while it was 3.50 & 3.36 (ppm) for road dust polluted trees in two successive seasons .Moreover, they mentioned that leaf nickel (Ni) of unpolluted pear trees was 2.02 & 2.38 (ppm) while it was 2.75&2.53 (ppm) for polluted trees with road dust in the same studied years, respectively.

FEASIBILITY

The findings of the present study indicated that the best treatment of NPK was T8 while, the best treatment of NRMM was T4, thus the following is the cost of each treatment:

The cost of T8= 3 kg ammonium sulphate x (2.0 L.E) + 2kg super phosphate triple x (1.75 L.E) + 1kg magnetite raw x (4L.E) + 1.5 kg potassium sulphate x (5.0L.E) = 6 + 3.5 + 4 + 5 =18.5 L.E/tree.

Cost of chemical fertilizers which added to cattle manure = 5.5 L.E/tree. (Notice: 15m3/Feddan cattle manure was used.).

Total cost of T8 = 18.5+5.5= **24 L.E /tree**.

Total cost of T4 = 3kg NRMM x(1.0 L.E) + 2kg ammonium sulphate x (2.0L.E) +1 kg magnetite raw x(4.0L.E) =**11.0 L.E /tree.**

[Remark: The cost of cattle manure was not considered because each studied tree was received the same amount of it.] .

CONCLUSION

Data obtained in this work approved that NRMM applications induced acceptable effects on the

performance of "Le Conte" pear trees planted in calcareous soil as compared with NPK applications.

Table 8. Effect of studied treatments on average fruit weight, fruit length , fruit diameters and fruit firmness of "le Conte" pear trees during 2008 and 2009 seasons

Parameters	Average fruit weight (gm)		Fruit length (cm)		Fruit diameters (cm)		Fruit firmness (lb / Inch ^{2})	
Treatments	2008	2009	2008	2009	2008	2009	2008	2009
T 1	135.88	143.14	6.48	6.50	5.92	5.98	13.24	13.56
T 2	139.18	147.18	6.52	6.56	5.94	6.12	13.59	13.76
T 3	145.16	149.22	6.56	6.62	5.95	6.12	13.65	13.92
T 4	146.19	150.14	6.59	6.63	5.97	6.14	13.71	13.96
T 5	139.14	145.16	6.54	6.60	5.96	6.12	13.51	13.69
T 6	146.21	150.19	6.58	6.65	6.11	6.16	13.65	13.81
T 7	150.14	153.14	6.65	6.68	6.12	6.22	13.75	13.98
T 8	152.16	155.21	6.65	6.72	6.16	6.25	13.79	14.12
Control	125.16	122.14	6.21	6.11	5.78	5.75	13.18	14.14
L.S.D at 0.05 level	3.89	3.46	0.037	0.023	0.015	0.020	0.074	0.025

Table 9. Effect of studied treatments on fruit yield, TSS % acidity % and total sugars % of "le Conte" pear trees during 2008 and 2009 seasons

Parameters	Fruit Yield kg / tree		TSS %		Acidity %		Total Sugars %	
Treatments	2008	2009	2008	2009	2008	2009	2008	2009
T 1	36.18	39.24	12.68	12.85	0.40	0.40	8.95	9.11
T 2	40.16	44.18	12.75	12.96	0.40	0.40	8.99	9.25
T 3	42.14	46.28	12.81	13.00	0.30	0.41	9.00	9.31
T 4	44.19	48.19	12.86	13.12	0.40	0.41	9.10	9.33
T 5	38.21	42.21	12.74	13.98	0.40	0.40	9.00	9.21
T 6	42.18	46.33	12.88	13.21	0.40	0.41	9.21	9.34
T 7	45.26	50.16	12.95	13.56	0.39	0.41	9.33	9.36
T 8	47.22	52.12	13.14	13.72	0.39	0.41	9.42	9.43
Control	32.21	29.18	11.59	11.45	0.41	0.42	8.85	8.77
L.S.D at 0.05 level	2.28	2.09	0.037	0.052	0.012	0.012	0.064	0.037

Table 10. The comparison between natural raw material mixture and NPK treatments in 2008 and 2009 years[1]

Treatments / Parameters	Shoot length (cm)	Shoot diameter (cm)	Shoot number	Leaf Area (cm^2)	L. total chlorophyll (spad)	Leaf N %	Leaf P %	Leaf K %	Leaf Ca %	Leaf Mg %	Leaf Fe (ppm)	Leaf Mn (ppm)	Leaf Zn (ppm)	Yield (kg/ tree)	Fruit weight (gm)	Fruit length (cm)	Fruit diameter (cm)	Fruit firmness ($lb/inch^2$)	TSS %	Acidity %	Total sugars %
(NRMM)	55.12	1.02	14.00	25.19	35.11	2.05	0.16	1.06	0.96	0.22	80.27	61.28	17.21	40.67	141.60	6.54	5.94	13.55	12.78	0.40	9.01
NPK	57.98	1.14	14.64	26.48	35.96	2.11	0.18	1.18	0.98	0.24	88.23	54.76	14.69	43.22	146.91	6.60	6.09	13.68	12.93	0.39	9.24
Significance	*	*	N.S.	N.S.	N.S.	*	*	*	N.S.	N.S.	*	*	*	*	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

2009

Treatments / Parameters	Shoot length (cm)	Shoot diameter (cm)	Shoot number	Leaf Area (cm^2)	L. total chlorophyll (spad)	Leaf N %	Leaf P %	Leaf K %	Leaf Ca %	Leaf Mg %	Leaf Fe (ppm)	Leaf Mn (ppm)	Leaf Zn (ppm)	Yield (kg/ tree)	Fruit weight (gm)	Fruit length (cm)	Fruit diameter (cm)	Fruit firmness ($lb/inch^2$)	TSS %	Acidity %	Total sugars %
(NRMM)	61.59	1.12	14.51	26.67	36.36	2.06	0.17	1.18	0.98	0.23	85.05	62.04	21.74	44.47	147.42	6.58	6.09	13.80	12.98	0.41	9.25
NPK	64.51	1.22	15.21	28.06	38.18	2.18	0.18	1.20	0.99	0.24	99.26	58.96	19.20	47.70	150.92	6.66	6.19	13.90	13.62	0.41	9.34
Significance	N.S.	*	N.S.	N.S.	*	*	N.S.	N.S.	N.S.	N.S.	*	*	*	*	N.S.	N.S.	N.S.	N.S.	*	N.S.	N.S.

1)Notice: control did not use in the statistical analysis of this comparison.

Table 11. Effect of studied treatments on fruit Co, Ni, Cu, Zn and Pb at the end of study(2009)

Element / Treatment	Co	Ni	Cu	Zn	Pb
T 1	0.0254	0.0420	0.0032	25.1001	0.0001
T 2	0.0420	0.0482	1.0142	30.0010	0.0005
T 3	0.1352	0.1536	1.4126	35.0420	0.0031
T 4	0.2462	0.2320	2.0050	38.0020	0.0040
T 5	0.0012	0.0002	0.0140	18.6210	0.0001
T 6	0.0060	0.0015	1.0560	20.00040	0.0003
T 7	0.0106	0.0050	1.8602	23.0020	0.0004
T 8	0.0820	0.0200	2.5460	25.0015	0.0005
T 9	0.0500	0.0020	1.0040	18.0016	0.0002
LSD at 0.01	0.07541	0.07541	0.7650	1.07884	N.S

Ministry of petroleum – Egyptian mineral resources authority (EMRA) – central laboratories sector (XRA- Lab).

In addition, using magnetite raw in rate of 1kg/tree combined with NRMM or NPK applications induced satisfactory results.

On the other side, studies carried out by the developed countries in the environment and in the general health field, approved that traditional methods in fertilization that depended basically and for a long time on chemical fertilizers have got side effect on the soil and the environment, eventually on human because it caused diseases. If the above mentioned points beside the cost of NRMM applications (NPK applications cost twice NRMM) taking into account, using NRMM and magnetite raw applications as a substitute for NPK fertilizers in feeding"Le Conte"pear trees are reasonable but it needs more investigations.

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الملخص العربي

استخدام مخلوط الخامات الطبيعيه وخام الماجنتيت (الحديد المغناطيسى)كبديل للاسمده الكيماويه فى تغذية أشجار الكمثرى"ليكونت" المترعه فى الارض الجيريه

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أجرى هذا العمل فى عامى ٢٠٠٨ و٢٠٠٩ لدراسة امكانية استخدام مخلوط الخامات الطبيعيه المعدنيه (NRMM) وخام الحديد المغناطيسى كبديل للاسمده الكيماويه NPK فى تغذية أشجار الكمثرى "ليكونت" المترعه فى الارض الجيريه. نفذت التجربه فى منطقة النوباريه محافظة البحيرة. كانت الاشجار عمر ٧سنوات ومطعومه على أصل كمثرى كميونس ومترعه على مسافة ٤×٥ متر. ٨ معاملات (٤معاملات NRMM +٤ معاملات NPK) بجانب الكنترول قد استخدمت وقد أعطيت كل المعاملات فيما عدا الكنترول حديد مغناطيسى بمعدلات مختلفه كما يلى: ٢٥٠ و٥٠٠ و٧٥٠ و١٠٠٠جم/شجرة. وقد أظهرت المقارنه الاحصائيه بين معاملات NRMM و NPK النقاط التاليه:

- معاملات NPK أحدثت زياده معنويه فى قطر النموات الحديثه فى عامى الدراسة وفى طول النمات الحديثة فى السنة الاولى فقط. بينما تم تكن الفروق معنوية بالنسبه لعدد النموات الحديثة ومساحة الورقة. أيضا أعطت معاملات NPK زيادة معنوية فى N% الورقة فى عامى الدراسة وزيادة معنوية فى الp% و K الورقة فى السنة الاولى فقط.
- أدت معاملات ال NRMM الى حدوث زيادة معنوية فى Mn (ppm) Zn, الورقة فى موسمى الدراسة بينما اعطت معاملات ال NPK زيادة معنوية فى Fe (ppm) الورقة فى عامى الدراسة.
- معاملات NPK أدت الى حدوث زيادة مؤكدة احصائيا (معنويه) فى محصول الاشجار فى كلا الموسمين بينما كانت الفروق بين المعملات NRMM, NPK غير معنوية بالنسبة لصفات جودة الثمار.
- أدت زيادة معدلات الأضافة من الحديد المغناطيسى الى حدوث زيادة معنوية فى النمو الخضرى للاشجار وكلوروفيل الورقة الكلى(SPAD) والمحتوى المعدنى للاوراق والمحصول وصفات جودة الثمار.
- أظهرت نتائج تحليل الثمار أن العناصر الثقيلة (الكوبلت- النيكل- الرصاص) كانت فى الحدود المصرح بها. هذا وقد كانت تكلفة معاملات NPK تقريبا ضعف تكلفة معاملات NRMM.

خلصت الدراسة الى أن استخدام مخلوط الخامات الطبيعية المعدنية وخام الماجنتت (الحديد المغناطيسى) كبديل للاسمدة الكيماويه فى تغذية أشجار الكمثرى "ليكونت" ممكن ولكنه يحتاج الى المزيد من الدراسة.