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IMPACT OF DEGRADATION OF SOME NATURAL COMPOUNDS AS AFFECTED BY INCUBATION PERIODS ON SOME PHYSIO-CHEMICAL PROPERTIES OF CALCAREOUS SOIL

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ABSTRACT: The main target of this study is concentrated in monitoring *the effect of incubation periods (which lasted three years from 2008 to 2010) on the decomposition of some natural compounds (i.e. compost , Magnetite , Ensiaben, K-humane, and urea)as related to some physico-chemical properties of calcareous soil (i.e., bulk density, total porosity, hydraulic conductivity, soil compaction, moisture constants, pH, ECe,and organic matter).*

The tested compounds were individually mixed with the studied of calcareous soil, and then put in plastic pots of 2 kg capacity.The soil moisture was adjusted at 60% of field capacity by irrigation, and then incubated under laboratory conditions for 3 years.This lab experiment was included 6 pilot treatments a which were seven replicated as well as soil samples in succession every 6 months were taken for analysis.

The otained results indicate that application of different natural compounds as individually treatments decreased values of bulk density, soil salinity, soil acidity organic matter, and soil compaction. The reverse was true for each of saturated hydraulic conductivity, total porosity, and moisture constants as well as available water, which showed pronounced increases.

The maximum incubation period for positive results was 12 months, and then their effective roles tended to decrease with time.

Key Words: *Physio-chemical properties, calcareous soil, natural materials of. compost, Magnetite, Ensiaben, K-humane, and urea.*

INTRODUCTION

Calcareous soils are a wide occurrence under arid and semi arid climates, where the presence of $CaCO_3$ is in considerable amounts. These soils cover more than million fedan of agricultural soils and more than 30% of desert soils of Egypt. Shawky *et al.* (2004) found that the calcareous soil can be defined as those which contain more than 14-17% total $CaCO_3$ or 4-7% active $CaCo_3$. Most of the calcareous soil problems are due to high percentage of $CaCO_3$ which cause the high EC and /or pH values, micronutrients fixation and/or precipitation as well as crust formation. Also, the organic matter content of these soils, generally is low due to the high temperature and arid climate.

Large quantities of agricultural residues and animal wastes are produced each year in Egypt. These include about 15 million tons of municipal wastes, 20 million tons of crop residues and 275.5 million m^3 of animal manure, (El-Shemy and Aly, 1997). Soil organic matter content strongly a effects soil fertility by means of its influence on nutrient cycling and on the physical, chemical and biological properties of soils .Compost addition was found to not only increase crop yield, but also to improve soil fertility in terms of organic C and N content, permeability, plant available water capacity and air-filled porosity (Keener *et al.* 2000). Also, the organic matter content of these soils, generally low due to the high temperature and arid climate. Klute and Dirksen (1986) mentioned that increasing soil ability to supply plant by its water requirement would follow increasing soil organic matter by available water. Rawls *et al.* (1992) found that increase in organic matter by a unit cause a relatively large increase in the percentage of water retained in soil at the field capacity than at wilting point in coarse textured soils and the opposite was true in case of fine textured ones where showed increased in both EC and wilting point with increasing organic matter. Bauer and Black (1992) stated that increasing organic matter decrease bulk density and consequently increase soil total porosity. They added that soil organic matter influences on water movement in soil because of its hydrophilic character and its effect on soil structure and bulk density. Lynch *et al.* (2005) applied compost derived from crop residue alone and with other materials. They found that the improvement in soil physical properties (soil bulk density and water content) was obtained for compost treatments alone. Tsadials *et al.* (2005) found that after three years of compost application, organic matter content, water retention capacity, available water, and infiltration rate were significantly increased, whereas bulk density was decreased.

Therefore, the aim of the present investigation was to study the effective role of some natural materials for modification of physio- chemical properties of calcareous soils.

MATERIALS AND METHODS

An incubation experiment was carried out on some natural compounds(1- i.e., compost, Humic acids as K-humane and magnetic iron)2- mixed with a calcareous soils taken from Noubaria Agricultural Research station. Table (1) represents the initial soil physio- chemical properties of the studied soil.under the lab conditions during three successive years from 200^ -2010. 3- Magnetic iron contain (4.3 % SiO_2 ,48. 8% Fe_3O_4, 17.3%, 26.7%F e_2O_3, 2.6% MgOand 0.3%CaO)and obtained from EL-Ahram company for mining and natural fertilizers (ECMNF) Giza, Egypt. 4- Ensiaben is a slow release N fertilizer containing 40% prepared by the General Organization of Agriculture Equilibrium Fund GOAEF). 5- Urea is containing 46% N. 6- The analysis of applied compost and K-humane are presented in Table (2).The lab experiment was condacted as two kilogram of calcareous soil was placed in plastic pots of 25 cm diameter and 25 cm depth combined with the tested natural materials.

Table (1): Some physio- chemical properties of the experimental soil

Soil properties	Value
Particle size distribution %	
Coarse sand	5.35
Fine sand	22.63
Silt	35.90
Clay	36.10
Texture class	Clay loam
Field capacity (F.C) %	24
Chemical analysis	
pH (1:2.5)	8.18
EC $dS.m^{-1}$	6.45
Organic matter %	0.31
Total $CaCO_3$ %	28.60
Total N $mg\ k^{-1}$	698.5
Available N $mg\ k^{-1}$	34.9

Table (2): Some characteristics of the compost and humic acids under studded

Characteristics	Humic acid (liquied)	Composted rice straw
P^H	5.56	7.08
EC (dSm^{-1})	6.15	5.67
O.C %	17	32.43
Macro-nutrients	Total %	Available (ppm)
N	1.29	0.84
P	0.25	503
K	1.79	631
Micro-nutrients	Total $mg\ L^{-1}$	Available (ppm)
Fe	92.3	217
Mn	11.6	107
Zn	2.65	98
Cu	0.36	16.6

The randomized complete blocks design was employed in this study, where seven replicates were used for each treatment .The treatments were:

1- Without adding natural compounds(control treatment)
2- Ensiaben (40% N) at a rate of $250kgfed^{-1}$.
3- Urea (48%N) at a rate of 200kg fed^{-1}.
4- Humic acid (K-humate) at a rate of 20 L fed^{-1}
5- Magnetite (Magnetic Iron Oxide) at a rate of 0.70 ton fed^{-1}
6- Compost at a rate of 5.0 ton fed^{-1}

Soil samples were mixed with the tested natural compounds before irrigation. Whereas, irrigation protected at 60% of field capacity (FC) and then incubation under laboratory conditions. Soil samples were taken every 6 month.The soil samples were prepared for the different physical and chemical properties according to the standard methods described by the different publishers as follows in Table (3). The average of the successive results were subjected to statistical analyses according to Snedecor and Cochran (1980)

Table (3): Soil properties as determined by the standard methods described by the different publishers.

Soil properties	References
Particle size distribution (%)	Gee and Bauder, 1986
Bulk density ($Mg\ cm^{-3}$)	Vomocil, 1965
Penetration resistance	Davidson, 1965
Pore size distribution (μ)	De Leenheer and De-Boodt, 1965
Saturated hydraulic conductivity ($cm\ h^{-1}$)	Klute and Dirksen, 1986
Total calcium carbonate (%)	Page *et al.*, 1982.
Organic matter content (%)	Page *et al.*, 1982.
Soil pH and electrical conductivity ($dS\ m^{-1}$)	Page *et al.*, 1982.
Total , available N%	Page *et al.*, 1982.

RESULTS and DISCUSSION

Physical properties

• Bulk density (BD) and total porosity (TP)

It is known that bulk density and total porosity are mostly affected by soil structure, texture organic matter content soluble salts and moisture content. Total porosity provides also valuable information about soil structure and is aversely correlated with bulk density. Mean values of bulk density (Mgm^{-3}) and total porosity (%) during the periodical analyses through the three years of incubation time are presented in Table (4). Generally, data revealed that increasing the incubation time of all natural compound under soil moisture of 60% from field capacity (FC) led to reduce the values of soil bulk density, and consequently an increase in soil total porosity. The efficiency of the applied natural materials on reducing BD values could be arranged in the following descending order of compost > Humic acid > magnetite (FeO) > Ensiaben = Urea > control. While the efficiency of the studied different natural materials on increasing of TP values had the same trends of those recorded with the 12 months These results may be attributed to adding any materials which encourage flocculation of soil particles, and then leading to the formation of stable aggregates and in turn the decrease of the bulk density and the increase total porosity. Also the best results were found after one year as well as the best treatment was magnetite after three years. This could be attributed to the rapid decomposition of other material. Application of organic materials was more significantly affected the soil surface, especially physical characteristics and chemical (nutrient recycling). These include aggregate stability, lower bulk density, less soil compaction, higher soil porosity and this increased water infiltration rate (Zeleke *et al.*, 2004). The decrease of bulk density and increase of total porosity may be due to enhancement in soil biological activities resulted from the small or narrow C/N ratio this biological activity increases the organic exudates which act as cementing agent for individual particles, (Negm *et al.*, 2005).

Table (4):Changes of bulk density, total porosity hydraulic conductivity and resistance of soil penetration as affected by different applied treatments after 3 years from incubation.

Treatments	Incubation Periods (months)							
	0	6	12	18	24	30	36	Mean
Bulk density(mgm^{-3})								
Without treated soil	1.39	1.38	1.36	1.34	1.33	1.33	1.32	1.35
Compost	1.28	1.18	1.16	1.15	1.14	1.13	1.12	1.17
Ensiaben	1.38	1.34	1.30	1.26	1.25	1.24	1.23	1.29
Urea	1.36	1.32	1.29	1.28	1.27	1.26	1.25	1.29
Humic acid	1.31	1.25	1.21	1.18	1.16	1.12	1.10	1.19
Magnetite (Fe O)	1.34	1.30	1.26	1.23	1.22	1.21	1.20	1.25
Mean	1.34	1.30	1.26	1.24	1.23	1.22	1.20	
L.S.D 0.05%	0.08	0.0.6	0.04	0.03	0.03	0.03	0.04	
Total porosity(%)								
Without treated soil	45.7	47.6	48.6	50.3	52.2	52.3	52.3	49.9
Compost	54.2	58.2	61.6	60.3	59.1	57.4	54.3	57.9
Ensiaben	50.8	51.9	53.5	55.1	56.1	55.2	54.0	53.8
Urea	51.6	52.4	54.3	54.8	54.3	54.1	53.2	53.6
Humic acid	53.6	55.5	59.1	58.2	57.5	56.7	54.0	56.4
Magnetite (Fe O)	52.7	54.6	57.6	57.3	57.0	55.5	53.8	55.5
Mean	51.4	53.4	55.8	56.0	56.0	55.2	53.6	
L.S.D 0.05%	1.01	1.04	1.08	1.04	1.12	1.08	1.04	
Hydraulic conductivity (cm h^{-1})								
Without treated soil	2.5	2.8	2.9	3.1	3.2	3..3	3.3	3.01
Compost	2.9	5.2	5.7	4.9	4.5	4.0	3.8	3.20
Ensiaben	2.6	3.5	4.2	4.1	3.7	3.3	3.0	3.49
Urea	2.6	3.7	4.4	4.0	3.5	3.0	2.7	3.41
Humic acid	2.8	4.6	5.0	4.5	4.0	3..5	3..3	4.0
Magnetite (Fe O)	2.7	4.5	4.8	4.3	3.9	3.4	3.2	3.83
Mean	2.68	4.05	4.50	4.15	3.8	3.42	3.22	
L.S.D 0.05%	0.02	0.02	0.05	0.02	0.05	0.05	0.01	
penetration resistance (kg cm^{-3})								
Without treated soil	5.7	5.6	5.4	5.3	5.2	5.1	5.0	5.33
Compost	5.3	5.0	4.8	4.8	4.7	4.6	4.6	4.83
Ensiaben	5.6	5.4	5.2	5.0	4.8	4.7	4.6	5.0
Urea	5.6	5.3	5.1	5.0	4.9	4.9	4.8	5.1
Humic acid	5.4	5.1	4.9	4.8	48	4.7	4.6	4.9
Magnetite (Fe O)	5.5	5.2	5.0	4.9	4.9	4.8	4.7	5.0
Mean	5.5	5.3	5.1	4.97	4.88	4.8	4.72	
L.S.D 0.05%	0.03	0.01	0.01	0.01	0.01	0.01	0.02	

Such processes increase aggregate formation and consequently increment soil total porosity, (Aggelides and Londra, 2000). This could be attributed to the rapid decomposition of other material. These results are in agreement with those obtained by (Mansour, 2002 and Reda *et al.*, 2006).

• Hydraulic conductivity (HC)

Mean values of HC (cm h^{-1}) after three years from incubation time are presented in Table (4). Data reveal that the value of soil H.C was increased with increasing the incubation time, furthermore. the data show that the effect of any applied materials is more pronounced after one year The efficiency of the studied different natural materials on increasing H.C values could be arranged in the following order compost > Humic acid > magnetite (FeO) > Ensiaben = Urea > control. These results may be attributed to the compost enhanced the soil aggregates which increase both of total porosity and drainable pores. Data in Table (4) reveal also that values of soil hydraulic conductivity after three years were lower as compared with one year this could be attributed to the increase decomposition materials similar results were obtained by Mohamed (2004).

• Soil compaction

Soil compaction refers to the fact that soil consists, on a volume basis of too little pore space and too much solid matter such as sand silt and clay influences the structure of arable soils negatively.

Compacted soils may also occur in nature as clay pan horizons, silt pan horizons or indurate horizons cemented by iron aluminum, silica calcium carbonate, calcium sulfate (gypsum) or humus. Brussaard and Van faassen (1994) and Whalley *et al.*, (1995) found that the soil compaction effects are resulted in an increase soil bulk density, severely reduced pore space homogenization of soil structure, and destroyed pore geometry and connectivity.Such results are more attributed with reducing transport of gases , water and nutrients as well as delaying biological processes .

Means values of penetration resistance (kg cm^{-2}) were measured by pocket penetrometer after three years from incubation time and presented in Table (4). Data reveal that the value of soil penetration resistance (P.R) was decreased with increasing the incubation time of any natural material. The efficiency of the studied different natural materials on decreasing penetration resistance (kg cm^{-2}) values could be arranged in the following descending order: compost > Humic acid > magnetite (FeO) > Ensiaben = Urea > control. After one year .That was sincere an increase in the macrospores, was occurred which led to increase drainage water, and consequently decrease the penetration resistance (P.R). Similar results were obtained by (Mansour, 2002 and EL-Maddah and Badr, 2005).This favourabl effect tended to decrease with increasing incubation time.

• Soil moisture retention

The phenomenon of water retention by soil against external forces has long been recognized as one of the primary function of the soil in sustaining plant growth under conditions of intermitted water supply, (Groenevelt and Polt 1972)Mean values of available moisture % after three year from incubation time are presented in Table (5) and the obtained data reveal that the values of available water, which is the most important and calculated as a difference between moisture content at field capacity (0.33 bar) and wilting point (15.0 bar), were positively increased with increasing the incubation time for any material.Also,it was noticed that the rate of increase in FC was higher than that of the rate wilting point (WP), and consequently an increase in available water reacting the maximum after one year from incubation time.

Table (5): Change of available water (A.W), relative increase (%) of (AW) and relative increase (m^3 fed^{-1}) of (AW) as affected by different treatments after 3 years from application

Treatments	Incubation Periods (months)							
	0	6	12	18	24	30	36	Mean
Available water% (AW)								
Without treated soil	14.5	14.6	14.6	14.7	14.7	14.7	14.7	14.6
Compost	16.5	17.9	18.0	17.7	16.9	16.8	16.8	17.2
Ensiaben	15.0	15.5	15.8	16.0	15.8	15.6	15.4	15.6
Urea	15.0	15.2	15.3	15.2	15.0	15.0	15.0	15.1
Humic acid	15.6	16.3	16.9	16.6	16.00	15.8	15.4	16.1
Magnetite (Fe O)	15.3	15.9	168	16.4	15.0	14.9	14.5	15.4
Mean	15.3	15.9	16.2	16.1	15.6	15.5	15.4	
L.S.D 0.05%	0.96	0.95	0.75	0.95	0.75	0.55	1.01	
Relative increase (%) of (AW)								
Without treated soil	-	0.7	0.7	1.4	1.4	1.4	1.4	
Compost	-	8.5	9.1	7.3	2.4	1.8	1.8	
Ensiaben	-	3.3	5.3	6.7	5.3	4.0	2.7	
Urea	-	1.3	2.00	1.3	-	-	-	
Humic acid	-	4.5	8.3	6.4	2.6	1.3	-	
Magnetite (Fe O)	-	3.9	6.5	5.2	-	-	-	
L.S.D 0.05%	-	0.04	0.04	0.04	0.05	0.04	0.04	
Relative increase ($m^3.fed^{-1}$) of (AW)								
Without treated soil	-	5.9	5.9	11.8	11.8	11.8	11.8	
Compost	-	71.4	76.4	61.3	20.2	15.1	15.1	
Ensiaben	-	27.7	44.5	56.3	44.5	33.6	22.7	
Urea	-	10.9	16.8	10.9	-	-	-	
Humic acid	-	37.8	69.7	53.8	21.8	10.9	-	
Magnetite (Fe O)	-	32.8	54.6	43.7	-	-	-	
L.S.D 0.05%		16.24	14.33	14.33	16.24	17.01	17.01	

The efficiency of the studied different natural materials on increasing available water (A.W) values could be arranged in the following descending order: Compost > Humic acid > Magnetite > Ensiaben =Urea >Control. These results may be attributed to adding such natural materials, especially compost that leads to change in pore size distribution and increase in water holding pores, and consequently increased the retained soil moisture. The rate of increase in A.W % as compared to control were 9.1,8.3, 6.5 , 5.3 and

2% or 76.4 , 69.7 , 54.6 , 44.5 and 16.8 m^3 fed^{-1} . for compost, Humic acid, Magnetite (FeO) Ensiaben,and Urea, respectively after one year of incubation time. These results are in agreement with Reda *et al* (2006). Pagliai *et al.*, (1981) mentioned that refuse derived compost and other organic amendments increase the volume of storage pores as well as transmission pores, reflected to field capacity and permeating gases exchange.

Chemical properties:

• Soil PH

Data in Table (6) clear that application of any material used decreased soil pH values, especially after two years from incubation time. This means that these materials had slightly acidic effects and hence it reduces soil pH values. Besides the improvement of soil properties were caused by the application of these natural materials to soil. Application of Humic acid was more effective on decreasing pH values especially after first year, followed by compost compared with control. Gradually increased of pH with increase of incubation period until end of incubation period (3 years) all treatments under studied similar results were obtained by Ismail, (1998) and Laila, (2001).

• Electrical conductivity (EC_e)

The movement of soluble salts in the soil depends mainly on its texture, structure, total porosity and permeability. Natural materials application plays an active role in improving salt movement and leaching process.

Data in Table (6). show the effect of different materials application on EC_e under irrigation at 60% from FC. Data indicated that the mean values of soil EC_e after three years of incubation time decreased with increasing the incubation time but the decreasing rate after one year was higher than after three year .This may be attributed to the improvement of soil physical properties and enhance the leaching process of salts. Furthermore, increased decomposition rate of application materials and salt accumulation in the soil, however saline soil occur mostly in the arid and semi-arid regions due to relatively high temperature which in turn results in the accumulation of soluble salts especially when the low quality water be used in irrigation (Loi and Singh (1974) and El-Sayed (1990). This result agrees with that obtained by Ebtisam (2007) who mentioned that OM play an important role in decrease soil salinity to extent improved barley grains germination.

• Total Organic Matter (O.M.):

Soils vary widely in their organic matter contents, however, under arid and semi arid conditions, the soil organic matter content is extremely small being less than 1% often or even less than 0.1%. On the other hand the general average all over the earth surface soils is amounting to about 5% (Bear, 1964).

Table (6): Changes of pH, EC, organic matter, total N and available N as affected by different treatments after 3 years from application to the studied calcareous soil.

Treatments	Incubation Periods (months)							
	0	6	12	18	24	30	36	Mean
pH (1:2.5 extract)								
Without treated soil	8.18	8.05	7.98	7.95	7.94	8.04	8.12	8.04
Compost	7.75	7.50	7.40	7.31	7.25	7.38	7.42	7.43
Ensiaben	8.01	7.83	7.74	7.69	7.67	7.65	7.64	7.75
Urea	8.11	7.94	7.85	7.80	7.78	7.77	7.87	7.87
Humic acid	7.78	7.53	7.41	7.34	7.31	7.40	7.45	7.46
Magnetite (Fe O)	7.96	7.97	7.90	7.86	7.85	7.83	7.87	4.89
Mean	8.0	7.82	7.72	7.67	7.65	7.71	7.78	
L.S.D 0.05%	2.09	2.09	2.09	2.04	1.34	1.34	1.34	
EC(dsm^{-1})								
Without treated soil	6.45	6.42	6.42	6.41	6.38	6.33	6.33	6.39
Compost	6.78	.5.72	3.69	3.65	3.65	3.60	3.48	4.2
Ensiaben	6.5	5.9 7	3.9 5	3.87	3.84	3.81	3.74	4.53
Urea	5.55	4.52	4.50	4.40	4.33	4.2 1	4.0	4.5
Humic acid	4.82	3.80	3.75	3.72	3.68	3.63	3.60	3.87
Magnetite (Fe O)	6.25	6. 0	5.9	5.82	5.65	5.11	4.98	5.67
Mean	6.06	5.41	4.7	4.65	4.59	4.45	4.36	
L.S.D 0.05%	0.45	0.34	0.34	0.33	0.34	0.31	0.31	
Organic matter content (%)								
Without treated soil	0.31	0.30	030	0.32	0.33	0.30	0.30	0.31
Compost	0.68	0.72	0.72	0.70	0.67	0.65	0.63	0.68
Ensiaben	0.58	0.61	0.64	0.60	0.56	0.54	0.50	0.57
Urea	0.55	0.62	0.62	0.60	0.55	0.53	0.48	0.56
Humic acid	0.56	0.66	0.62	0.61	0.57	0.55	0.52	0.58
Magnetite (Fe O)	0.32	0.34	0.38	0.36	0.34	0.32	0.30	0.34
Mean	0.50	0.53	0.55	0.53	0.50	0.48	0.46	
L.S.D 0.05%	0.01	0.01	0.03	0.01	0.03	0.02	0.02	

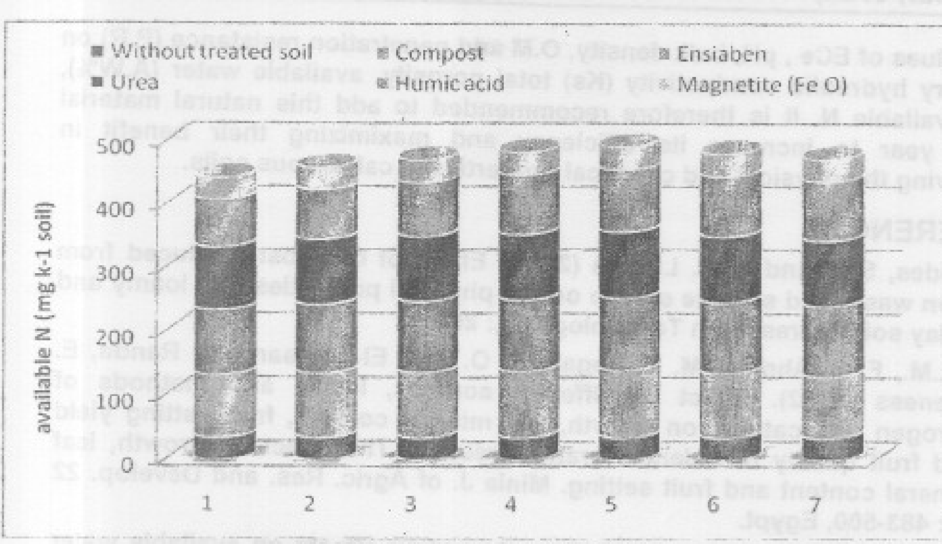
Data in Table (6) show the effect of incubation periods and soil natural materials on organic matter contents.Resalts in Table(6) reveled that the highest soil organic matter content (0.77 %) was obtained by the compost treatment after 24 months from application, then gradually decreased until the end (36 months), without a significant differences with all other treatments.The lowest content of 0.32 % was obtained by the control and magnetite treatments, organic matter content in turn did not differ significantly from the untreated soil and magnetite treatments (Table 5). On the other word, the application of compost was superior in increase of organic matter (OM) content in soil followed of Ensiaben and urea, especially in advanced periods, while the magnetite was lowest effect on OM content as compared to K-humate treatments.

• Total and available Nitrogen (N)

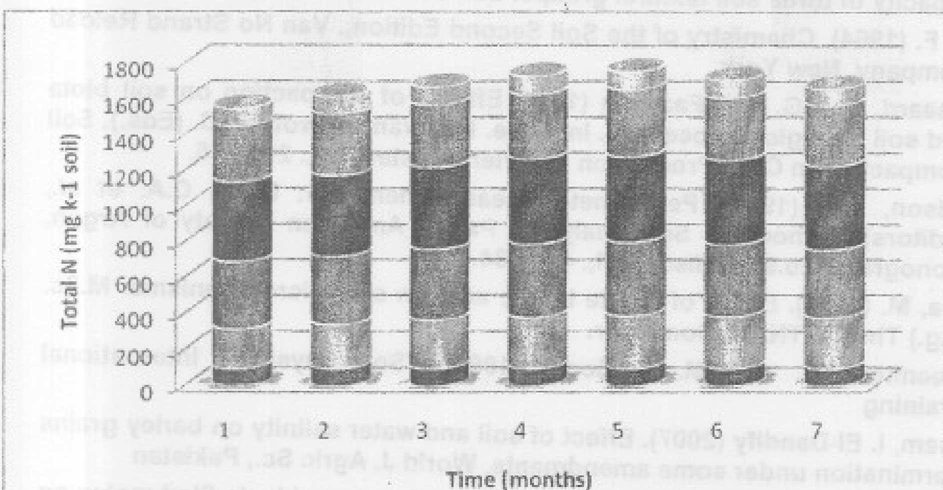
Nitrogen is the most important mineral element in fertilization programs because plants usually need N in greater amounts than other mineral nutrients. Nitrogen losses are caused by leaching, erosion, volatilization, denetrification and fixation in soil organic matter.

Data in Fig. (1) indicated that total and available of N as effected application of natural materials in calcareous soil. Sources of mineral N showed an irregular trend after 12 months, however urea and Ensiaben exhibited lower soil organic matter content than those treated soil with other materials due to their relative slow release of N which according to Gray and Williams (1979).Data in Fig. (1) indicates that total and available nitrogen (mg k^{-1})soil in the Ensiaben and urea treatments were significantly higher than all other treatments, followed of compost and Humic acids as K-humate treatments. While the magnetite treatment was slightly effect on N content in the studied calcareous soil. On the other hand, the results indicated that the incubation period was significant effects on total and available nitrogen in all treatments as compared to the control. Generally, the application of these treatments was more effective on N content in soil after 12 months than other period (three years). However, the application of controlled release N fertilizers they were developed mainly to reduce the number of replications per year, minimize the cost of production, and improve the efficiency of N used by plants, reactions and the rapid gentrification (Scuderi *et al*, 1993 and Wang and Alua, 1996). Previous studies showed that using slow release N fertilizers was preferable than using the fast one in improving growth and nutritional status of the trees. (Akl *et al.* 2002). The organic matter rich soils have a stimulating tendency in the process of nitrification as well as in the availability of N, P and K Sathiya Bama *et al.*, (2003). The increase in available N might be attributed to the N contributed from the native N by the enhanced microbial activities induced by the humic acid (Deepa, 2001). The use of liquid organic N fertilizer has the ability to reduce NH_3 volatilization in soil. The use of both Humic and fulvic acids could be effective in promoting NH_4^+ retention. Thus, it can be concluding that, humic substances, in general, have great ability in controlling NH_3 loss and retaining NH_4^+ in soils. It could be a cheapest, practical and easiest way to control N loss, (Susilawati, *et al.*, 2009).

On the other word the N-content variations one due to the highest content of nitrogen in the natural sources, which were reflected on the soil total nitrogen. The highest of available N were, 113, 106, 104, 98.5, 36.1 and 35.5 mg k^{-1} soil due to application of Ensiaben, compost, urea and K-humate, magnetite and untreated soil after 24 months from application on soil, respectively, While N-values were 480, 412, 375, 293, 101 and 99.5 mg k^{-1} soil for total N due to the application of urea, Ensiaben, K-humate, compost, magnetite and untreated soil respectively. Generally, the N content (total and available N) in the studied calcareous soil, tended to decrease gradually with increasing on incubation time, it may be due to slightly decrease of microbiology activity in soil.



Incubation periods (months)



Incubation periods (months)

Fig. 1. Effect of natural materials on available and total N in calcareous soil

CONCLUSION

Based on the a aforementioned discussion, it could be concluded that the usage of any natural materials previous could be positively affect soil physic-chemical properties, especially after one year from incubation time where

low values of ECe , pH, bulk density, O.M and penetration resistance (P.R) on contrary hydraulic conductivity (Ks) total porosity, available water (A.W%), and available N. It is therefore recommended to add this natural material every year to increase its efficiency and maximizing their benefit in improving the physical and chemical properties in calcareous soils.

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تأثير فترات التحضين علي تحلل بعض المركبات الطبيعية وعلاقته ببعض الخواص الفيزيوكيميائية لتربة جيرية

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الملخص العربي

الهدف الرئيسي من هذه الدراسة يتركز في تتبع تأثير فترات التحضين (حيث استمرت ثلاث سنوات من(٢٠٠٨ الى ٢٠١٠) على تحلل بعض المركبات الطبيعية مثل الكمبوست، الماجنتيت، الانسيلين، حمض الهيومك، اليوريا وانعكاس ذلك على بعض الخواص الطبيعية والكيمائية لتربة جيرية .

ولتحقيق هذا الهدف تم خلط هذه المركبات منفردة بتربة جيرية ووضعها في اصص سعة ٢ كيلو جرام كما تم ضبط مستوى رطوبة التربة عند السعة الحقلية (٦٠%) بالري ثم حضنت تحت ظروف المعمل لمدة ٣ سنوات بحيث اشتملت التجربة على ٦ معاملات تجريبية كرر كلا منها في سبع مكررات وأخذت عينات التربة بالتتابع كل ٦ أشهر لتحليلها وتشير النتائج إلي ما يلي :-

أقصي فترة تحضين للحصول على نتائج ايجابية هي ١٢ شهر بحيث أن زيادة فترة التحضين عن ذلك أعطي نتائج سلبية وقد دلت النتائج خلال هذه الفترة على حدوث انخفاض في قيم كلا من الكثافة الظاهرية وملوحة التربة وحموضة التربة واندماج التربة وعلى النقيض من ذلك أدت إلى زيادة كل من قيم التوصيل الهيدروليكي المشبع والمسامية الكلية والماء الميسر وكذلك المادة العضوية كما أظهرت النتائج زيادة ملحوظة في محتوى التربة من النتروجين الكلى والميسر. ولوحظ من النتائج أن تأثير هذه المواد على الخواص الطبيعية والكيماوية ينخفض تدريجيا بتقدم فترة التحضين بينما يكاد ينعدم تأثيرها بعد ٣ سنوات وهى نهاية فترة التحضين.