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RESPONDING OF SOME PHYSICAL AND CHEMICAL PROPERTIES OF DETERIORATED SOIL AT EL-FAYOUM OASIS AND WHEAT YIELD TO TILLAGE AND AMENDMENTS

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ABSTRACT

The present study was carried out, during the winter season of 2010/2011, on deteriorated, i.e. saline alkaline, soil at Al-Fayoum Oasis, Egypt. Soil treatments were included surface tillage up to 25 cm (Ts) and subsurface tillage up to 50 cm (Td) as well as the amendment treatments of gypsum (G) and sulfur mixed with manure fertilizer (S+FYM). As well as the control treatment (C) without any additions, i.e. zero treatment, to be used in the comparison. Some soil physical and chemical characteristics in addition to grain yield and uptake of some nutrients by wheat were studied.

In general, obtained data showed that, treated the saline alkaline soil of this study with tillage and any used amendments caused desirable effects on decreases all of bulk density, ECe , soil pH and soil ESP and increases all of, total porosity, hydraulic conductivity and soil organic matter with significant trends. These trends was more pronounced with (Td) than (Ts) and with (S+FYM) than with (G) .While the highest responding for the combination between tillage type and amendments was achieved in soil ploughed with (Td) type and amendment with (S+FYM) . The same trends were behaved with soil contents of available nutrients of N, P, K, Fe, Mn and Zn.

The application of amendments or ploughed soil with tillage resulted the highest wheat grain yields (kg/fed) and 1000 grain weight (g/plant) as well as N, P, K, Fe, Mn and Zn contents of grains than with control one (C). Wheat grain (kg/fed) and 1000 grain weight (g) values were significantly increased in case of (Td) treatment compared with (Ts) one. Generally, under the circumstances of this search work, it can be noticed that best improvement of the soil physical and chemical properties as well as the best yield and quality of wheat were achieved with the treatment of (S+FYM) in conjunction with sub-soil tillage (Td).

Kewwords: Deteriorated soil, Oasis, Tillage Amendments

INTRODUCTION

Improving of deteriorated soil can share in solving the problem of shortage in food production, to face the demand of fast growing population. Therefore one of the main targets for the agriculture policy in Egypt is how to exploit these saline soils in Egypt for growing crops, especially cereal crops. This can be achieved by using the optimum and adequate agricultural practices, such as applying soil amendments and organic fertilizers as well as using suitable tillage method to sustain fertility of the soil through improving some of their chemical, physical and biological properties.

Addition of amendments (e.g. gypsum and sulfur) or manure (e.g. farmyard manure) or combination of them to saline or saline alkaline soil can improve the soil physical and chemical properties. Galal et al., (1993) reported that the addition of gypsum caused a marked decrease in the values

of soil bulk density, while the values of hydraulic conductivity were highly and markedly increased. Hussain et., al. (2001) noticed that, EC values were significantly increased by applying FYM, (gypsum + sulfuric acid) and combination of them, also, soil pH decreased significantly in all treatments soil. Soil pH decreased significantly by applying sulfuric acid, gypsum, FYM and their combinations; moreover most of the applied treatments enhanced significantly the subsequent wheat yield. The best treatment in this regard was also the combination of all the three amendments. Muhammad et., al. (2010) stated that the highest grain yield is associated with amelioration effect of gypsum and less saline environment in ridges by irrigating next to the seed row which caused movement of salts away from the seeds and into the top of the ridge. Gypsum significantly reduced soil EC, SAR and pH in both soil depths of 0-15 and 15-30 cm as compared to conventional method. Soil tillage is among the important factors affecting soil physical properties and crop yield. Among the crop production factors, tillage contributes up to 20% Khurshid et al., (2006).

The main aims of this study to study the effect of tillage and amendments in deteriorated soil at El-Fayoum Oasis on some soil characteristics and wheat crop production.

MATERIALS AND METHODS

The study was carried out in deteriorated soil with bad characteristics of saline alkaline, at kasr El-Gibaly village, Al-Fayoum Oasis; Egypt. The initial soil were analyzed according to the methods described by Black (1965) and shown in Table (1). Soil analyses showed that, soil is saline alkaline soil with clay texture and low fertility for available macro and micronutrients.

Table (1). Some initial physic-chemical properties of the experimental field.

O.M (%)	**$CaCO_3$ (%)**	**Particle size Distribution (%)**			**Texture Class**	**Bulk Density (BD) (g/cm^3)**	**Total Porosity (TP) (%)**	**Hydraulic Conductivity (HC) (m/day)**
		Sand	Silt	Clay				
0.92	9.45	24.9	30.5	44.6	Clay	1.47	43.15	0.05

ECe (Soil paste) (dS/m)	PH 1:2.5	Soluble Ions (m.e/l)						
		Anions				Cations		
		Na^+	K^+	Ca^{++}	Mg^{++}	$HCO3^=$	Cl^-	$SO4^=$
8.91	٨.٣١	63.8	1.20	14.3	9.80	3.21	74.78	11.41

CEC (meq/100g. soil)	Exchangeable Cations (meq/100g soil)				ESP
	Na	K	Ca	Mg	
15.4	3.4	0.52	6.35	4.55	22.1

Available micro-nutrients (mg/kg soil)			Available macro-nutrients (mg/kg soil)		
N	P	K	Fe	Zn	Mn
65.90	3.62	208.0	2.50	1.55	0.64

Tillage type's treatments were surface tillage up to 25 cm depth (Ts) and sub-surface tillage up to 50 cm depths (Td). Amendment treatments were Gypsum (G) , which approximately equal to gypsum requirements as Schoonover method as described in Jackson (1973), with rate ≈ 4 ton/fed and as well as 10 m3 of farm yard manure (FYM) in mixing with 250 kg/fed sulfur (S+FYM). Also, control treatment (C) which not received any experimental treatments, i.e. zero treatment, to be used in the comparison.

Some properties of the used FYM were carried out as described by Brunner and Wasmer (1978) and shown in Table (2).

Table (2) some properties of the used farm yard manure (FYM).

Moisture (%)	E.C (1:5) (dS/m)	O.M (%)	O.C (%)	Total N (%)	C/N ratio	Bulk density (BD) (g/cm3)
20.45	3.4	43.52	25.3	1.41	17.94	0.46

The experiment was carried out during winter season of 2010/2011 and laid out in complete randomized design with three replicates, with plot area 20 m^2 (8 x 2.5 m). All the experimental plots were sowing with wheat grains (Triticum aestivum L, C.V. "Sakha 8") in Nov. 30^{th}. They received all the recommended agriculture practices. Organic manure of FYM was mixed with soil before planting. Nitrogen fertilizer (ammonium sulphate 20.5 % N) was applied at the rate of 75 kg N/fed in three doses. Potassium sulphate (48% K_2O) at the rate of 24 Kg K_2O/fed and super phosphate (15.5% P_2O_5) at the rate of 30 kg/fed were applied during field preparation.

At harvest stage (after 160 days from sowing), wheat grain yield from every experimental plot were recorded in (kg/fed) as well as 1000 grain weights (g) were determined. Samples of grain of all experimental plots were oven dried at 70 ^{0}C for several days until constant weights were obtained , crushed and wet digested using a mixture of H_2SO_4 + $HClO_4$ acids to analyzed for N, P, and K (Kg/fed) as well as Fe, Zn, Mn (mg/fed) as outlined by (Ryan et al., 1996).

Soil samples from surface layer (up to 25cm) and from sub-soil layer (up to 50 cm) were collected from each plot after harvesting, to determine some of soil physical properties such soil bulk density (BD, g/cm3) & Total porosity (TP, %) as Vomocil and Folcker (1965) and Hydraulic conductivity (HC m/day) using the undistributed soil column as Black, (1965). On the other hand, soil available N, P, K, Fe, Mn and Zn (mg/Kg) contents of the tested plots were determined as Page et al., (1982). Obtained data were statistical analyzed as stated by Snedecor and Cochran, (1971).

RESULTS AND DISCUSSION

(1) Responding of some physic-chemical to tillage and amendments:

Data in Tables (3 and 4) are shown the responding of the some physical and chemical properties of the studied soil to the experimental treatments, i.e. amendments and tillage.

Physical properties: Generally , data in Table (3) and represented in Fig (1) showed that, treated the saline alkaline soil (deteriorated soil) with tillage as well as amendments caused desirable effects with significant trend on bulk density (BD), total Porosity (TP) and hydraulic conductivity (HC). Compare with control and with calculation the variances as per-cent from (C) values, it can be noticed that tillage treatment of (Td) decreased BD with 12%, TP increased with 14% and HC increased with 240%. While BD decreased with 7%, TP increased with 10 % and HC increased with 180 % under plowing with (Ts) type. Ike (1986) reported that higher bulk density for soils under zero tillage is due to soil compaction. The lower soil bulk density and high porosity produced by ploughing at deep layer could be attributed to the loosening effects of tillage (Lal, 1997). Higher soil bulk density produced by ploughing at 10 could be due to effects of tractor wheel-traffic and implement passes and lower macro-porosity and evaporation rate (Agbede, 2006).

Table (3). Responding of some physic-chemical properties to tillage and amendments.

Treatments	Physical properties			Chemical properties			
	BD (g/cm3)	TP (%)	HC (m/day)	O.M (%)	pH (1:2.5)	ECe (dS/m)	ESP
Control (C)	1.47	43.15	0.05	0.92	8.31	8.91	22.20
Surface tillage (Ts)							
Gypsum (G)	1.34	48.77	0.17	0.95	8.11	7.17	11.51
S+FYM	1.30	50.58	0.19	1.36	8.00	6.55	9.81
Sub-Surface tillage (Td)							
Gypsum (G)	1.21	52.89	0.22	0.94	8.11	5.11	10.16
S+FYM	1.20	52.70	0.25	1.47	7.86	5.00	9.66
L.S.D. at (5%)							
Tillage	0.01	1.67	0.01	0.23	0.272	0.43	
Amendments	0.02	1.66	0.01	0.29	0.133	0.30	
Tillage x Amen.	0.02	2.35	0.02	0.40	0.188	0.42	

Naveed et al. (2010) reported that bulk density of soil in 3 cm to 20 cm layer was significantly increased when intensity of tillage system was decreased. On the other hand, treated soil with (S+FYM) caused decreasing in BD with 10%, increasing in TP with 13% and increasing in HC with 220%. These trends were more than the corresponding values in those soils treated with (G) , which were 9% , 12% and 200% for BD, TP and HC , respectively. Agele et al., (2005) stated that soil amended with FYM had lower bulk density (BD) and higher total porosity (TP) possibly due to increases in the proportion of macro-aggregates and organic soil. Also tillage practices and soil amendment using organic wastes are known to lead to improvement in soil physical conditions. Agele, (2007) reported that, improvement soil physical by adding organic materials and gypsum may be due to the cementing effect of organic material and to the effect of gypsum as a source of calcium ion which improve soil aggregation, soil structure and the other soil physical properties. Also, Naeem et al. (2007) reported that organic matter decreases the bulk density of soil. This effect can occur either directly by "diluting" the soil with a less dense material, or indirectly through greater aggregate stability. Indirect

effects seem to be the most important and are not dependent on soil class. On the other hand Gonzalez and Cooper band (2003) mentioned that increases in bulk density with increasing carbon content is responsible of decreases total soil porosity(TP) . In addition, the discussed trends were in accordance with Shirani et al., (2002) who reported that manures applications improved hydraulic conductivity of soil. Also, El-Kotb (2013) who stated tillage surface with three passes and addition natural amendments as farm yard manure or compost improved soil physical properties of calcareous soil through decrease bulk density(BD) and increase both of total soil porosity(TP) and hydraulic conductivity(HC).

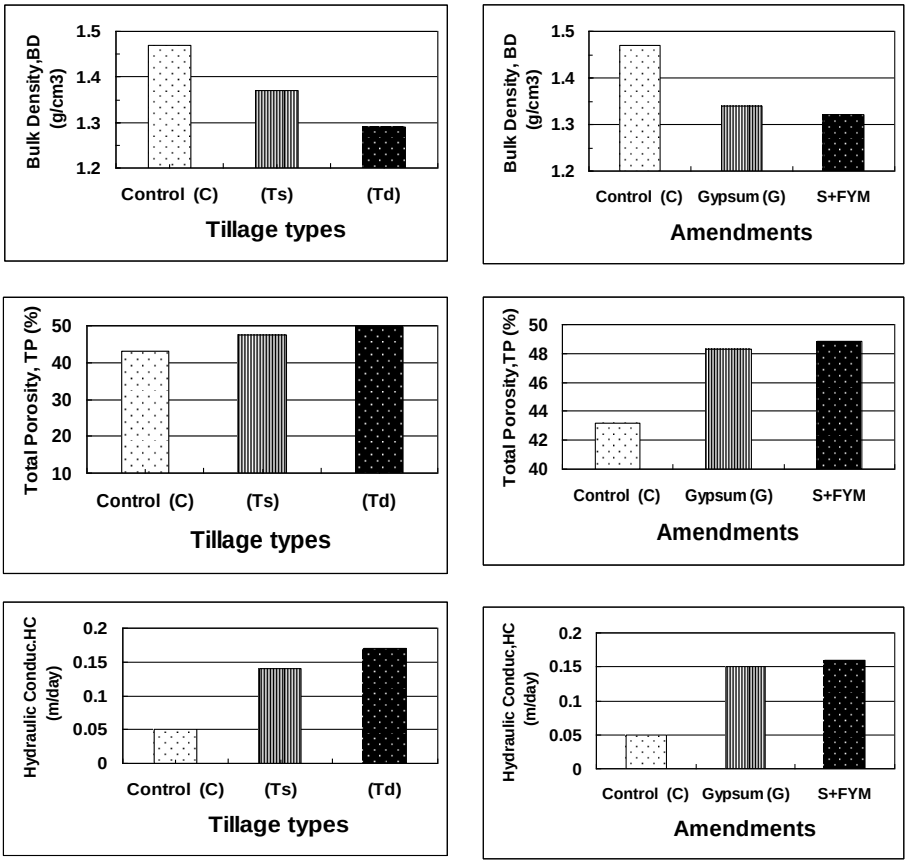

Fig. (1): Responding of soil physical properties of bulk density, total porosity and hydraulic conductivity to tillage types and amendments.

The interaction effects between amendments and tillage treatments showed significant trends between all values of the studied parameters. On the other hand, data showed that, the lowest BD (=1.20 g/cm) existed in the case of soil treated with (S+FYM) under (Td). The highest TP (= 52.89 %)

were obtained in soil of plots treated with (G) under (Td), while plots treated with (S+FYM) under (Td) recorded the highest value of (HC=0.25 m/day).

Chemical Properties: In general, data in Table (3) and represented in Fig (2) indicated that the studied chemical parameters of soil organic matter, pH, EC_e and ESP showed significantly desirable effects as a result of treated soil with the experimental treatments. With respect to the role of tillage types comparing with control (C) treatment; (Td) tillage was more effective than (Ts) for improving soil chemical properties. Whereas soil OM increased with 21 %, pH values decreased with 0.22 unit, EC_e decreased with 29 % and soil ESP decreased with 37 % under plowing with (Td) type, while the same parameters under (Ts) tillage achieved increasing in soil OM with 17 %, decreasing in pH values with 0.17 unit, EC_e decreased with 15% and soil ESP decreased with 35%. Ali and Kater (2009) showed that the different tillage systems emphasized the role of applied organic manure for improving the physical and chemical soil properties. El-Kotb (2013) found that soil O.M contents increased in soil plowed with minimum tillage of one pass through the upper layer than plowed with conventional tillage of three passes. Also, Ali et al (2004) reported that tillage leads to improve soil chemical properties such as EC and pH. Gypsum applied was effective in lowering the chemical parameters that might be due to substitution of exchangeable Na by Ca that produced more soluble salts (NaCl, or Na_2SO_4) and was leached by the irrigation water.

Regarding amendment treatments comparing with (C) treatments , amended soil with (S+FYM) attained the highest improvements in OM , pH , EC_e and soil ESP. Whereas soil OM increased with 36 % , pH values decreased with 0.25 unit , EC_e decreased with 23 % and soil ESP decreased with 37 % under amended with (S+FYM) , while the same parameters under amended with (G) achieved increasing in soil OM with 2 % , decreasing in pH values with 0.13 unit , EC_e decreased with 21 % and soil ESP decreased with 34 % (Lebron et al., 1994). The reclamation treatments of gypsum and amendments reduced significantly soil electrical conductivity of the saturation extract (EC_e) decreased on average from 12.34 to 3.66 dS/m, the exchangeable sodium percentage (ESP) dropped by 51 and 41 Shirani et al., (2002) concluded that addition manures significantly increased soil O.M. Abou El-defan et al. (2005) found that treated soil with gypsum with or without amendment decreased soil salinity , they continued that this ameliorative effect may be due to gypsum allow continuous calcium supply replacing sodium from soil matrix which caused in decrease (ESP) and forming new stable aggregates led to increase hydraulic conductivity (HC) and encourage the water flow down leaching the salt out El-hady and Abo-sederal (2006) reported that application of compost slightly decreased the pH values of soil, which often due to effects to nitrification. Also, Ayub et al., (2007) found that gypsum significantly regulated all of soil pH, salinity, N, P, K and OM. Abd Elrahman et al. (2012) found that, the chemical characteristics of deteriorated clay soil, i.e. pH, EC_e, soluble ions, SAR and ESP were improved by the application of amendments (e.g. gypsum, farmyard manure, compost and the combination among them) and the better effect exists by using 50% gypsum + 50% FYM. Also, (Giovanna et. al., 2012) reported that the

reclamation treatments reduced significantly soil salinity (EC_e) and sodicity (ESP). The highest responding for the combination between tillage type and amendments was achieved in soil ploughed with (Td) type and amended with (S+FYM) , whereas the best obtained values of soil characteristics were 1.47 % for OM, 7.86 for pH, 5.00 dS/m for salinity EC_e and 9.60 for ESP.

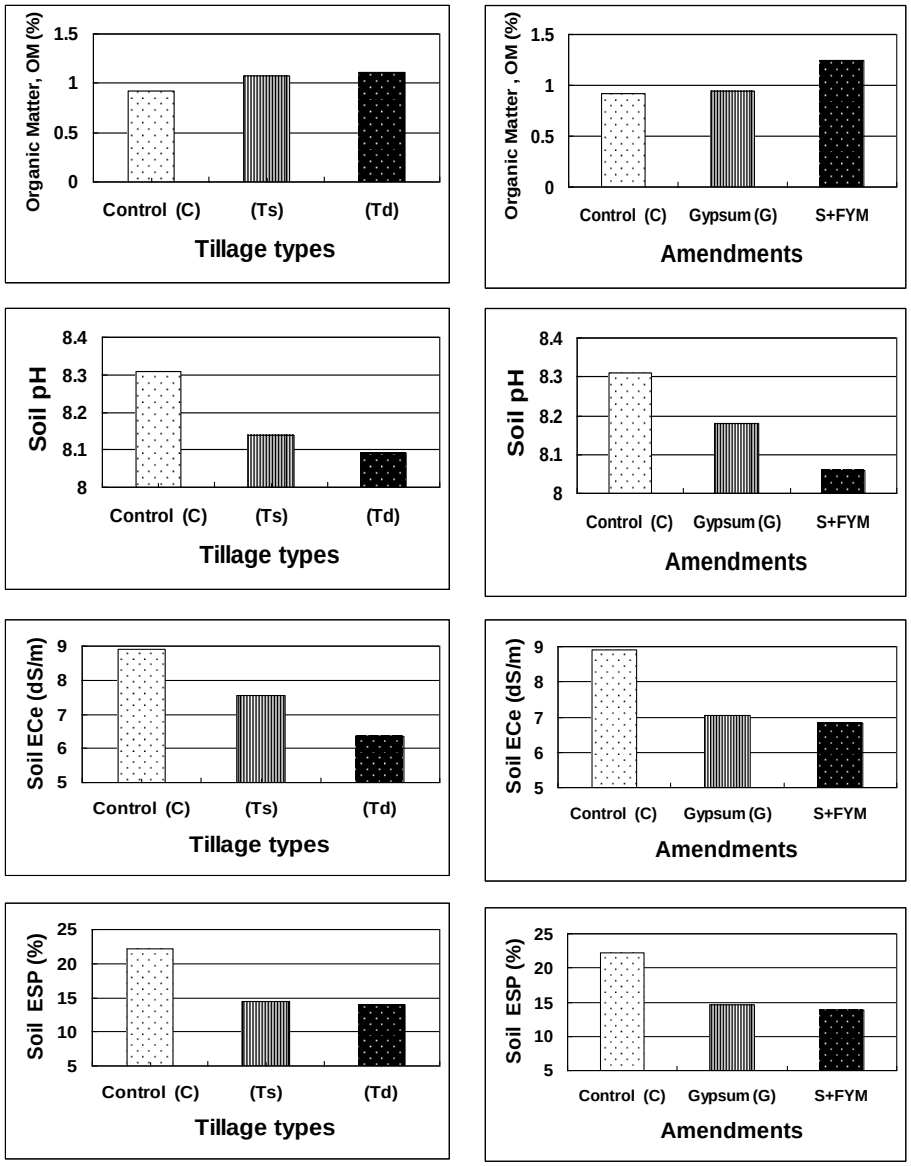

Fig. (2): Responding of soil chemical properties of organic matter, pH, EC_e and ESP to tillage types and amendments.

Available Macro and Micronutrients:

Generally, data in table (4) and represented in Fig (3) and (4) showed that the studied soil available macro and micronutrients of N, P, K, Fe, Mn and Zn showed significantly responding, with increasing trend, as a result of treated soil with amendments treatments of (G) or (S+FYM) under ploughed with tillage treatments of (Ts) or (Td) in comparing with (C) treatment.

Concerning the effects of tillage treatments, plowed soil with (Td) tillage caused significant increases in the contents of available-N and P than those soils treated with (Ts). On the other side, the contents of available-K, Fe, Mn and Zn showed insignificant differences between the soils as a result of plowed with tillage types of (Td) or (Ts). Whereas , their increasing values as % from control treatments under (Td) were 46% , 99% , 42% , 31 % , 47% and 45% while in soils plowed with tillage of (Ts) were 31% , 82% , 40% , 34% , 41% and 43% for soil available- N ,P , K , Fe , Mn and Zn , respectively. Ali and Kater (2009) showed that the different tillage systems emphasized the role of applied organic manure in improving the physical and chemical soil properties and consequently increase the concentration of N, K and P in the calcareous soil.

Table (4). Responding of some soil available nutrients to tillage and amendments.

Treatments	Available nutrients of soil (mg/kg soil)					
	Macro-nutrients			Micro-nutrients		
	N	P	K	Fe	Mn	Zn
Control (C)	45.9	3.62	175.3	2.54	1.05	0.64
Surface tillage (Ts)						
Gypsum (G)	56.5	7.21	265.4	3.63	1.53	0.82
S+FYM	77.8	8.96	296.7	3.96	1.87	1.29
Sub-Surface tillage (Td)						
Gypsum (G)	75.7	8.17	275.9	3.61	1.61	0.88
S+FYM	80.2	9.88	299.5	3.85	1.96	1.28
L.S.D. at (5%)						
Tillage	1.81	0.52	10.0	0.30	0.07	0.07
Amendments	5.32	1.40	8.30	0.13	0.15	0.01
Tillage x Amen	2.50	0.73	12.85	0.40	0.41	0.10

With regard to the effects of amendment treatments, amended soil with (S+FMY) caused significant increases in the contents of available nutrients than those soils amended with (G). Whereas, the increasing values of available nutrients as % from control treatments under (S+FMY) were 48 % ,107% ,47% , 36% , 55% and 67% while in soils amended with (G) were 29%, 75%, 36%, 28%, 33% and 22% for soil available- N ,P , K , Fe , Mn and Zn, respectively. The highest values available-nutrients in soil amended with (S+FMY) may be due to the beneficial role of FYM on physic-chemical properties of soil and to the role chelating agents in soil. The favorable effect of adding soil amendments might be due to either increasing the availability of P in soil as a result of reducing soil pH value in the amended soil or to release of phosphate ions from soil colloids by sulfate ions (Wahdan, 1997). Ayub Jan Muhammad et al., (2007) found that gypsum regulated soil nitrogen, phosphorus and potassium.

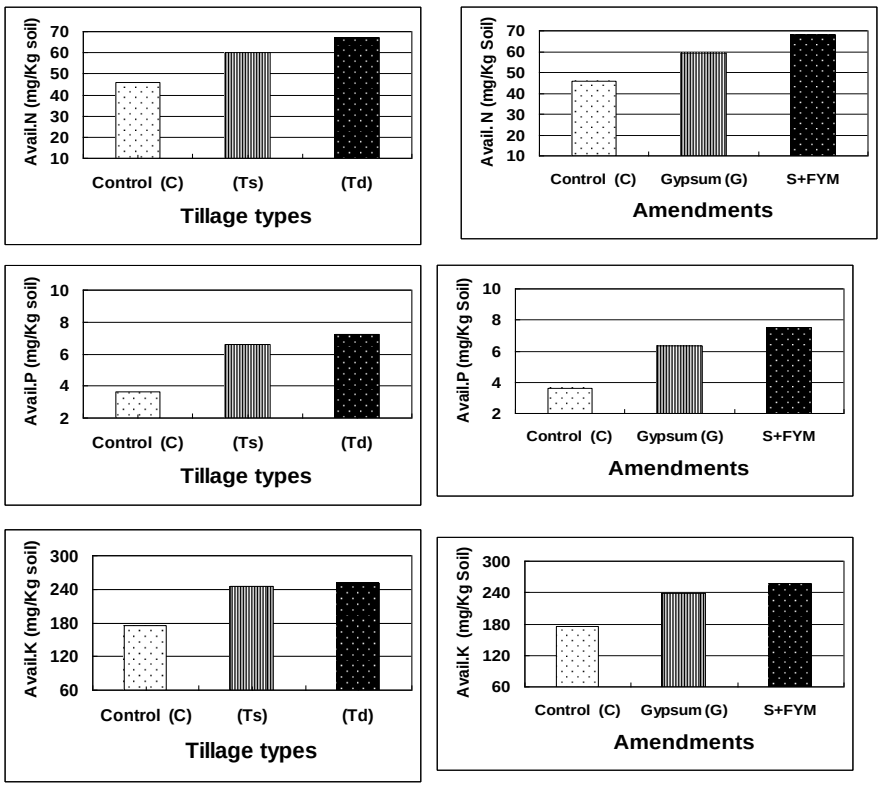

Fig. (3):Responding of soil available N, P and K to tillage types and amendments.

In relation to the interaction effect values , data in Table (4) supported the previous discussion, whereas The highest contents of soil available-N and P were noticed in soils amended with (S+FYM) under plowing with (Td) type , with highly significant differences than the corresponding values under the other interaction treatments. Regarding the contents of soil available-K and Fe, Mn and Zn, their highest values were observed in soil had interaction treatments of (S+FYM) under (Td), but insignificant trends were noticed. With the same corresponding values of (S+FYM) under (Ts). Soils amended with (G) under tillage with (Td) achieved the second third followed with soils amended with (G) under tillage with (Ts) with respect to their contents of available nutrients under study. These results were in coinciding with Ali and Kater (2009) showed that the different tillage systems emphasized the role of applied organic manure in improving the physical and chemical soil properties and consequently increase the concentration of N, K and P in the calcareous soil. Also, Adeyemo *et. al.* (2010) who stated the tillage-manure combination produced higher values of soil OM and available-N & P over tillage alone. Furthermore, Abd Elrahman

et al. (2012) reported that the better effect treatment on improvement available nutrients in soil was exists by using 50% gypsum + 50% FYM.

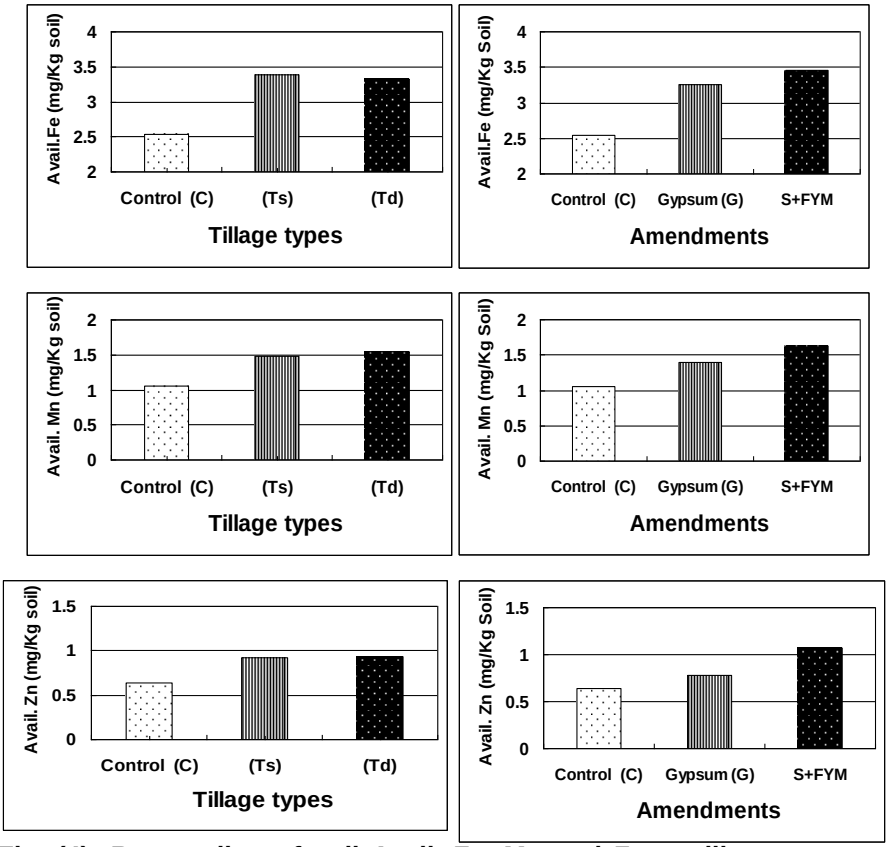

Fig. (4): Responding of soil Avail. Fe, Mn and Zn to tillage types and amendments.

2) Responding wheat production to tillage and amendments:

Wheat grain yield (kg/fed), 1000 grain weight (g) as well as the responding of their nutrients to amendments and tillage treatments are shown in Table (5).

Yield of Wheat grain (kg/fed.) and 1000 grain weight (g): A general trends, individual effects of amendments, i.e. (S+FYM) and (G), or tillage treatments, i.e. (Td) and (Ts), as well as interaction effects between them showed higher significant values of wheat grain yield (kg/fed) and 1000 grain weight (g) in comparison with soils received no-amended or no-plowed (C). For individual effects of amendment addition to deteriorated soil with bad characteristics of saline alkaline, at kasr El-Gibaly village, Al-Fayoum Oasis on wheat grain yield (Kg/fed) and weight of 1000 grain (g), data in Table (5) declared responding wheat yield and quality to tillage and amendments.

That amended soil with (S+FYM) was more effective than treated with (G) amendment. Whereas soil treated with (S+FYM) achieved wheat

grain yield of 1670 Kg/fed (with R.I ≈ 48%) and Weight.1000 grain of 50 g, while amended soil with (G) attained wheat grain yield of 1481Kg/fed (with R.I ≈ 32%) and Wt.1000 grain of 49 g. The effective role of organic manure was explained as El-Fakhrani (1999) who reported that organic manures play a direct role in sustain soil fertility and mechanisms i.e. providing nutrients after decomposition and acting as an energy source for soil organisms, increasing the soil CEC and thereby improving nutrients retention against leaching, building soil structure which increase the infiltration rate of water and water use efficiency. Similar finding on the effect of amended soil with gypsum or/and FYM on wheat yield was attained by Abou El-defan et al. (2005). According to Ali, et al. (2009) showed that the difference in tillage system or the application rate of farmyard manure led to significant increase in the yield, N, K and P content in plant. Abd Elrahman et al. (2012) found that the grain yield, weight of 1000 grains and NPK uptake of wheat plants were significantly increased due to the application of these amendments compared to the control, especially for 50% gypsum + 50%FYM treatment. Meanwhile plowed soil with tillage type up to 50 cm (Td) was awarded the highest wheat grain yield (Kg/fed.) and weight of 1000 grain (g) than tillage type up to 25 cm (Ts). Whereas, soil ploughed with (Td) achieved wheat grain yield of 1645 Kg/fed (with R.I ≈ 46%) andWt.1000 grain of 57g. ,while ploughed soil with(Ts) gave wheat grain yield of 1506 Kg/fed (with R.I ≈ 34 %) and Wt.1000grain of 42 g. This role of tillage in improving yield of growing crops was in coincide with the findings of El- Douby et al. (1996) and by Nawar and Khalil (2004) who observed a tendency for increase in yield of Faba bean and 100-seed weight with tillage compared to no-tillage system.

The interaction effect supported the previous discussion. Whereas (Td) amended soil with (S+FYM) recorded the highest values of grain yield of (2029 Kg/fed. with R.I 80 %) and 1000 grain weight of 69 g. , followed by soil treated with (S+FYM) under (Ts) which achieved grain yield of (1854 Kg/fed. with R.I≈ 65 %) and 1000 grain weight of 47 g. The effective role of combination between organic manure addition under tillage in increasing yield and weight of grain was in agreement with the trends found by El-Kotb (2013).

(A): (values of interaction effects)

Treatments	Wheat Yield			Nutrients uptake by wheat grains					
	Grain Yield		1000 grain Wt. (g)	Macro-nutrients (Kg/fed.)			Micro-nutrients (g/fed.)		
	(Kg/ fed)	R.I*		N	P	K	Fe	Mn	Zn
Control (C)	1126	00	34	29.28	2.25	32.65	140.75	45.15	27.70
Surface tillage (Ts)									
Gypsum (G)	1537	37	45	41.59	4.61	49.18	247.46	78.69	43.65
S+FYM	1854	65	47	52.76	5.84	62.53	317.03	107.72	63.96
Sub-Surface tillage (Td)									
Gypsum (G)	1779	58	67	42.70	5.34	55.15	284.64	91.08	58.88
S+FYM	2029	80	69	48.70	6.29	64.93	345.93	115.86	68.17
L.S.D.at (5%) Tillage x amend	59	---	3	8.1	1.9	7.70	28.08	25.12	17.69

(B): (mean values of individual effects)

Control (C)	1126	00	34	29.28	2.25	32.65	140.75	45.15	27.70
Ts	1506	34	42	41.21	4.23	48.12	235.08	77.19	45.10
Td	1645	46	57	40.23	4.63	50.91	257.11	84.03	51.58
Gypsum (G)	1481	32	49	37.86	4.07	45.66	224.28	71.64	43.41
S+FYM	1670	48	50	43.58	4.79	53.37	267.90	89.58	53.28
L.S.D. at (5%)									
Tillage	42	----	2	5.9	2.4	3.34	18.63	19.98	12.51
Amendments	19		1	2.3	1.2	2.26	18.86	21.87	12.74

RI (%)*: Relative Increments (% from control)

Nutrient contents by wheat grains (kg/fed):

Data in Table (5) indicate that, both of the individual effect of (Td) or (Td) caused highly significant increasing in uptake of N, P and K, Fe, Mn and Zn by wheat grain in compare with non-ploughed soil (Control). Generally, it can be noticed that Td treatment increased obviously the uptake of the most studied nutrient than (Ts) uptake, but with insignificant differences except for Fe-uptake only increased with significant trend. Furthermore, both of the individual effect of (G) or (S+FYM) caused highly significant increasing in uptake of N, P and K, Fe, Mn and Zn by wheat grain in compare with non-amended soil (C). It can generally noticed (S+FYM) increased obviously the uptake of the entire studied nutrient than (Ts) uptake, but with significant differences for N, K and Fe-uptake and with significant trend for P, Mn and Zn-uptake. Also, data in Table (5) showed that N , P and K, Fe , Mn and Zn-uptake by wheat grain (mg/ fed.) showed highly significant increasing as a result to amended soil with (G) or with (S+FYM) under plowed soil with tillage of (Ts) or with (Td) in comparison with the non-amended treatment (C). As a general trend , the interaction effects of experimental treatments of amendments and tillage types on N ,P ,K ,Fe , Mn and Zn-uptake by wheat grains can be arranged in the descending order of : (S+FYM) with (Td) > (S+FYM) with (Ts) > (G) with (Td) > (G) with (Td) .

From the above mention discussion, it can be concluded that, the best treatment which improve some physical and chemical properties of soil combined with the highest wheat grain yield and good seed quality can be

obtained in case of sub-soil tillage (Td), amended with both sulfur and Farm Yard Manure (S+FYM) followed by the soil amended with (G). Coincide trend regarding to the effective combination role between organic amendments and tillage on increasing yield of faba bean grain and their contents of N, P and K was noticed by El-Kotb (2013).

3) Assessment the most effective soil characteristics on wheat grain yield by using stepwise regression analysis:

The obtained data were exposed to statistical analysis of stepwise regression by using the Minitab program (Barbara and Brain, 1994). By using the stepwise regression equations it can mathematically predicted the contribution of any effective soil character on the yield, expressed as "contribution %".

Table (6) : Stepwise regression equations of the most effective soil characteristics on wheat yield.

Steps	Stepwise regression equations	R^2
Soil Chemical characteristics :		
1	Y = 17867 – 2000 pH	0.9023
2	Y = 12372 – 1200 pH – 96.7 ECe	0.9729
3	Y = 11021 – 1100 pH – 72.8 ECe – 13.1 ESP	0.9809
4	Y = – 1181 + 393.2 pH – 102.5ECe – 27.4 ESP + 610 OM	1.0000
Soil Physical characteristics :		
1	Y = 892 + 4391 HC	0.9291
Soil available nutrients :		
1	Y = 580.7 + 143.3 Avail-P	0.9825
2	Y = 1054.7 + 202.1 Avail-P – 261.3 Avail-Fe	0.9963
3	Y =812.1 + 157.6 Avail-P – 185.3 Avail-Fe+ 4.64 Avail- N	0.9980
4	Y =810.9 + 156.4 Avail-P – 185 Avail-Fe+ 4.5 Avail- N + 16.1 Avail- Zn	1.0000

Y : Wheat grain yield (Kg /fed.)

The stepwise regression equations presented in Table (6) showed the soil characteristics which had the most effective role on grain yield production of wheat. It can arrange the soil chemical characteristics, as their effective on wheat yield, in the following order of: soil pH > soil ECe > Soil ESP > soil OM. Their contribution factors (%) were 90.23, 7.06, 0.8 and 1.91 respectively. While the stepwise regression for the soil physical characteristics declared that Hydraulic Conductivity (HC m/day) had the highest contributed on yield (≈ 93 %) and was the most obviously effective than the other studied soil physical properties.

As for soil available nutrients, as shown in Table (6), their continuation factors were 99.25 %, 1.38 %, 0.20 % and 0.17 % for soil available–P, Fe, N and Zn, respectively.

REFERENCES

Abd Elrahman , S. H., Mostafa, M.A.M., Taha, M.A.O. and Elsharawy, M.A . (2012). Effect of different amendments on soil chemical characteristics, grain yield and elemental content of wheat plants grown on salt-affected soil irrigated with low quality water. Annals of Agricultural Sciences. 57:175–182.

Abou El-defan, T.A., El-Banna, I.M.M., El-Maghraby T.A., Abdall M.E. and Selem M.E. (2005). Efficiency of some amendments added to clayey soil irrigated with drainage water. J.Agric. Sci. Mansoura Univ. 30: 2479-3489.

Adeyemo A. J. and Agele S. O. (2010). Effects of tillage and manure application on soil physicochemical properties and yield of maize grown on a degraded intensively tilled alfisol in south western Journal of Soil Science and Environmental Management Vol.1: 205-216.

Agbede TM (2006). Effect of tillage on soil properties and yam yield on an Alfisol in Southwestern Nigeria. Soil Till. Res., 86:1-8.

Agele, S.O (2007): Efficacy of organic amendments on the establishment and biomass yield of grass species on adegarded alfisol. J. Plant Interactions: 2: 195-201.

Agele, S O, Ewulo BS, Oyewusi IK (2005). Effect of some management systems on soil physical properties, microbial biomass and nutrient distribution under rained maize production in a humid rainforest Alfisol. Nutr. Cycling Agroecosyst 72: 121-134.

Ali, M.H., Ali,A.A. , Kilany M.A. and Algala,M.D. (2004). interaction effect between tillage depth and soil conditioners on calcareous productivity under irrigation with saline water. Egypt. J. Appl. Sci. 19: 399-414.

Ali, M.H. and Kater I.M.M. (2009). Effect of chisel & rotary cultivator and organic manure application on improving the properties of calcareous soil. Egypt J. Soil Sci. 49 (1) 113-129.

Ayub J. M., Muhammad R., Abdul Baqi, H. R. and Wahab. (2007). Effect of different sources of sulfur on soil properties and physio-chemical characteristics of citrus limon l. (cv. lisbon) grown on alkaline soil in fata. Sarhad J. Agric. Vol. 23:95-99.

Barbara, F.R. and L.J. Brain (1994) Minitab Handbook. Duxbury press. An Imprint of Wad Sworth Publish. Comp. Belonont California U.S.A.

Black, C. A. (1965). “Methods of Soil Analysis”. Part 2. Am Soc. Agr., Washing., D.C.

Brunner,P. H. and Wasmer H.R. (1978). “Methods of analysis of sewage sludge solids wastes and compost”. WHO international Reference Center for wastes Disposal. CH-8600 Dubendorf, Switzerland.

El- Douby, K. A., El-Habbak, k.E., Seif El-Nasr, F. M. and Basal,S.A.(1996). Effect of tillage system and plant density under different P-fertilization levels on productivity of faba bean .Ann.Agric.Sci. 34: 907-918.

El-Fakhrani, Y.M. (1999). Combined effect of P-fertilization and organic manuring on barley production in sandy soil. Fayoum J.Agric.Res & Dev. 13: 81-97.

El- hady, O.A. and Abo-sederal S.A. (2006). Condition effect of composts and Acriylamide Hydrogels on a sandy calcareous soil .II : Phsyico-Bio-chemical properties of the soil. Inter. J. Agric. & Biology 1560-8530.

El-Kotb, H.M.A.(2013) : Combination effects of tillage systems and organic manures on some physico-chemical properties on calcareous soil and faba bean productivity. New.York.Sci.J. 6:193-202.

Galal, M. E., Sakr A. A. and Ali L. K. (1993). Influence of gypsum application from different sources and time of amelioration on some soil physical properties. J. Agric. Sci., Mansoura Univ., 18: 3777 – 3791.

Giovanna C., Lacolla G., Pallara M. and Lavia R. (2012). Reclamation of saline and saline-sodic soils using gypsum and leaching water.African Journal of Agricultural Research 7: 6508-14.

Gonzalez, R.F. and Cooper band, L.R. (2003). Compost dffects on soil chemical properties and field nursery production. J. Environ. Horti. 21: 38-44.

Hussain N, G. Hassan, Arshadullah M. and F.Mujeeb (2001). Evaluation of Amendments for the Improvement of physical properties of Sodic Soil. International Journal of Agriculture &Biology 3: 319–322

Ike IF (1986). Soils and crop responses to tillage practices in a ferruginous soil in the Nigeria Savanna. Soil Till. Res. 6: 261-272. Jackson ML (1962). Soil Chemical analysis. Prentice – Hall Inc. New Jersey, pp. 1-498.

Jackson, M. L. (1973). “Soil Chemical Analysis. Chapter 4 " Caption exchange for soil". Prentice Hall Inc., Englewood Califfs, U.S.A.

Khurshid K., Iqbal M., Arif M.S. and Nawaz A. (2006). Effect of tillage and mulch on soil physical properties and growth of maize. Int. J. Agri. Biol. 5: 593-596.

Lal R (1997). Long-term tillage and maize monoculture effects on a tropical Alfisol in western Nigeria on crop yield and soil physical properties. Soil Till. Res., 42: 145-160.

Lebron, I., D.L. S and Alberto F. (1994). Stability of a calcareous saline sodic soil during reclamation. Soil Sci. Soc. Am. J., 58: 1753-1762.

Muhammad J K, Mohammad U. K., Amin A., Mohammad F.A and Mohammad, S. (2010). Management of saline sodic soils through cultural practices and gypsum. Pak. J. Bot., 42: 4143-4155.

Naeem, A., Fayyez-ul-hassan and Ghulam qadir (2007). Effect of sub surfaces soil compaction and improvement measures of soil properties . Inter. Res. J. of agriculture and biology. 3: 509-513

Nawar, A.I. and Khalil, H.E. (2004). Evaluation of some agronomic and economic aspects of faba bean under different soil tillage systems and Bio-and chemical phosphorus fertilization. Adv. Agric. Res. 9: 593-666.

Naveed, I. K., Malik, A. U., Umer, F. and Bodla, I., M (2010). Effect of tillage and farm yard manure on physical properties of soil. Intern. J. of Plant Sci.14:75-82.

Page A.L., R Miller. H. and Keeney D.R. (1982). “Methods of soil analysis Part 2”. Chemical and microbiological properties. Second Edition. Amer. Soc. Agron. Madison, Wisconsin, USA.

Ryan, J.; Garabet S.; Harmsen K. and Rashid A. (1996). A soil and plant Analysis Manual Adapted for the West Asia and North Africa Region. ICARDA , Aleppo , Syria . 140pp.

Shirani, H., Hajabbasi, M.A., Afyuni M. and Hemmat, A. (2002). Defect of yard manure and tillage system on physical properties and corn yield in Central Iran. Soil and Tillage Res. 68: 101- 108.

Snedecor, G. W. and Cochran W.G. (1971). Statistical methods. 6th ed. Iowa State Univ. Press. Ames.

Wahdan ,A.A. , El-Gendi S.A. and Abdel-Mawgoud , A.S (1999). Amelioration technique for sodic soils in Al-Fayoum Oasis. Egypt.J.Soil Sci.2: 99-210.

Vomocil, J.A. and Flocker, W.J. (1965). Degradation of structure of vole loam by compaction. Soil Soc.Amer.Proc., 29: 7-12.

إستجابة بعض الخواص الفيزيقية الكيميائية لأراضى متدهوره فى الفيوم وإنتاجية القمح لأنواع مختلفة من الحرث وإضافة بعض محسنات التربة

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اقيمت تجربة حقلية فى قرية قصر الجبالى – بمحافظة الفيوم خلال الموسم الزراعى ٢٠١٠ – ٢٠١١ لدراسة تاثير استخدام بعض محسنات التربة (الجبس الزراعى– السماد البلدى المخلوط بالكبريت) تحت معاملات الحرث السطحى لعمق ٢٥سم والحرث تحت السطحى لعمق ٥٠سم على بعض خواص التربة الطبيعية والكيمائية وتيسر العناصر الغذائية بها وكذلك دراسة أثر تلك المعاملات على محصول القمح سخا ٨ ووزن ١٠٠٠ حبة ومحتوى الحبوب من العناصر الكبرى والصغرى .

والنتائج المتحصل عليها يمكن تلخيصها فيمايلى :

- أدت معاملة التربة الملحية القلوية بأى من معاملات الحرث أو المحسنات إلى إحداث تأثيرات مرغوب فيها للصفات الطبيعية والكيميائية للتربة ، تمثلت فى تخفيض قيم الحموضة (pH) والكثافة الظاهرية (BD) وقيمة % للصوديوم المتبادل (ESP) للتربة وزيادة كل من المسامية الكلية (TP) والتوصيل الهيدروليكى (HC) ووالـ % للمادة العضوية (OM) للتربة وكانت هذه التأثيرات معنوية مقارنة مع معاملة الكنترول التى لم تعامل بالحرث أو المحسنات (C) وكانت هذه الاتجاهات أكثر وضوحا مع معاملات الحرث حتى ٥٠سم (حرث تحت سطحى Td) عن الحرث حتى ٢٥سم (حرث سطحى Ts) مع معاملة مخلوط الكبريت المعدنى المختلط بسماد المزرعة.
- أعلى تأثير على محتويات التربة من العناصر الغذائية الميسرة Zn, Mn , Fe , P , K ,N .هو معاملة مخلوط الكبريت المعدنى وسماد مخلفات المزرعة (S+FYM) تحت نظام الحرث تحت السطحى (Td)
- زاد المحصول من حبوب القمح (كجم / فدان) و ١٠٠٠ وزن الحبوب (جم)، مع معاملة التربة المالحة القلوية بأى من معاملات الحرث أو المحسنات وافضل النتائج كانت تحت نظام الحرث تحت السطحى مع الكبريت المخلوط بالسماد البلدى.
- زاد محتوى حبوب القمح من الـ N والـ P والـ K والـ Fe والـ Mn والـ Zn مقارنة مع معاملة الكنترول التى لم تعامل بالحرث أو المحسنات (C).
- زاد محصول حبوب القمح (كجم / فدان) ووزن ١٠٠٠ الحبة (جم) بشكل ملحوظ تحت نوع الحرث تحت السطحى (Td) مقارنة بمعاملة الحرث السطحى (Ts) .

وبصفة عامة فإن أفضل تحسن فى الخصائص الفيزيائية والكيميائية وكذلك أفضل محصول من حبوب القمح ووزن الـ ١٠٠٠ جبة (جم) قد ظهر فى التربة التى عوملت بسماد مخلفات المزرعة المخلوط بالكبريت (S+FYM) تحت نظام الحرث تحت السطحى (Td) .