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GROWTH OF CORN PLANTS CULTIVATED IN DIFFERENTLY MANURED ARID SOILS AND IRRIGATED WITH VARIOUS WATER QUALITIES

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ABSTRACT: *This work was carried out to study the individual and combined effects of organic manures and irrigation water quality on growth of corn plants (Zea mays L (triple hybrid 310) and their contents of some macro nutrients. Surface soil samples representing alluvial, calcareous and sandy soils were used in these greenhouse experiments. The soils were manured with farmyard manure (FYM at 2 % C) and alfalfa plants as a green manure (GR), plus the control treatments. The used irrigation water sources were tap water (TW) agricultural drainage water (DW), mixed TW + DW at a ratio of 1:1, synthetic saline water at 2000 mg/l of TSS of $CaCl_2$ + NaCl at Ca : Na ratio of 1:1 (SW1) and synthetic saline water at the same content of TSS and Ca : Na ratio of 2:1 (SW2). All pots were planted with 5 corn seeds /pot. Plant samples were taken after 45 and 65 days of planting. Dry weights of plant samples were recorded and their contents of N, P and K were determined. The dry matter yield of corn plants increased as a result of organic manures application. Those increases were clearer with FYM especially at the first growth period. Under the different treatments of manures, the dry matter yield increased with advancing the plant age. The highest dry matter yields were found for the plants grown on the alluvial soil followed by those on the calcareous soil, to leave the sandy soil last in such concern. Also, with the different manure treatments, the highest dry matter yields were found for the plants irrigated with DW, whereas the lowest values were found with the treatments of SW2.*

The obtained data also showed greater positive effects of manure treatments on corn plant contents (%and mg/Kg) of N, P and K at both growth stages under the different soil conditions. The highest contents of such nutrients were found in the corn plants grown on the alluvial soil manured with FYM and irrigated by DW.

Key words: *Maize, Organic fertilization, Irrigation water quality, Nutrients uptake, cereal crops.*

INTRODUCTION

Under arid and semi-arid conditions, like Egypt, the most important two factors limiting soil productivity are irrigation water and organic matter supplements. For many centuries, farmers have confirmed that, the capacity

of soils to produce crops is more or less directly related to the amount of added organic matter (OM). Much attention has been drawn to the nature, behavior, and functions of (OM) in Egyptian soils, as well as composting of plant residues. Moreover, the golden motto should be "what comes out of the soil must be returned to the soil" and therefore the burning of garbage is a major and punishable agricultural crime.

Abou Houssien (1999a and b)found that, in alluvial soils of Kalioubiya and Minufiya Governorates of Egypt OM contents were about 2 % in the surface layers and decreased with depth. They also added that, content of OM and its distribution within soil profile depended on the type of cover plant and its cultivation season. Ahmed (2005) studying the content of OM and its distribution in soil profiles in some salt affected soils of Egypt and she found that, the content of OM and its vertical distribution within soil profiles were related to soil salinity, source of soil salinity, cultivated crop and irrigation water quality. She also, added that, soil content of OM decreased with increasing soil depth. Khalil *et al.* (2000) and El- Shinnawi (2009) found that, addition of different organic manures (compost, farmyard, and others) significantly increased the dry matter yield and macronutrients uptake of corn and faba bean plants in both sandy and clayey soils.

Alshahri (2008) noted that, different organic manures (FYM, sewage sludge and compost) applied to alluvial and calcareous soils increased EC, CEC and soil contents of both soluble cations and anions. The same study concluded that, soil pH and its content of $CaCO_3$(%)decreased with organic manure addition.

Abdel- Mawgoud et al. (2006) and Abou Houssien *et al.* (2009) found that irrigation with drainage water (as a low quality water) caused increases of soil salinity (EC), as well as, such salinity is influenced not only by salt concentration of irrigation water but also with the nature of soil. Shalaby et al.(2009) found that irrigation with drainage water increased soil salinity of several profiles of Al-Hamul, Kafr El-Sheikh Governorate of Egypt, due to salt accumulation in soil profile.

Corn (*Zea mays L*), known also as "maize", is considered in the third world as one of the most important cereal crops, coming after wheat and rice. Corn is grown primarily for human food and secondarily for animal fodder, as well as a raw material for some agro-industrial process. Maize is planted in about 1.979 million feddan in Egypt during (2005). The average grain yield was around 3.52 ton /feddan (feddan = 4200 m^2).

This work was carried out to study the individual and combined effects of organic manures and different qualities of irrigation water, on growth rate and macronutrient contents of corn plants grown on some arid soils, i.e. alluvial, calcareous and sandy.

MATERIALS AND METHODS

A. Soils:

Three surface soil samples (0 - 20 cm) were, separately, collected from three different places, in Egypt, i.e. 1) alluvial soil from Meet Khlaf village. Shibin El-Kom, Minufiya Govornorate, 2) calcareous soil from El-Nobaria region, El-Beheira Govornorate, and 3) sandy soil from El-Sadat City, Minufiya Govornorate. Each soil sample was air-dried, ground, well mixed and passed through a 2-mm sieve. Physical and chemical analyses of these three soils and, there content of C, N, P and K were carried out following the methods Page et al. "parts 1&2"(1982), and the obtained data are presented in Table (1).

B. Organic fertilizers

1-Farmyard stable manure "FYM": The used FYM (with rice straw litter) was taken from the Agricultural Reforming Farm, Meet Khlaf, Shibin El-Kom, Minufiya Governorate. The collected manure sample was air-dried and ground. Some chemical characteristics of such manure were carried out according to Page et al. "parts 2" (1982) and the obtained data are given in Table (2)

2- Green manure "G.M": Alfalfa (*Medicago sativa L)* was employed for the present purpose.

C. Irrigation waters

The water sources used in this study were: (1) Tap water (Nile) (TW), (2) agricultural drainage water (DW), from El-Kerenin drain of Minufiya Governorate. (3) Mixture of Tap water plus agricultural drainage water, at a ratio of 1:1(TW + DW), (4) Synthetic saline tap water, prepared using chloride salts of Ca and Na, mixed at a ratio of 1:1 of Ca : Na (SW1), at a total salinity of 2000 mg /l and (5) Synthetic saline tap water, prepared using chloride salts of Ca and Na, mixed at a ratio of 2 : 1 of Ca : Na (SW2), also at a total salinity of 2000 mg /l. Chemical analysis of the used natural water sources (TW & DW) was carried out using the methods described by Cottenie et al. (1982)and the obtained results are given in Table (3).

Table (1): Some physical and chemical characteristics of the experimental soils and their contents of available N, P & K.

Soil properties	Alluvial soil	Calcareous soil	Sandy soil
Particle size distribution (%)			
Sand	41.6	80.6	95.0
Silt	23.9	8.2	0.8
Clay	34.5	11.2	4.2
Texture class	Clayey loam	Sandy loam	Sandy
pH (1:2.5 water susp-)	7.9	8.3	8.3
E.C. "Electrical conductivity" (dSm^{-1}) (1: 5 water extract), at 25 C^{0}	0.42	1.88	0.33
Soluble Cations (meq/100g soil) (soil paste extract)			
Ca^{++}	1.11	9.54	1.06
Mg^{++}	0.29	0.38	0.62
Na^{+}	0.84	1.45	0.37
K^{+}	0.17	0.08	0.04
Soluble Anions (meq/100g soil) (soil paste extract)			
$CO_3^{=}$	Traces	Traces	Traces
HCO_3^{-}	1.00	0.65	0.50
Cl^{-}	0.48	0.48	0.29
$SO_4^{=}$	0.93	10.47	1.30
Total calcium carbonate (%)	2.60	22.00	0.85
CEC "Cation exchange capacity" (meq / 100 g soil)	27.26	6.75	3.66
SAR " Sodium adsorption ratio" of Soil	1.00	0.65	1.18
Organic carbon (%)	700	320	170
Total nitrogen (ppm)	1.10	0.19	0.01
C/N Ratio	1.90	0.34	0.02
Organic matter (%)	15.71	5.90	0.71
Available N (KCl extract) (mg / kg)	420.00	70.00	35.00
Available P (mg/kg) (NaHCO3-extract)	166.66	16.66	6.48
Available K(mg/kg) (ammonium acetate-extract)	11.0	6.50	5.00

Table (2): Characteristics of the used farmyard manure

pH (1:10 water susp)	EC. (dSm^{-1}) ((1:1 water extract)	Org. C (%)	Total N (%)	C/N Ratio	O.M (%)	Total P (%)	Total K (%)	Ash (%)	Moisture content (%)
7.7	8.50	15.64	0.90	17.38	26.90	0.15	1.85	30.00	40.10

Table(3) Chemical analysis of the natural water sources used for irrigation.

Water type	pH	EC ($dS\ m^{-1}$)	Soluble ions meq/l								SAR (meq/l)
			Cations				Anions				
			Na^+	K^+	Ca^{++}	Mg^{++}	$CO_3^=$	HCO_3^-	Cl^-	$SO_4^=$	
Tap water (Nile)	7.2	0.92	1.64	0.18	4.83	2.37	0.72	2.70	5.10	0.50	0.87
Drainage water	7.1	1.21	3.86	0.22	5.10	2.63	1.40	5.04	1.57	3.80	1.96

Green House Experiment

Plastic pots (180 pots) with 22-cm depth and 18-cm diameter were used in this study. These pots were divided into three main groups (60 pot / main group). Each pot of these three main groups was filled with 3.5 kg of each one of the soils under consideration. The pots of each main group were again divided into three subgroups (20 pot /subgroup). A subgroup was left without manuring. The second subgroup was treated with FYM at an application rate of 2 % carbon. Pots of the third subgroup were planted with alfalfa (*Medicaga sativa L.*), as a green manure, early in summer. Pots of the third subgroup were watered and 0.87g of alfalfa seeds were sown in each pot. Alfalfa plants were turned down in their same pots before flowering stage, in autumn. Conventional agricultural practices of cultivation and irrigation of alfalfa plants were followed. Pots of each subgroup were further divided into five sub-subgroups (4 pots each). Pots of each sub-subgroup were irrigated to a moisture level of 60 % of the water-holding capacity (WHC) of each treatment (soil + organic fertilization), using each water source. So, the design applied to this experiment was split-split design with four replicates. All pots were left, at a maintained moisture content, for one month before planting. Then, 5 grains of corn (*Zea mays c.* triple hybrid 310) were planted in June. After 15 days of germination, the plants were thinned to three per pot. Throughout the growth period of corn, moisture contents of the pots were maintained at 60 % WHC, as mentioned above, by irrigation with the used sources of water, regularly every 3 days.

Nitrogen was added, as ammonium nitrate (33.5 % N), at a fertilizer rate of 160 kg N/ feddan (0.56 mg /pot), at two equal doses, the first dose was introduced at planting time and the second was added after 35 days of sowing. Phosphorus was applied, as super phosphate (15.5 % P_2O_5), at a fertilizer rate of46 kg / feddan (0.16 mg /pot) before sowing. Potassium sulphate (48 % K_2O)was added at a fertilizer rate of 24 kg /feddan (0.09 mg /pot), at two equal doses after 15 and 45 days after sowing.

Plants of one replicate from each treatment were harvested above the soil surface at 45 days of sowing and the other three replicates were harvested at 65 days of sowing . The harvested plants of each replicate were leached several times with tap water and two times with distilled water, air-dried, oven-dried at 70 C° until their weight become constant, weighed, ground and kept for its chemical analysis. The obtained values of dry weights were statistically analyzed, at 0.05 level, (Duncan test), according to Snedecor and Cochran (1980).

0.5 g of oven-dried plant samples of each replicate were digested in 5ml of H_2SO_4 + 1ml of $HClO_4$ (30 %) in a 100 conical flask. The flask was heated on a sandy plate at 250 C°, until the mixture or sample become clear. The digest was diluted with distilled water up to 100 ml in a volumetric flask. Content of N, P and K were determined using the methods descrbed by Page et al. "part 2"(1982).

RESULTS AND DISCUSSION

I-Influence of the Studied Treatments on Growth of corn plants (Dry Matter Yield)

Data recorded in Table (4) show that, the dry matter yield of corn plants increased as a result of manuring, i.e. with FYM being higher than with GM. That trend was observed at the different growth stages of the plants and the soils tested as well as with the various sources of irrigation water. This positive effect was resulted from the role of manures, especially FYM, (Table 2), in improving soil properties, nutrients availability and plant growth. In this respect, Alshahri (2008), El Shinnawi *et al.*(2009) and Faiyad (2009) came to similar conclusions with other plants cultivated on different soils of Egypt and manured with different sources of organic fertilizers at varying application rates. It was also observed that the values obtained at the earlier growth stage were higher than those at the later one for all experimental variables. The present results confirm those of El-Shinnawi *et al.* (2009) and Faiyad (2009) on faba beans grown on alluvial and sandy soils fertilized with organic manures.

Table (4): Dry matter yield of corn plants cultivated on the three manured soils as affected by the different sources of irrigation water.

Organic fertilizer	*Water source	Alluvial soil				Calcareous Soil				Sandy Soils			
		After 45 day		At 65 day		After 45 day		At 65 day		After 45 day		At 65 day	
		g/plant	g/pot	g/plant	g/pot	g/plant	g/pot	g/plant	g/pot	g/plant	g/pot	g/plant	g/pot
Without	T.W.	0.90	2.70	1.09	3.28	0.60	1.80	0.79	2.36	0.50	1.50	0.51	1.53
	D.W.	0.69	2.07	0.80	2.41					0.35	1.05	0.39	1.17
	T.W +D.W	0.82	2.46	1.01	3.02					0.40	1.21	0.50	1.50
	S.W1	0.66	1.99	0.95	2.85	0.55	1.65	0.56	1.68	0.33	0.99	0.40	1.20
	S.W2	0.80	2.39	1.01	3.02					0.42	1.26	0.48	1.44
Farmyard manure	T.W.	1.20	3.60	1.28	3.84	0.85	2.55	1.05	3.15	0.62	1.86	0.71	2.14
	D.W.	0.92	2.76	1.15	3.45	0.67	2.01	0.71	2.13	0.39	1.17	0.53	1.59
	T.W +D.W	1.05	3.15	1.22	3.66	0.82	2.46	0.91	2.73	0.59	1.77	0.62	1.85
	S.W1	0.91	2.72	1.05	3.15	0.61	1.83	0.74	2.22	0.39	1.17	0.45	1.35
	S.W2	1.01	3.03	1.17	3.51	0.68	2.04	0.82	2.46	0.49	1.47	0.58	1.73
Green manure	T.W.	1.05	3.14	1.26	3.79	0.80	2.40	0.84	2.52	0.66	1.97	0.72	2.15
	D.W.	0.86	2.59	1.20	3.60	0.65	1.95	0.72	2.16	0.54	1.61	0.63	1.89
	T.W +D.W	0.96	2.88	1.40	4.20	0.75	2.25	0.80	2.40	0.32	1.85	0.95	2.84
	S.W1	0.94	2.82	1.22	3.66	0.55	1.65	0.61	1.83	0.46	1.37	0.51	1.53
	S.W2	0.97	2.91	1.50	4.50	0.70	2.10	0.73	2.19	0.56	1.68	0.66	1.98

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1= Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

The results appearing in Table (4) imply that, the dry matter yield of corn plants varied widely from cultivated soil to another, due to the properties of each, i.e. physical chemical, biological and nutrientional (Table 1), which were greatly affected by the organic treatments. In each manure treatment, the highest dry matter yields of corn plants were found for those grown on the alluvial soil, followed discerningly by the calcareous and sandy soils. Because of the suitable characteristics of the alluvial clay loam soil it came first; whilst the high $CaCo_3$ content and modest properties of the calcareous soil, as well as the poor conditions of the sandy soil, made both inferior (Table 1).

Data of Table (4) also indicate that amounts of the dry matter yield of corn plants, of the different treatments under study, varied widely according to the used irrigation water source. In each treatment of irrigation water, the highest dry matter yields of the cultivated plants were found in the plants grown on the alluvial soil fertilized with FYM and the lowest on the unmanured sandy soil. Regarding the effect of irrigation water sources on the dry matter yields of corn plants were found to be arranged as follows : DW > SW2 > SW1 > TW +DW > TW Table (4). This was correlated with the chemical composition of the water used (Table 3) and its influence on soil properties and nutrients availability. In this respect, Abou Houssien *et al.* (2009) and Fayed (2009) obtained similar results with different irrigation water sources on different soils of Egypt.

The combined effect of organic manures and irrigation water sources (co application) on the dry matter yields of corn plants is shown in Table (4). The tabulated data reveal that, the hazardous effect of some irrigation water sources , namely SW1 and SW2, may be reduced by manure application. In such concern, FYM treatments were more effective than those of GM. This is considered as bioremediation for the harm of saline irrigation water, to the favor of soil characteristics and plant growth. Such results are in agreement with those obtained by El-Gundy (2905) and Fayed (2009).

II . Influence of the Studied Treatments on Some macronutrient Contents of Corn Plants

Corn plant contents (concentration and uptake) of N, P and K as affected by organic manures, irrigation water sources, soil properties and plant growth stage are recorded in Tables (5 to 13). Data show that nitrogen contents of corn plants increased by manuring, with FYM excelling GM (Tables 5 to -7). This is attributed certainly to the high contents of N of the manures, as well as their role in enhancing N availability in soil (El-Shinnawi *et al.*, 2009 and Faiyad, 2009).

Data presented in Tables (5- 7) also reveal that, nitrogen concentration and its uptake by corn plants, under the different manure and irrigation water treatments varied from one soil to another.

Table (5): Nitrogen concentration and uptake of wheat plants grown on the alluvial soil as affected by the experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	2.31	6.93	20.79	3.22	11.74	35.21
	D.W.	2.31	5.31	15.94	2.94	7.86	23.59
	T.W.+D.W.	2.31	6.31	18.94	2.24	7.51	22.52
	S.W1	2.31	5.11	15.32	2.1	6.65	19.95
	S.W2	3.01	7.99	23.98	2.24	7.52	22.55
Farmyard manure	T.W.	3.03	12.12	36.36	0.42	1.79	5.38
	D.W.	2.85	8.74	26.22	0.56	2.15	6.44
	T.W.+D.W.	2.57	9	26.99	0.42	1.71	5.12
	S.W1	2.96	8.95	26.84	0.56	1.96	5.88
	S.W2	3.29	11.08	33.23	0.42	1.64	4.91
Green manure	T.W.	2.59	9.04	27.11	1.12	4.72	14.16
	D.W.	2.87	8.26	24.78	1.26	5.04	15.12
	T.W.+D.W.	2.73	8.74	26.21	1.33	6.21	18.62
	S.W1	2.73	8.55	25.66	1.33	5.41	16.23
	S.W2	2.31	7.47	22.41	0.84	4.2	12.59

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1=
Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

The highest contents of N in plants were found in those grown on the alluvial and the lowest on the calcareous soils. This trend was in harmony with soil properties and their contents of available nitrogen (Table 1).

Table (6): Nitrogen concentration and uptake of wheat plants grown on the calcareous soil as affected by the experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	2.31	4.62	13.86	2.38	6.24	18.72
	D.W.	2.87	0	0	0	0	0
	T.W.+D.W.	3.29	0	0	0	0	0
	S.W1	3.01	5.52	16.56	2.31	4.31	12.94
	S.W2	1.89	0	0	0	0	0
Farmyard manure	T.W.	1.89	5.36	16.07	1.82	6.37	19.11
	D.W.	1.85	4.13	12.4	1.9	4.5	13.49
	T.W.+D.W.	1.9	5.19	15.58	2	6.07	18.2
	S.W1	1.82	3.7	11.1	2.24	5.53	16.58
	S.W2	1.88	4.2613333	12.784	2.4	6.56	19.68
Green manure	T.W.	1.9	5.19	15.58	2	6.07	18.2
	D.W.	1.68	3.64	10.92	2.38	5.71	17.14
	T.W.+D.W.	1.47	3.68	11.03	2.24	5.97	17.92
	S.W1	1.75	3.21	9.63	1.82	3.7	11.1
	S.W2	2.03	4.74	14.21	2.1	5.11	15.33

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1= Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

Table (7): Nitrogen concentration and uptake of wheat plants grown on the sandy soil as affected by the experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	1.4	2.33	7	2.24	3.81	11.42
	D.W.	2.24	2.61	7.84	1.61	2.09	6.28
	T.W.+D.W.	1.26	1.69	5.08	2.03	3.38	10.15
	S.W1	1.95	2.15	6.44	1.82	2.43	7.28
	S.W2	0.56	0.78	2.35	1.61	2.58	7.73
Farmyard manure	T.W.	2.45	5.06	15.19	2.38	5.66	16.98
	D.W.	2.87	3.73	11.19	2.1	3.71	11.13
	T.W.+D.W.	2.24	4.41	13.22	2.31	4.75	14.25
	S.W1		0		2.66	3.99	11.97
	S.W2	2.87	4.69	14.06	2.24	4.31	12.92
Green manure	T.W.	2.17	4.75	14.25	2.24	5.35	16.05
	D.W.	2.38	4.26	12.77	2.17	4.56	13.67
	T.W.+D.W.	2.24	4.6	13.81	2.24	7.07	21.21
	S.W1	2.24	3.41	10.23	2.52	4.28	12.85
	S.W2	2.66	4.97	14.9	2.17	4.77	14.32

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1=
Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

Data reported in Tables (8 to 10) show that, similar effects of the organic manures and soil properties on increasing the plant contents of N, were found for the contents of P. Such contents were higher with FYM than with GM, phosphorus uptake also increased with advancing the plant age (being correlated with accumulation of dry matter), but P concentration decreased at the later growth stage, as a result of dilution effect. Generally, the highest P concentration, and uptake were found in the plants grown on the alluvial soil followed by the sandy one, whilst the calcareous soil was the least. These findings are in agreement with those obtained by Khalil et al. (2000), Alshahri (2008) and Fayed (2009), where they attributed the low content of P in different plants grown on calcareous soils to its lower availability under these soils conditions especially when untreated with any organic amendments.

Table (8): Phosphors concentration and uptake of wheat plants grown on the alluvial soil as affected bythe experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	0.26	0.78	2.34	0.21	0.77	2.3
	D.W.	0.29	0.67	2	0.26	0.7	2.09
	T.W.+D.W.	0.27	0.74	2.21	0.25	0.84	2.51
	S.W1	0.26	0.57	1.72	0.23	0.73	2.19
	S.W2	0.25	0.66	1.99	0.23	0.77	2.32
Farmyard manure	T.W.	0.43	1.72	5.16	0.25	1.07	3.2
	D.W.	0.47	1.44	4.32	0.4	1.53	4.6
	T.W.+D.W.	0.44	1.54	4.62	0.37	1.5	4.51
	S.W1	0.41	1.24	3.72	0.27	0.95	2.84
	S.W2	0.4	1.35	4.04	0.26	1.01	3.04
Green manure	T.W.	0.33	1.15	3.45	0.23	0.97	2.91
	D.W.	0.34	0.98	2.94	0.3	1.2	3.6
	T.W.+D.W.	0.32	1.02	3.07	0.29	1.35	4.06
	S.W1	0.3	0.94	2.82	0.25	1.02	3.05
	S.W2	0.3	0.97	2.91	0.25	1.25	3.75

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1=
Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

Table (9): Phosphors concentration and uptake of wheat plants grown on the calcareous soil as affected by the experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	0.25	0.5	1.5	0.22	0.58	1.73
	D.W.		0	0		0	0
	T.W.+D.W.		0	0		0	0
	S.W1	0.25	0.46	1.38	0.22	0.41	1.23
	S.W2		0	0	0.22	0	0
Farmyard manure	T.W.	0.38	1.08	3.23	0.3	1.05	3.15
	D.W.	0.4	0.8933333	2.68	0.34	0.8	2.41
	T.W.+D.W.	0.39	1.066	3.198	0.33	1	3
	S.W1	0.36	0.73	2.2	0.26	0.64	1.92
	S.W2	0.34	0.77	2.31	0.26	0.71	2.13
Green manure	T.W.	0.29	0.77	2.32	0.29	0.81	2.44
	D.W.	0.32	0.69	2.08	0.32	0.77	2.3
	T.W.+D.W.	0.3	0.75	2.25	0.27	0.72	2.16
	S.W1	0.29	0.53	1.6	0.25	0.51	1.53
	S.W2	0.29	0.68	2.03	0.25	0.61	1.83

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1= Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

Table (10): Phosphors concentration and uptake of wheat plants grown on the sandy soil as affected by the experimental treatments.

Treatmentss		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	0.17	0.28	0.85	0.21	0.36	1.07
	D.W.	0.23	0.27	0.81	0.3	0.39	1.17
	T.W.+D.W.	0.21	0.28	0.85	0.27	0.45	1.35
	S.W1	0.17	0.19	0.56	0.22	0.29	0.88
	S.W2	0.17	0.24	0.71	0.22	0.35	1.06
Farmyard manure	T.W.	0.51	1.05	3.16	0.38	0.9	2.71
	D.W.	0.53	0.69	2.07	0.45	0.8	2.39
	T.W.+D.W.	0.52	1.02	3.07	0.41	0.84	2.53
	S.W1	0.48	0.62	1.87	0.34	0.51	1.53
	S.W2	0.47	0.77	2.3	0.34	0.65	1.96
Green manure	T.W.	0.17	0.37	1.12	0.18	0.43	1.29
	D.W.	0.25	0.45	1.34	0.34	0.71	2.14
	T.W.+D.W.	0.23	0.47	1.42	0.25	0.79	2.37
	S.W1	0.18	0.27	0.82	0.22	0.37	1.12
	S.W2	0.18	0.34	1.01	0.22	0.48	1.45

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1= Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

Data presented in Tables (11 to13) show corn plants concentration of K and its uptake, as affected by the experimental treatments. From these data, it may be noticed that for the manured soils cultivated with corn plants and at their growth stages, contents of K were similar to those detected for both N and P. Thus, it could be mentioned that, K contents of the plants increased as a result of organic manure application, where FYM surpassed GM. The highest concentration and uptake of K were found in the plants cultivated in the alluvial soil and the lowest in the sandy soil. Potassium concentration, also, decreased with advancing the plant age. Similar results were found and discussed by Amer (1999) Mostafa (2001)) and El- Shinnawi *et al.* (2009).

Table (11): Potassium concentration and uptake of wheat plants grown on the alluvial soil as affected by the experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	3.81	11.42	34.27	4.14	15.09	45.26
	D.W.	3.58	8.24	24.73	3.98	10.63	31.9
	T.W.+D.W.	4.54	12.4	37.2	4.2	14.08	42.23
	S.W1	3.98	8.79	26.37	4.26	13.48	40.43
	S.W2	4.59	12.19	36.58	4.31	14.46	43.39
Farmyard manure	T.W.	4.26	17.03	51.08	1.12	4.78	14.34
	D.W.	3.64	11.16	33.49	1.51	5.79	17.37
	T.W.+D.W.	4.14	14.5	43.51	1.18	4.78	14.35
	S.W1	4.59	13.88	41.63	1.12	3.92	11.76
	S.W2	4.37	14.71	44.12	0.39	1.53	4.58
Green manure	T.W.	4.37	15.24	45.72	3.14	13.22	39.65
	D.W.	4.59	13.21	39.64	3.86	15.44	46.32
	T.W.+D.W.	4.09	13.08	39.24	3.92	18.29	54.88
	S.W1	4.09	12.81	38.43	3.36	13.66	40.99
	S.W2	3.58	11.59	34.76	3.86	19.29	57.86

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1= Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

Table (12): Potassium concentration and uptake of wheat plants grown on the calcareous soil as affected by concentration (%) and its uptake (mgl plant and mglpot) by corn planted in the experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mglplant	mgl pot		mglplant	mgl pot
Without	T.W.	1.01	2.02	6.05	0.9	2.35	7.05
	D.W.	1.18			1.01		
	T.W.+D.W.	0.62			0.78		
	S.W1	0.84	1.54	4.62	0.78	1.46	4.39
	S.W2	0.84		0	0.56	0	0
Farmyard manure	T.W.	4.31	12.22	36.65	4.54	15.88	47.63
	D.W.	4.33	9.6703333	29.011	4.6	10.886667	32.66
	T.W.+D.W.	4.3	11.753333	35.26	4.3	13.043333	39.13
	S.W1	4.26	8 66	25.97	4.37	10.77	32.32
	S.W2	4.3	9.7466667	29.24	4.2	11.48	34.44
Green manure	T.W.	2.52	6.72	20.16	2.52	7.06	21.17
	D.W.	2.86	6.19	18.56	2.35	5.64	16.92
	T.W.+D.W.	1.68	4.2	12.6	1.12	2.99	8.96
	S.W1	1.96	3.59	10.78	0.5	1.02	3.07
	S.W2	1.62	3.79	11.37	1.68	4.09	12.26

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1=
Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

Table (13): Potassium concentration and uptake of wheat plants grown on the sandy soil as affected by the experimental treatments.

Treatments		At 45 Day			At 65 day		
Organic fertilizers	* Water source	Conc. %	Uptake		Conc. %	Uptake	
			mg/plant	mg/ pot		mg/plant	mg/ pot
Without	T.W.	3.19	5.32	15.96	2.02	3.43	10.28
	D.W.	3.19	3.72	11.17	2.52	3.28	9.83
	T.W.+D.W.	2.74	3.69	11.07	2.86	4.76	14.28
	S.W1	3.19	3.51	10.53	2.18	2.91	8.74
	S.W2	0.67	0.94	2.81	2.18	3.49	10.48
Farmyard manure	T.W.	5.21	10.76	32.29	5.6	13.32	39.95
	D.W.	4.37	5.68	17.04	7.28	12.86	38.58
	T.W.+D.W.	4.7	9.25	27.75	7.28	14.96	44.89
	S.W1	4.45	5.21	15.63	7.84	11.76	35.28
	S.W2	4.54	7.41	22.23	4.42	8.5	25.51
Green manure	T.W.	3.25	7.11	21.33	2.74	6.55	19.64
	D.W.	2.91	5.21	15.63	2.69	5.64	16.93
	T.W.+D.W.	3.19	6.56	19.68	2.18	6.89	20.68
	S.W1	2.35	3.58	10.73	2.3	3.9	11.71
	S.W2	2.46	4.6	13.8	2.24	4.93	14.78

* T.W. = Tap water, D.W. = Agricultural drainge water, T.W.+D.W.= Mixed Water at a ratio of (1:1), S.W1= Synthetic water at a ratio of 1:1 (Ca:Na) and S.W2= Synthetic Water at a ratio of 2:1(Ca:Na)

The presented data in Tables (5to 13) show corn plant contents (% and mg/pot) of N, P and K, as affected by irrigation water quality. These data exhibited wide variations within the contents of such macronutrients, as influenced by the used sources of irrigation water. With most treatments under study, the highest contents of N, P, and K were found in the plants irrigated with DW, and the lowest values with SW2. The previous trend of the evaluated water sources was related actually to their chemical composition, effect on soil properties and reactions with available nutrients. DW showed highest values due to its higher contents of nutrients being leached away from the agricultural soils. These results are in agreement with those obtained by Abuo Houssien et al. (2009), Bahnasy (2009) and Shalaby et al. (2009).

Regarding the combined effect of both irrigation water sources and organic fertilizers shown in Tables (5 to 13), it may be concluded that, application of manures resulted in handicapping the passive effect of saline irrigation waters on corn plant contents of the macronutrients tested. This beneficial effect of manures on soil properties and plant growth and its uptake of nutrients confirm the findings of El sanat (2003) and Fayed (2009)

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نمو نباتات الذرة المنزرعة في أراضي جافة مختلفة مسمدة عضوياً ومروية بنوعيات مختلفة من المياه.

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الملخص العربي

أجري هذا البحث لدراسة التأثير الفردي والمشترك للأسمدة العضوية ونوعيات مختلفة من مياه الري على نمو نباتات الذرة ومحتواها من بعض العناصر الغذائية، حيث استعمل في تجربة أصص ثلاث أنواع أراضي جافة هي الرسوبية والجيرية والرملية وتم تسميد هذه الأراضي بسماد الإسطبل بمعدل إضافة ٢% كربون، وسماد أخضر (البرسيم الحجازي) علاوة على معاملة الكنترول بدون تسميد.

واستخدم في ري أصص التجارب مصادر مختلفة لمياه الري وهي ماء الصنبور (من نهر النيل) وماء الصرف الزراعي وخليط بينهما بنسبة ١:١ وماء تركيبي يحتوي أملاح ذائبة بتركيز ٢٠٠٠مجم/لتر (كلوريدي الكالسيوم والصوديوم) بنسبة الكالسيوم : الصوديوم ١:١ وماء تركيبي آخر عند نفس المحتوى من الأملاح الذائبة ولكن بنسبة كالسيوم : صوديوم ١ : ٢ وتم زراعة جميع الأصص ببذور الذرة وأخذت العينات النباتية بعد ٤٥ و ٦٥ يوم من الزراعة. وقدر الوزن الجاف للعينات النباتية وكذلك محتواها من النتروجين والفسفور والبوتاسيوم عند هاتين الفترتين.

وأوضحت النتائج زيادة محصول المادة الجافة لنباتات الذرة نتيجة للإضافات المختلفة من الأسمدة العضوية ، وكانت هذه الزيادة أكثر وضوحاً في معاملات سماد الإسطبل عن السماد الأخضر، وخاصة في مرحلة النمو الأولى وأزداد محصول المادة الجافة بزيادة عمر النبات. كما تم الحصول على أعلى محصول للمادة الجافة في النباتات النامية على الأرض الرسوبية يليها في ذلك النباتات النامية على الأرض الجيرية وجاءت الرملية أخيراً. وأيضاً مع مختلف معاملات

التسميد العضوي وجد أعلى محصول للمادة الجافة في النباتات المروية بماء الصرف الزراعي في حين كان أقل هذه القيم موجوداً في النباتات المروية بماء الصنبور.

كما أظهرت النتائج المتحصل عليها التأثير الإيجابي الكبير لمعاملات التسميد العضوي على محتوى نباتات الذرة، عند مراحل النمو المختلفة وتحت مختلف ظروف الأراضي المختبرة، من كل من النتروجين والفسفور والبوتاسيوم ووجد أعلى محتوى من هذه المغذيات (% أو مجم/ كجم) في نباتات الذرة المنزرعة في الأراضي الرسوبية والمسمدة بسماد الإسطبل والمروية بماء الصرف الزراعي.