EFFECTS OF LONG TERM IRRIGATION USING MIXED NILE WITH DRAINAGE WATER AND ORGANIC FARMING MANAGEMENT ON SOME PROPERTIES AND FERTILITY OF SOME FAYOUM SOILS, EGYPT.

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ABSTRACT

Objectives of the present work were to study the effects of long term (> 10 years) use of mixed Nile with drainage water in irrigation and organic farming management in some Fayoum Governorate soils on plant essential macro and micro nutrients availability and some soil characteristics.

Six soil profiles were excavated to achieve the first objective: three of which at an area irrigated with fresh Nile and three represented soils irrigated with mixed water. Two other profiles were dug in a private farm at Ibshaway, Fayoum: one from a long term (>10 years) organic managed filed and the second represented in a conventional managed field at the same area.

The use of mixed Nile with drainage water resulted in great increases in the mean values of soil salinity expressed as ECe values and the concentrations of AB- DTPA extractable P, K, Fe, Mn, Cu, Zn and hot water extractable NO_3 – N.

Soil cultivated under organic farming system for >10years had less salinity and slightly less pH values and contained more extractable available N, Fe, and Cu and less Zn, Mn , and P than soils of the conventional managed field. The concentrations of hot water extractable - N were found below the critical deficiency limit in all the studied soils. AB - DTPA extractable- Zn concentrations were below its critical deficiency limit in most soils or within the deficiency range in some others. Concentrations of all other nutrients ranged between deficient or sufficient depending upon quality of irrigation water, soil depth and management system. Means of extractable concentrations of all the studied nutrients generally decreased with soil depth down to 90 cm in all the studied soil profiles.

INTRODUCTION

Soil fertility is a reflection of so many factors that directly or indirectly affect essential nutrients availability to plants and related soil characteristics. Fayoum soil properties and fertility are expected to be affected by long term use of low quality irrigation water and applied farming management system.

Due to limited amounts of Nile water wide areas of agricultural lands at Fayoum Governorate are irrigated using either mixed Nile with drainage water through several mixing stations or even using drainage water in some other areas. Little information is available in the literature concerning the effects of long term irrigation with mixed fresh Nile and drainage water on plant essential nutrients availability in Fayoum soils. Most of research work had been directed towards the influence of waste water on soil properties.

Irrigation using mixed drainage water affects soil characteristics, contributes as a source of contamination of trace elements in agricultural soils and is harmful especially for vegetable production (**Huang et al., 2006). Selem et al. (1989)** found that, using drainage water in irrigation for two months from planting up to the maximum growth caused a slight decrease in available N and P as compared to that irrigated with fresh water. **Hegazi (1999) and Abdellah (1995)** found that using agricultural drainage water in irrigation increases the organic matter content especially in the surface soil layer. Long- term wastewater irrigation resulted in increases in Soil pH, ECe, extractable – P and exchangeable -K in the investigated areas compared with the control plots irrigated with fresh water **(Liu and Haynes, 2010)**. Similar results were found by **Mojiri (2011)** except that soil pH was decreased due to the use of waste water in irrigation.

More than five thousands hectors of agricultural Fayoum soils are currently cultivated under organic farming management and going to expand. This is also expected to influence some soil characteristics and fertility. **Mallory and Griffin (2007**) stated that repeated long-term additions of organic materials not only increase stocks of mineralizable soil N, but also bring about changes in soil characteristics that influence N dynamics and other nutrients availability. **Burger and Jackson (2003**) found that K-extracted with ammonium acetate was approximately twice as high in the organically than the conventionally managed soil. The application of long-term organic amendments with low amount of chemical fertilizers enhances microbial biomass activity and nutrient availability more than recommended amount of only chemical fertilization **(Liu et al. 2000**). Several research workers stated that the application of organic manures to soil results in enhancements of N, P and K availability to plants in soil with superiority of poultry manure over compost (**Bahaskaran and Krishna, 2009andAbeer, 2016)**.

Objectives of the present work were to study the effects of long term (> 10 years) use of mixed Nile with drainage water in irrigation and the application of organic farming management in some Fayoum Governorate soils on plant essential macro and micro nutrients availability and some soil characteristics.

MATERIALS AND METHODS

1. Soil Sampling.

Eight soil profiles were excavated at different locations in Fayoum governorate. Sites of the studied profiles were identified using a "GPS" as shown in the map (figure **1**). Profiles sites were selected to cover the objectives of the present work as follows:

a- Six soil profiles from Fayoum alluvial soils to study the effects of long term irrigation using mixed Nile with drainage water : three of which were irrigated with mixed water and the other three were irrigated with Nile water both for more than 10 years.

b- Two profiles from Shambolya farms at Ibshaway, Fayoum Governorate to study the effects of long term organic farming management on soil properties and fertility as: one profile from an organic managed field and the other was excavated in a conventional managed field at the same area.

Three samples were collected from each profile at the depth: 0 – 30 cm, 30–60 cm and 60– 90 cm.

2. Laboratory Analysis.

Collected soil samples were air-dried, gently crushed, passed through a 2 mm sieve and stored in plastic bottle. Soil samples were analyzed for Particle size distribution, ECe, pH, organic matter, total calcium carbonate equivalent, available Nitrogen, Phosphorus, potassium, Manganese, zinc, Copper and Iron.

Soil analyses were done according to the following methods:

Particle size distribution by the hydrometer method (ASTM No.152 H Temp.) Using sodium hexametaphosphate - sodium carbonate as dispersing agents **(Piper, 1950).**

Calcium carbonate equivalent content volumetrically using Sh calcimeter **(Wright, 1939).**

Soil pH in soil paste using a pH -meter according to **Jackson (1979).**

Electrical conductivity (ECe) in the saturation paste extracts Using EC-Meter according to **Jackson (1979)**.

Organic matter content using Walkley and Black method as described by **Jackson, (1979).**

Available macro and micro nutrients in soil were extracted using 1.0 M ammonium bicarbonate and Di-ethylene triamine Penta Acetic Acid at pH 7.6 **(AB – DTPA)**as described by **Soltanpore &Workman (1979)**.

NO_3-N was extracted with hot water as described by **APHA (2012)** and determined using UV- Spectrophotometer.

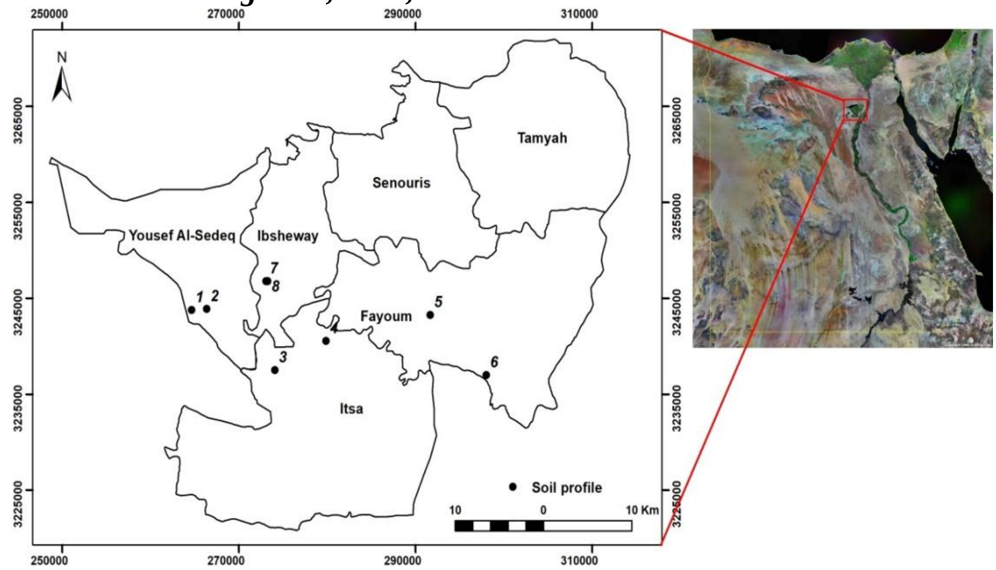

Fig.1 Location of the studied sites at Fayoum Governorate, Egypt.

RESULTS AND DISCUSSION

1. Effects of long term irrigation using mixed Nile with drainage water on soil properties and nutrients availability.

Soil content of organic matter, ECe values, pH values and the concentrations of AB-DTPA extractable P, K, Fe, Mn, Zn, Cu and hot water extractable NO_3-N in some Fayoum alluvial soils irrigated using mixed Nile with drainage water for more than 10 years in comparison with those always irrigated with Nile water are given in tables **1, 2 and 3** and figures**2-10**. Data obtained clearly showed great differences in the mean values of all the studied soil properties and the concentration of available nutrients. The use of mixed Nile with drainage water and sometimes with only drainage water particularly at the winter blocking period generally results in great increase in the mean values of soil salinity expressed as ECe values, soil pH and concentrations of AB-DTPA extractable P, K, Fe, Mn, Cu, Zn and hot water extractable NO_3-N in all profiles layers down to 90 cm. On the contrary the mean organic matter content decreased in soils irrigated with mixed in comparison with fresh water irrigated soils particularly in the upper 30cm soil layer. The decrease of organic matter in salinized soil as a result of irrigation with relatively saline mixed water may be due to reductions in plants growth under saline conditions and consequent reduction in the amount of plant residues.

Table (1): Particle size distribution of the studied soil profiles.

Soil Profile No.	Irrigation Water	Soil depth (cm)	Particle size distribution			Soil Texture class
			Clay %	silt %	Sand %	
1	Mixed Nile with drainage water	0 – 30	69.5	24.1	6.4	C
		30 – 60	66.6	28.5	4.9	C
		60 – 90	72.1	23.1	4.8	C
2		0 – 30	34.5	18.2	47.3	SCL
		30 – 60	27.9	11.6	60.5	SCL
		60 – 90	15.9	5.5	78.6	SL
3		0 – 30	52.1	26.5	21.4	C
		30 – 60	59.5	30.4	10.1	C
		60 – 90	62.1	28.7	9.2	C
4	Nile Fresh water	0 – 30	30.5	6.7	62.8	SCL
		30 – 60	21.8	5.7	72.5	SCL
		60 – 90	28.5	6.4	65.1	SCL
5		0 – 30	52.9	38.6	8.5	C
		30 – 60	55.8	36.3	7.9	C
		60 – 90	55.1	38.1	6.8	C
6		0 – 30	58.5	34.3	7.2	C
		30 – 60	58.6	33.5	7.9	C
		60 – 90	60.5	32.9	6.6	C

SL: sandy Loam , SCL: sandy clay Loam, C: Clay , SC: sandy clay

Table (2): Soil pH, ECe values, Organic Matter and Calcium carbonate contents of the studied soil profiles.

Soil Profile No.	Irrigation water	Soil depth (Cm)	pH in soil paste	ECe dS/m	Organic matter %	$CaCO_3$ %
1	Mixed Nile with drainage water	0 – 30	7.84	16.20	1.17	2.14
		30 – 60	7.69	18.77	0.78	3.28
		60 -90	7.44	9.85	0.65	3.41
2		0 – 30	7.63	13.0	1.09	9.81
		30 – 60	7.62	11.9	0.70	11.0
		60 – 90	7.25	3.42	0.65	4.07
3		0 – 30	7.62	15.65	1.96	4.28
		30 – 60	7.60	13.00	1.04	5.93
		60 – 90	7.53	7.51	0.65	3.17
4	Nile fresh water	0 – 30	7.11	4.02	1.16	8.67
		30 – 60	7.10	6.05	0.64	5.90
		60 – 90	7.30	3.83	0.38	5.04
5		0 – 30	7.29	4.68	2.5	5.12
		30 – 60	7.26	1.79	1.09	7.90
		60 – 90	7.30	1.27	0.67	7.41
6		0 – 30	7.40	1.03	2.02	8.13
		30 – 60	7.50	1.23	0.98	7.90
		60 – 90	7.50	1.30	0.41	6.87

Table (3): Ammonium bicarbonate - DTPA extractable P, K, Mn, Fe, Cu, Zn and hot water extractable NO_3-N in the studied soil profiles.

Soil Profile No.	Irrigation Water	Soil depth (cm)	Extractable – nutrients						
			N	p	K	Mn	Zn	Cu	Fe
			mg kg^{-1}						
1	Mixed Nile with drainage water	0- 30	19.34	14.76	117.2	29.31	1.68	3.76	5.72
		30-60	6.59	22.44	52.6	20.63	1.56	4.04	2.08
		60-90	3.27	10.96	18.2	10.32	0.76	3.39	1.88
2		0- 30	22.34	14.56	120.2	28.68	1.45	3.85	6.68
		30-60	11.27	9.800	78.00	25.56	1.40	1.68	1.92
		60-90	6.59	4.88	27.9	14.79	0.6	0.76	1.88
3		0- 30	14.52	2.12	110	27.17	1.44	2.28	4.04
		30-60	10.17	0.84	95.9	24.02	1.15	2.76	3.92
		60-90	12.51	0.63	47.5	26.80	0.84	2.92	3.12
4	Nile fresh water	0- 30	4.61	2.40	55.5	2.94	0.22	1.88	2.55
		30-60	4.36	2.30	35.7	2.86	0.20	0.92	1.32
		60-90	3.52	2.08	47.3	2.39	0.16	0.16	0.92
5		0- 30	5.83	2.77	60.19	4.56	1.28	0.98	1.80
		30-60	4.45	2.76	58.19	2.94	1.22	0.88	1.52
		60-90	2.57	2.29	50.50	1.95	1.16	0.44	0.92
6		0- 30	2.02	5.96	60.50	3.89	0.42	0.82	2.48
		30-60	1.60	2.20	50.30	4.52	0.40	0.72	2.06
		60-90	0.94	2.76	45.00	3.92	0.40	0.70	1.28

The increase of soil salinity in soils irrigated with mixed water could be due to the greater salinity of mixed than Nile canals water. Analysis of irrigation water in some canals at some Fayoum water mixing stations before and after mixing showed that water EC values of the irrigation canals: Bahr EL-Nazla at Al Hamoly, Bahr- El Banat at Elwady, Bahr Wahby at Tamia were 0.91, 0.76, 0.8, 0.73 dS/m, respectively with a mean of 0.8 dS/m. Values of water at the same locations after mixing were 1.78,0.96,1.61,1.63 dS/m respectively with a mean value of 1.5dS/m. Water pH values were 7.92, 7.71, 8.04, 7.96 before mixing and 8.00, 7.73, 7.85, respectively in mixed water for the same locations (**Abdurrahman,2007)**.The increase of extractable nutrients in soil irrigated using mixed Nile with drainage water as shown in table (3) could be a result of the greater concentrations of nutrients in drainage water than fresh Nile water. **Howaida (2016)** found that the mean values of each of P, K and NO_3 in some drains at Sinnuris, Fayoum Governorate were 1.45 mgL^{-1} in august 2010 and 4.74 mgL^{-1}in January for P, 13.4 and24.29 for K and 7.32, 16.44 for NO_3 respectively. Corresponding means for some Nile canals were 0.09, 0.541for P, 6.25, 13.76 for K and 4.31, 11.5 for NO_3.

The effect of irrigation water on soil quality was found to differ with depth through soil profile. The following is a detailed discussion on the changes of the studied soil characteristics with depth under irrigation with either fresh Nile or mixed Nile with drainage water.

2. Changes in Soil Properties and Nutrients Availability with Depth:

2.1. Soil salinity.

Soil salinity in terms of ECe values are shown in table (**2**) and figure**3.** It could be observed from data that soils irrigated using mixed Nile with drainage water contained greater soluble salts content than those irrigated with Nile water. With respect to the changes of ECe values with depth it is clear from data that soil salinity in terms of ECe values were decreased with soil depth. The greater salinity content of the top layers could be due to the translocation of soil solution by capillary action, water evaporation, and accumulation of salts on soil surface in addition to irrigation with mixed saline water and the limited amount of irrigation water under dry and hot weather conditions of Fayoum region.

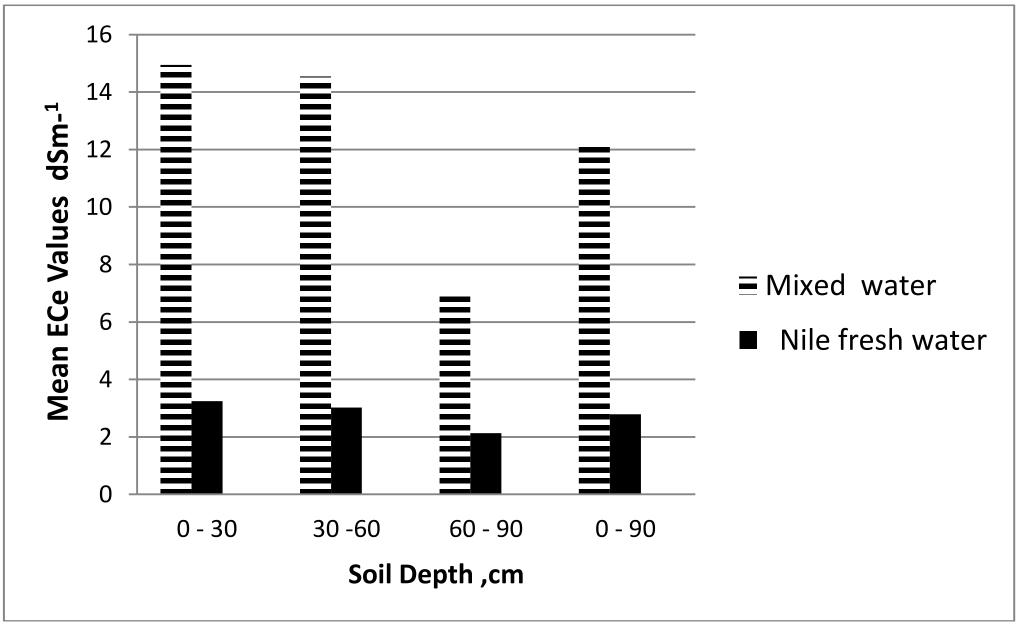

Fig. (2) Changes of ECe values with soil depth through soil profiles irrigated with mixed or Nile fresh water.

2.2. Soil pH.

The pH values of soils irrigated with Nile water and those irrigated using mixed Nile with drainage water are presented in table (**2**). Data indicated that soil pH values were generally greater in soils irrigated with mixed than those irrigated with fresh Nile water. Very little differences were observed in the pH values of the different layers of soils irrigated with fresh Nile water showing no clear trend with respect to soil depth under such conditions. On the other hand, soil pH values within all soil profiles irrigated with mixed water were found to decrease with depth.

2.3. Soil organic matter.

Soil organic matter contents for the studied soil profiles under irrigation using Nile water or mixed Nile with drainage water are given in table (**2**) and figure **2**. It is clear from data that soil organic matter content sharply decreased with depth in both soils irrigated using fresh Nile water and those irrigated with mixed Nile and drainage water. The mean values of soil organic matter % for soil profiles irrigated with Nile water were1.89 % in the upper 30 cm, 0.91% within the 30 – 60 cm layer and 0.48% within the 60 – 90 cm soil layer. Corresponding mean values for soils irrigated with mixed water were 1.4% for the upper 30 cm, 0.84% for the 30 – 60 cm and 0.65 % for the 60 – 90 cm layer.

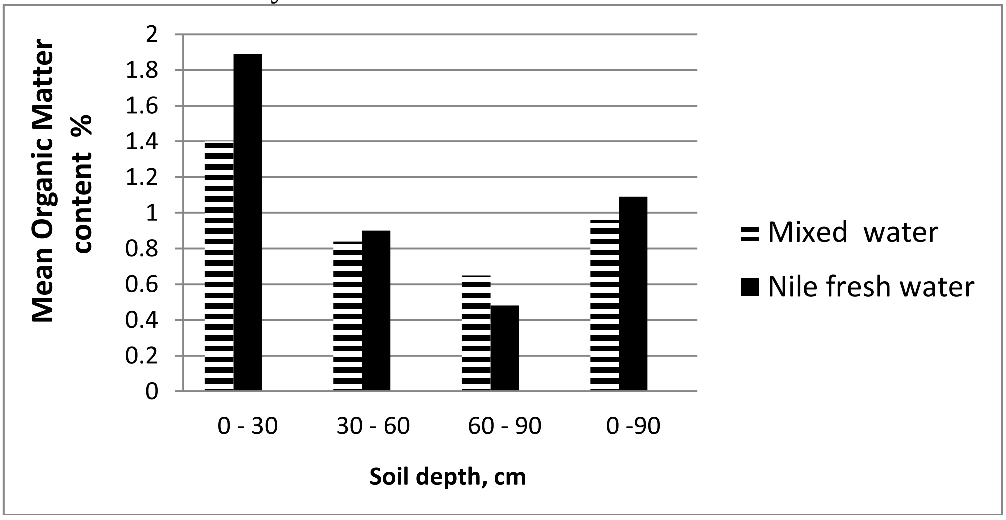

Fig.3 Changes in the mean organic matter contents with soil depth through soil profiles irrigated with mixed or Nile fresh water.

2.4. Plant nutrients availability.

Figures (**4**, **5**, **6**, **7**, **8**, **9 and 10**) show the mean values of available N extracted as NO_3 with hot water and each of, P, K, Mn, Zn, Cu and Fe extracted with AB-DTPA solution of pH7.6. Data obtained indicated that the general mean concentrations of extractable available values of all the studied nutrients generally decreased with soil depth down to 90 cm. These results could be attributed to the richness of soil upper layer in organic matter and prevailing biological activities within the root zoon in addition to the contribution of organic and mineral fertilizers applied to top soil.

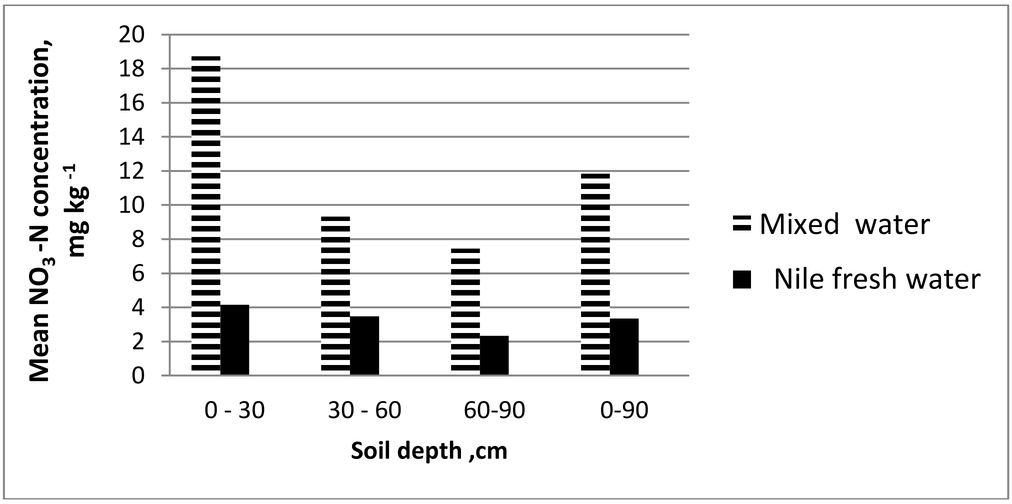

Fig.4 Changes in hot water extractable NO_3- N with soil depth through soil profiles irrigated with mixed or Nile fresh water.

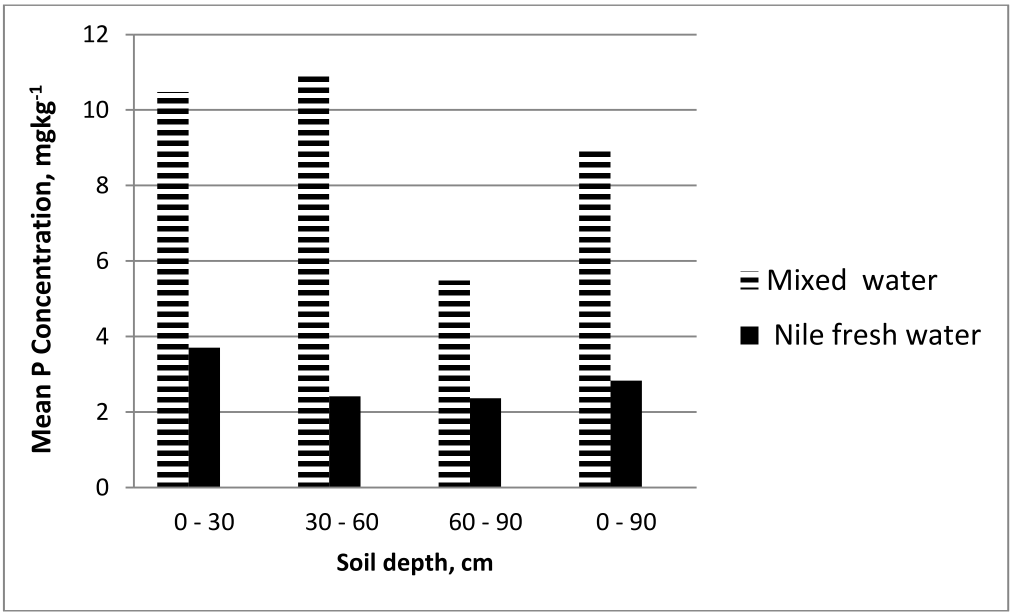

Fig.5 Changes in AB-DTPA extractable-P with soil depth through soil profiles irrigated with mixed or Nile fresh water.

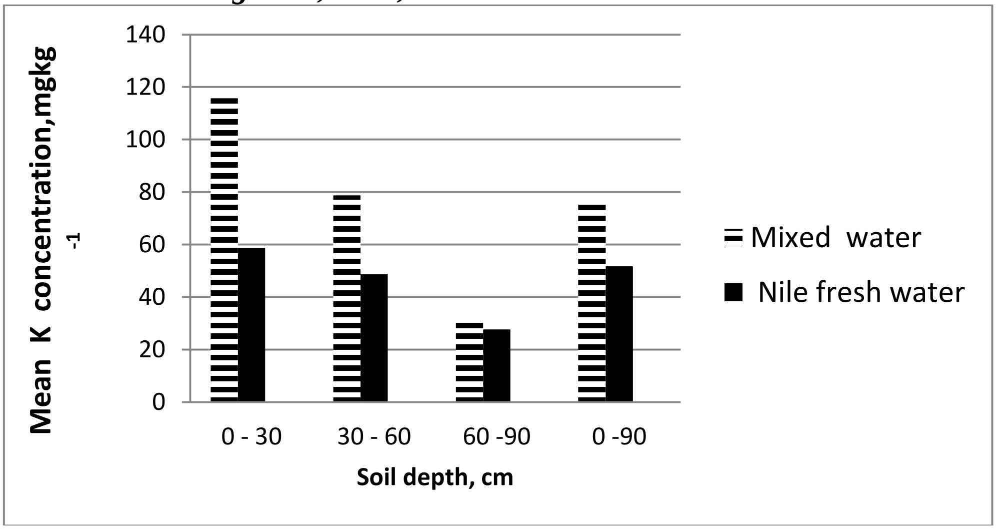

Fig.6 Changes in AB - DTPA extractable -K with soil depth through soil profiles irrigated with mixed or Nile fresh water.

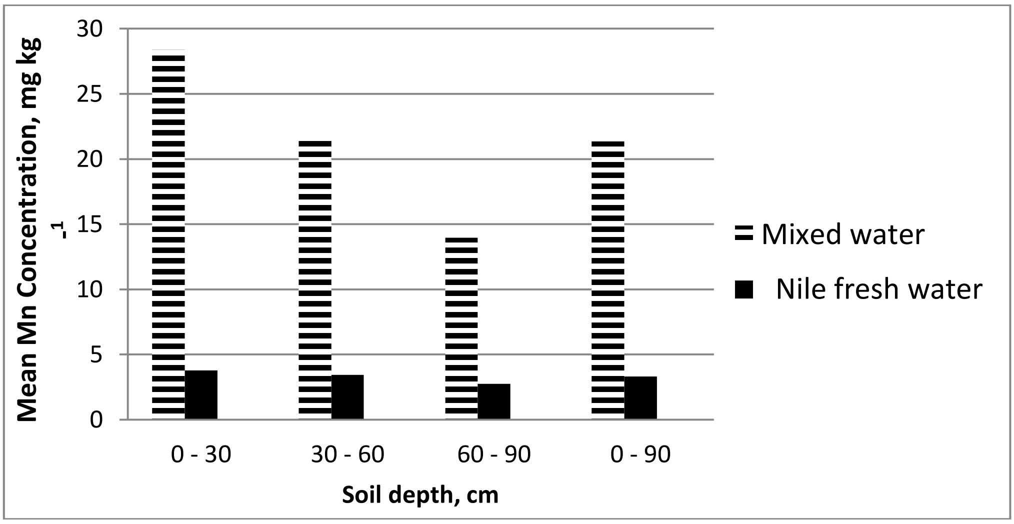

Fig.7 Changes in AB -DTPA extractable -Mn with soil depth through soil profiles irrigated with mixed or Nile fresh water.

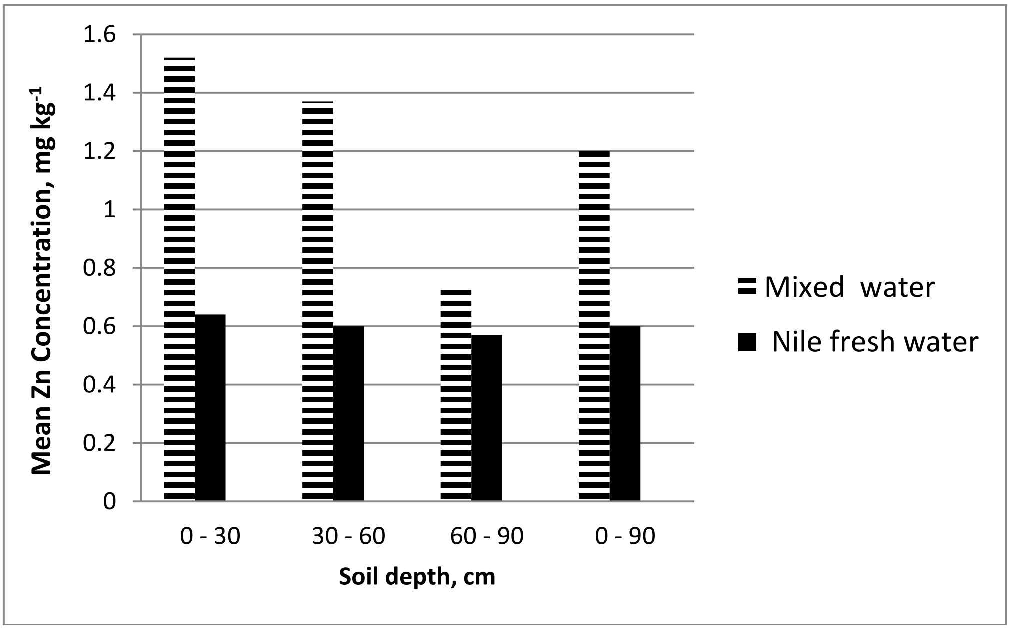

Fig.8 Changes of AB -DTPA extractable -Zn with soil depth through soil profiles irrigated with mixed or Nile fresh water.

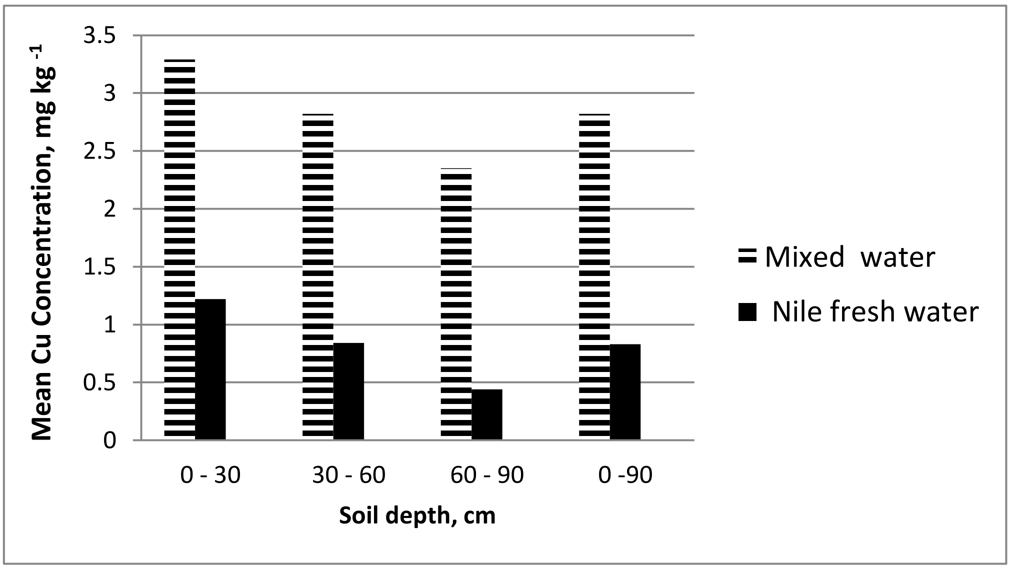

Fig.9 Changes of AB-DTPA extractable-Cu with soil depth through soil profiles irrigated with mixed or Nile fresh water.

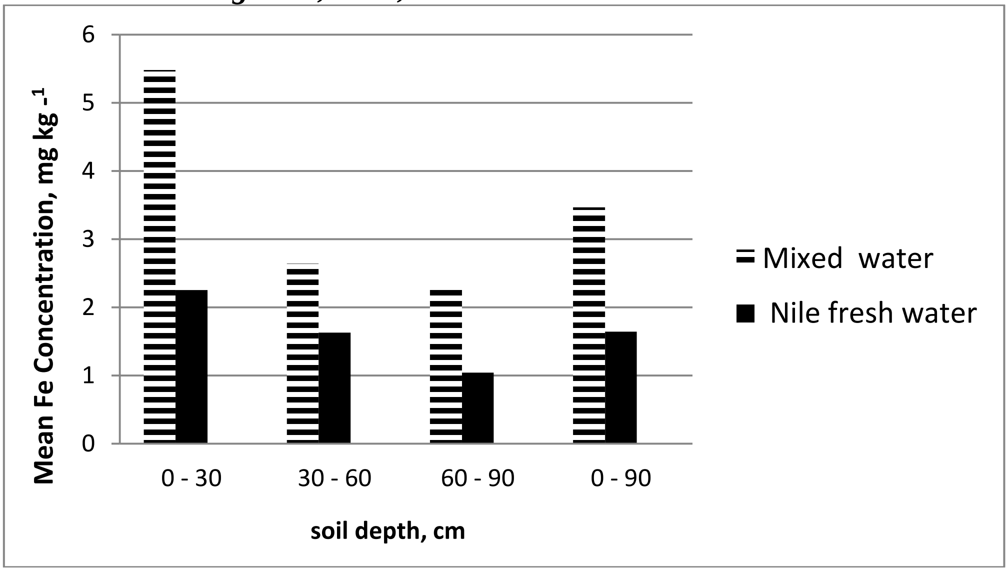

Fig.10 Changes of AB -DTPA extractable Fe with soil depth through soil profiles irrigated with mixed or Nile fresh water.

3. Effects of long term organic farming management on soil characteristics and plant nutrients availability.

Tables **4**, **5** and **6** presents the values of soil paste extract ECe, pH, organic matter content and plant nutrients availability within the two studied soil profiles. The first profile (No**7.**) represented an area in a private farm on which organic farming has been managed for more than 10 years and the second profile (No **8.)** represented a filed conventionally managed in the same area. The two fields were chosen to have similar particle size distribution and both are calcic soils table (**4**). Data in tables **4**, **5** and **6** show the values of ECe, pH, organic matter content and extractable available nutrients. Data obtained results showed that soil cultivated under organic farming management contained less ECe values and greater organic matter contents within all the studied soil layers (0- 30, 30 – 60 and 60 - 90 cm) in comparison with those of corresponding means of conventionally managed soil. The differences were greater between values of the top30 cm layer in comparison with those of the 30 – 60, and the 60 - 90 cm layers. Obtained data (table **5**) also showed that soil cultivated under organic farming system for>10 years had slightly less pH values within the top 30 cm of soil profiles. Results could be attributed to the effect of added organic materials and the formation of more organic acids in soil as a result of organic matter decomposition, however the slight differences observed in pH values could be a result of the buffering action of soil. The greater salinity observed in soils conventionally managed could be a result of chemical fertilizers applications at high rates. Data presented in table (**6)** indicated that organic managed soil contained more available N, Fe and Cu and Less Zn, Mn and P than conventional managed field within all soil profile Layers and very little differences were observed between soil layers in their AB- DTPA extractable – K content.

Table (4): Particle size distribution of organic and conventionally managed soils.

Farming System	Soil Profile No.	Soil Depth (cm)	particle size distribution			Soil texture Class
			Clay %	Silt %	Sand %	
Organic	**7**	0 – 30	62.1	21.3	16.6	Clay
		30 – 60	59.4	26.8	13.8	Clay
		60 – 90	69.3	19.3	11.4	Clay
Conventional	**8**	0 – 30	61.6	21.9	16.5	Clay
		30 – 60	62.7	21.8	15.5	Clay
		60 – 90	62.5	21.6	15.9	Clay

Table(5): Soil pH, ECe values, Organic Matter and Calcium carbonate contents in organic and conventionally managed soils.

Farming System	Soil Profile No.	Soil Depth (cm)	pH in soil paste	ECe dS/ m	$CaCO_3$ %	Organic matter %
Organic	**7**	**0 – 30**	**7.55**	**5.17**	**10.92**	**2.51**
		30 – 60	**7.70**	**4.72**	**11.82**	**1.61**
		60 – 90	**7.81**	**4.36**	**12.81**	**0.26**
Conventional	**8**	**0 – 30**	**7.61**	**8.00**	**18.30**	**1.75**
		30 – 60	**7.60**	**11.85**	**11.09**	**1.10**
		60 – 90	**7.85**	**12.65**	**11.67**	**0.93**

Table (6): Ammonium bicarbonate -DTPA extractable nutrients and hot water extractable NO_3-N in conventionally and organic managed soils.

Farming System	Soil Profile No.	Soil Depth (cm)	Extractable – nutrients						
			N	p	K	Mn	Zn	Cu	Fe
			mg kg^{-1}						
Organic	**7**	**0- 30**	**5.53**	**1.60**	**217.0**	**2.48**	**0.63**	**2.84**	**4.76**
		30-60	**3.63**	**1.25**	**118.2**	**0.83**	**0.55**	**2.57**	**3.80**
		60-90	**3.59**	**0.72**	**90.40**	**0.79**	**0.39**	**2.52**	**3.76**
Conventional	**8**	**0- 30**	**4.81**	**2.60**	**208.0**	**3.72**	**1.32**	**2.40**	**4.54**
		30-60	**2.85**	**1.44**	**124.8**	**2.08**	**1.24**	**1.78**	**4.17**
		60-90	**2.20**	**1.28**	**102.7**	**1.36**	**1.14**	**1.60**	**3.92**

It could be concluded from data in tables **4**, **5** and **6** that long term organic farming management in the studied area resulted in greater organic matter content, slightly less pH values and more available Fe and Cu in comparison with conventionally managed soil in the upper 30 cm soil layer. It was also observed that the values of AB – DTPA extractable Zn were below the critical deficiency limit in organic managed soil, however they were somewhat greater in conventionally managed soil, but still within the deficiency range (the range between the critical and sufficiency limit). Hot water extractable N and AB – DTPA - P concentrations were below the critical deficiency limits of P both in organically and conventionally managed soil.

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تأثير الري بالماء المخلوط بمياه المصارف والزراعة العضوية لفترة طويلة علي بعض خواص وخصوبة التربة في بعض أراضي محافظة الفيوم.

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أجريت هذه الدراسة لتحقيق هدفين: الاول هو دراسة تأثير ري التربة بمياة مخلوطة من مياة نهر النيل العذبة مع مياة الصرف لمدة طويلة (<١٠ سنوات) على خواص وخصوبة بعض الاراضي الرسوبية النهرية في محافظة الفيوم مقارنة بالاراضي التي تروي بمياه ترع نهر النيل النهرية العذبة أما الهدف الثاني فهودراسة تأثير تطبيق نظام الزراعة العضوية لفترة طويلة (أكثر من ١٠ سنوات) على صفات وخصوبة التربة مقارنة بالاراضي التي زرعت زراعة تقليدية.

ولتحقيق الهدف الاول تم حفر عدد ٦ قطاعات تربة لعمق ٩٠ سم:ثلاثة منها تمثل أراضي الفيوم الرسوبية النهرية التي تروي منذ أكثر من عشر سنوات بمياة ري مخلوطة في محطات خلط مياة النيل مع مياة الصرف وثلاثة قطاعات تمثل أراضي تروي بمياة ترع نهر النيل العذبة.

ولدراسة تأثير الزراعة العضوية على خواص التربة وخصوبتها تم حفر قطاعين في إحدى المزارع التي يطبق فيها نظام الزراعة العضوية في مركز ابشواي – محافظة الفيوم ويمثل القطاع الاول حقلا تطبق فيه الزراعة العضوية أما القطاع الثاني فيمثل تربة تزرع بالطريقة التقليدية كلاهما منذ أكثر من عشر سنوات وقد تبين من نتائج هذه الدراسة ما يلي:

أدي استخدام مياة مخلوطة في ري التربة لمدة طويلة (تزيد عن ١٠ سنوات) الي زيادة ملحية التربة زيادة كبيرة حيث أصبحت التربة شديدة الملحية وتراوحت قيمة التوصيل الكهربي لعجينتها المشبعة بين ١٣- ١٦ ديسيسمينز /م مقارنة بالاراضي التي تروي بمياة النيل العذبة التي لم يزد في طبقتها السطحية عن ٤,٦٨ ديسيسمينز /م، ومن ناحية أخري فقد أدي الري بمياة مخلوطة الي زيادة تركيز عنصر النتروجين النتراتي المستخلص بواسطة الماء الساخن وعناصر الفوسفور والبوتاسيوم والحديد والمنجنيز والنحاس والزنك المستخلصة باستخدام مخلوط محلول بيكربونات الامونيوم ومحلول ثنائي الايثلين ثلاثي الأمين خماسي حامض الخليك (AB – DTPA) عند رقم هيدروجيني ٧,٦.

وقد بينت نتائج الدراسة أيضا أن التربة التي تم تطبيق نظام الزراعة العضوية بها تحتوي نسبة أعلي من المادة العضوية ولها رقم هيدروجيني pH أقل قليلا من الاراضي التي زرعت بالطريقة التقليدية لفترة اكثر من ١٠ سنوات خاصة في الطبقة السطحية (صفر– ٣٠ سم) كذلك وجد أن محتوي التربة المزروعة تحت نظام الزراعة العضوية من النتروجين المستخلص بالماءالساخن وعناصر الحديد والنحاس المستخلص بمحلول(بيكربونات الامونيوم – ثنائي الايثلين ثلاثي الأمين خماسي حامض الخليك (AB – DTPA) أكبر مقارنة بالاراضي تحت نظام الزراعة التقليدية خاصة في الطبقة السطحية أما عناصر الفوسفور والزنك والمنجنيز فكانت أقل تحت ظروف الزراعة العضوية ولم تكن الفروق واضحة في تركيزات عنصر البوتاسيوم حيث اختلفت باختلاف العمق.

وقد وجد أن تركيز عنصر النتروجين الميسر (المستخلص بالماء الساخن) في جميع الأراضي تحت الدراسة أقل من الحد الحرج للنقص، كذلك وجد أن تركيز الزنك الميسر أقل من الحد الحرج في معظم الاراضي أو يقع في المجال الحرج في بعض الاراضي الاخري .أما بقية العناصر الغذائية الاخري فقد اختلفت تركيزاتها ما بين كافية الي أقل من الحدود الحرجة بأختلاف ملحية ماء الري المستخدم وعمق التربة ونظام الزراعة بها.

وبينت النتائج أن محتوي التربة من الاملاح الذائبة معبرا عنها بقيمة التوصيل الكهربي (ECe) و نسبة المادة العضوية وتركيز النتروجين والفوسفور والبوتاسيوم والحديد والمنجنيز والزنك والنحاس المتاحة للنبات في التربة تنخفض بزيادة عمق التربة.