STATUS OF TOTAL AND CHEMICALLY AVAILABLE NUTRIENT IN THE INTERFERANCE AREA BETWEEN EL-FAYOUM AND NILE VALLEY

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ABSTRACT

Sixteen soil profiles were selected from physiographic units representing the interference area between El-Fayoum Governorate and Nile Valley in order to study their total and DTPA-extractable nutrition elements. Moreover, the relation between total and available micronutrients and some soil variables was undertaken.

Total Fe, Mn, Zn and Cu varies from 1500 to 37000, 32 to 535, 7.0 to 95.0 and 11.8 to 60.0 mg kg^{-1} soil, respectively. DTPA-extractable Fe, Mn, Zn and Cu ranged from 2.0 to 22.5, 0.3 to 7.3, 0.15 to 2.4, and 0.25 to 1.4 mg kg^{-1} soil, respectively. Generally, the soils of El-Fayoum and the Nile valley contain the high values of Fe, Mn, and Zn, while the interference soils contain the high values of Cu. The data show that, DTPA-extractable micronutrients are in adequate amounts in all the studied surface samples, except for the soils of old and young terraces which are low.

Factors affecting total and DTPA-extractable micronutrients were predicted through correlation coefficients between some soil variables with total and available micronutrients. Also, the statistical measures, i.e., weighted mean, trend and specific range of these nutrients were computed and interpreted in terms of soil genesis and formation.

INTRODUCTION

The fast growing population in Egypt, above a very limited area of agricultural land confining to the Nile valley and Delta, makes a pressing need to set up expansion programs to face and solve the problems of food, energy, employment and housing. Plans to invade the vast areas of desert, to introduce the possible into agriculture, have been laid down. Priority has been given to develop the interface area between El-Fayoum depression and the Nile valley to reclaim these soils which could be considered as one of the promising area for agricultural development, due to the availability of land and presence the vital roads and viulways.

Since soils and plants are significant components of ecosystems, the study of micronutrients in the soils of interference area between El-Fayoum and the Nile valley sheeds light on the appropriate supply of these elements to living organisms and therefore is of great concern in environmental studies.

The distribution of micronutrients in soils may reflect to some extent, the amounts contained in the parent material from which the soil was found (Stevenson 1986). However, the micronutrients exist in somewhat different during the various of soil formation forms, micronutrients released from the primary minerals and incorporated into other forms, such as structural components of secondary silicates, complexes with organic matter and occlusion in Fe and Mn oxides.

Under the Egyptian soil consideration the pedochemistry of such elements was given due consideration with particular emphass on soil genesis and formation (El-Demerdashe et al. 1980, Hassona et al., 1996, Abdel-Razik 2002 and Garis, 2006).

The current study points to evaluation of total and available micronutrients distribution in the various physiographic units recognized in the interface area between El-Fayoum and the Nile valley. It is essentially a trial to search for evidence pertaining to relationship between physiographic units and their content of micronutrients. In other words, it is an attempt to use such elements as criteria for soil genesis and formation.

MATERIALS AND METHODS

Sixteen soil profiles representing the mean physiographic units characterizing the interface area between El-Fayoum and the Nile Valley were selected for this study (Fig 1). Soil samples representing the subsequent morphological variations within the entire depth of each profile were collected. Soil samples were air dried, crushed and sieved through a 2mm screen. Physical and chemical properties (Table 1) of the soil samples were carried out as follows.

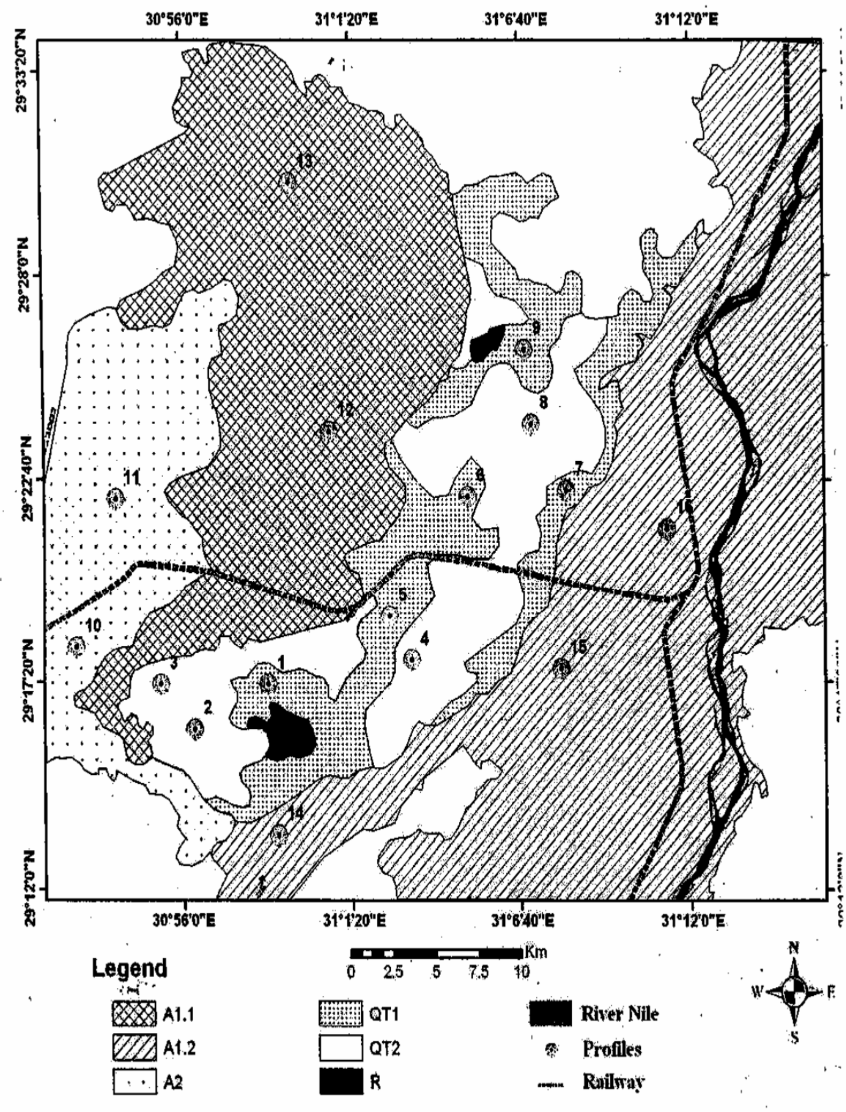

Figure (1): Physiographic units of the study area.

Table (1) some physical and chemical properties of the studied soil profiles

Physiographic unit	Profile	Depth (cm)	Sand % Coarse sand	Sand % Fine sand	Silt %	Clay %	Texture	O.M g/kg	$CaCO_3$ %	pH	EC dSm^{-1}
Old Terraces	1	0-25	5.80	78.50	7.30	8.40	LS	3.8	153.0	7.4	41.3
		25-75	14.30	71.90	6.50	7.30	LS	2.7	102.0	7.4	26.6
		75-120	15.30	65.20	4.20	15.30	SLK	1.3	73.0	7.3	56.0
		120-150	9.50	70.00	7.90	12.60	SL	0.1	86.0	7.6	20.9
	5	0-25	7.20	70.70	5.90	16.20	SL	3.4	75.0	7.7	72.2
		25-65	3.40	69.90	11.30.2009	15.40	SL	1.9	94.0	7.9	11.7
		65-90	7.80	69.20	10.40	12.60	SL	1.5	102.0	8.1	4.8
		90-120	4.70	57.80	15.10	22.40	SCL	2.2	79.0	8.0	4.0
	6	0-20	5.90	73.10	7.80	13.20	SL	3.0	104.0	7.6	43.3
		20-60	3.40	84.20	4.90	7.50	LS	2.1	78.0	7.5	37.7
		60-90	6.30	81.80	3.90	8.00	LS	1.1	63.0	7.5	33.8
		90-120	13.60	72.50	5.20	8.70	LS	1.0	52.0	7.6	41.3
	7	0-25	13.00	53.80	10.40	22.80	SCL	6.5	64.0	7.4	17.7
		25-75	25.30	57.90	7.50	9.30	LS	3.5	103.0	7.4	113.2
		75-150	19.80	64.70	6.40	9.10	LS	2.0	96.0	7.2	156.6
	9	0-25	2.90	60.10	17.20	19.80	SCL	4.5	28.0	7.4	8.4
		25-55	3.40	77.30	5.30	14.00	SL	2.0	152.0	7.8	3.8
		55-90	2.20	47.30	7.60	42.90	C	4.5	39.0	7.8	4.5
		90-150	2.50	78.90	6.40	12.20	SL	1.2	105.0	8.41	4.2

Table (1) cont.

Physiographic unit	Profile	Depth (cm)	Sand % Coarse sand	Sand % Fine sand	Silt %	Clay %	Texture	O.M g/kg	$CaCO_3$ %	pH	EC dSm^{-1}
Young Terraces	2	0-25	15.80	74.70	3.20	6.30	SL	2.4	50.0	7.6	21.5
		25-65	3.40	78.20	6.40	12.00	SL	1.2	46.0	7.6	31.9
		65-90	15.20	71.60	5.70	7.50	LS	1.0	112.0	7.7	33.7
		90-120	13.40	72.10	5.00	9.50	LS	0.5	84.0	7.8	42.8
	3	0-30	14.20	70.30	9.20	6.30	LS	3.5	96.0	7.2	50.9
		30-70	6.50	77.10	7.30	9.10	LS	2.2	102.0	7.4	33.9
		70-150	7.20	79.60	5.20	8.00	LS	1.2	154.0	7.5	47.8
	4	0-25	8.30	70.20	7.30	14.20	SL	1.5	76.0	7.6	8.5
		25-75	10.20	84.60	2.20	3.00	S	1.2	45.0	7.7	4.8
		75-110	15.70	73.50	4.30	6.50	LS	1.0	113.0	7.8	38.3
		110-150	17.60	71.00	3.50	7.90	LS	0.5	120.0	7.7	30.3
	8	0-25	7.30	52.60	15.00	25.10	SCL	4.5	70.0	7.1	91.6
		25-75	2.20	62.60	15.20	20.00	SCL	3.2	25.0	7.1	114.1
		75-150	3.10	63.30	16.40	17.20	SCL	1.2	32.0	7.1	87.3
Alluvial Basin	10	0-20	3.50	28.60	22.30	45.60	C	6.5	32.0	8.1	0.9
		25-75	5.40	86.30	3.00	5.30	LS	3.4	73.0	8.2	1.3
		75-15	2.10	88.20	2.50	7.20	LS	1.2	54.0	8.3	1.7
	11	0-25	3.45	27.24	25.80	43.51	C	6.0	15.3	7.5	9.8
		25-65	2.50	25.00	26.30	46.20	C	7.7	12.8	8.0	6.2
		65-90	2.85	26.89	22.46	47.80	C	6.5	13.6	7.8	4.4
		90-150	3.65	26.05	20.15	50.15	C	2.3	4.3	8.0	4.8

Table (1) cont.

Physiographic unit	Profile	Depth (cm)	Sand %		Silt %	Clay %	Texture	O.M g/kg	$CaCO_3$ %	pH	EC dSm^{-1}
			Coarse sand	Fine sand							
Alluvial plain (locally Terraced)	12	**0-30**	5.25	22.77	24.38	47.60	C	14.0	17.9	7.8	7.4
		30-70	9.24	25.25	20.21	45.30	C	8.0	14.3	7.7	1.1
		70-110	7.3	21.30	25.20	46.20	C	5.0	13.6	7.5	6.6
		110-130	7.5	23.37	30.38	38.75	CL	1.3	22.1	7.7	7.6
	13	**0-25**	3.45	27.81	22.37	46.37	C	14.5	66.3	7.4	2.2
		25-60	4.27	22.12	25.41	48.20	C	7.6	82.5	7.6	6.1
		60-90	3.29	25.17	21.38	50.16	C	5.5	81.6	7.6	5.8
		90-150	3.65	23.76	20.16	52.43	C	3.0	76.4	7.7	4.5
Alluvial plain	14	**0-25**	5.15	27.21	22.34	45.30	C	18.0	12.8	7.9	1.3
		25-60	3.24	23.26	25.70	47.80	C	8.0	25.6	7.8	1.5
		60-90	5.17	16.52	28.60	49.71	C	5.0	21.3	7.8	1.6
		90-140	3.24	26.23	22.30	48.23	C	2.0	17.0	7.7	1.1
	15	**0-25**	2.15	32.74	20.70	44.41	C	16.5	24.0	7.6	1.9
		25-60	6.54	24.25	22.46	46.75	C	9.0	21.5	7.7	1.9
		60-90	3.14	23.37	25.34	48.15	C	6.5	17.5	7.7	1.4
		90-130	5.45	22.45	21.74	50.36	C	2.5	13.4	7.8	1.6
	16	**0-25**	4.63	24.90	23.16	47.31	C	17.0	24.6	7.6	1.9
		25-60	5.27	20.91	24.17	49.65	C	7.5	21.7	7.9	0.7
		60-95	3.15	27.85	21.85	47.15	C	4.5	20.1	7.1	8.5
		95-150	4.87	31.72	20.17	43.24	C	2.1	20.3	8.5	1.5

Texture legend:

S	Sand	LS	Loamy sand	SL	Sandy loam
SCL	Sandy clay loam	SL	Clay Loam	C	clay

1- Particle size distribution of soil samples was measured using international Pipette method according to Page (1982).
2- Organic matter content was determined by Walkley and Black procedure as described by Piper (1950).
3- Calcium carbonate contents was determined using Collin's calcimeter.(Page 1982).
4- pH values was determined in the soil paste using Bechman pH meter and electrical conductivity of the saturation extract was determined by a conductivity salt bridge as described by Page (1982)
5- Total content of micronutrients (Fe, Mn, Zn and Cu) were extracted by digestion in a mixture of conc. HF +62%Perchloric acid as recommended by Hesse (1971).
6- Chemically extractable micronutrients were evaluate after extraction with DTPA(pH=7.3) according to Lindsay and Norvell (1978).

Both total and extractable Fe, Mn, Zn and Cu were determined by Atomic-Absorption Spectrophotometer, Perkin Elmer, model 380. the data obtained of simple correlation were statistically analysed according to Snedecor and Cochran 1976) by using SAS program (SAS Institute 1982).

RESULTS AND DISCUSSION

According to Shoman (2007), the physiographic units extracted from visual interpretation, the studied area between El-Fayoum and Nile valley could be classified into six main physiographic units namely:

1- Old terraces QT1)
2- Young terraces (QT2)
3- Alluvial fan basin (A2)
4- Alluvial plain (locally terraced (A1.1)
5- Alluvial plain (A1.2)
6- Rock land (R)

To assess the relationship between physiographic units and their contents of trace elements, the levels and distribution of total and DTPA-extractable Fe, Mn, Zn and Cu in the representative soil profiles will be discussed. Moreover, on attempt is made to shed light on their status and the factors controlling behavior in the soil of the studied area.

Total and available contents of micronutrients

Tables (2 and 3) give values of total and available content of Fe, Mn, Zn and Cu in the studied soils which will be discussed within the content considering the physiographic units.

1-Soil of old terraces

This physiographic unit was represented by profiles 1, 2, 6, 7 and 9. Total Fe, Mn, Zn and Cu contents ranges from 2000 to 34000, 60 to 360, 7.0 to 95 and 15 to 40.0 mg kg^{-1}, respectively. The lowest value characterized the soils of profile1, while the highest content was that of the soils of profile 9. The wide ranges of total micronutrients were apparently associated with soil texture. For instance, the lowest content of micronutrients is found in coarse textured samples. While the higher content characterized the medium to fine textured samples.

Table (2): Total trace elements Fe, Mn, Zn and Cu (mg/kg) of the studied soil profiles.

Physiographic unit	Profile	Depth (cm)	Total trace elements (mg/kg)			
			Fe	Mn	Zn	Cu
Old Terraces	1	0-25	4000.0	115.0	10.0	30.0
		25-75	2000.0	60.0	7.0	15.0
		75-120	5000.0	200.0	13.0	33.0
		120-150	4000.0	170.0	15.0	
	5	0-25	6500.0	115.0	15.0	28.0
		25-65	7100.0	75.0	12.0	30.0
		65-90	9000.0	80.0	13.0	35.0
		90-120	13270.0	100.0	10.0	30.0
	6	0-20	9000.0	117.0	15.0	35.0
		20-60	3100.0	100.0	12.0	25.0
		60-90	21500.0	85.0	10.0	24.0
		90-120	2000.0	75.0	7.50	18.0
	7	0-25	10000.0	170.0	30.0	40.0
		25-75	3000.0	75.0	15.0	35.0
		75-150	2800.0	80.0	12.0	25.0
	9	0-25	10140.0	90.0	8.60	26.0
		25-55	20000.0	210.0	80.0	25.0
		55-90	34000.0	360.0	95.0	22.0
		90-150	18000.0	320.0	81.0	25.0
Young Terraces	2	0-25	9000.0	176.0	17.0	50.0
		25-65	6000.0	119.0	18.0	48.0
		65-90	4300.0	100.0	13.0	30.0
		90-120	2200.0	98.0	10.0	22.0
	3	0-30	4150.0	89.0	7.50	25.0
		30-70	3000.0	85.0	7.90	22.0
		70-150	2850.0	70.0	6.30	25.0
	4	0-25	6000.0	115.0	20.0	50.0
		25-75	1500.0	32.0	14.3	14.0
		75-110	2300.0	85.0	7.50	25.0
		110-150	2500.0	80.0	7.00	28.0
	8	0-25	11350.0	98.0	9.70	28.0
		25-75	12750.0	100.0	9.70	26.0
		75-150	11150.0	95.0	10.10	25.0

Table (2):cont.

Physiographic unit	Profile	Depth (cm)	Total trace elements (mg/kg)			
			Fe	Mn	Zn	Cu
Alluvial Basin	10	0-20	25000.0	625.0	85.0	16.50
		25-75	25010.0	520.0	75.0	18.30
		75-15	22300.0	500.0	70.0	19.70
	11	0-25	25000.0	420.0	75.0	21.00
		25-65	21000.0	410.0	70.0	16.00
		65-90	25000.0	325.0	65.0	21.00
		90-150	20000.0	170.0	30.0	20.00
Alluvial plain (locally Terraced)	12	0-30	23000.0	485.0	65.0	19.50
		30-70	19000.0	310.0	71.0	20.00
		70-110	18000.0	337.0	27.0	17.50
		110-130	15000.0	120.0	30.0	30.00
	12	0-25	37000.0	353.0	95.0	31.00
		25-60	34000.0	320.0	85.0	22.00
		60-90	27000.0	400.0	73.0	20.00
		90-150	19500.0	340.0	69.0	18.00
Alluvial plain	14	0-25	17450.0	275.0	20.0	60.00
		25-60	20000.0	130.0	22.0	18.30
		60-90	21000.0	400.0	15.0	16.70
		90-140	19340.0	310.0	20.0	15.30
	15	0-25	25000.0	400.0	80.0	12.50
		25-60	21650.0	380.0	20.0	15.60
		60-90	20000.0	281.0	22.0	11.80
		90-130	18000.0	270.0	25.0	15.70
	16	0-25	22470.0	215.0	28.0	20.30
		25-60	20150.0	380.0	14.0	18.20
		60-95	18000.0	310.0	17.0	15.30
		95-150	17000.0	300.0	20.0	19.60

Table (3): Available DTPA-extractable micronutrients Fe, Mn, Zn and Cu (mg/kg) of the studied soil profiles.

Physiographic unit	Profile	Depth (cm)	Available micronutrients (mg/kg)			
			Fe	Mn	Zn	Cu
Old Terraces	1	0-25	3.00	1.20	0.80	0.50
		25-75	3.00	0.80	0.20	0.80
		75-120	3.30	1.50	0.30	0.40
		120-150	4.00	1.20	0.40	0.60
	5	0-25	3.20	1.30	0.60	0.60
		25-65	3.50	1.80	0.40	0.40
		65-90	3.80	1.70	0.50	0.50
		90-120	3.20	4.20	0.80	0.40
	6	0-20	3.00	4.00	0.70	0.45
		20-60	2.80	1.80	0.50	0.30
		60-90	2.00	1.50	0.40	0.25
		90-120	2.10	1.00	0.30	0.25
	7	0-25	4.00	1.40	1.80	1.20
		25-75	2.10	1.50	0.70	0.50
		75-150	2.00	1.30	0.60	0.45
	9	0-25	3.80	3.20	0.40	0.57
		25-55	6.00	3.10	0.40	1.10
		55-90	5.00	3.00	0.32	1.20
		90-150	4.30	2.60	0.41	1.00
Young Terraces	2	0-25	3.80	1.80	0.50	0.45
		25-65	3.10	1.70	0.40	0.38
		65-90	3.00	1.20	0.60	0.50
		90-120	2.80	1.00	0.30	0.45
	3	0-30	2.70	1.30	0.50	0.60
		30-70	2.40	1.20	0.60	0.54
		70-150	2.00	1.00	0.20	0.20
	4	0-25	2.80	1.80	0.60	0.46
		25-75	2.60	0.70	0.20	0.70
		75-110	2.60	0.60	0.40	0.40
		110-150	2.70	0.50	030	0.50
	8	0-25	2.60	3.10	0.60	0.25
		25-75	2.80	4.00	0.50	0.30
		75-150	2.70	3.70	0.20	0.40

Table (3):cont.

Physiographic unit	Profile	Depth (cm)	Available micronutrients (mg/kg)			
			Fe	Mn	Zn	Cu
Alluvial Basin	10	0-20	2.60	2.50	0.53	0.33
		25-75	3.40	2.80	0.40	0.45
		75-15	3.00	2.70	0.30	0.36
	11	0-25	19.50	0.50	0.15	0.35
		25-65	4.00	0.40	1.20	1.20
		65-90	22.00	0.50	0.80	0.40
		90-150	6.00	2.00	0.60	0.35
Alluvial plain (locally Terraced)	12	0-30	5.70	0.90	0.57	0.31
		30-70	22.50	0.60	0.37	0.65
		70-110	3.00	1.30	0.58	0.38
		110-130	6.00	0.60	2.40	1.40
	13	0-25	2.00	7.30	0.36	1.20
		25-60	3.00	3.00	0.40	1.10
		60-90	3.20	0.40	0.26	0.27
		90-150	2.50	0.50	0.30	0.50
Alluvial plain	14	0-25	2.80	3.00	0.80	0.30
		25-60	3.40	1.90	0.40	0.50
		60-90	4.00	2.50	0.20	0.45
		90-140	3.10	0.30	0.20	0.27
	15	0-25	13.60	1.30	0.38	0.36
		25-60	4.00	1.60	0.57	0.46
		60-90	5.00	2.00	0.36	0.27
		90-130	3.60	1.60	0.51	0.21
	16	0-25	6.70	1.30	0.70	1.10
		25-60	4.10	2.30	0.60	0.90
		60-95	4.00	2.10	0.90	1.00
		95-150	3.80	2.00	1.30	0.75

DTPA-extractable Fe, Mn, Zn and Cu in the soils of old terraces ranged from 2.0 to 6.0, 0.8 to 4.2, 0.2 to 1.8 and 0.25 to 1.2 mg kg^{-1}, respectively. According to Lindsay and Norvell (1978), the surface layers of all the studed soil profiles contain marginal levels of Fe, Mn, and Cu, while the soils have a Zn deficiency.

2. Soils pf young terraces

This physiographic unit was represented by profiles 2, 3, 4 and 8. the total contents of Fe, Mn, Zn and Cu fluctuate from 1500 to 12750, 32 to 176, 6.3 to 20.0 and 14.0 to 50.0 mg kg^{-1}. The lowest values of Fe, Mn, and Cu were detected in the sub surface layer of profile 4, while the highest values were found in the surface layers of profiles 2 and 4, and highest Fe value was detected in the subsurface layer of profile 8.

With regard to DTPA-extractable Fe, Mn, Zn and Cu (Table 3) as related to the soils of young terraces, their content varies from 2.0 to 3.8, 0.5 to 4.0, 0.2 to 0.6 and 0.25 to 0.7 mg kg^{-1}. respectively. Concerning the critical levels presented by Lindsay and Norvell (1978). The surface layers of the studied soil profiles contain a marginal of Fe, and low of Mn, Zn and Cu.

3. Soils of alluvial fan basin

This physiographic unit is presented by profiles 10 and 11.Table (2) reveals that total Fe, Mn, Zn and Cu values ranged from 21000 to 28000, 170 to 625, 30 to 85 and 16 to 21 mg kg^{-1}, respectively. The lowest values of total Fe, Mn, Zn and Cu were found in the soils of profile 11. The highest values of Fe, Mn and Zn were detected in the surface layer of profile 10, while Cu were detected in the surface layer of profile 11.

Data in Table (3) show that the amounts of DTPA-extractable Fe, Mn, Zn and Cu ranged between 2.6 to 220, 0.4 to 2.8, 0.15 to 1.2 and 0.33 to 1.2 mg kg^{-1}, respectively. The surface layers of this physiographic unit cntent adequate levels of Fe and Mn deficiency levels of Zn and Cu according to Lindsay and Norvell (1978).

4- Soil of alluvial plain (locally terraces)

This physiographic unit is represented by profiles 12 and 13. total Fe, Mn, Zn and Cu ranged from 15000 to 37000, 120 to 535, 30 to 95 and 17 to 31 mg kg^{-1}, respectively. The highest values of total Fe, Mn, Zn and Cu were detected in the surface layer of profile 13, while the lowest values for total micronutrients were found in the deepest layers of profile 12.

DTPA-extractable (Table 3) Fe, Mn, Zn and Cu for the investigated physiographic unit ranged from 2.0 to 22.5, 0.4 to 7.3, 0.26 to 2.4 and 0.5 to 1.4 mg kg^{-1}, respectively. Considering the critical level of micronutrients proposed by Linsay and Norvell (1978), the surface layer of the studied soil profiles contain adequate levels of Fe and Mn and low levels of Zn and Cu

5-Soils of alluvial plain

This physiographic unit was represented by profiles 14, 15 and 16. Total values of Fe, Mn, Zn and Cu ranged from 17000 to 25000, 130 to 400, 14 to 80 and 11.8 to 60 mg kg^{-1} respectively. The highest values of total Fe, Mn and Zn characterized the surface layer of profile 15, while those of Cu was found in the surface layer of profile 14.

With regard to the chemically available contents of Fe, Mn, Zn and Cu in the alluvial plain soils ranged from 2.8 to 13.6, 0.3 to 3.0, 0.2 to 1.3 and 0.21 to 1.1 mg kg^{-1}, respectively. According to Lindsay and Norvell (1978), the surface layers contain an adequate levels of Fe and low levels of Mn, Zn and Cu.

Based on the abovementioned results, it is clear that the alluvial fan basin, alluvial plain (locally terraces) and alluvial plain physiographic units contain the high content of micronutrients than the soils of old and young terraces. The high content of total and DTPA-extractable micronutrients are characterized the soils have low content of $CaCO_3$ and fairly high content of clay, while the low content of micronutrients are found in the coarse and medium textured soils.

Micronutrients and soil components

The relationship between total and DTPA-extractable micronutrients and some soil components such as clay% , sand%, silt% EC, OM, pH and $CaCO_3$ are computed using statistical analysis.

Table (4) shows that, the obtained coefficients indicate very highly positively significant correlations between total Fe and each of OM%, silt% and clay%. Also very highly negatively significant correlations between total Fe and EC, $CaCO_3$% and coarse sand% while highly positively significant with pH.

Table (4) revels that the statistical analysis shows that DTPA-extractable Fe is significantly, positively correlated with OM% and silt% and positively highly significantly correlated with clay%. In contrast, available Fe is negatively significant correlated with $CaCO_3$% and fine sand%.

Similar results were obtained by Hafez et al.(1992) Abbas et al.(2003).and Abdel Aziz et al.(2007).

Statistical analysis(Table4) shows that total Mn is negatively significantly correlated with EC and $CaCO_3$%, while available Mn is negatively significantly correlated with coarse sand%. Similar results were reported by Abd el Razik (1999), El-Bassiouny (2006) and Abd el Aziz (2007).

Table (4): Correlation coefficients (r) between some soil constituents and total and DTPA-extractable micronutrients in the studied soils

Soil variables	Available				Total			
	Fe	Mn	Zn	Cu	Fe	Mn	Zn	Cu
pH	0.06	-0.02	0.12	0.12	0.38**	0.26	0.32*	-0.17
EC_e (dSm^{-1})	-0.26	0.03	-0.05	-0.25	-0.55***	-0.32*	-0.44**	0.21
$CaCO_3$ %	-0.36*	-0.007	-0.17	-0.009	-0.51***	-0.30*	-0.18	0.27
OM %	0.31*	0.18	0.09	0.19	0.59***	0.26	0.41**	-0.05
Coarse sand %	-0.19	-0.33*	0.04	-0.06	-0.63***	-0.10	-0.44**	0.29*
Fine sand %	-0.35*	0.03	-0.22	-0.17	-0.70***	-0.24	-0.36**	0.35*
Silt %	0.33*	0.05	0.26	0.16	0.68***	0.18	0.30*	-0.35*
Clay %	0.36**	0.03	0.15	0.17	0.79***	0.26	0.45***	-0.37**

* significant 0.05% (r=0.273

** highly significant at 0.01 (r=0.0354)

***very highly significant at 0.001(r=0.443)

The obtained correlation coefficient indicate that total Zn is positively and very highly significant correlated with clay% and OM% and positively significantly correlated with pH and silt%, while it is showing a negatively highly significantly correlated with EC, coarse sand% and fine sand%. These findings are in agreement with those of Abdel Aziz et al.(2007). No significant correlation could be detected between available Zn and all the other tested factors.

With regad to the relationship between total and DTPA-extractable Cu and some soil components, data in Table (4) reveals positively significant correlated between total Cu and each of coarse sand% and fine sand% and negatively significant correlated with silt% and clay %, while DTPA-extractable Cu is insignificant correlation with all the studied soil factors. These relations are in agreement with those of El-Hemely (2001) and Grais (2006).

To work out a relationship between the distribution of total micronutrients and physiographic units of the studied soil profiles, the three statistical measures suggested by Oertal and Giles (1963) have been calculated, Table (5), these measures could be written as follows:

1) $W=[\sum(c \times d)/P]$

Where, c = concentration of elements in the layer
d = thickness of layer
P = depth of profile
W= weighted mean

2) $T = (W - S)/W$ when $W>S$
$T = (W - S)/S$ when $S>W$

Where, W = weighted mean
S = the concentration in the surface layer
T = Trend

3) $R = (H - L) / W$

Where, R = specific range
L = The lowest observed concentration in the solum,
H =the highest observed concentration in the solum, and
W = Weighted mean

Table (5) reveals that the weighted mean (W) for total Fe, Mn, Zn and Cu ranges from 2703.3 to 27300; 71.0 to 527.5; 5.2 to 77.9 and 18.2 to 34.9 mg kg^{-1}, respectively. These data indicating that the lowest values of (W) for Fe, Mn, and Zn are associated with the young terraces soils (profiles 3 and 4) which have low percent of clay and silt contents, while the highest values of (W) characterized the soils of alluvial fsn basin and alluvial plain (locally terraces) (profiles 10 and 13). The wide variation of weighted mean in the studied soil profiles may be attributed to geogenic factors rather than pedogenic ones, i.e., may be ascribed to the intern changes in the nature of parent material rather than to soil. Moreover, the studied soils can be categorized according to the weighted mean of total Fe, Mn, Zn and Cu of each locality in the following orders:

Alluvial fan basin > alluvial plain (locally terraces)> alluvial plain> old terraces> young terraces for Fe, Mn and Zn

Old terraces> young terraces> alluvial plain (locally terraces)> alluvial plain> alluvial fan basin for Cu

Considering the trend (T) and specific range (R) of total micronutrients in the studied physiographic units, data in Table (5) reveal that alluvial plain basin, alluvial plain (locally terraces) and alluvial plain soils are highly symmetrical as indicated by the small values of (T) and (R). these results show that the soil profiles within each physiographic units are mostly of genetic or geographic interrelation. Also, the results reveal that the soils of old terraces and young terraces representing interferance zone have a high values of (T) and (R) are mainly heterogeneous in soil materials or surface from different levels of pedogenic processes through their formations.

Table (5) Weighted mean (W), trend (T) and specific rang (R)of the studied soil profiles

Physiographic unit	Profile	Fe			Mn			Zn			Cu		
		W	T	R	W	T	R	W	T	R	W	T	R
Old Terraces	1	3633.3	0.09	0.83	133.2	0.14	1.05	10.9	0.08	0.73	28.6	0.05	0.87
	5	9535.7	0.32	0.71	97.7	0.15	0.41	12.0	0.20	0.42	30.5	0.08	0.23
	6	3570.8	0.60	1.96	92.8	0.21	0.45	10.9	0.27	0.73	24.7	0.30	0.69
	7	4066.7	0.59	1.77	93.3	0.45	1.02	16.0	0.47	1.13	30.8	0.23	0.48
	9	20823.3	0.51	1.15	269.0	0.67	1.01	72.0	0.88	1.20	24.5	0.06	0.16
Young Terraces	2	4696.7	0.48	1.15	123.6	0.30	0.63	13.8	0.18	0.58	34.9	0.30	0.80
	3	3150.0	0.24	0.41	77.8	0.13	0.24	5.2	0.26	0.31	24.2	0.03	0.12
	4	2703.3	0.55	1.66	71.0	0.38	1.17	11.7	1.59	1.11	26.3	0.47	1.37
	8	11716.7	0.03	0.14	97.2	0.01	0.05	9.9	0.09	0.04	25.8	0.09	0.12
Alluvial Basin	10	24486.7	0.13	0.23	527.5	0.16	0.24	74.2	0.13	0.20	18.2	0.09	0.16
	11	21933.3	0.12	0.23	309.5	0.26	0.81	54.0	0.28	0.83	19.3	0.08	0.26
Alluvial plain (locally Terraced)	12	19000	0.17	0.42	329.5	0.32	1.12	49.8	0.23	0.76	20.7	0.06	0.63
	13	27300	0.26	0.64	379.8	0.29	0.57	77.9	0.18	0.33	21.5	0.31	0.60
Alluvial plain	14	19539.3	0.10	0.18	278.1	0.01	0.97	19.4	0.03	0.36	24.3	0.60	1.85
	15	20790.4	0.17	0.34	327.2	0.18	0.40	33.5	0.58	1.79	14.2	.0.15	0.28
	16	18880.0	0.16	0.29	306.8	0.30	0.54	19.2	0.31	0.73	18.4	0.09	0.27

W: Weighted mean
T: Trend
R: Specific range

In view of the obtained results, it be concluded that total micronutrients could partially be used as a criterion for soils differentia. Moreover, the levels of such elements could be used as guide for substanting the nature of parent materials together with the pedogenic factors acted on them. Thus lead to the prediction of soil genesis and formation.

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حالة بعض المغذيلت الكلية والميسرة فى أراضى التداخل بين الفيوم ووادى النيل

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اختير ستة عشر قطاع اراضى ممثلة للوحدات الفيزوجرافية المختلفة لمنطقة التداخل بين محافظة الفيوم ووادى النيل وتم تقدير العناصر الغذائية الصغرى الكلية والميسرة المستخلصة بمركب الDTPA واجرى التحليل الاحصائى لدراسة العلاقة بين المحتوى الكلى والميسر من هذه العناصر وبعض متغيرات التربة تحت الدراسة وقد اوضحت نتائج الدراسة مايلى:

الكمية الكلية لعناصر الحديد والمنجنيز والزنك والنحاس تختلف اختلافا واضحا حيث تراوحت ما بين 15000 الى 37000، 32 الى 535، 7 الى 95 ، 11.8 الى 60.0 جرام/كجم تربة على الترتيب- اما الكمية الميسرة والمستخلصة كيميائيا باستخدام مركب DTPA من تلك العناصر تراوحت ما بين 2.0 الى 22.5، 0.3 الى 7.3، 0.15 الى 2.4، 0.25 الى 1.4 جرام/كجم تربة على الترتيب.

وطبقا للمعادلات المقترحة عالميا لكافه العناصر بالنسبه لاحتياجات النبات غذائيا وجد أن اراضى الفيوم ووادى النيل تحتوى عل تركيز عالى من عناصر الحديد والمنجنيز والزنك بينما أراضى التداخل تحتوى على تركيز عالى من النحاس. وبصفة عامه أثبتت الدراسة أن جميع الاراضى تحتوى على كميات كافية من العناصر الغذائية الميسرة فيما عدا أراضى المصاطب القديمة والحديثة (أراضى التداخل) والتى تحتوى على تركيز منخفض من عنصرى الزنك والنحاس.

وقد أجرى التحليل الاحصائى لتحديد مدى الارتباط بين المحتوى الكلى والميسر من هذه العناصر وبعض متغيرات التربة. كذلك اجريت المقايس الاحصائية وهى المتوسط الوزنى (W) ، والاتجاه (T) ، النطاق النوعى (R) للمحتوى الكلى من هذه العناصر. وقد نوقشت النتائج لتحديد أصل ومنشأ وتكوين الاراضى بالمنطقة المدروسة.