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PHYSIOCHEMICAL, MINERALOGICAL AND MORPHOLOGICAL STUDIES OF COASTAL SOILS NORTH - WEST OF EGYPT.

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ABSTRACT

The northwestern coast is located in the western desert of Egypt. The whole region is under hot arid conditions. Four landforms were identified and soils the area is sufficient for initiated cultivation of figs and the associated industrial and economic activities. Abundant runoff, and water shed practices the lands are promising for agricultural expansion. Sixteen soil profiles representing the four landforms of coastal plain, windblown formation, piedmont like plains and plateau formation were taken to study the morphological, chemical, physical and mineralogical characteristics of the area. and explore possible .
Keywords: Landforms, plains, Egypt

INTRODUCTION

Agricultural expansion requires exploring suitable land and water resources to meet needs for food to the growing population. The northwestern coast of Egypt represents a potential land for such objective The transport of Nile water through El-Hamam Canal until El-Dabaa City would allow potenial development in this region. Soils parent materials differ in composition from one place to another because of the variations in their geological origin and their position in the landforms. These materials reflect their characters on the formed soils. As a consequence of the rapid rate of evaporation, salts sometimes do not penetrate deep but accumulate on the surface forming crust or just accumulate below the surface. According to Hammad *et al.* (1977) soils of Natrun - Maryout areas have formation, of evaporate horizons. And soils of the old deltaic plain, have high calcium carbonate and gypsum. They also they noticed that anhydrites found in the soils of depressions and plains indicate precipitation of in a hyper saline solution rather than as accumations in a horizons.

Hammad and Abdel - Salam (1968) stated that the only prominent feature of development of calcareous soils of the western coast of Egypt is the formation of calcium carbonate accumulations as (calcic horizon) which vary in position, thickness and other properties depending on their position .
Hammad (1976) concluded that aridity of Natron – maryut area resulted in a degradation of its old surface; and that Maryout lake environment is responsible for the presence of evaporates in the old deltaic plain.
Vieillefon (1976) mentioned that, gypsum can be transported by water or wind and re-deposited in locations forming gypsum dunes or be incorporated in the soil. Metwally (1987)

Metwally, (1987).noticed that soils of this area very from sand to clay, non – saline, to extremely saline, calcareous (18 to 95% $CaCO_3$) with polygorskite being the dominant clay mineral (Abdel Latif, 2003 and Abdel – Razik 2005) reported that most soils of the north – west coast of Egypt are marine sediments and fluvio-lacustrine dominated with playgorskite followed by kaolinite with occurence smectite, illite, vermiculite, chlorite and interstrtifed minerals.Clay mineralology suggests their inheritance from parent materials, except of palgorskite which is either inherited or neo-genetically, formed stimulated by presence of high $CaCO_3$ and soluble salts. (Abdel Razik, 2005) The current study area covers four landforms, the north – west coastal area of Eygpt with an objective of assessing the physiochemical, mineralogical and morphological properties.

MATERIALS AND METHODS

The investigated area in the northwestern coast of Egypt is stretched between longitudes 27° 00′′ 29° 30′′east and latitudes 31° 30′′ - 30° 30′′ north Fig. 1 shows a location map of the area. LANSAT - ETM images of 2001 and digital elevation model CDEM were used in ENV1 4.5 software to produce the geomrphological map of the studied area (Fig. 2)

Sixteen soil profiles were made to represent the identified landforms of. The profiles were dug to a depth of 150 .cm except for profile. 16 which was dug to a depth of 60 cm due to a presence of Table 1 shows the studied landforms and the profiles representing them

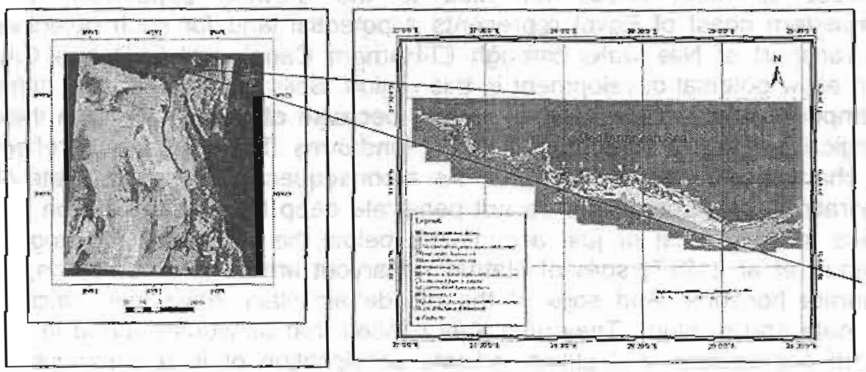


Figure 1:- Location map of the studied area and the dug soil profiles.

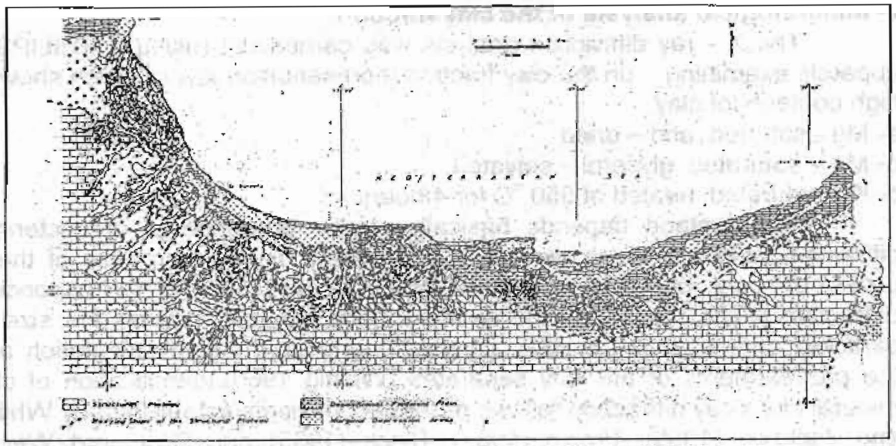


Figure 2: The geomorphological map of the Mediterranean coastal zone.

Table 1: The main landforms of the investigated area.

Landform unit	Sub units	profile No.
Coastal plain	Moderate to limited depth sand to sandy clay soils.	3,5,6,7,9,16
	Shallow soils of coarse texture with rock outcross.	1
	Consolidated rocky ridges sloping and dissected	8 , 13 , 14
	Soil of the lagoonal depressions	10
Windblown Formation	Quartzitic inlanddunes and sheets.	12
	Oolitic inladdunes and sheet	11
Piedmont	Denuded shallow rocky soils	2
Plateau formation	Shallow rocky soils.	4 , 15

1- Laboratory analysis:

- Soil colour in was assessed using the Munsell soil color charts (Anon. 1975).
- Mechanical analysis was carried using the pipette method (piper 1950)
- Calcium carbonate using the calcimeter , the following detrmintions were done according to methods cited in Black et al(1965).
- Gypsum content by precipitation with aceton
- Bulk density this was done using the core methods (Black et al, 1965).
- Organic matter content was determined using the Walkley and Black method.
- Soil pH in the soil past .
- The following analyses were carried out on the saturation extract:
- Soil salinity and soluble ions in the past – extract, with, with the soluble sulphate anions being by calculated subtraction.
- Soil bulk density using soil cores.

2- Mineralogical analysis of the clay fraction:

The X - ray diffraction analysis was carried out (using 1 PHILIPS 1 apparels examining: on the clay fraction representation layers which showed high contents of clay

a- Mg - satrated, arid – dried.

b- Mg – saturated, glycerol – solvated.

c- K – saturated, heated at 550 °C for 4 hours.

This method depends basically on the presence of characteristic diffraction peaks for each mineral. The intensity of the sharpness of these peaks are not only dependent on the number and the corresponding diffraction plains present in the examined sample, but also on the size of particles, chemical composition, crystal imperfection, crystal orientation and the pretreatments of the clay separates (Whittig 1965).Identification of clay minerals by x-ray diffraction follows essential principals established by Whittig and Jackson (1955), Brown (1961), Black (1965) and Dixin and Weeds (1977). Semi – quantitative mineralogical determinations were estimated by measuring the area under peaks (Gjems 1967).

RESULTS AND DISCUSSION

1- Landforms of the area:

Geological maps showing landforms in the northwestern coast together with the generated digital elevation modal were used. Field work verified presence of these the units and enabled the description of these units. Location of soil profiles were pre- determined to characterize the soils occupying the surfaces of these landforms. The field conditions decided their locations (Fig.1).The identified landforms are given in Table 1, they are as follws:

1- Coastal Plains. Their elevation is lower than their surroundings impeded natural drainage and hence shallow water table . Aeolian sand deposits cover more than half of the surface as sand sheets, dunes and hummocks. Lower parts of the coastal plains are practically suitable for construction of tourist resorts.

2- Windblown formations. According to the elevations, two submits were recognized. Those are (a) Quartzitic inland dunes and sheets,and (b) Oolitic inland dunes and sheet. The topography is generally undulated , locally hilly. The general prominent features in these are is salinity. Water table is shallow. Due to excessive evaporation, high salinity prevails and salts are noticed on the surface of the low and the relatively moderately high lands.

3- Piedmonts. Denuded shallow rocky soils with exposed. Salinity and calcite formations are secondary accumulations.

4- Plateaus. Shallow rocky soils at the foot of scarps of the highlands. They are generally rocky covered with a desert pavement of rock fragments. These fragments are silicified, calcite and dolomite at the surface

2- Soils in the area.

Using the digital elevation model (DEM Fig 1) generated from topographic and contour maps merged with the unsupervised LANDSAT image of 2010 , a soil map was elaborated (Fig 1). Soil mapping units , presented Table 3 and4, are as follwes:

Soils of the coastal plains. The soils are generally sandy to sandy loam, occasionally sandy clay loam and layer rock in profile 9 (Table2). With regard to the surrounding limestone of the plateau, the soils contain calcium carbonate of 25.5 to 98.5% Gypsum is not found. Calcic horizons are in the soils developed probably on plateau rock formation. (Table3)

Soils of the windblown formations. These are soils developed from windblown formations. Sandstone and siliceous dolostone. Soils are rich in ironstone concretions, hence their to calcareousness. The soils are yellowish brown (Table 2), mainly sandy loams. Most soils are saline, with low elevation (Table 4).

Soils of the Piedmont plains. These are soils are generally sandy loams, originated from denuded shallow rocky formations salinity decrease, while gypsum increase with depth, (Table 3).

Soils of the Plateau formations. Texture range between sand to sandy loam with slight salinity, shallow rocky with hard pans in two profiles after at 40 cm depth in profile 4 and 28 cm depth in profile 15 after 28 cm. (Table 4).

3-Mineralogy.

Mineralogical identification in ten clay samples representing soils for different Landforms containing appreciable amounts of clay. Using X-ray diffraction reveals dominance of kaolinite followed by Illite and montmorillonite in soils of coastal plain. Montmorillonite was dominant in the wind-blowen formations followed by kaolinite and Illite. Montmorillonite was dominant followed by kaolinite and Illite in soils of the piedmont landforms. The dominance of Kaolinite in the plateau landform is relatively abundant in limestone. Generally, the identified accessory minerals are dominated by quartz and feldspars. (Table 5 and Fig 4)

Table (2): Landform unit morphological, characteristics of soil of the North- western coast of Egypt.

Landform unit	Sub units	Profile No.	Location	Depth cm	colour Dry	colour Moist	Field texture	Structure	Consistence Dry	Consistence Stick	Consistence Plastic	Boundary
Coastal plain	Shallow soils of coarse texture with rock outcross.	1	31° 18′ 45.66″ N 27° 20′ 12.36″ E	0-40	10YR 8/4	10YR 7/4	SL	MA	SO	SST	SPL	AS
				40-90	10YR 8/2	10YR 7/1	SL	MA	SO	SST	SPL	AS
				90-150	10YR 8/4	10YR 7/4	SL	MA	SHA	NST	NPL	
	Moderate to limited depth sand to sandy clay soils.	3	31° 11′ 43.62″ N 27° 47′ 59.94″ E	0-30	7.5YR 7/4	7.5YR 6/4	SL	MA	SHA	SST	SPL	AS
				30-70	10YR 8/2	10YR 7/1	SCL	MA	HA	ST	PL	AS
				70-150	7.5YR 7/4	7.5YR 6/4	SL	MA	HA	SST	SPL	
		5	31° 03′ 11.57″ N 28° 00′ 05.10″ E	0-20	7.5YR 8/2	7.5YR 7/1	SL	SG	LO	NST	NPL	AS
				20-70	10YR 8/3	10YR 7/4	SL	MA	HA	SST	SPL	AS
				70-110	7.5YR 8/2	7.5YR 7/4	SL	MA	HA	SST	SPL	AS
				110-150	10YR 7/1	10YR 8/3	LS	MA	SO	SST	SST	
		6	31° 04′ 00.75″ N 28° 07′ 00.00″ E	0-20	10YR 8/2	10YR 7/4	LS	MA	SO	SST	SPL	AS
				20-30	10YR 8/2	10YR 7/1	SL	MA	HA	SST	SPL	AS
				30-70	10YR 8/2	10YR 7/3	SCL	MA	SO	ST	PL	AS
				70-120	10YR 8/2	10YR 7/1	S	SG	LO	NST	NPL	AS
				120-150	10YR 8/2	10YR 7/1	S	SG	LO	NST	NPL	
		7	31° 04′ 06.68″ N 28° 14′ 00.78″ E	0-45	7.5YR 7/4	7.5YR 6/4	SCL	MA	FI	ST	PL	AS
				45-100	7.5YR 7/3	7.5YR 6/4	SLC	MA	HA	ST	PL	CS
				100-150	10YR 8/3	10YR 7/4	SCL	SMA	HA	ST	PL	
		9	31° 01′00.00″ N 28° 28′ 16.1″ E	0-40	7.5YR 7/4	7.5YR 6/4	SL	MA	SO	SST	SPL	AS
				40-80	10YR 8/2	10YR 6/3	SL	MA	HA	SST	SPL	AS
				80-120	7.5YR 7/4	7.5YR 6/4	SL	MA	HA	SST	SPL	AS
				120+	10YR 8/3	10YR 8/3	S	SG	LO	NST	NPL	
		16	30° 48′ 04.15″ N 28° 56′ 06.55″ E	0-20	10YR 8/4	10YR 6/6	LS	MA	SO	NST	NPL	AS
				20-60	10YR 8/4	10YR 7/6	SCL	MA	SO	SST	SPL	AS
				60+	ROCK							
	Soil of the lagoonal depressions	10	30° 57′ 07.93″ N 28° 45′ 07.70″ E	0-30	10YR 8/4	10YR 7/4	SL	MA	SO	SST	SPL	AS
				30-60	10YR 8/3	10YR 7/2	SL	MA	SHA	SST	SPL	AS
				60-110	10YR 8/3	10YR 7/2	SL	MA	SHA	SST	SPL	AS
				110+150	10YR 7/2	10YR 6/1	SCL	MA	HA	ST	PL	
	Consolidated rocky ridges sloping and dissected	8	31° 02′ 08.48″ N 28° 22′ 13.05″ E	0-30	10YR 8/4	10YR 7/3	SL	MA	SO	SST	SSP	AS
				30-80	10YR 8/2	10YR 7/4	CL	MA	SO	SST	SSP	AS
				80+150	10YR 8/3	10YR 7/2	CL	MA	SO	SST	SSP	
		13	30° 56′ 12.78″ N 28° 18′ 10.48″ E	0-15	10YR 8/4	10YR 7/1	S	MA	SO	SST	SPL	AS
				15-45	10YR 8/3	10YR 6/4	LS	MA	HA	ST	PL	AW
				45-110	10YR 8/3	10YR 7/2	SL	MA	SO	SST	SPL	AS
				110-150	10YR 8/2	10YR 7/2	LS	MA	SO	SST	SPL	
		14	30° 57′ 16.56″ N 27 °08′ 15.83″ E	0-15	10YR 8/3	10YR 7/6	SL	MA	SHA	SST	SPL	AS
				15-70	10YR 8/4	10YR 6/6	S	SG	LO	NST	NPL	AS
				70-150	10YR 8/3	10YR 7/2	SL	MA	SHA	SST	SPL	

Table cont:-

Landforn unit	Sub . units	Profile No.	location	Depth Cm	colour		Field texture	Structure	Consistence			Boun-dary
					Dry	Moist			Dry	Stick	Plastic	
Windblown Formation	Quartzitic inlanddunes and sheets.	12	30° 52′ 772″N 28° 31′ 724″ E	0-30	10YR 8/4	10YR 7/6	SL	MA	SO	SST	SPL	AS
				30+	10YR 8/4	10YR 7/3	SL	MA	HA	SST	SPL	
	Oolitic inladdunes and sheet	11	30° 50′ 404″ N 28° 47′ 602″ E	0-15	10YR 8/2	10YR 7/2	SL	MA	SO	SST	SPL	AS
				15-35	10YR 8/2	10YR 7/3	SL	MA	SHA	SST	SPL	AS
				35-90	10YR 8/2	10YR 7/7	SCL	WE CV AB	FI	ST	PL	AS
				90-150	10YR 8/1	10YR 7/2	SCL	WE MV AB	FI	ST	PL	
Piedmontl ike Plains	Denuded shallow rocky soils. Shallow	2	31° 11′ 904″ N 27° 26′ 208″ E	0-50	7.5YR 7/4	7.5YR 5/4	SL	MA	SO	SST	SPL	CS
				50-110	10YR 8/2	10YR 7/1	SL	MA	SO	SST	SPL	AS
				100-150	7.5YR 8/2	7.5YR 7/2	SCL	MA	FI	ST	PL	
Plateau Formation	Shallow rocky soils.	4	31° 17′ 388″ N 27° 17′ 936″ E	0-20	7.5YR 7/4	7.5YR 6/4	L	MA	FI	ST	PL	AS
				20-40	7.5YR 7/3	7.5YR 6/3	L	MA	HA	ST	PL	AS
				40+	ROCK							
		15	30° 57′ 754″N 27° 58′ 688″ E	0-8	10YR 8/4	10YR 6/6	S	SG	LO	NST	NPL	AS
				8-28	10YR 8/3	10YR 7/6	L	MA	SHA	ST	PL	AS
				28+	ROCK							

Notes: (1) Texture : SL: sandy loam; S: Sand; LS: loamy sand ; SCL: sandy clay loam ; CL: clay loam

Table (3): Physical properties of the studied soils of the North-western coast of Egypt.

Landfom unit	Sub units	Profile No	Depth (cm)	Particle size distribution Sand %	Silt %	Clay %	Texture	$CaCO_3$ Gkg^{-1}	Density Mgm^{-3} Real	Bulk
Coastal plain	Shallow soils of coarse texture with rock outcross.	1	0-40	77.72	17.09	5.19	SL	467.5	2.64	1.33
			40-90	78.72	14.08	7.20	SL	573.7	2.59	1.41
			90-150	73.72	17.08	9.20	SL	552.5	2.68	1.43
	Moderate to limited depth sand to sandy clay soils.	3	0 – 30	70.48	18.26	11.26	S L	765.0	2.59	1.29
			30 – 70	63.55	19.15	17.30	SCL	616.2	2.62	1.32
			70 – 150	67.57	20.17	12.26	SL	658.7	2.64	1.34
		5	0 – 20	79.75	10.04	10.21	SL	510.0	2.69	1.35
			20 – 70	78.70	11.09	10.23	SL	637.5	2.58	1.43
			70 – 110	68.61	18.13	13.26	SL	595.0	2.67	1.41
			110-150	84.78	8.03	7.19	LS	913.7	2.58	1.50
		6	0 – 20	84.77	3.02	12.12	L S	833.0	2.59	1.30
			20 – 30	68.55	17.73	13.72	SL	671.5	2.67	1.33
			30 – 70	64.62	17.10	18.28	SCL	773.5	2.57	1.35
			70 – 120	91.83	2.00	6.18	S	969.0	2.68	1.49
			120 -150	95.83	2.01	2.16	S	956.2	2.69	1.52
		7	0 – 45	58.28	19.27	22.45	SCL	425.0	2.59	1.25
			45 – 100	58.23	18.27	23.50	SCL	340.0	2.57	1.30
			100 150	56.12	19.33	24.55	SCL	488.75	2.60	1.32
		9	0 – 40	63.39	20.25	16.36	CL	701.25	2.45	1.34
			40 – 80	57.29	19.24	23.47	SCL	255.0	2.60	1.38
			80-120	87.32	8.51	4.17	LS	985.0	2.45	1.55
			120 -150	87.80	10.03	2.17	S	969.0	2.50	1.59
		16	0 – 20	82.53	12.31	5.16	LS	985.0	2.55	1.59
			20 - 60	68.56	15.28	16.16	SCL	361.2	2. 60	1.42
			60+	ROCK						
	Soil of the lagoonal depressions	10	0 – 30	74.62	14.12	11.26	SL	488.7	2.44	1.39
			30 – 60	72.93	14.13	12.94	SL	552.5	1.59	1.41
			60 – 110	79.64	14.14	6.22	LS	573.7	2.63	1.59
			110 -150	62.53	14.12	23.35	SCL	658.7	2.54	1.29
Coastal plain	Consolidated rocky ridges sloping and dissected	8	0 – 30	64.49	21.21	14.30	SL	552.5	2.59	1.32
			30 – 80	58.44	24.23	17.33	SL	595.0	2.54	1.33
			80 – 150	59.85	23.58	16.57	SL	318.7	2.61	1.33
		13	0 – 15	93.71	3.02	3.27	S	357.0	2.59	1.52
			15 – 45	74.57	13.19	12.24	SL	493.0	2.48	1.46
			45 – 110	76.49	13.14	10.37	SL	646.0	2.54	1.50
			110 – 150	82.67	9.05	8.28	LS	446.2	2.54	1.54
		14	0 - 15	76.62	14.08	9.30	SL	646.0	2.54	1.50
			15 – 70	93.74	3.01	3.25	S	403.7	2.58	1.62
			70 - 150	76.60	13.08	10.32	SL	36.125	2.52	1.55
Wind-blown Formation	Quartzitic inlanddunes and sheets.	12	0 -30	74.59	12.11	13.30	S L	488.7	2.63	1.43
			30 +	73.71	13.63	12.66	S L	446.2	2.63	1.49
	Oolitic inladdunes and sheet	11	0 – 15	76.85	12.92	10.23	S L	510.0	2.52	1.47
			15 – 35	74.70	12.07	13.23	S L	616.2	2.58	1.49
			35 – 90	68.40	13.18	18.42	S L	743.7	2.56	1.50
			90 – 150	59.41	14.15	26.44	S CL	616.2	2.54	1.48
Piedmontlike Plains	Denuded shallow rocky soils. Shallow	2	0 – 50	76.17	13.43	10.23	S L	297.5	2.70	1.43
			50 -100	70.62	15.11	14.27	SL	382.5	2.69	1.47
			100 - 150	66.6	18.13	15.27	SL.	403.7	2.63	1.50
Plateau Formation	Shallow rocky soils.	4	0 – 20	60.38	26.30	13.32	SL	345.0	2.59	1.30
			20 – 40	59.48	27.24	13.28	SL.	403.7	2.62	1.43
			40+	Rock						
		15	0 – 8	91.73	6.02	2.25	S	318.7	2.59	1.64
			8 - 28	69.41	17.19	13.40	SL.	467.5	2.54	1.59
			28 +	Rock						

Notes: (1) Texture : SL: sandy loam; S: Sand; LS: loamy sand ; SCL: sandy clay loam ; CL: clay loam

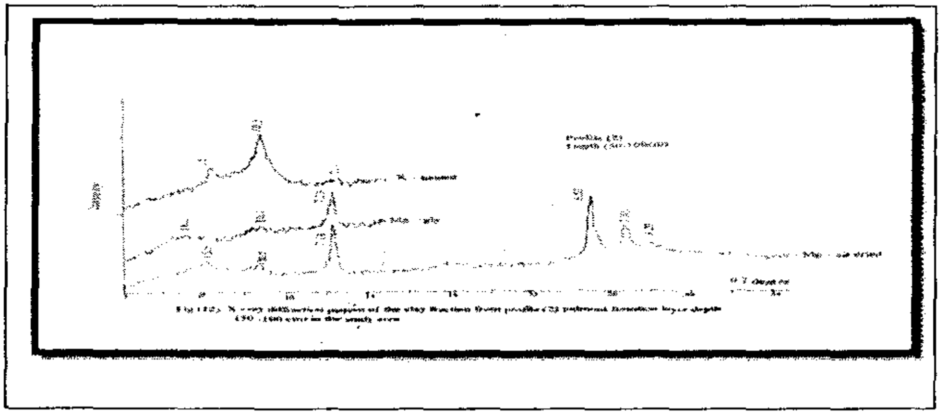
Table (4): Chemical properties of the studied soils

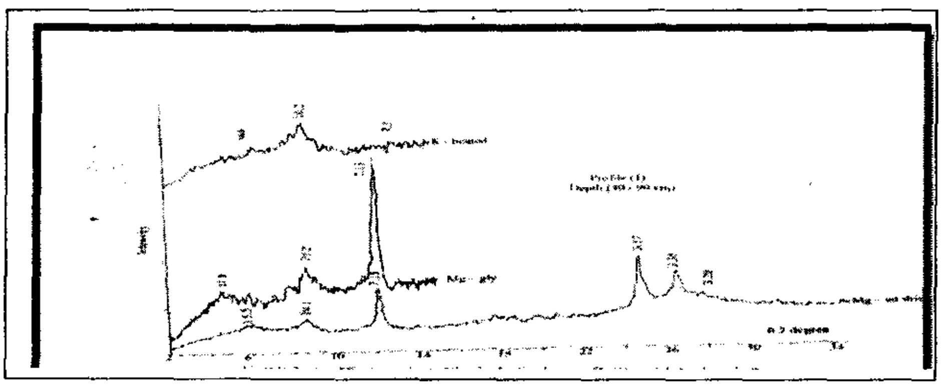
Profile No.	Depth Cm	S.P %	pH in past	EC dSm^{-1}	Gypsum $G\ kg^{-1}$	Soluble cation ($mmolcL^{-1}$)				Soluble anion ($mmolcL^{-1}$)			O.M %
						Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^-	Cl^-	SO_4^{--}	
1	0 – 40cm	30	7.75	1.94	Nil	2.5	7.5	10.56	0.4	2.50	17.0	1.46	0.05
	40 -90cm	45	8.74	0.64	Nil	0.5	1.5	5.13	0.07	3.50	3.0	0.7	0.10
	90 – 150cm	37	8.45	0.83	Nil	1.5	2.0	6.04	0.13	2.0	6.5	1.17	0,12
3	0 – 30cm	29	6.95	11.98	Nil	18.0	22.0	77.13	12.6	3.5	118.0	9.4	0.07
	30 –70cm	30	7.02	16.62	Nil	39.0	31.0	92.43	10.51	2.0	160.0	15.23	0.29
	70- 150cm	29	7.12	12.86	Nil	28.0	19.0	78.33	8.67	2.0	125.0	7.43	0.30
5	0 – 20cm	28.5	8.25	0.73	Nil	2.50	1.65	3.24	0.22	1.3	5.0	1.03	0.11
	20 – 70cm	31	7.93	8.91	Nil	15.0	10.50	66.09	5.75	2.0	90.75	4.25	0.19
	70 – 110cm	31	8.21	1.91	Nil	1.0	2.0	16.3	0.29	4.0	13.0	2.35	0.20
	110 – 150cm	28	7.78	5.54	Nil	20.0	18.0	42.43	4.42	2.0	80.0	3.5	0.27
6	0 – 20cm	25	7.55	5.80	Nil	12.0	9.0	38.43	1.95	2.5	58.0	0.88	0.08
	20 – 30cm	35	7.44	64.9	Nil	22.0	32.0	621.74	21.51	4.5	655.0	25.5	0.15
	30 – 70cm	38	7.65	12.75	Nil	15.0	6.0	108.78	2.7	3.0	128.0	1.48	0.17
	70 – 120cm	37	7.67	5.65	Nil	13.0	2.0	42.78	0.36	1.5	53.0	3.64	0.11
	120 – 150cm	33	7.60	5.95	Nil	12.0	8.0	41.35	0.81	3.0	51.0	8.16	0.28
7	0 – 45cm	37	8.36	0.8	Nil	0.5	0.4	7.33	0.27	2.0	5.0	1.5	0.15
	45 – 100cm	40	8.30	1.19	Nil	2.0	1.0	9.77	0.37	1.5	11.0	0.46	0.22
	100 –150cm	42	8.02	1.22	Nil	2.0	1.0	10.22	0.30	0.4	11.0	2.0	0.41
9	0 – 40cm	42	7.69	9.14	Nil	18.9	15.0	57.55	3.51	1.5	90.0	3.46	0.22
	40-80cm	42	8.18	1.38	Nil	0.7	0.4	13.5	0.55	1.0	13.0	1.1	0.17
	80-120cm	34	7.77	11.30	Nil	23.0	19.0	73.44	2.47	2.0	113.0	2.91	0.25
	120-150cm	38	7.54	42.42	Nil	31.0	25.0	393.9	1.79	3.0	440.0	6.9	0.35
16	0 – 20cm	30	8.30	0.72	Nil	1.0	3.0	3.6	0.35	1.6	5.15	1.2	0.09
	20 – 60cm	34	7.96	8.44	Nil	10.10	11.9	639.96	6.84	5.0	80.9	6.9	0.21
	60+	Rock											
10	0 – 30cm	31	8.03	39.4	Nil	16.0	24.0	327.59	3.03	2.0	390.0	3.4	0.02
	30 – 60cm	28	7.71	68.7	Nil	28.0	45.0	626.20	4.61	2.5	693.0	8.31	0.25
	60 – 110cm	27	7.95	58.6	Nil	24.0	41.0	546.3	4.23	2.0	590.0	9.42	0.24
	110 -150cm	40	7.90	115.0	Nil	25.0	8.0	11458.	6.64	4.0	1152.	28.46	0.27
8	0 – 30cm	37	7.66	49.0	Nil	22.0	63.0	433.0	2.95	3.0	505.0	31.0	0.03
	30 – 80cm	41	7.67	16.36	Nil	26.0	23.0	128.8	1.76	2.0	170.0	7.5	0.17
	80 – 150cm	42	7.77	14.33	Nil	35.0	25.0	89.2	8.1	1.0	130.0	26.3	0.23
13	0 – 15cm	25	7.91	1.30	Nil	1.5	3.6	8.2	0.45	2.0	10.0	1.77	0.06
	15 – 45cm	26	8.56	1.29	Nil	1.0	1.78	11.01	0.4	0.5	12.9	0.79	0.27
	45 – 110cm	29	8.52	1.85	Nil	3.0	1.0	16.3	0.31	2.5	15.0	3.0	0.25
	110 –150cm	32	8.50	2.14	Nil	2.0	0.6	20.7	0.24	2.2	18.6	2.73	0.34
14	0 – 15cm	26	8.22	2.29	Nil	1.0	2.0	20.7	0.56	3.0	20.0	1.3	0.13
	15– 70cm	24	7.85	4.47	Nil	8.0	9.16	30.22	0.61	3.0	40.0	4.99	0.16
	70 – 150cm	30	8.04	1.57	Nil	9.0	1.0	12.87	0.33	2.0	13.09	1.9	0.23
12	0 – 30cm	24	7.65	18.53	NIL	20.0	33.02	148.4	2.41	4.0	190.0	9.83	0.01
	30 +	24	8.12	5.26	NIL	7.5	6.0	44.03	0.57	2.0	55.0	1.28	0.02
11	0 – 15cm	37	7.62	31.3	NIL	35.0	26.0	280.74	1.56	3.0	324.0	17.39	0.09
	15 –35cm	38	7.52	43.4	NIL	20.0	27.0	429.0	1.31	2.5	580.0	15.67	0.21
	35 –90cm	46	7.29	50.5	NIL	25.0	45.0	451.0	1.18	4.0	523.0	10.0	0.23
	90- 150cm	42	7.33	44.2	NIL	25.0	10.0	448.50	0.87	1.9	470.0	12.47	0.12
2	0 – 50cm	27	7.77	11.60	0.75	20.0	11.0	91.74	3.26	4.0	118.0	5.24	0.01
	50-100cm	42	8.07	2.61	2.6	5.0	6.0	14.63	1.73	3.0	22.0	2.56	0.08
	100 – 150cm	49	7.75	3.60	7.47	15.0	5.0	15.04	1.7	8.36	15.50	12.74	0.14
4	0 – 20cm	31	8.12	0.56	NIL	2.0	1.0	3.06	0.09	.95	4.0	1.2	0.01
	20 –40cm	42	8.45	0.47	NIL	1.68	1.2	2.22	0.07	1.50	3.0	0.67	0.02
	[illegible]	Rock											
15	0 – 8cm	23	7.99	2.15	NIL	5.0	4.3	13.78	0.53	3.0	19.0	1.3	0.03
	8 – 28cm	36	8.01	1.10	NIL	2.0	3.0	6.48	0.24	3.0	10.0	1.72	0.02
	28+	Rock											

Table (5): Semi – quantitative determination of the mineralogical compositionof the clay fraction (<0.002mm) separated from some layers of the studied profiles.

Landforms unit	P. No	Depth (cm)	Clay minerals				Accessory minerals						
			Mont	Illite	Kaol	Chl	Quartz	Feld	Dolo	Apat	gyps	Poly	Cal
Coastal plain	1	40 - 90	Mod	Few	Com	-----	Com	Tra	-----	-----	----	---	---
		90 -150	Mod	Com	Few	Few	Few	----	----	Mod	----	-----	---
	9	40 - 70	Tra	Tra	Dom	Tra	Few	Tra	----	-----	-----	----	----
		70 -110	Mod	Few	Com	Few	Mod	Few	----	----	-----	----	---
Wind-blown formation	12	0 - 30	Dom	Few	Mod	Few	Few	Tra	Tra	-----	-----	------	----
		30 - 80	Mod	Few	Com	Mod	Few	Tra	----	-----	----	-----	----
Pidmont	2	50 -100	Mod	Few	Com	Few	Few	Tra	----	----	-----	-----	----
		100150	Dom	Few	Few	Tra	Few	Tra	----	----	Tra	Mod	-----
Plateau	4	0 - 20	Tra	Few	Dom	Tra	Mod	Tra	Tra	---	----	-----	-----
		20 - 40	Mod	Few	Com	Few	Mod	Tra	----	----	----	----	Tra

Dom = dominant (>40%)   Tra = trace (<5%)   ---- = absent
Com = common (25-40%)   Mod =moderate (15-25%)   Few = (5-15%) 1`q





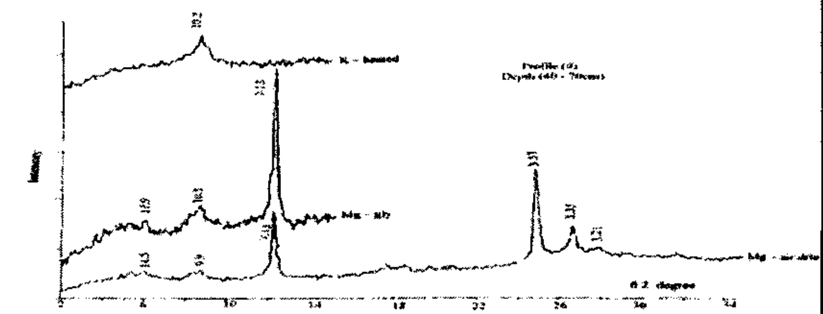


fig (16): X - ray diffraction pattern of the clay fraction from profile (9) coastal plain layer depth (40 - 70cm) in the study area

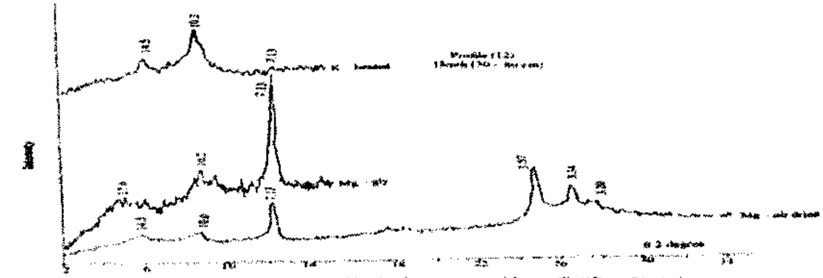


Fig (17): X-ray diffraction pattern of the clay fraction separated from profile (12) windblown formation layer depth (30 - 80cm) in the study area

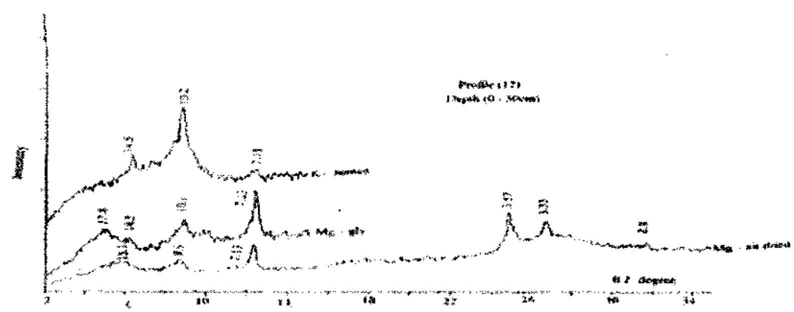


Fig (18): X-ray diffraction pattern of the clay fraction from profile (12) windblown formation layer depth (0- 30cm) in the study area

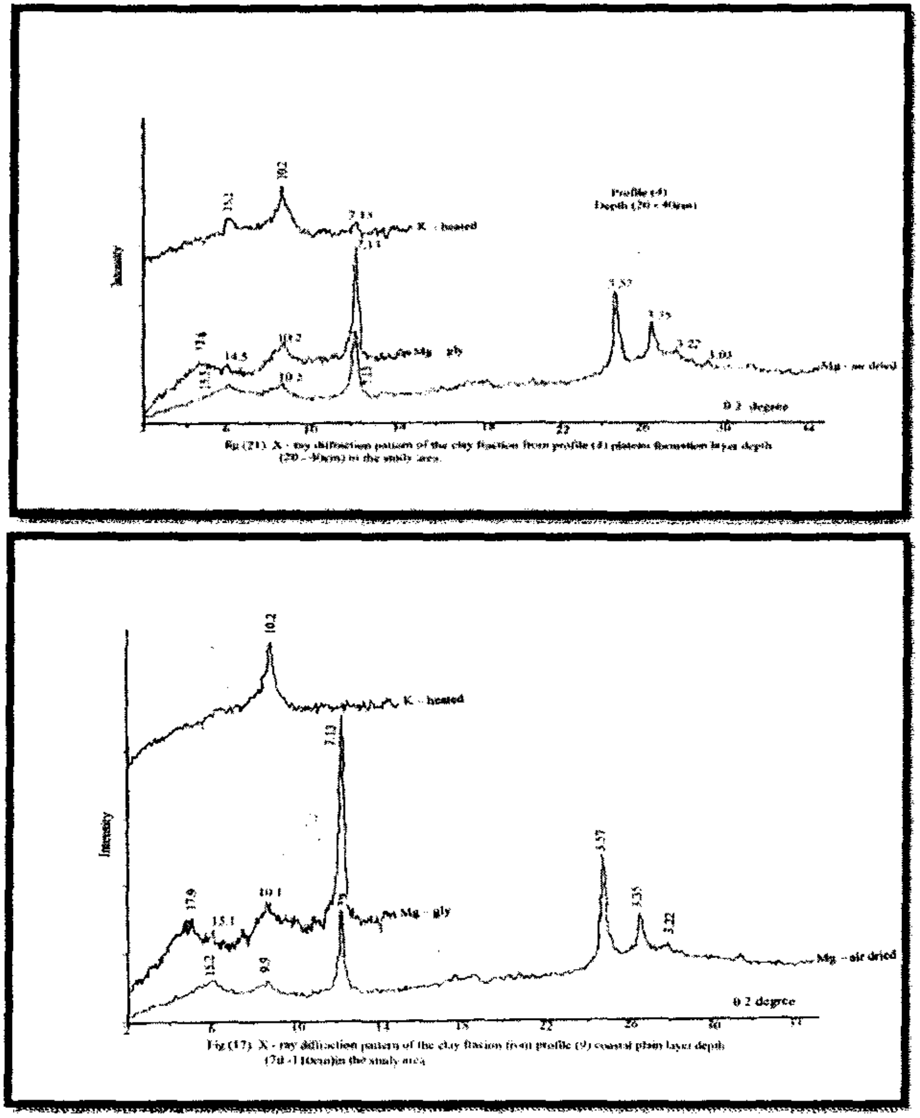


Fig (4): X-ray diffraction patterns of the clay fractions separated from some layers of soil profiles

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دراسة الخصائص الفيزوكيميائية و المنرلوجية و المورفولوجية لاراضى الساحل الشمالى الغربى – مصر

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اجريت هذه الدراسة على بعض اراضى الساحل الشمالى الغربى بمصر والواقعة تحت اربع وحدات جيمورفولوجية رئيسية مختلفة حيث تتميز بوجود تغيرات فى ظروف تكوين هذه الأراضى وغالباً ما تعزى الى المناخ. وقد اوضحت الدراسات المورفولوجية والطبيعية والكيميائية والمعدنية ان هذه الأراضى تحتوى على افاق تشخيصية وخاصة افق ال Salic & calcic horizons وايضاً وجود Hard pan فى بعض القطاعات الأرضية وتبين من التحليل المنرلوجى ان الكأولينيت يسود فى الcoastal plain & plateau formation يليه المونتمورينوليت ثم الأليت وعلى العكس يسود المونتمورينوليت ثم الكأولينيت ثم الأليت فى Piedmont like plains & widblowen formation .

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