Egypt. J. Soil Sci. **Vol. 63,** No. 2, pp: 197 - 207 (2023)

Egyptian Journal of Soil Science

http://ejss.journals.ekb.eg/

Mineralogical Study of Clay Fraction of Soil Along Nasser Lake Affected by Construction of The High Dam, Aswan, Egypt

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CLAY mineralogy studies were essential for understanding the weathering environments and source regions of fluvial sediments affected by construction of the High Dam. This study conducted in Aswan Governorate, Egypt, to knowing the minerals formed the clay fraction separated from some horizons of soil profiles. To achieve this purpose, were taken eight soil profiles from the western side of Nasser Lake to evaluate some soil properties and study clay mineralogy. The clay fraction was separated from the layers have a high content of clay and prepared for X-ray diffractometry which used to determination, to define of the different clay and accessory minerals. Our results showed that, the soil pH ranged from neutral (7.36) to highly alkaline (8.9), and it was classified as non-saline to highly saline and slightly to moderately calcareous. So, the values of soil EC ranged from 0.17 to 5.8 dSm^{-1} and $CaCO_3$ ranged from 0.04 to 7.39%, respectively. Moreover, the cation exchange capacity (CEC) was low to very high, ranging from 6.1 to 44.28 $CmoL_ckg^{-1}$, with a predominantly sandy texture. Also, results revealed that, dominated contents of kaolinite minerals indicated followed by smectite, micasmectite, vermiculite, Sepiolite and plagioclase. The identified accessory minerals were dominant quartz followed by aragonite, calcite and hematite. In general, weathering was not severe because accessory minerals were not formed in large quantities, and perhaps these obtained results are due to the type of parent material predominated, whether present in the study area or transported across of Nile River to the place of sedimentation, and the weather conditions prevailing in the study area helped in that.

Key words: X-ray, Clay and Accessory minerals and weathering.

1. Introduction

Nasser Lake constructed on the Nile River in South-eastern Egypt. It was formed when the High Dam was built in 1971 is one of the largest artificial lakes in the world. As a result, a sedimentary soil rich in clay minerals was formed on its banks, and it prevented the colloidal particles from reaching the rest of the Egyptian soils through the Nile River during the annual flood every year. This led to a loss of soil fertility in the Nile Valley and its delta (Mohamed, 2019). In some soil studies to evaluate Egyptian soils, the dominant trend was that soil reactivity varied from neutral to highly alkaline, and the soil pH, EC, CEC, and $CaCO_3$ values were based on the nature of the parent material and the prevailing climatic conditions (Mohamed et al. 2019; Ali et al. 2015;Elwa et al. 2021).

River sediments generally consist of solid particles of sand, silt, clay minerals and other organic matter. In river systems, the amount of sediment transported is controlled by both flow transport capacity and sediment supply according to water velocity (Mohamed, 2019). Sediments are characterized by a continuous change in their properties as a result of being immersed in water for long periods, and river sediments, especially at dam waters, are subjected to many transformations in their components, which leads to new qualities and products that have a great relationship with the use of land for agricultural purposes (Vital and Stattegger, 2000).

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Received: 13/03/2023; Accepted: 05/04/2023
DOI: 10.21608/EJSS.2023.199852.1580

Both geological and chemical processes of soils are occurred in water conditions. In addition, the continuous interaction of water with exposed mineral surfaces at the rock-water interface has produced a wide variety of weathering products, including clay minerals (Hazen and Ferry, 2010). The study of clay fractions is important in evaluating suspended sediment maturity, weathering intensity, and source area (raw material). Moreover, there are some processes possibly altering the accumulation of clay minerals such as river transport, sedimentation, remobilization, and tributary inputs (Guyot et al. 2007 and Wang et al. 2016). Fluvial sediments are important constituents of fine-particle, clay minerals are widely distributed in these sediments (Adriaens et al. 2018; Khan et al. 2019). Clay mineral groups are sensitive to bedrock geology and chemical weathering and are considered to be effective indicators of the characteristics of the source regions; when they are entrained in water, they can be transported over considerable distances from their source regions (Liu et al., 2018 and Zhao et al., 2018).

Mineralogical studies of river sediments play an important and fundamental role in evaluating the effect of weathering phenomena on the soil physical and chemical properties and sediments alike. By rivers, one of the geological materials most affected by physical factors, whether physical by rolling, creeping and rubbing as a result of being carried in the course of the river, or chemical as a result of immersing it in water, which is the agent most reactive with these sediments through dissolution, hydration, hydrolysis and oxidation. Due to the different sizes of particles of these sediments, they vary in the extent to which they are affected with weathering, but in general, the intensity of weathering of these sediments increases with the increase in the finesses of the particles, where they are the finerwhich, it represents the clay are the most affected and changed by chemical weathering (Borger 2004). On the other hand, the clay fraction is the most effective part and most of the physical and chemical properties are attributed to of soil and sediment. Clay particles move in a suspension way from the upper parts to the lower parts of soils. Clay particles move as a suspension from the surface horizons to the lower horizons for the soil profiles, when water is adsorbed on dry lattice units or interposes in the soil, therefore, these units act as a filter to trap the clay particles and accumulate in the subsurface horizons (Staff Surviving Soils 2006).

With the increase of the distance from the source area (raw material) and the place of deposition, the suspended sediments show clay mineral groups that may have changed by transport, sorting and sedimentation compared to the inputs from the different tributaries.For example, illite and chlorite usually reflect a dry-cold climate and/or low rainfall (Pang et al. 2018). On the contrary, kaolinite marks well developed leached soils and mature sediments under tropical climate and more especially high deposits which cause severe weathering. Moreover, smectites may also characterize intermediate weathering intensity (Saleemi and Zulfiqar 2000;Thiry 2000). Moreover, kaolinite forms mainly may be due to pedogenesis, which is characterized by intense hydrolysis and complete removal of mobile cations and also, a high concentration of it indicates a warm and humid climate (Pang et al. 2018). Clay mineralogy can show drivers of weathering and explain recent trends in climate and weather conditions in source regions (Khan et al. 2019). This research aims to study the impact of the construction of the High Dam on the mineralogical characteristics and soil properties in the western region adjacent to Lake Nasser in southern Egypt and northern Sudan. To give an idea of the type of clay minerals found in the study area.

2. Materials and Methods

2.1. Study area

This study was conducted on the soils located western Nasser Lake, Egypt (N: 22º 02`10’’ to 23º 57`55’’; E: 31º 18`26’’ to 32º 51`38’’). Lake Nasser is one of the largest artificial lakes that arose after the construction of the High Dam on the Nile River in southern Egypt. Its length is about 500 km in the Egyptian and Sudanese lands, and it extends in the Egyptian lands only 350 km, the other distance which equal 150 km was Sudanese land. Eight soil profiles were taken to study some soil properties and mineralogical composition of clay (**Figure 1**). The first seven profiles were taken from Egyptian land and the profile number 8 was taken from Sudanese land. Soil samples of eight profiles were air-dried, ground and sieved through a 2 mm sieve and characterized for some soil properties according to procedure (Klute 1986;Cottenie et al. 1982) and the data are shown in **Table 1**. The clay content of each horizon in the soil profile was estimated to identify the horizon have a high clay content (**Table 1**). The clay of these horizons was separated.

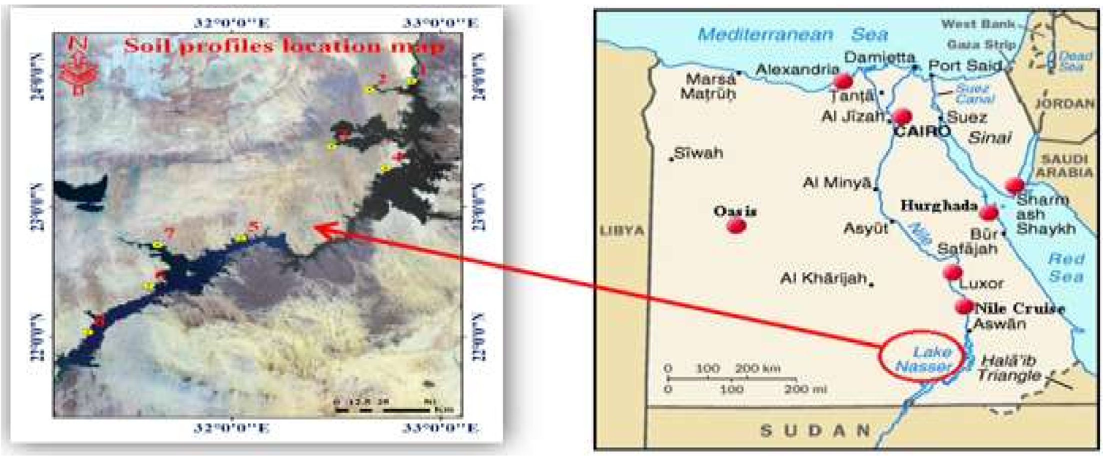

Fig. (1). The location of the studied soil profiles in Nasser Lake region.

2.2. Mineralogy of the clay fraction

Soil samples were taken from each soil profiles at a soil depth (horizon) have a high clay content for its the clay mineralogical analysis. Separation of the clay fraction (less than 2 μ) was carried out after the essential pretreatments, i.e., the removal of soluble salts, carbonates, organic matter and iron and manganese oxides (Soukup et al 2008). Identification of different clay and accessory minerals was carried out following the criteria established by Al-Ani and Sarapaa (2008).

After removing the weld materials from the clay fraction, soil: water suspension (1: 10) was prepared. A 20 g of sodium hexameta phosphate were added to each liter of the suspension and shaken horizontally at 300 rpm for 30 minutes. Clay fraction was separated from suspension based on Stock's Low. A weight of clay fraction was saturated by magnesium using 1.0 N Mg $(OAC)_2$ (pH= 7.0) on glass slide, where its repeated two times and another part was saturated on anther glass slide by potassium using 1.0 N KOAC (pH= 7) which also repeated into two times. One of the two Mg-saturated clay fraction was air-dried at room temperature and second was treated with ethylene glycol. Also, the first slide of K saturated was air-dried at room temperature and the second was heated at 550 ^oC. Treated clay fractions were scanned by Phillips X-ray diffract meter with CuKα radiation, 45 KV and 35 mA and scanning between 4 and 34 of 2θ. Identification of different clay and accessory minerals was carried out following the criteria established by Al-Ani and Sarapaa (2008). The obtained X-ray diffract grams were interpreted and the semi-quantitative estimation of the proportions of clay minerals was performed by measuring the peak area as determined by Schultz (1964), Jackson, (1964), Mac Ewan (1968) and Carroll (1970). The quantities of clay minerals were calculated using the area under the curve by a semi-quantitative method according to method of Gjems (1963) based on the thickness of the mineral layer d-spacing.

3. Results and Discussion

3.1. Soil properties

3.1.1. Soil physical properties

The size distribution of soil particles is an important indicator of the extent of weathering to which the soil has been exposed the prevailing climatic conditions. Results showed that sand, silt and clay of the studied soil profiles ranged between 55.17 to 96.65%, 1.10 to 27.01% and 2.11 to 23.87%, respectively Table 1.The data represented in Table 1 also showed that the soil texture in the studied soil samples for all soil profiles was 56% sand, 16% sandy loam, 20% loamy sand and 8% sandy clay loam.The size distribution of soil particles and soil texture indicate that the sandy textured is dominated, and this may be because the soil is not exposed to extreme weathering, or because of the parent material from which the soil is composed (Kiflu and Beyene 2013). The bulk density (BD) of the studied soil samples is also related to the size distribution of soil particles, so the lowest value of it was 1.41 g/cm^3, associated with the highest value of clay 23.87%, while the largest value of BD was 1.84 g/cm^3, and it was related to the largest content of sand 96.65%. The saturation percentage (SP) for the studied soil samples was also associated with the size distribution of soil particles, so the lowest value was 12.67%, which was related to the increase in the content of sand, while the highest value for SP was 49.98%, which was related to the increase in the soil content of clay.These results were consistent with those obtained by Hammad et al.(2014) and Al-Soghir et al. (2022) for the physical properties of the soil around Nasser Lake.

Table 1. Physical and chemical properties of the studied soils.

Profile No.	Depth (cm)	Particle size distribution (%)			*Soil texture	Bulk density (g/cm^3)	SP (%)	pH	EC	CEC	Total $CaCO_3$ (%)
		Sand	Silt	Clay							
1	0-25	94.10	1.85	4.04	S	1.78	16.00	8.23	0.38	6.10	3.91
	25-60	79.62	15.12	5.26	LS	1.61	18.67	8.53	0.47	20.81	3.48
	60-150	70.92	21.75	7.33	SL	1.61	23.20	8.39	0.56	26.56	5.65
2	0-15	94.17	1.59	4.24	S	1.79	18.00	7.93	0.78	7.33	1.30
	15-40	93.83	2.15	4.02	S	1.73	18.67	8.53	0.29	7.18	1.30
	40-150	89.54	2.50	7.96	S	1.75	18.67	8.52	0.19	9.70	0.04
3	0-20	96.65	1.24	2.11	S	1.84	17.33	8.32	0.88	10.59	1.09
	20-50	95.32	1.47	3.21	S	1.83	18.33	8.62	0.49	6.54	0.65
	50-150	87.49	4.75	7.76	LS	1.71	17.33	8.71	0.75	16.68	0.35
4	0-15	93.48	3.15	3.36	S	1.75	18.67	8.00	1.20	13.01	1.65
	15-35	92.06	1.10	6.84	S	1.72	17.33	8.10	0.22	15.47	1.30
	35-150	91.34	5.25	3.41	S	1.75	12.67	8.12	0.21	6.53	0.04
5	0-20	91.48	4.24	4.28	S	1.80	18.67	7.69	2.00	14.32	4.78
	20-50	92.98	3.39	3.64	S	1.78	17.60	7.77	1.75	8.91	6.09
	50-150	77.76	9.80	12.44	SL	1.73	20.67	7.66	1.63	30.19	2.61
6	0-20	91.31	3.32	5.37	S	1.69	22.00	7.79	0.17	6.58	7.39
	20-50	79.72	6.74	13.54	SL	1.61	27.33	7.52	3.46	28.41	6.52
	50-110	55.17	20.96	23.87	SCL	1.41	36.67	7.36	5.80	41.95	6.70
	110-150	60.61	17.41	21.98	SCL	1.42	49.33	7.59	5.50	44.28	0.09
7	0-25	91.58	4.21	4.21	S	1.71	20.53	8.73	0.51	8.20	2.78
	25-40	92.94	2.00	5.06	S	1.72	21.33	8.58	0.32	6.59	4.78
	40-100	88.30	5.53	6.17	LS	1.68	18.67	8.44	0.51	17.48	3.17
	100-150	87.48	6.24	6.28	LS	1.61	22.00	8.34	0.35	22.10	1.30
8	0-50	85.31	4.70	9.99	LS	1.68	18.67	8.90	1.09	24.29	7.39
	50-100	67.95	27.01	5.04	SL	1.63	22.67	7.68	0.50	37.63	29.57

Note: * soil texture (S = sand; LS = loamy sand; SL = sandy loam and SCL = sandy clay loam); pH (1:2.5) soil: water susp.; EC (electrical conductivity) in extract (1:5) dSm^{-1}, CEC = cation exchange capacity (cmol$_c$/kg) and SP = saturation percentage.

3.1.2. Soil chemical properties

Data in Table 1 showed that soil pH of soil samples was generally near neutral to strongly alkaline where pH values varied between 7.36 and 8.9. This may be attributed to the parent material or the dominance of base cations in the study area or their association by low sedimentation (Hamed and Khalafallh 2017). Soil salinity varies widely from 0.17 to 5.8 dS/m (non-saline to strongly saline). These results of soil EC were related to the nature of dissolved cations and anions in the soil solution.Similar results were obtained by Sweed and Negim (2019). Cation exchange capacity (CEC) values vary from one soil profile to another and from one horizon to another within the profile; the values ranged from 6.1 to 44.28 CmoL$_c$ kg^{-1}. Its values were also related to the content of clay and sand in the studied soil samples (Table 1). The distribution pattern of total $CaCO_3$ (TCC) does not trend in a particular direction with depth within the profiles under study. The values of TCC ranged from 0.04 to 7.39% in all studied soil samples except for a subsurface sample (50 - 100 cm) in soil profile No. 8 was 29.57%. These results showed that the soil was slightly to moderately calcareous. Likewise, these data can be explained by the climatic conditions prevailing at the study area, which are related to low rates of evaporation, depth percolation rates and soil textures (El-Sayed et al. 2016). These results were consistent with those obtained by Hammad et al. (2014) for the chemical characteristics of the soil around Nasser Lake.

3.2. X-ray analysis of clay fractions

To provide more information about the studied mineralogical composition of the clay fraction which is the most reactive portion of soils was identified the clay fraction separated from the eight samples were x-rayed and their x-ray diffraction patterns are presented, Fig. 2 and identified on the basis of the guideline provided by Dixon and Schulze (2002); Harris and White (2007). Data in Figures 2 and 3 showed that, the X-ray diffraction curves of the profiles of the study soils for the clay sections of the Nasser Lake region. The X-ray diffraction technique (XRD) is one of the mostwidely used tools to identify the mineralogical composition of the clay fraction. X-ray diffraction curves of the clay minerals identified in the clay fraction that separated from some layers of the soil profiles are shown in Figures 2 and 3. They are shown as follows:

Kaolinite was identified by the very sharp and narrow XRD peaks at 7.1 - 7.3 A° (001) and 3.55 - 3.59 A° (002) in Mg and K saturated samples. It persists with treatments of glycolation. The crystal lattice of kaolinite is destroyed and the peak disappears when the mineral is heated to 550 °C K saturation treatment (Dixon 1989). Kaolinite forms in the lithological environment from feldspars and, to a lesser extent, from micaceous sandstones (Rossel 1982).

- **Semectites** (smectite and micasmectite) were the third predominant minerals. Occurrence of smectites in the examined soil samples may be related to many factors that include parent material and prevailing environmental conditions (El-Attar and Jackson, 1973).they was identified by the presence of the 14.0 to 15.7 A (001) peaks of Mg-saturated samples that shift towards the lower angle direction to give diffraction lines between 15.85 and 18 A° after glycolation due to expansion. Semectites are also, confirmed by diffraction lines that appear as broad peaks between 12.4 and 12.9 A° with K-saturation and, vary between 9.9 and 10.15 A° with heating at 550 °C of K-saturation treatment (Gjems 1963).
- **Palygorskite and sepiolite** were existed as trace amounts in all studied soil samples. Palygorskite offers a strong XRD line of 10.4 to 10.5A° and moderate reflections of 5.38 to 5.48A°, 4.46 to 4.49A° and 3.23A°. Regarding sepiolite, a strong maximum peak occurs at 12.4 A° with moderate reflections at 4.49, 4.29, 4.02, 3.34 and 4.18 A° (Singr 1989). Heating of sepiolite to 550°C by the K saturation treatment causes new reflections at 10.4, 9.2 and 8.2 A° (Nagata et al. 1974; Van Scoyoc et al. 1979).
- **Vermiculite** gave a XRD peak at 14.02 A°on Mg-saturation that shifts to 14.9 A° on ethylene glycol solvation at 10.0 to 12 A° upon K-saturation and about 10 A° upon heating at 550°C (Dauglas 1989).
- **Pyrophyllite** gave a strong XRD line at 9.16 to 9.21 A° and moderate reflections at 4.60 to 4.57 A°, 4.41 to 3.08 A° and 3.04 A° (Singr 1989).

Accessory minerals

Quartz gave strong XRD peaks at 4.26 A° and 3.34 A° (Drees et al. 1989). Aragonite gave strong XRD peaks at 3.40 to 3.27 A° (Doner and Lynn 1989). Plagioclase gave peaks at 4.03 A° and 3.15 to 3.21 A° (Doner and Lynn, 1989). Calcite showed peaks at 3.04 A° and 2.29 A° (Doner and Lynn, 1989). Hematite showed peaks at 2.69 to 2.51 A° (Drees et al., 1989). XRD analyzes confirmed the slight variation in the chemical and mineralogical composition of the clay fractions from the Lake Nasser sediments, and showed that physical weathering was predominant due to low in second clay minerals compared with amount of quartz present in the clay fractions in under study area.

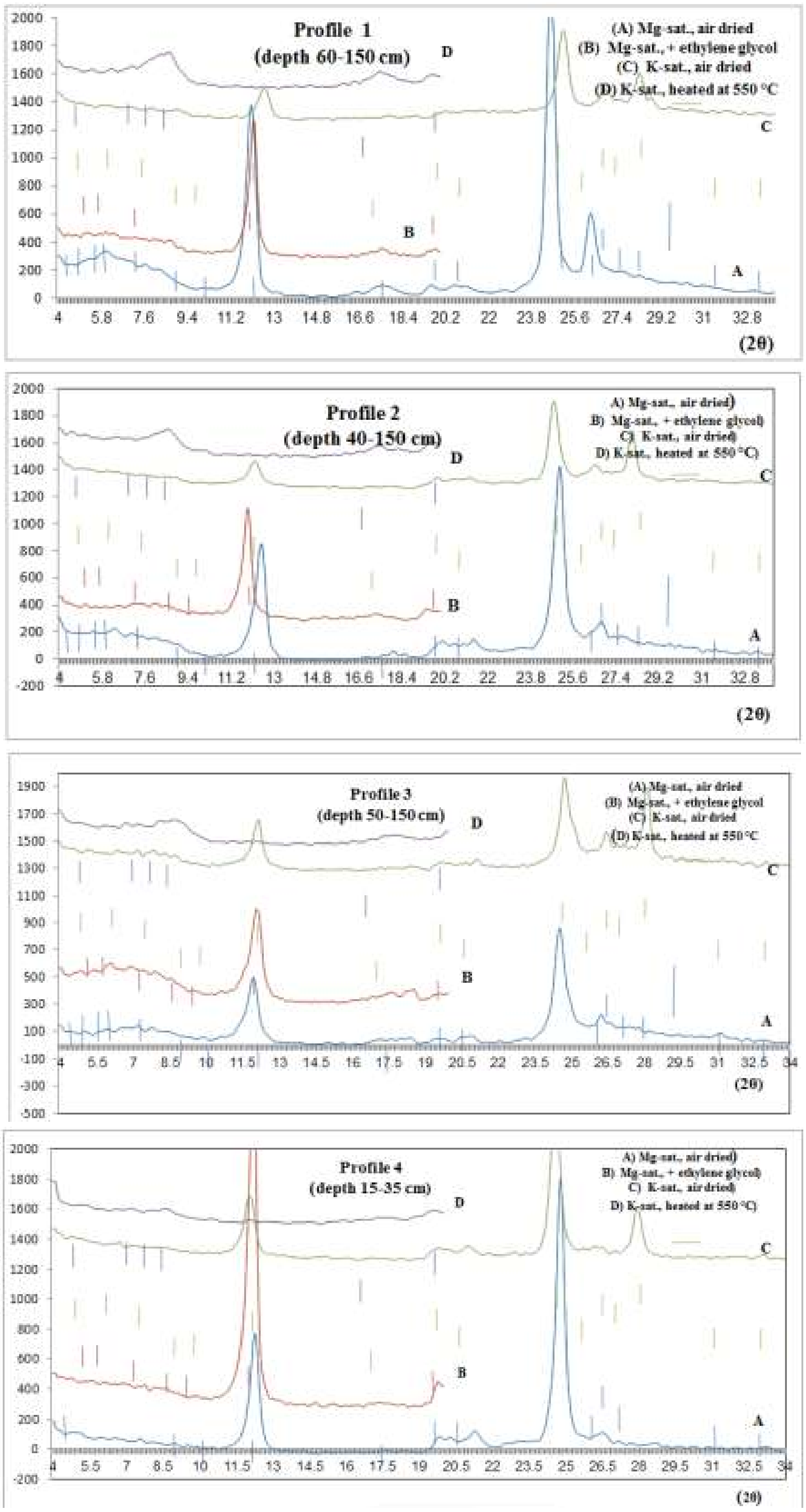

Fig. (2). X-ray Diffractograms of the clay fractions of the studied soils (Soil profiles No. 1,2, 3 and 4) in Nasser Lake region.

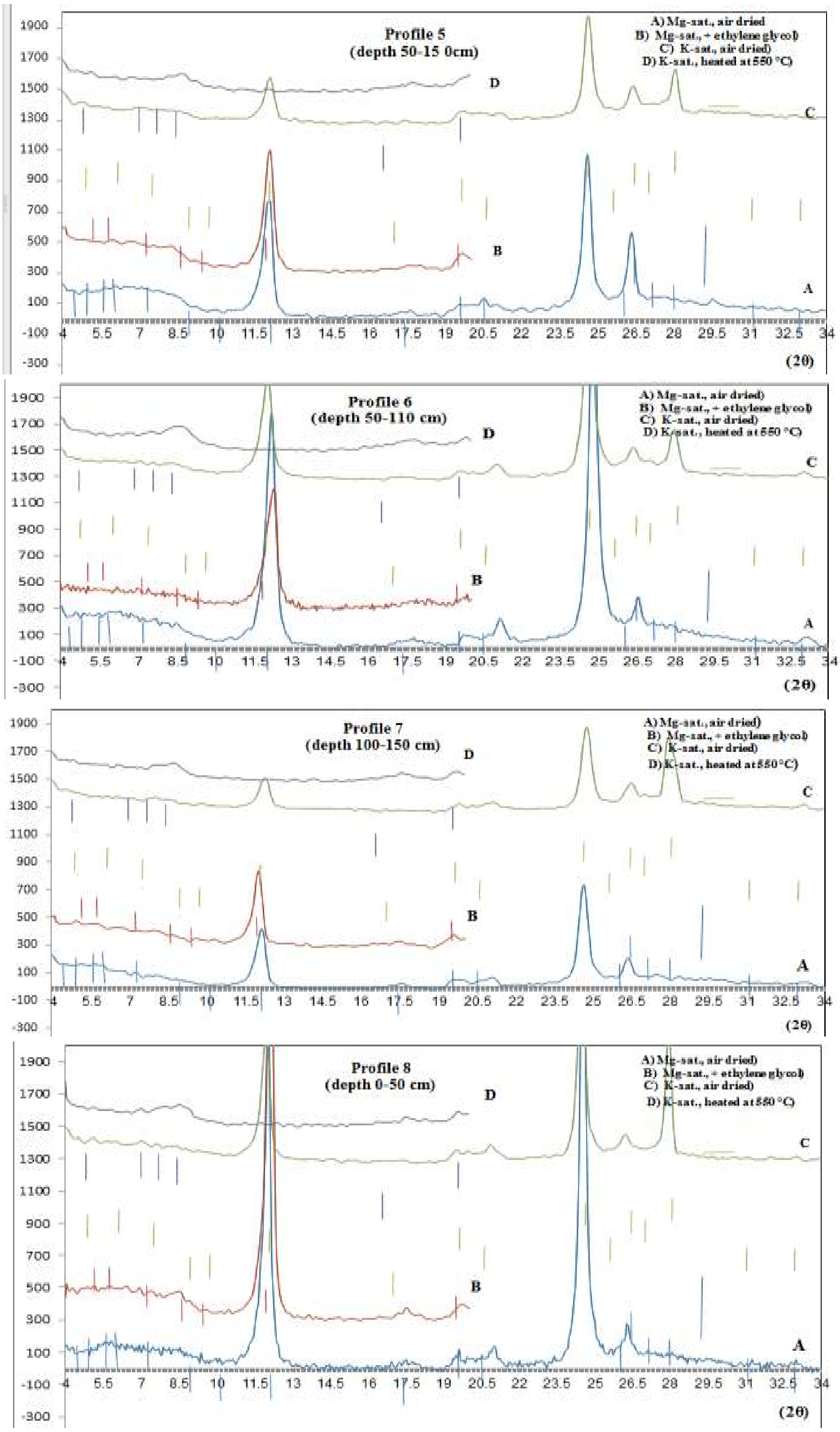

Fig (3). X-ray Diffractograms of the clay fractions of the studied soils (Soil profiles No. 5,6, 7 and 8) in Nasser Lake region.

Table (2). Percentages of semi-quantitative values of the identified mineral types in the clay fraction (<2µ) of some studied soil samples.

Profile No.	Depth (cm)	Micasmectite	Smectite	Vermculite	Sepiolite	Palygorskite	Mica	Pyrophyllite	Kaolinite	Quartz	Aragonite	Plagocalsite	Calcite	Hematite
1	**60-150**	1.22	5.20	0.82	0.82	3.27	2.04	nil	37.56	40.10	8.16	0.80	nil	nil
2	**40-150**	4.69	15.20	1.08	0.72	0.72	1.81	0.36	33.21	33.57	3.61	0.70	3.97	0.36
3	**50-150**	3.59	19.00	0.65	0.65	1.63	0.33	1.63	31.05	32.68	3.92	0.90	2.94	0.98
4	**15-35**	2.03	6.08	0.68	1.35	0.68	0.68	0.68	25.68	57.43	2.03	1.40	0.68	0.68
5	**50-150**	2.95	14.39	1.11	0.74	2.95	1.85	1.11	25.09	33.58	14.76	0.74	0.37	0.37
6	**50-110**	2.71	12.22	0.45	0.45	2.26	2.26	1.36	29.41	41.63	4.52	1.36	0.90	0.45
7	**100-150**	5.56	12.30	0.79	1.59	2.78	1.98	1.19	23.81	39.68	7.94	1.19	0.79	0.40
8	**0-50**	3.69	4.06	0.37	1.48	2.58	5.54	1.11	38.75	38.75	1.85	0.37	0.74	0.74
Average		**3.31**	**11.06**	**0.74**	**0.98**	**2.11**	**2.06**	**0.93**	**30.57**	**39.68**	**5.85**	**0.93**	**1.30**	**0.50**

3.3. Mineral compositions of clay fractions

Clay fractions of the soil in the study area have an important role in determining physical and chemical properties especially the chemical reaction that occurred in the soil. Data represented in Table 2 and Figures 2 and 3 show that, the X-ray diffraction for the clay fractions of the studied soil profiles at the Nasser Lake region, this table show that the largest mineral found in the clay fraction was quartz, where its content ranged between 32.68% (in profile number 3 at a depth of 50–150 cm) to 57.43% (in profile number 4 at 15-35 cm depth) with an average value of 39.68 %. The presence of quartz in clay assemblages may be due to physical weathering of both sand and silt fractions under the prevailing dry conditions and remains from the original geological materials.Whereas, the study area is characterized by a hot and dry climate throughout the year (Xiong et al., 2022 and Abdellatif et al., 2020).

Kaolinite occupied the second ranked in terms of quantity after quartz, whose its amount ranged from 23.81% in soil profile No. 7 at a depth of 100-150 cm to 38.75% in soil profile No. 8 at a depth of 0-50 cm with an average value of 30.57%. Bahnasawy, (2018) and Ali et al., (2018)found that kaolinite is the dominant mineral compared to other clay minerals. These results showed that the soil under study was not exposed to severe weathering. While smectite came in third ranked in terms of quantity in clay fractions of all studied soil samples with ranged values of 4.06 vs. 19.00 % which found in soil profile 8 at the surface layer (0 – 50 cm) and in soil profile 3 at the subsurface layer (50 – 150 cm), respectively. Moreover, aragonite came in fourth ranked in terms averages value of 5.85 % its ranged between 1.85 vs. 14.76 % which found in soil profile 8 at the surface layer (0 – 50 cm) and in soil profile 5 at the subsurface layer (50 – 150 cm), respectively. While, micasmectite came in fifth ranked in terms averages value of 3.31 % and ranged between 1.22 vs. 5.56 % which found in soil profile 1 at the subsurface layer (60 – 150 cm) and in soil profile 7 at the subsurface layer (100 – 150 cm), respectively.

Table 2 also illustrated that the mean values of minerals in the clay fractions were 2.11, 2.06, 1.30, 0.98, 0.93, 0.93, 0.74 and 0.50% from palygorskite, mica, calcite, plagocalsite, pyrophyllite, vermculite and hematite, respectively. The previous data showed that, the clay mineral assemblies did show regular trends along the direction of the sediments on the side of Lake Nasser (the study area). These results were due to the exposure of this region to the same climatic conditions and parent material (Amer et al. 2020).

Regarding to data of clay minerals in Table (2) showed that, the clay minerals assemblage consists of quartz and kaolinite as the major constituent followed by smectite and micasmectite. The mineral composition of the clay fractions in the study area indicates that, the soil in the study area is derived from different main materials which are sandstone and mudstone, so its clay minerals are dominated by quartz and kaolinite, respectively. Andkaolinite may be product of more intensive weathering regime. These minerals are usually inherited from the parent material and affected by pedogenic processes that parent material to mineralogical changes. From these data it was shown that physical weathering was dominant compared to chemical weathering due to the increased amount of quartz present in the clay fractions. These results were confirmed with those funded by Amer et al. (2020).

3.4. Semi-quantitative clay mineral of the clay fractions

Semi-quantitative measurements of the minerals present in the clay fraction can also be calculated from the maximum relative area of the principal reflections and/or the relative reflected intensities of these minerals (Norrish and Chappell 1966). Results in Table 3 showed that the clay minerals in studied soils were mainly quartz and kaolinite (from level common to dominant) with variable quantities of other minerals. Bahnasawy(2018)found the dominance of quartz in the northwest coast soils. Although smectite mineral was present in moderate amounts of soil profiles No. 2 and 3. It was present in few quantities in soil profiles No. 1, 4, 5, 6 and 7 and it was present in trace amount in soil profile No. 8. On the other hand, vermculite, sepiolite, plagocalsite and palygorskite minerals were trace encountered. But, micasmectite mineral was present a trace amounts in all the soil profile under study except that in soil profile No.7 it was present in few amounts. Pyrophyllite, calcite and hematite minerals were quantities trace in all the soil profile under study except that in soil profile No.1 they were present in nil amounts. Aragonite mineral was quantities from trace to few in all soil profiles under study.Overall, these results indicated that the weathering was not severe because secondary clay minerals were not formed in significant quantities. In (1991) Al-Demerdashaet al.in a study of Lake Nasser, they found that the clay mineral assemblages are predominantly kaolinite with less pronounced occurrence of hydrated mica, chlorite, and palygorskite. These data were confirmed with results Azzam (2004).

Table 3. Mineralogy of the clay fraction separated from the studied soils of the in Nasser Lake region.

		Clay minerals groups									Accessory minerals group			
Profile No.	**Depth (cm)**	**Micasmectite**	**Smectite**	**Vermculite**	**Sepiolite**	**Palygorskite**	**Mica**	**Pyrophyllite**	**Kaolinite**	**Plagocalsite**	**Quartz**	**Aragonite**	**Calcite**	**Hematite**
1	**60-150**	*	**	*	*	*	*	nil	****	*	*****	**	nil	nil
2	**40-150**	*	***	*	*	*	*	*	****	*	****	*	*	*
3	**50-150**	*	***	*	*	*	*	*	****	*	****	*	*	*
4	**15-35**	*	**	*	*	*	*	*	****	*	*****	*	*	*
5	**50-150**	*	**	*	*	*	*	*	****	*	****	**	*	*
6	**50-110**	*	**	*	*	*	*	*	****	*	*****	*	*	*
7	**100-150**	**	**	*	*	*	*	*	***	*	****	**	*	*
8	**0-50**	*	*	*	*	*	**	*	****	*	****	*	*	*

Notes: Traces *< 5 %, Few ** 5-15 %; Moderate ***15- 25%; Common **** 25-40 % and Dominant ***** >40 %.

4. Conclusion

Clay mineralogy was studied from clay fractions from the soils of the western region adjacent to Lake Nasser, Egypt, and they were examined to know the types of clay minerals and the extent of exposure of this region to weathering. The results indicated that the common minerals were dominated by quartz and kaolinite, whose quantities amounted to more than 65% of the total clay fractions examined, followed by minerals, smectite and mica-smectite assemblages, palygorskite, Mica, Calcite, Plagocalsite, Pyrophyllite, vermiculite and Hematite in sediments the study area. Based on the mineralogical analysis of clay fractions, it was clear that the soils under study did not expose to severe influences from different types of weathering, perhaps because of the nature of the parent material in the study area or transported with the water of the Nile River, or the nature of the prevailing climate (arid and semi-arid).This was confirmed by the presence of secondary clay minerals in small quantities and the predominance of quartz in all the studied clays. With regard to the physical and chemical properties, they were within the appropriate limits for the cultivation of many crops without problems.

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