

Summary

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The area under investigation lies adjacent to Suez Canal from eastern edge and El-Manzala Lake from the northern one, as well as it is bounded by El-Sharkia governorate and Ismaillia city from the west and north rims, respectively. Also, it lies between longitudes $32^{\circ} 10'$ to $32^{\circ} 15'$ East and latitudes $30^{\circ} 40'$ to $31^{\circ} 10'$ North. To achieve this work, more than 60 auguring and mini pits were excuted to demarcating, correcting and check the validity and accuracy of the boundaries for the identified physiographic units. Nineteen soil profiles were chosen to represent the different physiographic units in the studied area. The obtained results of the studied soil variables could be discussed in the following:

- * Soil salinity varied widely from 0.79 to 165.81 dS m^{-1} , and their values were more related to inherited salts from the original geological formations, intrusion of salty water seepage from El-Manzala Lake and Suez Canal, fluctuation of saline water table in some soil sits, low level elevation and climatic arid conditions.
- * Soil pH values ranged from 6.76 to 8.87, and they values were more affected by salinity, exchangeable sodium percentage, gypsum content and siliceous nature.
- * Soluble sodium and magnesium were the dominant soluble cations in the soils of young deltaic plain and soils of fluvio-marine, while sodium and calcium were the dominant ones in the other soil units. Whereas, chloride and sulphate represented the dominant soluble anions.

- * Soil organic matter content was low and ranged between 0.02 and 3.73 %, may be due to arid conditions. The relatively high content was more related with soils of heavy clayey texture.
- * Soil CaCO_3 ranged from 0.05 to 25.59 %. The higher content was more related with the presence of shell fragments.
- * Soil gypsum content ranged between 0.04 and 56.10 % in the different studied soil profiles. Soil site 11 has the highest content (52.65 and 56.10 %), due to the occurrence of natural.
- * Cation exchange capacity ranged between 3.0 and 68.90 me/100 g soil. Its values were correlated positively and significant with each of silt, clay, organic matter and calcium carbonate, and the reverse was true with coarse sand, total sand and gypsum content.
- * Exchangeable sodium percentage varied widely from site to another, as it ranged between 3.07 and 58.92 % in the different layers of the studied area. Exchangeable calcium percentage ranged between 14.76 and 71.65 %, exchangeable magnesium percentage ranged from 3.39 to 54.93 % and exchangeable potassium percentage ranged from 0.25 to 6.22 %. In general, exchangeable calcium percentage was the dominant exchangeable cation.
- * The highest values of CEC and ESP were related to the soils of young deltaic plain and fluvio-marine, which are characterized by high clay and organic matter contents.
- * Soil texture tends to be coarse in aeolian, old deltaic terraces, gypsiferous deposits and old sand remmenants, while the reverse is true in young deltaic plain and fluvio-marine. Some

soil profiles appeared alternative pattern or stratification of soil texture, especially in the soil aeolio-deltaic plain deposits.

- * Soil bulk density ranged from 1.03 to 1.67 g cm⁻³. Its values were significant and positive correlation with coarse sand and total sand, while appeared an opposite trend with silt, clay, (silt + clay), organic matter, gypsum and calcium carbonate contents.
- * Soil real density ranged from 2.23 to 2.77 g cm⁻³. It was positive and significant correlation with coarse sand and total sand, while appeared a negative and significant correlation with each of silt, clay, (silt + clay), organic matter, gypsum content and total carbonate.
- * Total porosity varied between 28.69 and 58.94 %. It was positive and significant correlation with silt, clay, (silt + clay), organic matter, total carbonate, salinity and bulk density, and appeared an opposite trend with each of sand, total sand, real density, exchangeable magnesium and exchangeable calcium + magnesium.
- * Data of soil moisture characteristics could be presented and discussed as follow:
 - Moisture content at field capacity ranged between 28.20 and 48.55 % in clayey soil; 7.23 and 18.53 % in sandy soils.
 - Moisture content at wetting point ranged from 1.19 to 7.69 % in sandy soils; 17.63 and 34.51 % in clayey soils, Moisture content at available moisture ranged from 12.0 to 21.21 % in clay soils; 5.803 to 9.59 % in coarse soils. Moisture contents at field capacity, wetting point and available moisture were positive and significant correlation

with each of clay, silt + clay, organic matter contents, total carbonate and salinity, the reverse was true with each of coarse and total sand and exchangeable calcium and magnesium.

- * Pore size distribution of the studied soils showed that macro and meso-pores appeared a positive and significant correlations with coarse and total sand, silt (meso-pores), silt + clay (macro-pores), organic matter (macro-pores), gypsum contents (macro-pores), calcium carbonate contents (meso-pores), salinity (macro-pores), exchangeable calcium, exchangeable calcium + magnesium, bulk density (meso-pores), real density and hydraulic conductivity, while appeared an opposite trend with each of silt (macro-pores), clay, silt + clay (meso-pores), organic matter (meso-pores), calcium carbonate (macro-pores), exchangeable sodium-magnesium percentage.
- * The hydration and micro pores appeared a positive and significant correlations with each of silt, clay, silt + clay (hydration-pores), organic matter contents, calcium carbonate contents, exchangeable sodium percentage and salinity. While they exhibited a negative and significant correlations with each of coarse and total sand, exchangeable calcium, exchangeable magnesium (hydration pores), exchangeable calcium + magnesium, bulk and real density and hydraulic conductivity.
- * Soil hydraulic conductivity values varied from 0.03 to 20.54 cm h^{-1} , and a negative and significant correlation was occurred with silt, clay, total carbonate, organic matter,