Delineating Physiographic and Taxonomy Unites of Soil Innjaf Depression and The Southern Steppe Area

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Abstract :

This study aims to characterize the soil in the study area.Soil samples were located randomly in depth of soil varies with different locations. Soil texture analyses were tested according to Textural Triangle of USDA. The physiographic unites of area were defined as features of desert environment. Also, the soil taxonomy classified the study area as an Arid Soils and the classifier reach to the subgroup. Soil horizons vary from gypsic tocalsic, and saline. Soil quality analyses for Ec,pH, Na, Ca, Mg and SAR were studies to recognize the soilchemistry. The results indicatedthat soil which existing in north east of study area have very strong to strongsaline (Ec), i.e. the soil saline is moderate toward the middle of study area and finally became slightly saline in south west of study area. pH values still the same range (7.4-7.6) for all soil samples. SAR shows the soil is suitable for agriculture purposes.

الخلاصة :

تهدف الدراسة الى وصف وتحليل ترب منطقة الدراسة التي تشمل بحر النجف والبادية الجنوبية في منطقة النجف جنوب غرب العراق. توزعت نماذج التربة المدروسة عبر منطقة الدراسة، أخذت نماذج التربة على اعماق مختلفة حسب اختلاف مواقع تلك النماذج. تم اجراء التحاليل الفيزيائية للتربة نسجة التربة استنادا الى مثلث التصنيف النسيجي USDA. لقد تم من خلال الدراسة تحديد الوحدات الفيزيوغرافية بانها جزء من البيئة الصحراوية. من دراسة نسجة التربة تبين ان التربة من نوع الترب الجافة Arid Soil وان التصنيف تفرع وصولا الى تحت المجموعة. كذلك ان فضائات او انطقة التربة تختلف من gupsic الى calsic و saline. ان التحاليل الكيميائية للتربة شملتEc، pH، Na، Ca، Mg وكذلك حساب SAR لفهم الطبيعة الكيميائية للتربة. من نتائج التحاليل تبين ان التربة الواقعة في الجزء الشمالي الشرقي من منطقة الدراسة ذات ملوحة شديدة، وتصبح متوسطة في وسط منطقة الدراسة، بينما تقل الملوحة وتصبح قليلة في الجزء الجنوبي الغربي من منطقة الدراسة.من جهة اخرى اثبتت نتائج تحليل pH تراوحت من 7.4 الى 7.6 لكل ترب منطقة الدراسة. ومن نتائجSARتبين ان تربة منطقة الدراسة مناسبة للأغراض الزراعية.

The study area :

Figure (1) shows the location of soil sampleswithin study area. The area is in the south-western part of Iraq (Najaf depression and southern steppe (Al-Badia)). The area is considered as a part from western desert of Iraq which lack of surface water. There are many springs which occur in the north-east of the study area (Najaf depression). These springs extended along the line of Abu-Jir fault. Major of study area was desert land and there are some of sand dunes occur in Al-Ramla area of Najaf depression. Also, some of Mesa geological feature occurs in study area.

2.3 Demographic Characteristics :

The study area includes many of separated population groups of are settled or itinerant. These groups become little wherever to tend to south –west of the study area. The settled population groups founded in areahave to be associated with agriculture; or agriculture and livestock breed activities. While, the itinerant population groups are associated with only livestock breed activities. Some of industrial activities are found usually in the northeast part of area.

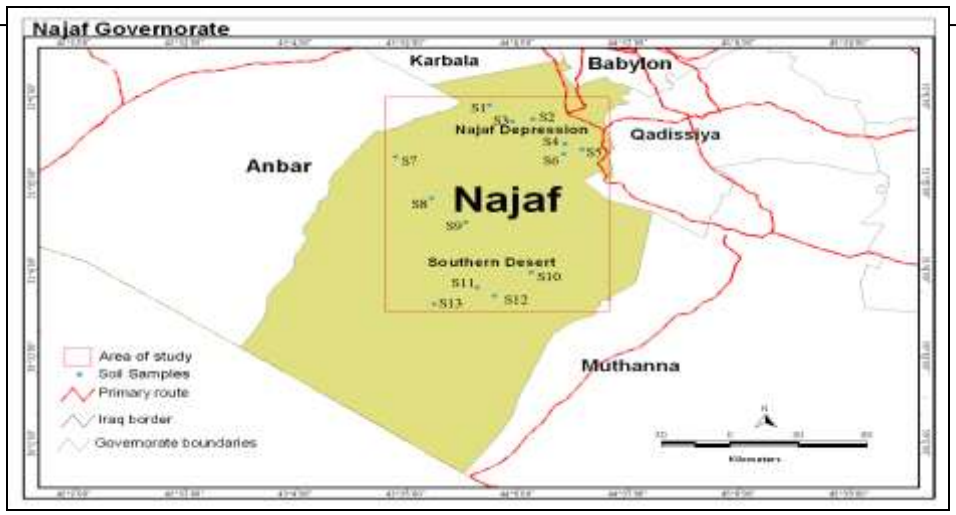

Figure 1: The location of soil samples within study area.

2.4Gemorphology and Topography:

Iraq is near the centre of the so-called "Fertile Crescent" which is characterized by a topographically-low, generally cultivated area (central depression) which extends from central Syria to the Arabian Gulf(Jassim and Coff, 2006). This north west-south east oriented trough contains the youngest sediments in Iraq and is flanked by a gently-inclined plateau to the west and south-west, and by a series of ridges and depressions passing into mountainous area in the north east. The highest elevation in western Iraq is near the Iraq-Saudi Arabia-Jordan triple border junction (936 m), from which the ground slopes towards the Euphrates River at a gradient of 10-20 m/km. This western inclined plain is a desert with rainfall ranging from 50-l00 mm/yearand can be divided into two sectors. The valleys(wadian) of western desert lie north of latitude 32° and are characterized by numerous valleys of east-west, north east-south west and north-southorientation. The Southern Desert lies south of latitude 32° and west south -west of the Euphrates River. It lacks the active drainage often seen in the Western Desert, (Jassim and Coff, 2006).

The study area is characterized with flat relief which gradient slow toward north-east and there are several hills with karstification phenomena which distributed in Limestone which consist most of out crops in the study area. Many factors like geological composition, the nature of sediments, and the climate situation, controlled in form of geological features in the desert area, (Waierdy, 1994). The recent form of earth surface result from alternation of physical and chemical weathering process through Quaternary period. These processes caused cracking and fracturing of rocks that occur in the area which lead to form Al-Hamad and Al-Sarier, (Al-Ani, 1983).

Physiography:

The term physiography refers of topographic of large area from height differentiations and also to the land features which gather to form the physiographic unite. The term refers also the climate influence on topographic relief and relationship with geological features which occurs in an area (Al-Naqib, 1960). The study area was laid within two units based on physiographic division of Parsons (1955) (figure 2).

A. Lower wadian Zone

It's consisting of northern and eastern parts of western highland. The zone includes many valleys and the tectonic activities were led to rise the southern parts of this zone. Also, the zone covered by the sediments of the tertiary period, which represented by Euphrates formation in the northern parts of the zone. Some of the

valleys reverse existence the faults which construct discharge areas for ground water (Waierdy, 1994).

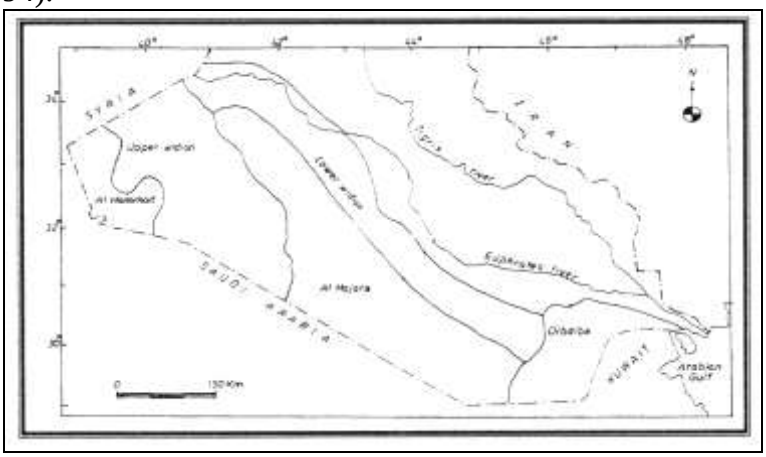

Figure 2: The physiographic units in western desert (Parsons, 1955).

B. Al-Hijara stony plain

It's consisting of calcite stone belong to Eocene period formations which has little slop toward north-east. The area'stopographic controlled by many scarps which have different volumes. Also, its axes toward north of north west(Al-Azawi, 1988).

Tectonic Situation of study area :

The studied area is located within the stable shelf zone, in the Rutba-Jezira, Salman and Mesopotamian subzones. The Rutba-Jezira subzone is characterized by the presence of the Rutba Uplift which is a major dome. The flanks of the dome dip to the east and south east towards the Euphrates River and to the west and north west towards Jordan and Syria. The Salman subzone is a sub-Herycanianhigh. It subsided strongly in latest Palaeozoic-Triassic time. It forms a monocline; the Tertiary section dips towards the Euphrates River.The Mesopotamian Zone contains the Tigris and Euphrates rivers in central and south Iraq and is covered with Quaternary sediments which overlie a complete Mesozoic and Cenozoic section (Buday and Jassim, 1987).

Fild Work and Basic data :

Field work consist of delineate the soil sample locations distributed over the study area, and then measure the depth of soil locations. It was conducted during the year of 2010. The physiographic unites and soil was classified to taxonomic unites during field work. Later the soil samples analyzed physically (texture) and chemically. Also, other basic data for soil sample locations were collected from origin sources.

Results and Discussion :

1.Soil Analyses

Table (1) exhibits the results of different analyses and basic data for soil samples.

A. Soil Texture

The depth of soil in the study area vary form site to another (table 1).Soil samples were taken at two or three different depths for moderate, deep, and very deep soil depths.The practice size analysis was conducted by wet sieving in the laboratory according to the procedure of (Carver, 1971). Then, the percentage of (sand, silt, and clay) was result for each soil sample. The percentages were falls onto the USDA Textural Triangle (Brown, 1990) which shown in figure (3) in order to correctly indicate the textural class name of mineral soil. The results were exhibited in table (1).

Table 1: Characterizes of soil samples in the study area.

Sample No.	Soil Depth (m)	Texture	EC	S	pH	$_r$Na	$_r$Ca	$_r$Mg	SAR	Physiographic Unites	Soil Classification Taxonomy	Elevation above Sea level (m)	Groundwater level (m)
S1	Deep (100-150)	Silt clay-sand clay	20	S3	7.4	12.2	4.4	3.9	6	Lower widian plain	Typichaplogysids	40	12
S2	Very deep (>150)	Silt clay	18-27	S3-S4	7.3	13.9	4.2	3.7	7	Gypsiferous land	Saline gypsids	36	8
S3	Deep	Sandy loam	10	S2	7.4	11.0	4.4	5.1	5	Gypsiferous land	Typichaplogysids	43	11
S4	Very deep	Silt clay	26	S4	7.3	14.4	3.4	3.1	8	Saline land translation zone	Gypsicsalids	24	5
S5	Very deep	Silt clay	28	S4	7.3	14.4	3.1	3.4	8	Depression marsh land	Alluvial soil-Aquictorrifluvents	15	2-3
S6	Moderate deep (75-100)	Sand clay-loam	17	S3	7.4	14.3	3.3	3.1	8	Gypsiferous land	Typichaplogysids	34	7
S7	Moderate (50-75)	Silt loam	9-5	S2-S1	7.5	11.1	4.7	5.0	5	Desert plateau	Typichaplocacids	159	>50
S8	Moderately shallow (25-50)	Silt loam	7	S1	7.7	11.3	4.8	5.3	5	Desert plateau	Typichaplocacids	160	>50
S9	Moderately shallow	Silt clay loam	7	S1	7.5	9.1	5.3	4.8	4	Desert plateau	Typichaplocacids	140	>50
S10	Shallow (10-25)	Silt loam	6	S1	7.5	7.8	6.2	6.9	3	Desert plateau	Typichaplocacids	158	>50
S11	Shallow	Sandy loam	7	S1	7.5	7.6	6.2	6.7	3	Desert plateau	Typichaplocacids	170	>50
S12	Shallow with fragment	Silt loam	4	S1	7.5	9.1	5.5	4.6	4	Desert plateau	Typichaplocacids	168	>50
S13	Very Shallow with fragment	Loam	5	S_1	7.6	9.5	5.4	5.9	4	High land with rock fragment	Lithic calcids	193	>75

$_r$Na, $_r$Ca and $_r$Mg units: epm or milli-equivalents per liter (meq/l)

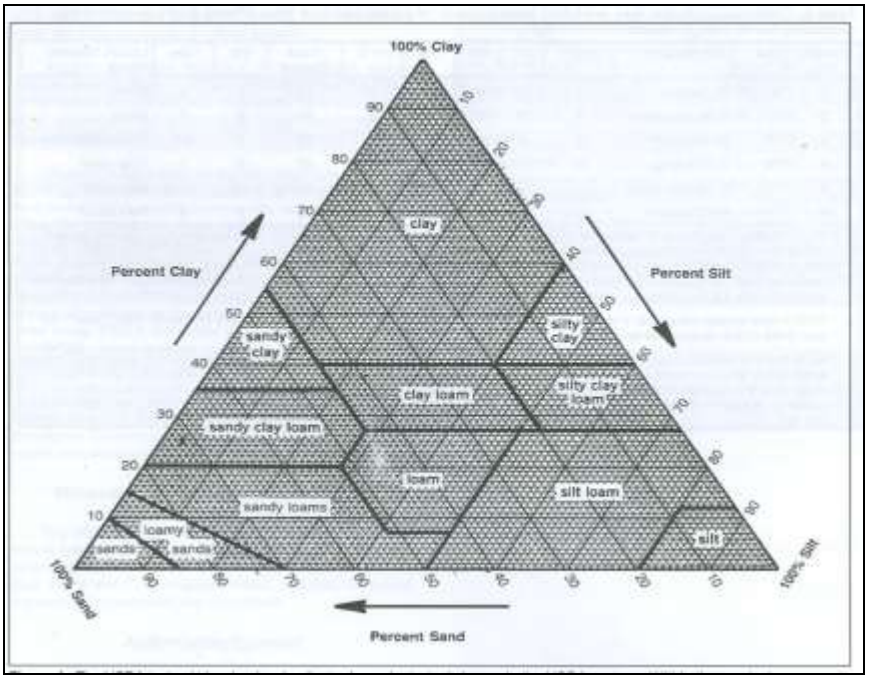

Figure 3: The USDA soil textural triangle (Brown, 1990)

B. Chemical Analysis :

Chemical analyses for different parameters were conducted for soil samples. After made a soil-water extract, the parameters selected and procedures followed for analysis of soil samples according to (table 2).

The EC was records different values. Table (3) exhibit the soil type classification based on its EC value (Solir, 1982). This classification used EC value to represent the salinity degree of soil. After compared the EC values of study area with this classification, the results indicate that soil samples lay within different state of S_1, S_2, S_3, and S_4 (table 1). The soil samples which existing in the north east of study area have very strongly to strongly saline (EC), so far the soil samples saline is moderatetoward the middle and finally became slightly saline in the south west of study area.

Table 2: Analytical methods for selected soil quality parameters

No	Parameters	Methods	References
Physical			
1	pH	Measured in 1:2.5 (w/v), soil: water	Jackson (1973)
2	EC	Measured in 1:5 (w/v), soil: water	Jackson (1973)
Soluble ions			
3	Na^{+*}	Flame Photometric Method	Gupta (1999)
	Ca^{++*}	Flame Photometric Method	
	Mg^{++*}	Flame Photometric Method	

* **Measured in 1:5 (w/v), soil: water**

Table 3: Soil type classification based on its EC value (Solir, 1982)

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Symbol	EC ds/m ((µmhos/cm)/1000)	Soil Type
S_0	0-4	Very slightly saline soil
S_1	4-8	Slightly saline soil
S_2	8-16	Moderately saline soil
S_3	16-25	Strongly saline soil
S_4	>25	Very strongly saline soil

The pH values stay at the same range (7.4-7.6) for all soil samples. The tendency of water to replace absorbed calcium and magnesium with sodium and be expressed by the Sodium Absorbed Ratio (SAR), where all the ion concentrations are in epm or milli-equivalents per liter (meq/l) as following equation and (Todd, 2007):

$$SAR = \frac{rNa}{\sqrt{r(Ca + Mg)/2}}$$

The increases of SARcause reducing soil permeability and plant growth. The SAR was needed the analyses Na^{+}, Ca^{++}, and Mg^{++} parameters of soil samples. Therefore, the SAR results of soil samples (table1) were suitable for agriculture purposes.

2. Soil Physiographic

Based on the field work, many of physiographic unites were found in the study area, and it was classified according to the Buring (1960), as exhibit in table (1). Most units vary from gypsiferous to saline lands.

3.Soil Classification

The classification was done according to recent classification taxonomy of Soil Survey Staff (2003) and the results were exhibit in table (1). The results refer that all soil samples belong to the Arid Soils class, except sample S5 which belong to the Enti Soils (undeveloped soil). The Arid Soils class characterized bydry humid system, and the evaporation rate more than rainfall rate. Also, characterized by light colour and low contain of organic matter. The classification used the distinguish horizons like gypsic, calcic, and saline horizons, in order to classify the soil of study area. Table(1) exhibit that classification was for subgroup level and based on evolution and development of soil, also on the temperature and humid content of soil.

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