Tikrit Journal for Agricultural Sciences (2019) 19 (3):128-145
https://doi.org/10.25130/tjas.19.3.16

IRAQI Academic Scientific Journals
العراقية المجلات الاكاديمية العلمية

ISSN:1813-1646 (Print); 2664-0597 (Online)
Tikrit Journal for Agricultural Sciences
Journal Homepage: http://tujas.tu.edu.iq

TJAS
Tikrit Journal for Agricultural Sciences

Ali H. I. Al-Bayati[1*]

Mustafa K. Al-Ani[2]

Haidar H. Falah[2]

1*Collage of Agriculture-Anbar University- Iraq*

2 *Ministry of Water Resources– National Water Resources Center- Iraq*

KEY WORDS:

Sea of Najaf: Aridisols soils: Characterization and classification of soils: Land classification; Soil maps; Soil mottling.

ARTICLE HISTORY:

Received: 18/08/2019

Accepted: 19/09/2019

Available online: 10/10/2019

Characterization and Classification of Some Soils Adjacent to the Southern of Al-Najaf Sea – Iraq

ABSTRACT

The study area was selected in the Najaf Governorate. It's adjacent to the southern part of Al- Najaf Sea and its area (17150.5 ha), located between the longitudes 425594E and 445138E and between the Latitudes 3521842N and 3538169N (UTM), it's covered the soil types and its geomorphological units which located within the sedimentary environment of Al- Najaf Sea. The semi details soil survey was carried out to selected area for study by grade soil system and according to soil texture examination results, ten heterogeneous sites were selected and geographically determined using a GPS device. In every study area, the pedon was digger and morphologically soil units soil units descripted. The samples were then taken from each diagnostic horizon and transferred to the laboratory for some chemical analysis and physical measurements. According to the results, the soil of the study areas was classified from the level of the order to level the family according to the American system (2014) and was completed to the level of the series based on the classification system of soil proposed by Al-Aqadi (1976 and 1982). The lands of the region were classified according to the productive capacity proposed by Klingebiel and Montgomery (1961).

The results showed that there is a variation in the morphological characteristics, whether within the single pedon or the study area, due to the effect of the topographic factor, which was reflected in the characteristics and thickness of the horizons and the nature of their arrangement and the accompanying characteristics of each horizon. The pidogenical processes, mainly washing, loss and gain, salinization have been reflected in the presence of some subsurface diagnostic horizons like the calcic, gypsic and salic horizons, with the supremacy of the primordial evolution diagnostic surface horizon, represented by the Ochric horizon. The results of the texture class showed a difference in the soil content of the soil separators indicated that there was a difference in the soil content of the soil from the main soil separators, depending on the topographical location. The results of the cartographic analysis of the texture class map for the first meter indicated the dominance of moderately fine varieties (43.6%), while the coarse texture showed lowest percentage(5.3%). The studied soils was different with carbonate content and had a different distribution with depth due to the effect of situational conditions. The values of this component ranged from 145 to 500 gm.Kg^{-1}, the state of variation in the distribution pattern of this component in the study pedons is consistent with the state of variation in the calcification activity and the observed elevation of this

* *Corresponding author: E-mail*: Albayati1961@yahoo.com

component values in the sub-surface horizons due mainly to the nature of the parent material. The soil content of the gypsum ranged between 6 to 665 gm.Kg^{-1}, with a general trend of high soil content of this component with depth. The percent of sodium exchange percentage was ranged between 3.2 to 8.4, and did not exceed the risk limits (15%). Classification of studied area showed existence two soil orders, The majority was within Aridisols order, which formed (92.5%)from studied area. The most common great soil groups were Typic Calcigypsids(44.75%), followed by Gypsic Aquisalids (29.53%), Typic Aquisalids (5.76%), Leptic Haplogicids (6.42%) and Typic Hapiogpsids by 6.04%. The Entisol order formed 7.5%, diagnosed in great sub group under the Typic Torrifluvents. The classification of the study area lands according to the determinants of productivity indicated that the IV class had the highest percentage of the total area (48.19%), while the I class did not exceed (5.23%). The following determinants were recorded: the texture, the drainage, salinity and gypsum percentage, which emphasizes the need to take the necessary administrative measures when exploiting these agricultural lands in the future.

INTRODUCTION

The soils and their congregations in the land are basic economic resources that have a variety of uses, mainly agricultural uses. These uses are in themselves diverse, and they are the tasks of managing the soil. Soil management cannot perform its function unless it begins its efforts by identifying the existing soil types in the designated geographical area first. The soil survey and classification of the tasks of the diagnosis of these soils and descriptions, and the description itself is the same degrees of density and the best descriptions enough to serve the purposes of survey and classification and management together. The detection of geomorphological and biological of soil and interpretation and the associated changes in the soil characteristics of chemistry, physical and biological, is one of the most important tasks required to determine the administrative procedures required to implement the management of these lands.

The Najaf sea depression is a topographical view extending along the Euphrates River, which is only 15 kilometers wide and it was variable in wide. It is 16 km wide in the south-east, but is reduced to 10 km in the center, Categorically 40 km from northwest of Najaf to the southwest of Al-Hira city, in the right side of the road connecting the two cities. Its astronomical location is located between latitudes $32^{o}04^{-}$ - $39^{o}45^{-}$ North and between longitudinal lines $44^{o}06^{-}$- 44^{o} 29^{-} east, with area 435.8 km^2, of which 203 km^2 is within the administrative boundaries of Najaf district,and 232.8 km^2 is geographically located in Al-Hira district.

The first semi-detailed survey of the Najaf sea soils was carried out in 1973 by Al-Obaidie and Aziz for an area of 30500 ha. The following physiographical units were found: RL River levee, IL Irrigation levee, B Basin, SD Depression, SH Marshlands, O old irrigation channels and D Desert region.the most of the soil in their study area was within saline and saline alkaline soils, with high quantities of calcium carbonate, which ranged between 20-38%, while the proportion of gypsum ranged between 1-58% in the soil.

A study carried out by Salloum and Sukkar (1994) for soil survey and classification of some lands of the west of the Najaf Sea, covering an area of 22220 ha, by examining 32 pedons representative

of the project, noting the low soil content of the organic matter, the soil reaction ranged from neutral to moderately base 6.86-8.31, with CEC values ranging from low to high, because these soils are medium to coarse textures, and contain a small amount of clay with high gypsum, Salic horizon is diagnosed. The gypsum ratio in the region was ranged between 0.1-82.0%, while the lime content ranged between 7.4-86.8%. The soil of the study area was structure less due to low soil content of organic matter and clay, which are factors of association in addition to the high soil salinity. Aridisols and Entisols soil orders were found in the region, which representing 53.8% and 46.2% of the area of the studied area respectively. The sovereignty were for great soil group Typic Salorthids and Aquic Torrifluvents at both orders respectively. The classification of land showed that class III and IV accounted for 30.0% and 44.5% of the region respectively, and the texture, salinity, and drainage class , as well as soil content from gypsum above 25% were the limitations of production and removing some of these limitations has shown dominance of class II followed by class III with 61.5% and 18.9% for two classes respectively.

In a study carried out by Katie and Majid (2013) for soil survey and hydrological investigation of the Fadak farm in Al- Najaf Governorate, noting that there are clear differences in most of the soil characteristics of the project because to vary the factors and processes of soil formation and activity of geological, geomorphological and pedagogical processes which affected In the formation and development of soils, and that most of the soil of the project was poorly structure to structure less because it is sedimentary soils affected by salinity and sand texture with a high percentage of silt and low clay content, in addition to the high content of gypsum soil and the low content of organic matter, diagnosed with concentrations of gypsum in various forms and formation the horizon Gypsic horizon and Petro gypsic horizon with prospects of Salic horizon in the first 50 cm of the soil surface.

The presence of gypsum and salt in the soils of the project called for placing it under the saline gypsiferous soils group, and for the increase of the soil content of the project of gypsum and lime, which totals more than 90%, which means that the soil of the project are Calcerou Gypsiferrous material. Classification all the soils of the project were under the great group Petrogypsic Haplosalids. And according to US classification system for land productivity, they were diagnosed the classes VI, IV, IIV and IIIV because present the gypsum in high quantities, with high concentration of salt and the possibility of removing these limitation factors under current region conditions was not possible.

Al-Hamdani *et al.* (2018) examined 16 pedons and 24 auger holes of 75 cm depth in the Najaf sea area of Iraq. The soil of the region, according to American classification, falls within the Entisols order and two sub-order are Fluvents and Psamments, and two great group Torrifluvents and Torripsamments respectively, with nine soil families and 15 soil series identified according to the proposal of Al-Agidi (1976).

Therefore, the current study aims to characterize and classification some soils adjacent to the southern part of Al-Najaf Sea and to show their geographical distribution and the effect of the physiographical location in their soil characteristics, in addition to determining the productivity of the lands of the study area.

MATERIALS AND METHODS

The study area was chosen with an area of 17,150.5 ha, located between longitudes 425594E and 445138E and between latitudes 3521842N and UTM 3538169N, which cover the soil types and geomorphological units that are located within the sedimentary environment of Al- Najaf Sea, and adjacent to the southern part of the this Sea. It is bordered from the north by the Sea of Najaf, and from west Strategic Line and from the east road Najaf – Abo Sheir and from the south road Kufa - Kufa Cement Plant. A semi-detailed survey of the selected area of study was carried out using the grade method through the drilling of 94 augur holes, which were located in a library and in a 1000 m interval between a hole and Geographically fixed using a GPS device. According to the results of texture examination, ten heterogeneous sites geographically were selected. Pedons which are representative to the poisons are then digging to detect the soil series within the selected study area as shown in Fig. 1.

The selected pedons were explanation and morphological descripted as fundamental in the Soil Survey Staff (2006), and then disturbed soil samples of each diagnostic horizon were collected and digitized and placed in plastic bags and transported to the laboratory for conducting some chemical and physical measurements according to the methods in Black *et al.* (1965).

A descriptive legend of the soil and the relevant map units was prepared in each site, and signed on a map of a semi-detailed soil survey of the area, with a scale of 1: 50000.The Arc GIS program It is used for creating and using maps.

The soil of the studied areas was classified from the level of order to the level of the family according to the American system (Soil Taxonomy, 2014) and was completed to the level of the series based on the classification system of soil proposed by Al-Aqadi (1976 and 1982).

The lands of the region were classified according to the productive capacity proposed by Klingebiel and Montgomery (1961) and the completion of a map of the land productivity of the study area with a scale of 1: 50000.

.

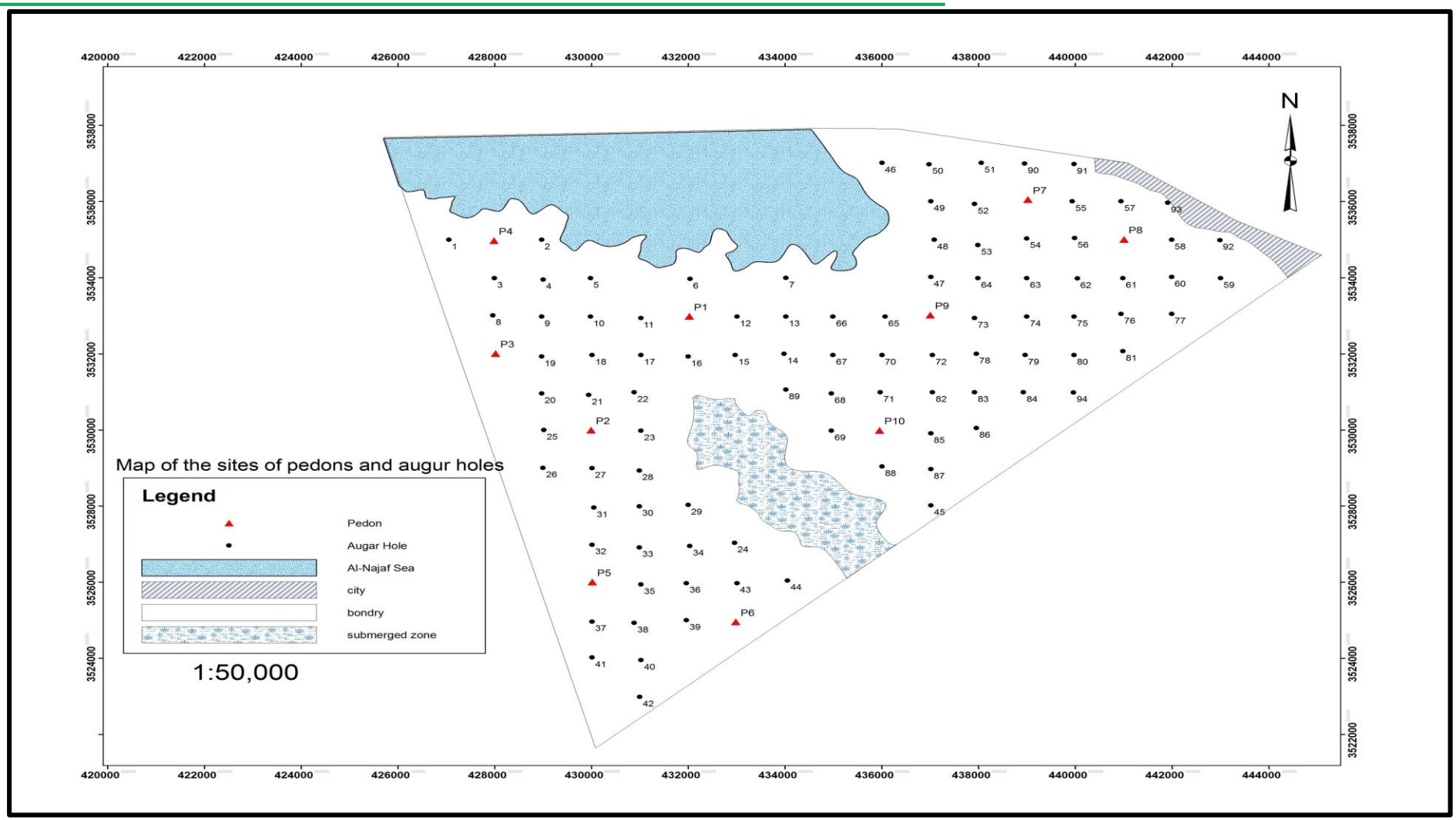

Figure (1) Map of the sites of pedons and studied augurs according to the grade tem method of the study area.

RESULTS AND DISCUSSION

1. Variations in some soil properties for the study area pedons

The results of Table 1 show that the depth of the pedons was ranged between 100-140 cm and the thickness of A horizon was between 15-30 cm. Most of them were within the range of 15-17 cm. The diagnosed variation in the thickness of the horizon is mainly due to sedimentation conditions and the nature of sedimentation materials, which is mainly related to land geomorphology and the extent of proximity and distance from the source of sedimentation, as well as the state of erosion prevailing at each site of the examination, the higher A horizon thickness was recorded within the lower physiographical units sites (the basins and depressions). In terms of the drainage class, the results of this morphological index showed that they ranged from poorly drained to well drained, which was identified in both Pedons 4 and 7 in the D and RL physiographical units respectively. The variation observed in the internal drainage class is due mainly to the high level of ground water as well as the effect of the topographical factor within the region, as well as the effect of texture in this property. It was not observed through the results of the morphological description the presence of a mottles in the Pedon 7 (within the physiographical unit RL), while it was presence in the lower physiographical units, mainly due to the difference in the topography location, and the depth of ground water and its impact in the soil mottling by the occurrence of reduction of some elements especially iron and manganese. Both color indices the value and chroma are related to the degree of drainage, the poorly drainage soils have a high value and chroma less than 2 (Soil survey manual, 2017).

The results presented in Table 1 indicate the dominance of medium and moderately fine texture in the RL and IL physiological units, this is due to the proximity of these two units from the sediment source, causing the deposition of moderately coarse separators in both units. It is normal to deposit the coarse separators near the source of sedimentation and the finesse of the deposited material increases by moving away from the sediment source. Thus the dominance and presence of fine to moderately fine texture in B and D units was attributed to the land scape and the occurrence of these two units in the lower region of the study area.

Table 1 shows the class of soil texture which was prevailing in the morphological examination sites, indicating that there is a variation of the studied pedons in terms of the dominant texture as well as in their distribution pattern with depth within each pedon. This is due to the interrelated effect of geomorphological and pedogenetic processes(washing, loss and gain, salinization), In addition to the conditions of agricultural use experienced the region. The results of morphological description and laboratory analysis of soil texture classes showed that there was no significant heterogeneity in the soil content of the area from the clay separation with the depth, as the conditions for the formation of the clay gain horizons, especially the Argillic horizon. According to Soil Survey Staff, 2014.

Table (1) Some characteristics of the soil of the study sites.

Physiography unit	Pedon No.	Horizon	Depth cm	Drainage type	G.W.T (cm)	Mottling	Texture Class	ECe $dS.m^{-1}$	Total Carbonate gm.Kg^{-1}	Gypsum $CaSO_4.2H_2O$ gm.Kg^{-1}	SPSP ESP %
Silted Basin	1	A	0 -15	Imperfectly	170	10YR 2/1	L- SiCL	58.8	232	130	7.1
		C	15 -30					44.5	265	61	6.0
		Cyg1	30 -70					22.1	145	303	4.0
		Cyg2	70 -100					21.9	281	118	4.0
	2	Apy	0 -16	Imperfectly	165	5Y4/2	L-SiL	55.6	354	204	6.8
		Bky	16 -36					43.2	302	233	5.9
		Cyg	36 -72					24.3	402	284	4.0
		Cy	72 -124					21.9	281	118	3.9
River levee	5	A	0 -15	Moderately well	210	-	L- SCL	54.1	212	331	6.8
		Bky	15 -32					43.0	218	665	5.9
		Cy1	32 -58					31.0	151	607	5.0
		Cy2	58 -88					28.6	251	443	4.6
		Cy3	88 -120					21.4	233	321	3.8
		Cy4	120-140					18.6	255	376	3.5
	3	Ay	0 -15	Moderately	160	-	SiL	40.5	189	124	5.8
		Cyz	15 -30					35.7	274	201	5.5
		Cy	30 -47					26.7	278	221	5.0
		Cyg1	47 -66					23.1	351	232	4.2
		Cyg2	66 -92					15.6	360	201	3.2
		Cy1	92 -110					13.2	380	224	2.9
Silted Depression	4	Ay	0 -17	Poorly	123	(5Y6/1) - (5Y4/2)	L-SiL	52.3	201	254	6.5
		Bky	17 -35					42.9	269	263	5.9
		Cy	35 -85					14.1	256	463	2.9
		Cyg	85 -123					15.6	289	514	3.1
Irrigation levee	6	Az	0 -28	Moderately well	195	-	L-SiL	68.0	204	91	6.1
		Bkg	28 -56					56.4	386	65	6.9
		Ck1	56 -90					47.1	316	92	6.3
		Ck2	90 -108					42.0	361	221	5.9
		Ck3	108 -132					32.1	376	201	5.1
Silted Basin	8	Ayz	0 -15	Imperfectly	125	(10YR 2/1) - (10YR 4/2)	SL- SiCL	69.5	256	405	7.7
		Byg	15 -32					40.3	280	357	5.6
		Cyz	32 -98					23.1	286	267	4.0
		Cy	98 -117					15.6	303	356	3.2
Silted Depression	9	Az	0 -29	Moderately well	144	10YR(6/6	SL-LS-L	79.0	168	105	8.4
		Bkz	29 -52					45.0	351	83	5.5
		C	52 -73					39.0	273	6	5.0
		Cz1	73 – 90					42.0	227	8	5.6
		Cz2	90 -110					47.0	195	114	6.3
Silted Basin	10	A	0 -20	Imperfectly	158	5Y (5/2) - 10YR(6/8)	S -SiCL	39.0	251	24	7.2
		C	20 37					40.0	305	32	5.8
		Ckg	37 -63					31.8	413	50	5.1
		Ayz	63 – 88					27.8	425	194	4.7
		Byg	88 -110					17.9	500	233	3.6
River levee	7	Ap	0 -30	Well	170	-	SL -SiC	15.8	298	45	3.2
		Cy	30 -49					8.5	265	79	1.9
		C1	49 -69					7.9	264	39	2.1
		C2	69 -88					6.7	273	50	1.9
		C3	88 -108					5.8	272	54	1.8
		C4	108 -140					4.6	292	50	1.4

Figure (2) shows the distribution of field diagnosed texture classes for the study area according to (SOLR, 1982) for irrigation purposes for depth (0-25, 25-50, 50-75, 75-100cm) for augur holes sites, according to table 2 results. The results of the cartographic analysis of the completed map, as shown in Table (3), showed that the moderately fine texture as weighted mean for augur site which formed (43.6%), while the coarse texture was formed the lower percent from study region reached (%5.3). Figure (2) shows the distribution of field diagnosed texture classes for the study area according to (SOLR, 1982) for irrigation purposes for depth (0-25, 25-50, 50-75, 75-100 cm) for augur holes' sites, according to table 2 results.

The results of Table (1) showd that the salinity of the soil of the study area was ranged between the moderately salinity to the high salinity (according to SOLR 1982). The electrical conductivity values were ranged from 4.6 to 79.0dS.m^{-1}, the lower value was recorded in the C5 horizon pedon 7, while the highest value recorded at Az horizon in Pedon 9, most of the soil of the study area was saline soil except Pedon 7, the reason for increased soil salinity in the region in general, due to high temperature and severe drought experienced by the region, as well as the impact of high ground water level in the region also the affected of region by the salted water of Najaf sea, which hinder the exploitation of the land use.

The reason for the decline in the values of electrical conductivity in some parts of the study area is due to washing due to the irrigation by the Euphrates River, which works to dissolve salts and wash from the soil body, as well as the factor of soil use for agriculture. Indicating salinization activity in the study area due to the high level of ground water, with a limited presence of desalinization. Which indicates the need to remove the salts from the body of the soil and reclamation before future exploitation, (Al-Rawi, 2007: Sulaiman and Al-Qasab, 2012).

The results of the laboratory analysis for some chemical properties of the studied area soils showed that they had a different content of carbonates and had a different distribution with depth due to the effect of calcareous parent material in the study area for each pedon. The values of this component ranged from 145 to 500 gm.kg^{-1}, recorded at sight Cyg1 for pedon 1 and Cky2 for pedon 10 respectively (Table 1). The high soil content of carbonate in the region is consistent with referred to it (Buringh, 1960) who was indicated that Iraqi soil content is higher than this component.

The results in Table (1) indicate that there is a horizontal and vertical variation in soil content from gypsum within the study pedons. The heterogeneity of soil content from gypsum is due to the effect of the nature of the parent material and geomorphology of the land surface which effects on the nature of its distribution (Al-Rawi, 2003). Its ranging from 6 to 665 gm.kg^{-1}, with a general trend of high soil content of this component with depth in all studied pedons. The lowest value was recorded at C horizon of Pedon 10, while the highest value was at the horizon Bky of Pedon 5, due to the high solubility of gypsum and its rise due to the capillary characteristic which facilitated the deposition of gypsum and its accumulation with evaporated water in the surface horizon (Delver, 1962).

Table (1) showed that the values of the percentage of sodium exchange in the surface horizons of the soil of the sites under study ranged from 3.2 to 8.4, with the lowest values at the Ap horizon of Pedon 7,while the higher value was recorded at horizon Az pedon 9. The results showed that study area was saline soils, for the high salt content more than 50 dS.m^{-1} And not to exceed the sodium exchange rate of 15% according to the classification of the US salinity laboratory.

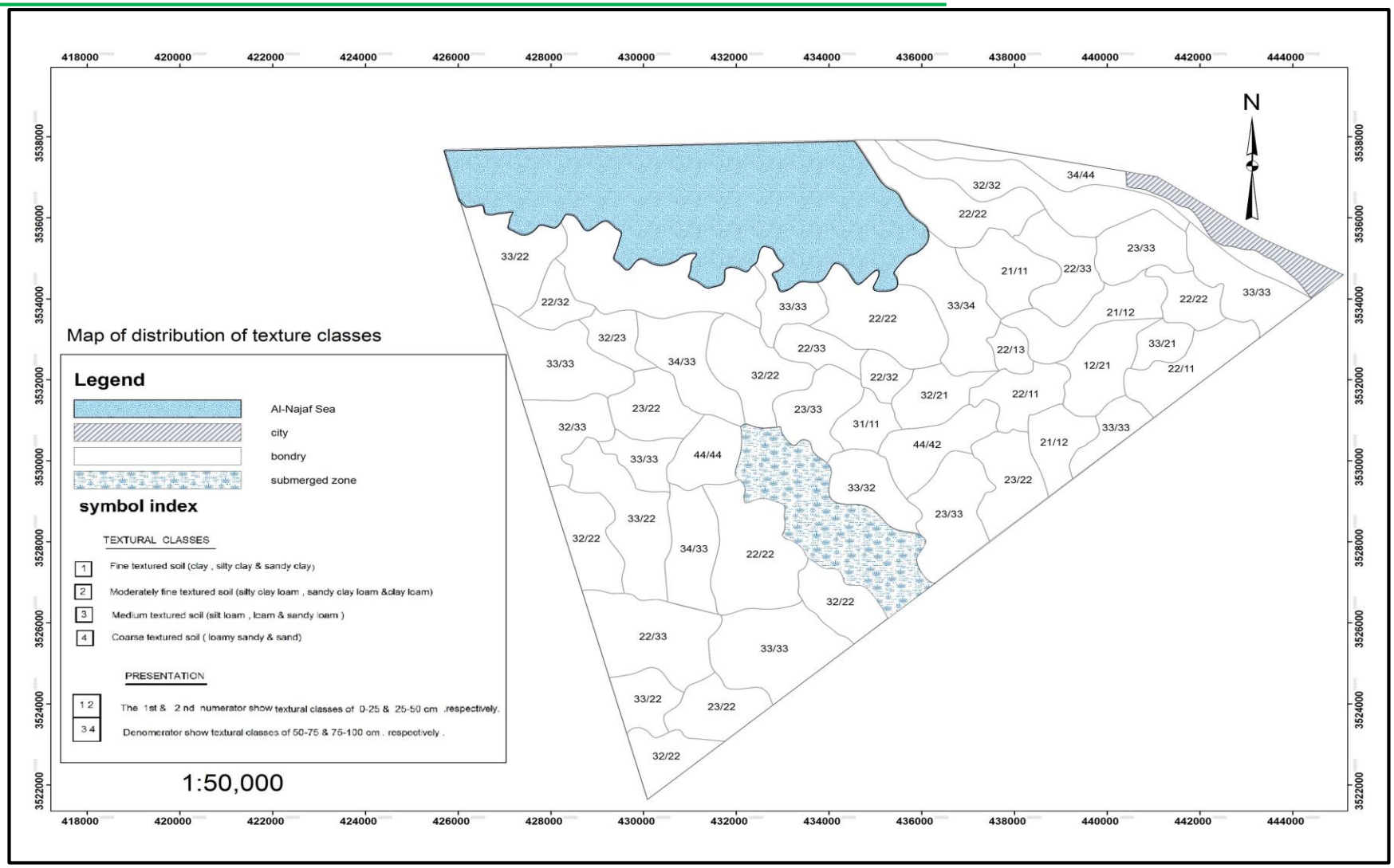

Figure (2) Map of the distribution of texture classes diagnosed at field to the study area according to (S.O.LR, 1982).

Table (2) Texture classes for the first meter of the augur checkup position and their geographical Coordinates and their physiographic locations in the study area.

Physiography unit	Augar No.	UTM		Depth(cm)			
				0-25	25-50	50-75	75-100
		X	Y	Texture classes			
RL	37	430000	3525000	SCL	SiCL	L	L
	38	431000	3525000	SiCL	CL	L	SL
	39	432000	3525000	L	L	L	CL
	40	431000	3524000	SiCL	L	SiCL	SiCL
	41	430000	3524000	L	L	SiCL	SiCL
	42	431000	3523000	L	SiCL	SiCL	SiCL
	50	437000	3537000	SiL	SiCL	SiL	SiCL
	51	438000	3537000	SiL	SiCL	SiL	SiCL
	90	439000	3537000	SiL	LS	LS	LS
	91	440000	3537000	SiL	LS	LS	LS
	92	443000	3535000	SiL	LS	LS	LS
	93	442000	3536000	L	LS	LS	LS
L	26	429000	3529000	L	SiCL	SiCL	CL
	31	430000	3528000	L	L	SiCL	SiCL
	32	430000	3527000	L	SiL	SiCL	SCL
	35	431000	3526000	SiCL	CL	L	L
	36	432000	3526000	SiL	L	L	SL
SB	8	428000	3533000	SiL	SiL	SiL	SiL
	9	429000	3533000	SiL	SiCL	L	SiL
	15	433000	3532000	L	SCL	SiCL	SCL
	16	432000	3532000	SiCL	L	SiCL	SiCL
	17	431000	3532000	SiL	LS	SL	L
	19	429000	3532000	SiL	SiL	L	SiL
	20	429000	3531000	SL	SCL	SiL	L
	21	430000	3531000	SiCL	SiL	SCL	SCL
	22	431000	3531000	SiCL	SL	SCL	SCL
	23	431000	3530000	LS	LS	LS	LS
SB	24	430000	3530000	SiCL	SiCL	CL	SCL
	25	429000	3530000	SiL	L	SCL	SCL
	27	430000	3529000	L	SiL	SiCL	SCL
	28	431000	3529000	L	LS	L	SL
	29	432000	3528000	SiCL	SiCL	SCL	SCL
	30	431000	3528000	L	LS	L	SL
	33	431000	3527000	L	LS	SiL	L
	34	432000	3527000	SiCL	SiCL	SiCL	CL
	43	433000	3526000	SL	SiL	SiL	SiL
	44	434000	3526000	L	SCL	SCL	CL
	45	435000	3527000	SiL	SiCL	SCL	SCL
	55	440000	3536000	SiL	SiCL	L	SCL
	57	441000	3536000	SiCL	L	L	SiL
	58	442000	3535000	SiL	SiL	L	L
	59	443000	3534000	SiL	L	L	SL
	60	442000	3534000	SiCL	SiCL	CL	SCL
	61	441000	3534000	SiCL	SiC	SiC	SCL
	62	440000	3534000	SiCL	SiC	SiC	SiCL
	68	435000	3531000	SiL	SiL	SiC	SiC
	69	435000	3530000	SiL	SiL	SiL	SiCL
	71	436000	3531000	SiL	CL	SiCL	SiC
	72	437000	3532000	L	CL	SiCL	SiC
	73	438000	3533000	SiCL	SiCL	SiC	SL
	75	440000	3533000	SiC	CL	SCL	SiC
	76	441000	3533000	L	SiL	SCL	SiC
	77	442000	3533000	SiCL	SiCL	SiC	SiC
	78	438000	3532000	SiCL	SiCL	SiC	SiC

Physiography unit	Augar No.	UTM		Depth(cm)			
				0-25	25-50	50-75	75-100
		X	Y	Texture classes			
	79	439000	3532000	SiCL	SiCL	SiC	SiC
	80	440000	3532000	SiC	SiCL	SiCL	SiC
	81	441000	3532000	SiCL	SiCL	SiC	SiC
	82	437000	3531000	S	LS	LS	SiCL
	83	438000	3531000	SiCL	SiCL	SiC	SiC
	84	439000	3531000	SiCL	SiC	SiC	SCL
	85	437000	3530000	SiCL	SiL	L	L
	86	438000	3530000	SiCL	L	SCL	SCL
	87	437000	3529000	SiCL	SiL	L	SL
	88	436000	3529000	SiCL	SiL	SiL	SL
	94	440000	3530000	L	L	L	L
SD	1	427000	3535000	SiL	SiL	SCL	SCL
	2	429000	3535000	SiCL	CL	SiCL	SCL
	3	428000	3534000	SiCL	CL	SiL	SCL
	4	429000	3534000	SiCL	SiCL	SIL	SCL
	5	430000	3534000	SiCL	CL	CL	SCL
	6	431000	3534000	SiCL	SiCL	SCL	SCL
	7	433000	3534000	SiL	L	CL	SL
	10	430000	3533000	SiL	LS	CL	SL
	11	431000	3533000	SiL	LS	SL	SL
	12	433000	3533000	SiCL	SiCL	SL	SiL
	13	434000	3533000	SiCL	CL	L	SL
	14	434000	3532000	SiCL	SiL	L	L
	18	430000	3532000	SiCL	SiL	SiCL	SCL
	46	435000	3534000	SiCL	SiCL	SiCL	SCL
	47	437000	3534000	L	SiL	SL	LS
	48	437000	3535000	SiCL	SiL	SiC	SiC
	49	437000	3536000	SiCL	SiCL	SCL	SCL
	52	438000	3536000	SiCL	SiCL	SiCL	SCL
	53	438000	3535000	SiCL	SiC	SiC	SiC
	54	439000	3535000	SiCL	SiCL	SiL	SL
	56	440000	3535000	SiCL	SiL	SL	SiL
	63	439000	3534000	SiCL	CL	L	L
	64	438000	3534000	SiCL	SiC	SiC	SiC
	65	436000	3533000	SiCL	SCL	SCL	SCL
	66	435000	3533000	SiCL	SiCL	SCL	SCL
	67	435000	3532000	SiCL	SiCL	L	SCL
	70	436000	3532000	SiL	SiCL	SiCL	SiC
	74	439000	3533000	SiCL	SiC	SiC	SiCL
	89	434000	3531000	SiCL	SiL	SiL	SL

Table (3) Cartographic analysis of texture class in the study area.

The percentage of texture class from total area	The area of texture class in ha	Texture class
13.8	1873.9	Fine
43.6	5910.1	Moderately fine
37.2	5045.2	Medium
5.3	720.7	Coarse

2. Classification of the study area

The results of Table (4) showed that the order Aridisols was formed most of the soil of the study area with percentage 92.5% of total studied area. The soil within this level is characterized by a Aridic moisture regime, the rate of water loss by evaporation is more than the amount of rain falling in most months of the year, the amount of precipitation in the study area reached (101.3 mm annually), while the annual evaporation amounts reached 3829.2 mm and the soil is dry and does not have moisture for a long time (Al-Azzawi,2017). The soil temperature regime of the region was hyper thermic.This order soils is distinguished by its light color for its low content of organic matter and finest texture to moderately coarse. It diagnosed the presence of gypsic horizon , Salic horizon and Calcic horizon, as noted in the discussion of some characteristics of the studied area soils.

Table (4) The classification of the soil of the study region and its area.

Order	Sub order	Great group	Sub Great group	Series	Pedon No.	Area of series (ha)	Percentage of series from all area	Percentage of order from all area
Aridisols	Salids	Aquisalids	Typic Aquisalids	112CKF	10	780.46	5.76	92.5
			Gypsic Aquisalids	132CCM	6	1275.00	9.41	
				122XKF	8	1452.42	10.72	
				122CCM	9	1274.05	9.40	
	Gypsids	Haplogypsids	Leptic Haplogypsids	122XKP	4	870.48	6.42	
			Typic Hapiogypsids	132CKM	3	817.94	6.04	
		Calcigypsids	Typic Calcigypsids	142XKF	1	1456.94	10.75	
				132CKF	2	1634.96	12.07	
				122XKM	5	2971.63	21.93	
Entisols	Fluvent	Torrifluvents	Typic Torrifluvents	DW56	7	1016.12	7.50	7.5

The diagnosed great soil group in the studied area was Calcigypsids, Aquisalids and Haplogypsids. Table 4 showed the distribution of sub great soil group in the studied area, the dominated was Typic Calcigypsids with percent 44.75%,after that Gypsic Aquisalids 29.53%, Typic Aquisalids5.76%, Leptic Haplogypsids 6.42% and Typic Hapiogypsids 6.04%. Nine soil series were diagnosed which retired to this order, the dominated series was 122XKM with area reached 2971.63ha(21.93% from total area), while the series 112CKF formed the lower area from studied region reached 780.46ha(5.76%) as showed in Fig.3. The Entisols order was formed 7.5% from region area(Table,4), it was recent formed soils described absence the development from B horizon formation, because the conditions which not allow to soil development as the geomorphological process as erosion and sedimentation in addion to the vegetation shortage and low precipitation which not exceed (101.3mm/year) which not allow for some formation processes to development it. While the great soil group which diagnosed within this order was Torrifluvents and sub great soil group was Typic Torrifluvents with percent 7.50% (Table, 4).

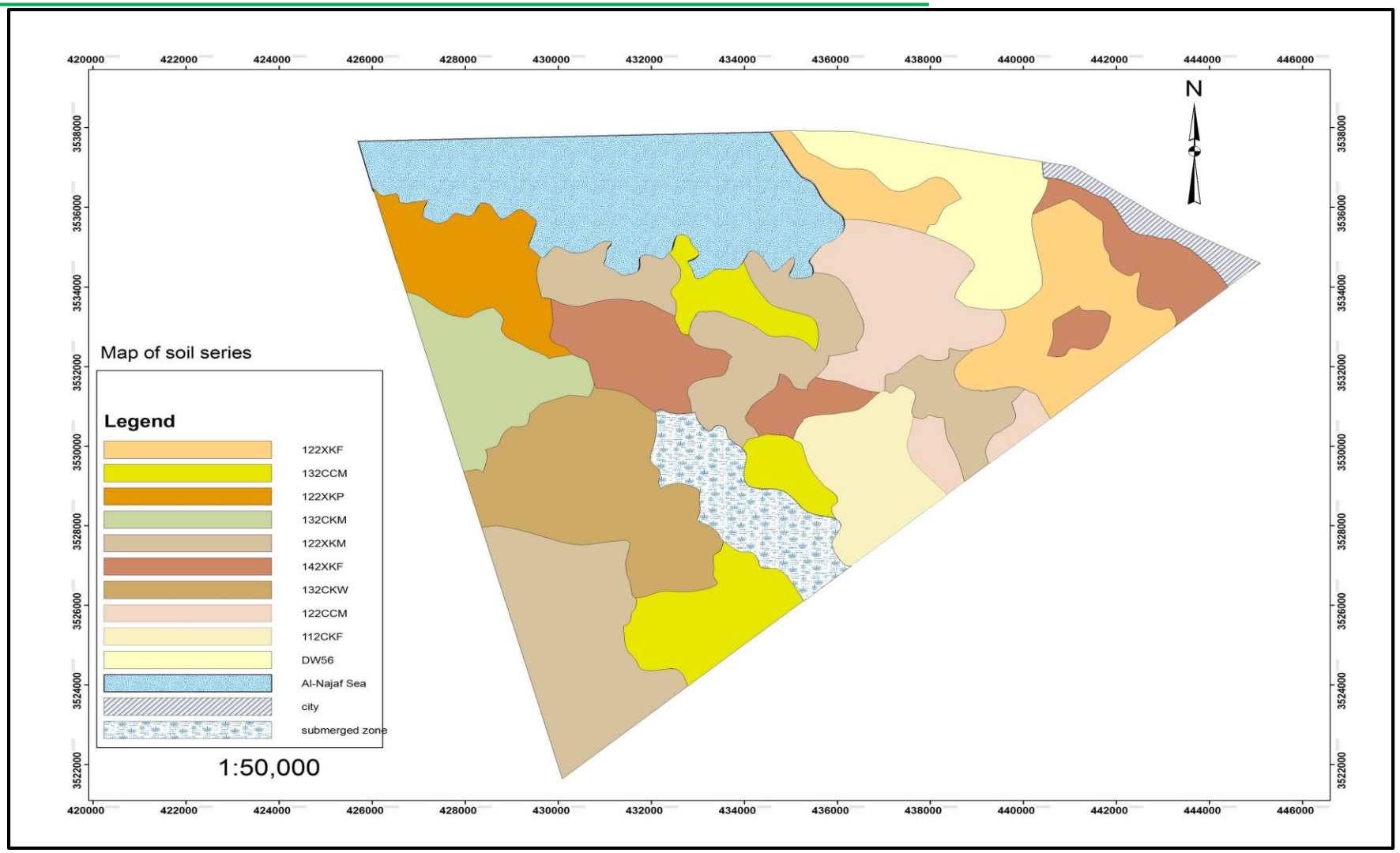

Figure (3) Located soil series in the study area based on the Al-Agidi proposal(1976)

3. Land classification for studied region according to productivity capability.

Fig.4 pointed to the studied region land productivity capability map and its geographical distribution. As Table 5, showed the area of land productivity capability classes in the studied region. The class I reached 5.23%, class II 11.75%, class III 34.83%, while class IV recoded 48.19% from total area, which was pointed that two classes The third and fourth was formed all studied area (83.02%), with declined the portion of first and second classes which was suitable for agriculture, this reality confirm necessity take the essential managing practices when cultivated these lands in the future. The results in Table 5 showed the recoded limitations within second class was the texture(t), the drainage (d) and gypsum content percentage (y), the dominate limitation within this class was the texture allowed gypsum percentage, than the lower limit was drainage (Fig.5).

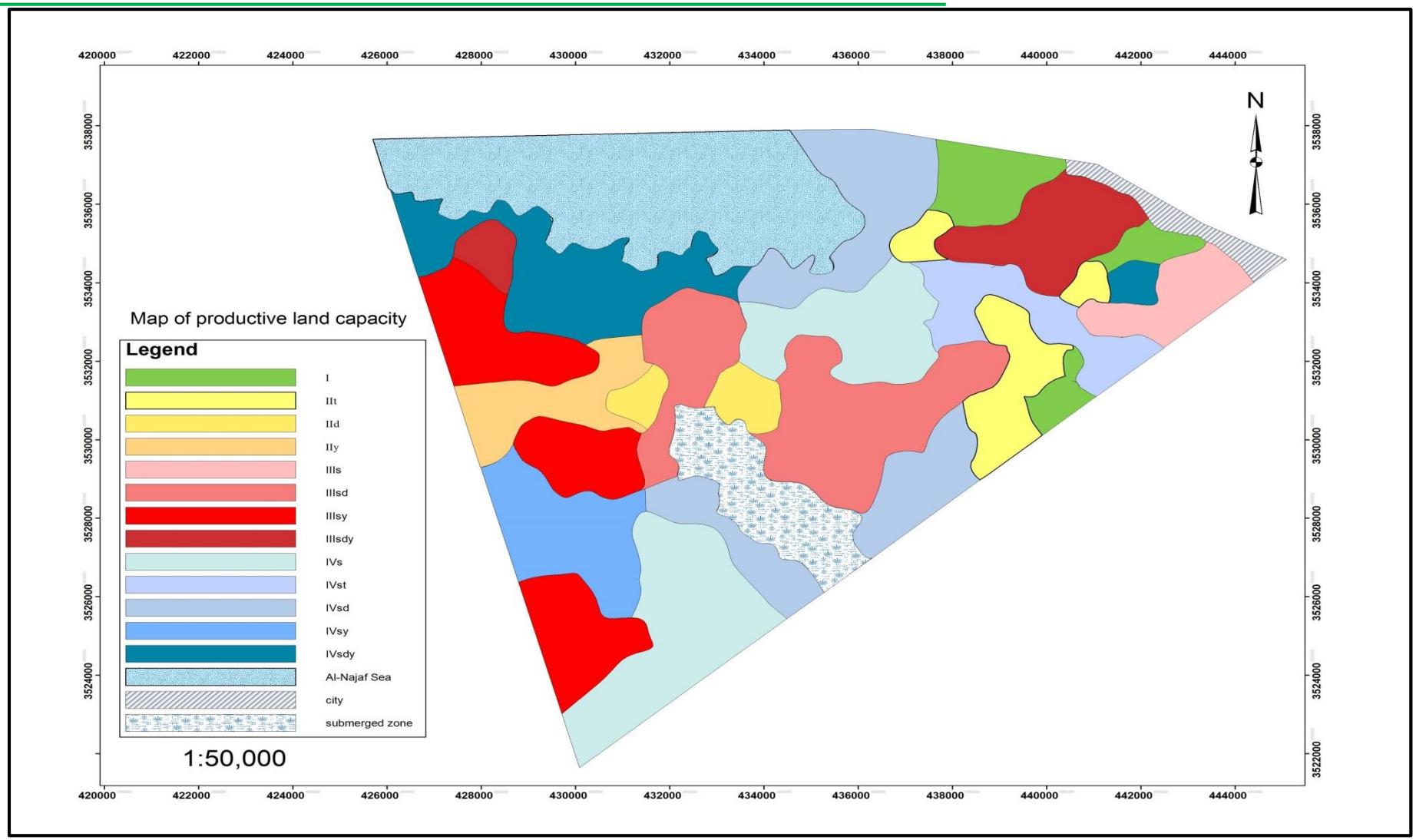

Figure (4) located land Classification in the study area.

Table (5) Land classes and subclasses and their proportions in the study area.

The area of land sub class ha	Sub class	The area of land class ha	The percentage of class from total area	Class	Total area ha
-	-	709.4	5.24	I	13550
705.4	IIt	1591.9	11.74	II	
321	IId				
565.5	IIy				
452.2	IIIs	4719.2	34.83	III	
1817.7	IIIsd				
1587.8	IIIsy				
861.5	IIIsdy				
2066.8	IVs	6529.5	48.19	IV	
811.6	IVsy				
621.7	IVst				
1772.3	IVsd				
1257.1	IVsdy				

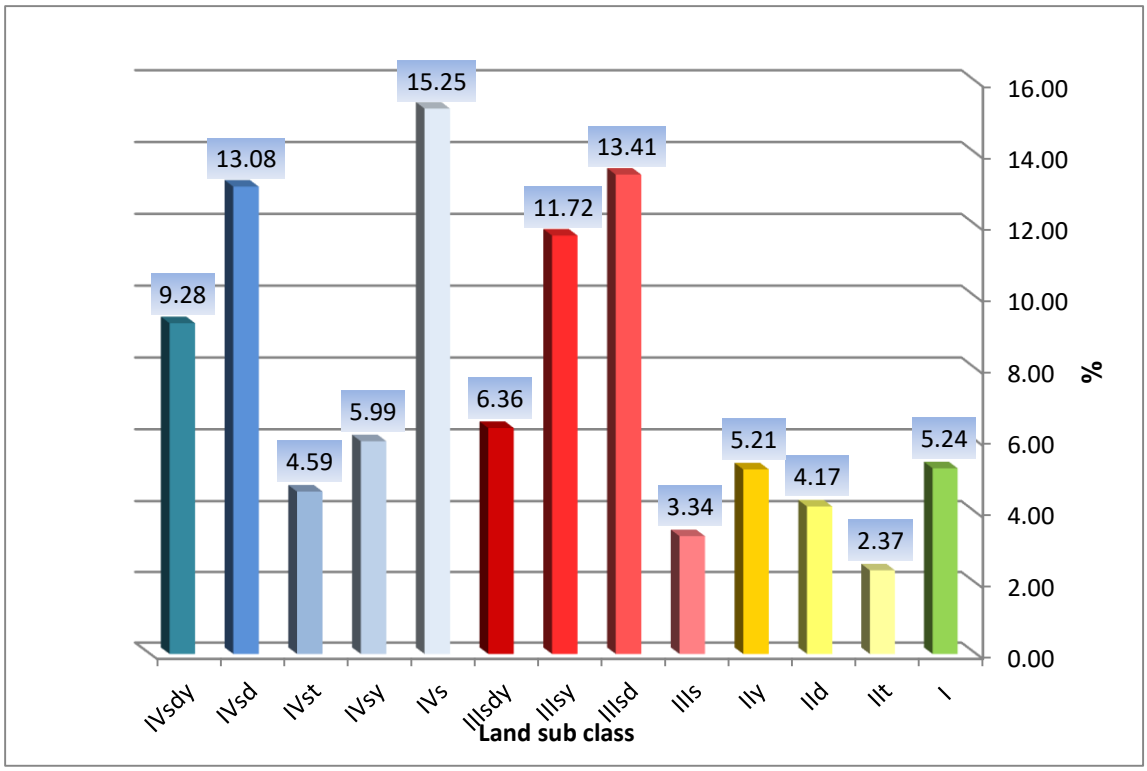

Figure (5) The percentages of sub class of land which located in the study area

REFERENCES

Al-Agidi, W. K., 1976. Proposed soil classification at series level for Iraqi Soil – Alluvial Soils. Univ. of Baghdad , Iraq .

Al-Agidi, W. K., 1982. Proposed soil classification at series level for Iraqi Soil – Zonal Soils. Univ. of Baghdad, Iraq.

Al-Azzawi, H.H. F., 2017. Effect of the physiographic position in some soil characteristics and the soil's ability to produce barley and cotton crops in some projects within the sedimentary plain in Iraq. Master Thesis. Faculty of Agriculture, Anbar University.

Al-Hamdani, A. S., D. R. Ndioui and H. M. H. Al-Shamri, 2018. Characterization and classification of soil maps units in the area of the Sea of Najaf using Remote sensing and GIS techniques and prediction of delineation Between the map units. 2 - Digital classification of the region of the Najaf Sea - Iraq. magazine Kufa for Agricultural Sciences Issue (10) Part (1).198 -224.

Al-Rawi, M. K. I., 2003. Characterization and classification of some sedimentary soil series and their effect on the soils properties. PhD thesis. Collage of Agriculture, University of Baghdad.

Al-Rawi, M. K. I., 2007. The pedology of some Western desert depression from Iraq. (Iraqi Academic Journal) Faculty of Agriculture - University of Baghdad.

Black, C.A, 1965. Methods of soil analysis. Part I, American Society of Agronomy. Madison, Wisconsin, USA. 1572 p.

Buringh, P., 1960. Soils and Soil Condition in Iraq. Ministry of Agriculture,Baghdad, Iraq.

Delver, P.,1962. Properties of saline soil in Iraq. Netherland . J. Agric. Sci. 10 (3): 194-10.

Salloum, A. J. and R. H. Sukkar, 1994. Soil Survey and Land Classification "Bahr Al-Najaf Project" Ministry of Water Resources - Al-Furat Center for Studies and Design of Irrigation Projects.

Sulaiman, A. H. A. and N. F. Al-Qasab, 2012. Classification and evaluation of some sedimentary soils in the center of the Mesopotamians plain. Tikrit Univ. J. of Agric. Sci. Vol. (12) Issue (3) Page: 162-155.

Katie, H. H. and K. I. Majid, 2013. Soil survey and hydrological investigation project Fadak Farm (the holy upper threshold) Najaf Al- Ashraf. Ministry of Water Resources-Center National Water Resource Management - Department of Environmental Studies.

Klingebiel , A.A. and P.H Montgomery .1961 . Land capability classification. USDA , Soil Cons. Serv. Agri. Handbook No. 210,21p.

Ndiwi, D. R. and A. D. Mohamed and A. Kazem, 2011.The Effect of the Physographic Position on the Properties of Some Sedimentary Soils and the Endocrine Classes in Basrah Governorate. I-Morphological Characteristics of Endocrine Structures. Basrah Journal of Agricultural Sciences, Vol. 24, No. (1): 23-38.

Soil Survey Staff, 2006. Soil Survey Manual. USDA – SCS. Agric. Hand book 18. Washington, DC: U.S. Government printing Office.

S.O.L.R.,1982. Specification for soil surveys and Hydrological investigations in Iraq. General Establishment for design and Research. Selma Press, Baghdad, Iraq.

USDA , 2014 . Keys to Soil Taxonomy . Nine edi. Natur . Res. Conser . service.

توصيف وتصنيف بعض الترب المحاذية لجنوب بحر النجف– العراق

علي حسين ابراهيم البياتي* ومصطفى خالد العاني ** وحيدر حسن فلاح**

*كلية الزراعة– جامعة الانبار

**وزارة الموارد المائية–المركز الوطني للموارد المائية

المستخلص

اختيرت منطقة الدراسة في محافظة النجف الاشرف وبشكل محاذي للجزء الجنوبي من بحر النجف وبمساحة (17150.5 هكتار) والواقعة بين خطي الطول 425594E و 445138E ودائرتي العرض 3521842N و3538169N (UTM) بحيث تغطي أنواع الترب ووحداتها الجيومورفولوجية المتواجدة ضمن البيئة الترسيبية لبحر النجف. نفذ خلالها عملية مسح شبه مفصل للمنطقة المنتخبة للدراسة باعتماد طريقة التشبيك واستنادا على نتائج فحص النسجة، انتخبت عشرة مواقع متغايرة حددت جغرافيا باستعمال جهاز GPS. حفرت عندها البيدونات الممثلة موقعياً ووصفت مورفولوجيا، ثم استحصلت عينات ترابية مثارة ممثلة لكل أفق تشخيصي،

ونقلت إلى المختبر لغرض إجراء بعض التحاليل الكيميائية والقياسات الفيزيائية عليها. واستناداً اليها صنفت ترب مناطق الدراسة ابتداءً من مستوى الرتبة إلى مستوى العائلة وفق ما جاء في النظام الأمريكي الحديث (2014)، واستكمل لمستوى السلاسل اعتمادا على نظام تصنيف سلاسل الترب المقترح من قبل Al-Aqadi (1976 و1982). تم تصنيف أراضي المنطقة حسب القابلية الإنتاجية المقترحة من قبل Klingebiel و Montgomery (1961).

اظهرت النتائج وجود حالة من التباين في الصفات المورفولوجية سواء ضمن البيدون الواحد او بيدونات منطقة الدراسة، وذلك لتأثير عامل الطبوغرافية مما انعكس في صفات وسمك الافاق وطبيعة ترتيبها وما رافقها من صفات مميزة لكل افق. ان العمليات البيدوجينية وفي مقدمتها عمليات الغسل والفقد والكسب، وعملية التملح قد انعكس ذلك على تواجد بعض الافاق التشخيصية تحت السطحية والمتمثلة بالأفق الكلسي والجبسي والملحي، مع سيادة الافق التشخيصي السطحي البدائي التطور والمتمثل بالأفق اوكرك. اشارت نتائج صنف النسجة وجود تباين في محتوى ترب الدراسة من مفصولات التربة الرئيسة وذلك اعتماداً على الموقع الطوبوغرافي لها.، وان نتائج التحليل الكارتوكرافي لخريطة صنف النسجة للمتر الاول اشارت الى سيادة الاصناف المعتدلة النعومة بنسبة (43.6%)، في حين اصناف النسجة الخشنة قد شكلت اقل نسبة (5.3%).

ان ترب الدراسة كانت ذات محتوى متباين من الكربونات وذات نمط توزيع مختلف مع العمق بسبب تأثير الظروف الموقعية. اذ تراوح قيم الكربونات بين 145 الى 500 غم.كغم$^{-1}$، ان حالة التباين في نمط توزيع هذا الكربونات في بيدونات الدراسة يتماشى مع حالة التباين في نشاط عملية التكلس والارتفاع الملاحظ للكربونات في الافاق تحت السطحية يعزى بالأساس الى طبيعة مادة الاصل. اما محتوى الترب من الجبس فقد تراوح بين 6 الى 665 غم.كغم$^{-1}$، مع وجود اتجاه عام لارتفاع محتوى الترب من الجبس مع العمق. اما نسبة النسبة المئوية للصوديوم المتبادل فقد تراوحت بين 3.2 الى 8.4، ولم تتجاوز حدود الخطورة (15%). صنفت ترب منطقة الدراسة ضمن رتبتين هما الاريديسول والتي شكلت معظم منطقة الدراسة وبنسبة (92.5%) وشخص عندها مجاميع الترب تحت العظمى Typic Calcigypsids بنسبة 44.75% ويليها Gypsic Aquisalids بنسبة 29.53 % و Typic Aquisalids بنسبة 5.76% و Leptic Haplogypsids بنسبة 6.42% و Typic Hapiogypsids بنسبة 6.04% .

اما رتبة الانتيسول فقد شكلت نسبة (7.5%) شخصت عندها تحت مجاميع الترب العظمى Typic Torrifluvents.

تصنيف اراضي منطقة الدراسة وحسب محددات الانتاجية اشارت الى ان الصنف IV شكلت اعلى نسبة من مساحة المنطقة الكلية (48.19%) في حين ان الصنف I لم يتجاوز نسبة (5.23%). وقد سجلت المحددات التالية وهي النسجة والبزل ونسبة الجبس والملوحة، وهذا يؤكد ضرورة اتخاذ الاجراءات العلمية الادارية اللازمة عند استغلال هذه الاراضي زراعيا مستقبلا.

الكلمات المفتاحية: بحر النجف: الترب الجافة: توصيف وتصنيف الترب: تصنيف الاراضي. التبقع: خرائط الترب.