



Variation in Some Morphological Characteristics of Dried Marsh Soils in Southern Iraq

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Abstract: This study was conducted to determine the state of variation in some morphological traits (texture and color) of the marshes soils in southern Iraq. Three tracks were chosen that cover most of the marshes in southern Iraq. The first track towards Basra, and it covered Al-Shafi, Al-Dair, and Al-Mashab. The second track towards Dhi Qar, it covered the marshes of the Chabayish, the Alhmmar, and Alfuhud. The third track towards Maysan and covered the great marshes and Al-Mashreh. Dissection holes were made and then the texture and color of each were described. The soils of the study area represent the state of the newly formed soils that are not developed. Soils showed a variation in the texture of the soil, as the dominance of silty clay class (SiC) in Basra soils. The 31.81% of the horizons of pedons were pale orange-yellow color in the dry condition and grayish-yellow brown, with a percentage of 37.30 in the wet condition the soils of Dhi Qar. The thickness of the horizons was 10-30 cm, at an average of 50%, and the dominance of the clay texture class, C in the gray-yellow and olive-gray color at 25% of each in the dry condition. In wet condition, the dominance of the yellow-gray color is mysterious and black-brown 25% each. The dominance was for the thickness of the horizons 50-21 cm at 72.70% in the province of Maysan, and the dominance was for the type of clay texture SiC and clay C. The pale yellowish-brown and brown-gray colors were dominant by 18.2% for each in the dry condition, while the dominance was for the olive-gray color by 36.4%.

Keywords: Morphological characteristics, Texture, Color, Dried marsh soils

Soil is a developed, dynamic, natural body resulting from the interaction influence of climate and living matter on the parent material under the influence of gradient for a period of time. Many soils are similar in their general conditions, such as vegetation cover, degree of natural drainage and climatic conditions, but they are composed of different origin materials, so soil they differ in their morphological, physical, chemical, and mineral properties. The southern marshes, as part of the sedimentary plain, are a geologically complex area from a tectonic point of view, and this was explained by studies and scientific research on the origin of its origin. The most prominent of these geological studies of the region is of Lees and Falcon (1952) and Karim (1998) which provided geological description of the stages of its development and its modern tectonics. The environment of the marshes was subjected to a rapid environmental change during the past two decades and in a short time, was subjected to drying that led to significant changes in the physical, chemical, and morphological characteristics of the marsh soils. A number of studies have been conducted on the physical and morphological traits of the marshlands in Iraq. Al-Ani et al (2000a) showed that soils were clay or silty clay, except for the horizon texture of one, which was mixed clay-silty, where the sand was the lowest separated, reaching 13.1-16.1% compared to the high content of clay, which was 34.9-68.5% and for silt 28.6-50.1%. They added that the

values of the bulk density decreased in the surface horizon, sand ranged between 1.25-1.31% this may be due to the high percentage of organic matter in this horizon. Al-Husseini (2005) also indicated, when studying the dried Alhmmar marsh soil, that the texture of the soil and for all horizons was the soft texture (SiC, C), except for the surface horizons of the pedons (3,4), which showed a texture of medium softness (SiCL). The bulk density were slightly high and the highest values were on the C1 horizon of pedon 5 with an average of 1.71 g.cm^{-3} - which behaved as the impermeable layer, while the true density and porosity values were within the measured normal range in Iraqi soils Mutashar (2007), in southern Iraq, showed that the soil of the study was silty clay to clay with a high granular content of silt and clay ranging from 85% to 95%. The current study is on the morphological and physical traits of marsh soils.

MATERIAL AND METHODS

The eight pedons were selected representing three paths covering most of the marshes in southern Iraq, namely:

1. First path is towards Basra and includes the marshes of Al-Dair, Al-Shafi and Al-Mashab
2. Second path towards Dhi Qar and includes the marshes of Al-Jbayish, Al-Fahd and Al-Hamar
3. Third path in the direction of Maysan and includes the marshes of Al-Azeem and Al-Musharrah

Figure 1 shows the geographical locations of these marshes selected for study. After identifying the sites required for the study, the soil section was excavated and its morphology was described according to what was mentioned in the American Soil Survey Manual (Soil Survey Staff 2003). Soil samples representing each horizon were taken, the soil samples were air-dried and smashed manually. Soil Texture and color in the dry state was estimated according to Munsell color index.

RESULTS AND DISCUSSION

Morphological characteristics: The morphological description show that all soils are undeveloped, where their pedons had a horizontal sequence of type C - A and the absence of a subsurface illuviation horizons type B, and this is the nature of the prevailing environmental factors that do not help the development of soils. The Parent material for all pedons was a newly formed sedimentary material transported by the Tigris, Euphrates and Shatt al-Arab rivers, and formed under a dry climate and poor vegetation cover consisting of some non-dense weeds and reeds and an almost flat topography.

Soil color: The results indicate the wavelength (Hue) of the horizons of the pedons in Basra province, represented by the pedons 1-8, varied between YR-2.5 and Y10 in the dry and wet conditions, while the value of the color intensity ranged between 6-7 in the case dry and between 4-5 in wet condition. The chroma purity ranged between 2-3 in the dry and wet conditions. The results of the morphological description indicate that the dominance for the wavelength is 10YR and by 45.5% in the dry and wet conditions, and the color intensity was dominant at the value of 7 and by 54.5% in the dry state. The dominance was 5 and by 4.55% in the wet condition. that the result indicated 31.81% of the horizons of Basra province are orange-yellow color, 22.72% are yellow-gray and gray-yellow brown, 13.63% are light gray and 9.09% are yellow-brown. Gray olive color in the dry state. In the wet condition, yellow-gray brown and light yellow-brown with a percentage of 22.72, then for a dark gray-yellow color with a percentage of 18.18, and olive-gray color with a percentage of 13.6 and dark gray and an olive-grey color with a percentage of 9.09 for each of them then to a dark olive color at an average of 4.54% for each of them. This variance in the color of the soil may be mainly due to the percentage of both organic matter

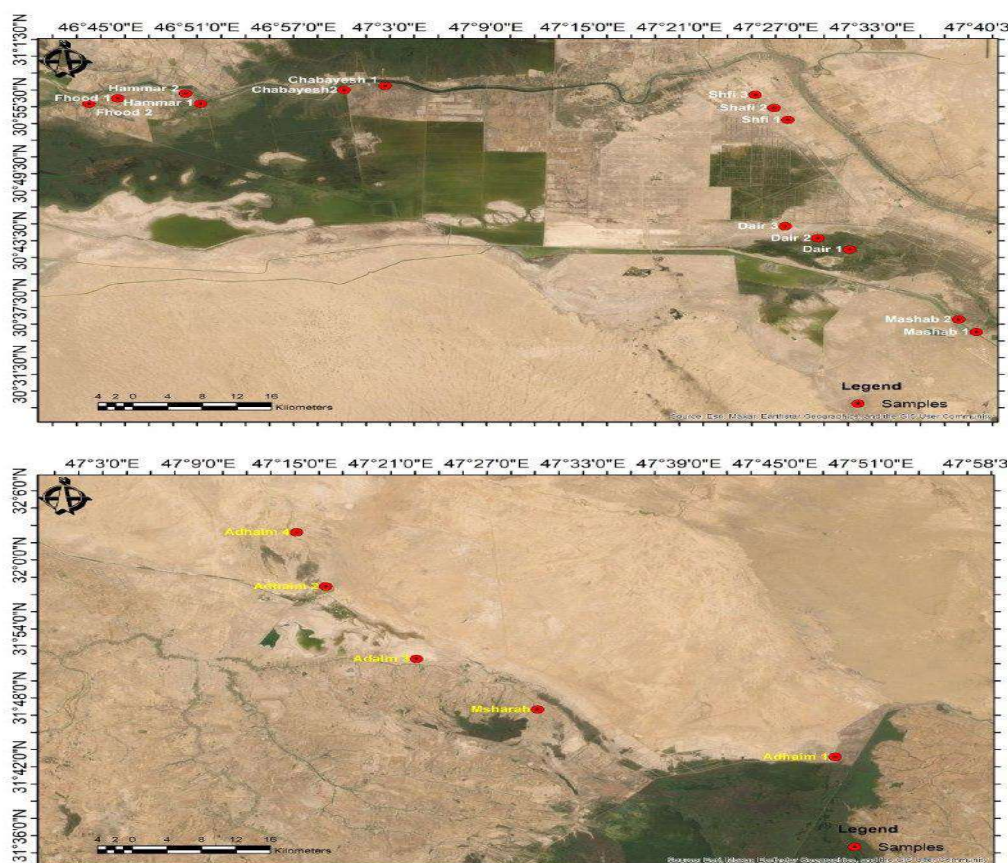


Fig. 1. Satellite Image representing the study sites

and calcium carbonate, as well as the difference in soil texture and the percentage of particles, especially clay particles, which give a color that tends to darken compared to the rest of the particles, especially when humidified, as well as the percentage of organic matter that increased leads to an increase dark color. The higher the percentage of calcium carbonate, the lighter the color of the soil. These results are consistent with the findings of Allen (2005). Konen et al (2003) indicated that there is a significant relationship between the dark color of the soil and its content of organic matter and clay particles. As for the pedons located in Dhi Qar province, represented by the pedons 9-14, the results indicate that the value of the wavelength (Hue) of the pedons varied between 10YR-2.5Y in the dry and wet conditions, with the value of 2.5Y value dominance and by 40% for both cases. As for the value of the color intensity, it ranged between 3-6 in the dry state and between 2-4 in the wet state, and the color intensity was dominant, and by 55% in the dry state, and in the wet state, the intensity of the color was 4 and by 65%. The degree of purity of color (Chroma) ranged between 1-3 in the dry and wet conditions, and the degree of purity was dominant at 2 and by 80% in the dry state and 75%

in the wet state. From these results, we note that the dominance was for gray-yellow and gray-olive at 25% of each, then for gray-yellow and gray-olive color at 25% each, then for dark gray-yellow and gray-yellow-brown at a rate of 10% for each of them, then for black-brown, gray-brown and yellowish-brown at a rate of 5 % each in the dry state. In wet condition, the color was yellow-dark gray and black-brown at 25% each, then dark olive-brown by 10%, then pale yellow-brown color by 5%. In pedons located in the Maysan province, represented by the pedons 15-19, the results indicate that the value of the length (Hue) of the pedons varied between YR - 2.5Y 10 for the dry and wet conditions and the wavelength was YR 10 and by 45.5% in the dry state, while in the wet state, the dominance was for each of YR 5 and 2.5 YR at an average of 36.4% each. As for the color intensity ranged between 5-7 in the dry condition, and dominance was for the value of 5, at an average of 45.5%, or in the wet condition, the intensity of the color ranged between 2 - 5, and the dominance was for the value of 4 at an average of 45.5%. As for the degree of purity (Chroma) ranged between 1-4 in the dry state, and the dominance was for a value of 2 and by 36.4% in the dry state, and for the wet state

Table 1. Morphological traits of the horizons of pedons, Basra province

Pedons number	Series	Horizon	Depth (cm)	Soil texture	Color	
					Dry	Wet
1	MM9	A	0-28	SIC	7.5 YR7/2	7.5YR5/2
		C ₁	28-71	SICL	7.5 YR7/2	7.5YR5/2
		C ₂	+113	SICL	2.5YR7/2	2.5YR5/2
2	MM11	A	0 – 25	SICL	5Y 7/2	5YR 4/2
		C ₁	25 – 78	SICL	10YR 6/3	10YR 5/3
		C ₂	+117	SICL	10YR 6/3	10YR 4/3
3	MW11	A	0 – 23	SIC	10YR 6/2	10YR 4/2
		C ₁	23 – 68	SIC	10YR 6/3	10YR 5/3
		C ₂	+120	SIC	10YR 7/2	10YR 5/2
4	DM76	A	0 – 34	CL	5Y 6/2	5Y 4/3
		C ₁	34 – 62	CL	10YR 7/2	10YR 5/2
		C ₂	+ 100	SICL	5Y 7/2	5Y 5/2
5	DM77	A	0 – 30	CL	5Y 6/2	5Y 4/3
		C ₁	30 – 65	CL	5Y 7/2	5Y 5/2
		C ₂	+110	C	2.5 Y 6/2	2.5Y 4/2
6	DM77	A	0 – 31	CL	10YR 6/2	10YR 5/3
		C ₁	34 – 68	CL	10YR 6/2	10YR 4/2
		C ₂	+113	CL	10YR 7/2	10YR 4/2
7	MM9	A	0 – 21	SIC	10YR 6/2	10YR 4/2
		C ₁	+ 90	SIC	2.5Y 7/2	2.5Y 5/2
		A	0 – 32	SIC	10YR 7/2	2.5Y 5/2

ranged between 1-3 and the dominance was for a value of 2 and by 63.6%. The study indicates dominance in this province was for the pale yellowish-brown colors with a percentage of 27.3% in the dry state, while in the wet state the dominance was for black-brown colors at an average of 27.3%.

Soil texture: The textures of soil materials for the horizons of the pedons of Basra province, represented by pedons 1-8, show that there is a difference in the textures of the pedons of the soils. Soils located in the Al-Shafi area and represented

by pedons 1-3 ranged in texture from soft SiC to medium texture SiCL, and the convergence in the textures of horizons indicates. The sedimentation conditions and the sediment source are similar, as well as the weak activity of the pedogenic processes. This is consistent with Young et al (1998). Texture of the pedons 4-6 located in the Al-Dair area, they were soft Texture SiC, CL and C, As for the pedons located in the Al-Mashab, represented by pedons 7 and 8, their textures ranged from soft to medium texture (SiCL, SiC,

Table 2. Morphological traits of the horizons of pedons Dhi Qar province

Pedons number	Series	Horizon	Depth (cm)	Soil texture	Color	
					Dry	Wet
9	DM17	A	0 – 20	C	2.5Y 4/2	2.5Y 3/3
		C ₁	20 – 35	C	2.5Y 6/2	2.5Y 4/2
		C ₂	35 – 81	SiC	2.5Y 6/2	2.5Y 4/2
10	TM1277	C ₃	+ 116	SiC	10YR 4/2	10YR 3/2
		A	0 – 24	C	10YR 3/2	10YR 2/2
		C ₁	24 – 43	C	10YR 4 /1	10YR 2/2
11	DM117	C ₂	43 – 87	SiC	2.5Y 5/2	2.5Y 3/2
		C ₃	+120	C	5Y6/2	5Y4/2
		A	0 – 22	C	2.5Y 5/3	2.5Y 3/3
12	DW117	C ₁	22– 46	SiC	10YR 5/2	10YR4/3
		C ₃	+ 99	C	10YR 6/3	2.5Y 4/2
		A	0 – 28	SiC	2.5Y 6/2	2.5Y 4/2
13	MM12	C ₁	28– 54	SiC	2.5Y 6/2	2.5Y 4/2
		C ₃	+ 115	C	10YR 6/2	10YR 4/2
		A	0 – 24	CL	10YR 6/2	5Y 4/2
14		C ₁	24– 72	C	5Y 6/2	5Y 4/2
		C ₃	+ 116	C	5Y 6/2	2.5Y 4/2
		A	0 – 30	CL	2.5Y 6/2	2.5Y 4/2

Table 3. Morphological traits of the horizons of pedons, Maysan province

Pedons number	Series	Horizon	Depth (cm)	Soil texture	Color	
					Dry	Wet
15	MP11	A	0 – 19	SiC	10YR 4/3	10YR 2/3
		C ₁	+ 41	SiC	10YR 4/1	10YR2/1
16	MP11	A	0 – 23	SiC	2.5Y 5/3	5Y 5/2
		C ₁	+ 50	SiC	10YR 5/4	2.5Y 4/2
17	MM12	A	0 – 25	C	7.5YR 5/4	5Y 4/2
		C ₁	+ 73	C	10YR 6/4	2.5YR 4/3
18	MP12	A	0 – 20	C	10YR 5/1	10YR 3/1
		C ₁	+65	C	5Y 7/2	5Y 5/2
19	MW12	A	0 – 18	SiC	2.5Y 6/2	2.5Y 4/2
		C ₁	18 – 57	C	5Y 6/2	5Y 4/2
		C ₂	+ 100	C	2.5Y 3/2	2.5Y 5/2

C). This shows that the dominance in the pedons was for silty clay texture (SIC) with 36.40%, then for the loam clay texture (CL) at an average of 27.30%. followed by silty clay loam texture with a percentage of 22.72%, for the clay texture with a percentage of 13.63%. The texture of the pedons of Dhi Qar province, represented by pedons 9-14, ranged between soft texture (C, CL, SIC) and medium texture (SICL). Thus the dominance in Pedons was for the clay texture type at 50%, then for the clay silty texture at an average of 35%, for the clay loam at an average of 10% and for clay silty loam at an average of 5%. The texture of horizons pedons-19 was soft texture (C, SIC), and the dominance of silty clay texture was 45.50% and for clay texture type was 45.50%.

Thickness of horizon: The results show variation in the thickness of the horizons of the Basra province, where the thickness of the horizons generally ranged between 30-20 m, with a percentage of 36.40% of the horizons, 31-50 cm at an average of 54.50%, greater than 50 cm at an average of 54.50% and greater than 50 cm at an average of 9.10%. This difference in the thickness of the horizons is due to the nature of the sedimentation process, and was observed that the lower horizons are thicker than the upper horizons, due to the variation in the amounts of sedimentary materials and the duration of sedimentation. The thickness of the horizons of the pedons of Dhi Qar province represented by the pedons 14-9 ranged between 30-10 cm and by 50% and 50-31 cm by 40% and greater than 50 cm by 10%. The variation in the thickness of the horizons is mainly due to the intensity of sedimentation processes and not to the case of variation in the impact of pedogenic processes, as they have limited activity in these soils due to the nature of the prevailing conditions in the study area, which do not help the activity of pedons processes (Al-Atab, 2008). In Maysan province, the thickness of the horizons for pedons ranged between 10-20 cm, with a percentage of 27.30%, and 50-21 cm.

CONCLUSIONS

Soils are undeveloped soils, and the components of the soil did not show a specific pattern in the distribution with depth, due to the weak activity of the pedogenic processes and the presence of an effect of the depth of the ground water and the land use factor in some characteristics of the study pedons.

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