DOMINANT TAXONOMIC UNITS AND TENTATIVE SOIL SERIES FOR MONOFIA GOVERNORATE

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ABSTRACT

Fifteen soil profiles representing the different soils of Monofia Governorate were chosen for this investigation. The studied soils were classified according to Soil Survey Staff (1998). The high levels were Typic Haplotorrerts, Vertic Torrifluvets, Typic Torrifluvents, and Typic Torripsamments. Tentative Soil Series in Monofia soils were performed as follows: Kafr El-Sharfa, El-Barina, Kors Shubra, Bshamy, Sakiat and Kofor El-Raml series

On the other hand the low taxonomic levels were; Fine montmorillonitic, thermic, typic Haplotorrerts.

Fine loamy, montmorillonitic , Thermic, Vertic Torriflurents.

Fine loamy, mixed, thermic, Typic Torrifluvents, and Sandy, Siliceous, theronic, Typic Torripsamments the soils of Kafr El-Sharafa soil Series were the majority in duded most soils in El-Manofia Governorate followed by Kors soil Series, wherease the other tentative soil Series were a minor.

Key words: Dominant Taxonomic, Tentative, Soil Series, Monofia, Representative Description, Parent material.

INTRODUCTION

Monofia Governorate is one of the Nile Delta Governorates located in the North of Cairo Governorate between the two Nile branches (Roseta and Demitta branches). The soils of Monofia Governorate has triagle shape, its base in the North beside El- Gharbia Governorate. The top of the triagle locates in the south beside Cairo Governorate. The base of the triagle is about 50 km, a height of about 60 km. The area of Monofia Governorate is 15142 km^2 i.e. about 365564 Feddan. The Monofia Governorate slopes are level and slope normally from east south to west north. According to **Soil Survey Studies (1960 s)** the soils were classified into two Great Groups, as the follows:

A- The first is the Recent Nile Alluvial soils which include the following soils:

I-Heavy textured soils including five soil types a namely:

1-Soils have deep heavy clayey textured and dark brown color.
2-soils have a clayey textured at the top and bottom of the soil profile, and, the middle is clay loam textured soil.
3- Soils have a clayey textured above loamy soil.
4-Soils have a clay texture with a depth reaching 120 cm from the surface above sandy loam or loamy sand.
5-Soils have clay loam texture in the surface soil above clay textured soil in the subsurface.

II- The medium textured included three soil types:

1-Soil have a clay loam or loamy through the whole profile.
2-Soils have clay texture in the surface above clay loam or loamy.
3-Soils have a loamy or clay loam texture above sandy soils.

III- Coarse Textured Soils included:

1-Soils have a sandy loam texture or loamy sand through the whole profile.
2-Soils have a clay texture in the surface soil above sandy loam or loamy sand.
3-Soils have a clay loam texture in the surface above loamy sandy or sandy loam.
4-Soils have a sandy texture through the whole profile.
5-Soils have a loamy or clay loam texture above sandy soil.

B- The second great group of subdeltaic Depositional soils include:

1. Soils have a sandy texture through the whole profile.
2. Soils have a clayey texture in the surface of the depth of 25 cm from the soil surface above sandy soil.

The soil series is the lowest category of the national soil classification system. The name of soil series or the phase of the soil series is the most homogenous classes in the system of taxonomy and the most common reference term used to name soil map unit.

The aim of this research is to classify the soils of Monofia Governorate to the tentative Soil Series.

MATERIALS AND METHODS

Based on **Soil Survey Studies (1960s)** fifteen soil profiles representing the different Nile deposits in Monofia Governorate were chosen and sampled according to **soil survey staff, (1962),** (Map 1). The different physical and chemical analysis, particle size distribution, were carried out using the intrenational pipete method **(Jackson, 1965)**, soluble ions according to **Richards (1954)**. PH was determined in the saturated soil paste according to **Richards (1954)**. Total carbonate for theatudied soil profiles was determined using Collin's calcimeter. Soil Taxonomy was for the studied soil profiles performed according to **soil survey staff, (1998)**.

RESULTS AND DISCUSSION

Taxonomic units:

I: The heavy textured recent Nile Alluvial soils in Monofia Governorate represented by the studied soil profiles Nos. 1-4 had a wide cracks in the soil surface of a wide more than 5 cm and depth of more than 50 cm., strong slickensides at C1 and C horizon. The studied soils have high clay contents up to 51.8% (Table 1) such soil characteristics are similar to that of the Vertisols soil order according to **Soil Survey Staff, (1998).** These soils had neither any diagnostic soil horizon, salic, calcic nor gypsic horizons. The electrical conductivity values were lower than 30.0dS/mwith calcium carbonate contents lower than 15.0% and gypsum less than 5.0% (Table 2). On this basis, these soils were classified as Typic Haplotorrerts. According to **Ramadan, (1978)** the dominant clay mineral in these studied soils is smectite. Therefore they were classified in the family taxa as clayey, montmorillonitic, thermic, Typic Haplotorrerts, (Table 3).

II: The medium textured soils of the Recent Nile Alluvial soils in Monofia Governorate represented by the studied soil profiles Nos.5-8 have a medium soil texture, whereas, the clay contents ranged between 25.3to 33.5 % at the control section layer of profiles Nos. 6-8. They had neither diagnostic horizon (salic, gypsic and calcic) nor pedogenic feature (slickensides). The studied soil profile No.5 have a clayey texture in the surface horizons A_P and C_1 horizons, (Table 1) and moderate slickensides in the C_1 horizon.

Map 1

Table (1) Some physical properties of the studied soils

Pr. No.	Horizon	Depth	Coarse sand	Fine sand	Silt	Clay	$CaCO_3$	Hydraulic Conductivity
1	A_P	0-25	3.5	23.9	19.3	47.3	1.5	0.37
	C_1	25-50	2.2	32.1	25.1	37.1	1.3	0.10
	C_2	50-100	1.3	15.7	25.3	51.8	2.1	0.2
	C_3	100-150	5.7	18.5	23.1	48.1	1.7	0.2
2	A_P	0-30	3.1	17.3	30.1	45.3	3.54	0.2
	C_1	30-60	2.5	17.1	35.3	40.0	1.7	0.1
	C_2	60-100	2.7	35.7	25.7	35.3	1.9	0.1
	C_3	100-150	3.5	18.1	33.9	40.1	2.1	0.2
3	A_P	0-20	5.1	47.1	12.5	35.3	2.5	0.2
	C_1	20-60	4.3	37.3	13.7	45.5	3.1	0.1
	C_2	60-150	2.5	25.1	21.1	46.7	2.7	0.1
4	A_P	0-25	3.5	23.1	25.1	45.3	2.5	0.1
	C_1	25-50	2.5	32.7	23.7	37.9	1.7	0.2
	C_2	50-100	1.5	15.3	30.1	47.3	2.3	0.1
	C_3	100-150	13.1	60.1	9.1	17.1	1.1	3.5
5	A_P	0-20	5.1	30.1	19.3	42.3	3.5	0.2
	C_1	20-50	3.3	35.3	27.7	30.1	1.7	0.3
	C_2	50-90	3.1	20.7	27.1	45.7	2.1	0.3
	C_3	90-150	4.5	20.1	21.1	41.5	1.3	0.2
6	A_P	0-25	3.5	51.7	13.1	28.3	3.5	0.3
	C_1	25-50	4.1	41.1	21.3	30.7	2.5	0.2
	C_2	50-100	4.5	45.3	17.1	29.3	3.1	0.2
	C_3	100-150	6.1	55.1	9.1	25.7	2.1	0.3
7	A_P	0-25	3.7	25.1	25.1	43.3	2.5	0.1
	C_1	25-50	5.3	37.7	19.1	33.5	2.3	0.1
	C_2	50-100	3.1	39.3	29.1	26.3	2.1	0.3
	C_3	100-150	3.0	27.1	41.1	25.5	1.7	0.3
8	A_P	0-25	2.5	45.3	19.1	27.3	2.3	0.2
	C_1	25-50	2.3	47.1	21.3	25.7	2.5	0.3
	C_2	50-120	3.5	53.7	13.1	25.3	1.7	0.3
	C_3	120-150	17.3	63.1	5.3	10.1	1.1	3.5
9	A_P	0-25	5.1	53.1	11.5	20.7	2.5	1.5
	C_1	25-50	3.5	61.7	9.3	21.5	3.7	3.1
	C_2	50-100	3.1	71.3	7.1	15.9	3.1	2.5
	C_3	100-150	2.9	73.5	3.1	17.1	1.9	2.3
10	A_P	0-25	5.5	31.3	19.1	39.3	1.5	0.1
	C_1	25-50	5.1	69.1	5.1	17.1	1.7	1.5
	C_2	50-100	13.7	65.5	3.5	13.7	1.3	1.7
11	A_P	0-30	5.1	39.7	21.1	30.3	2.5	1.3
	C_1	30-60	11.3	45.3	13.3	23.1	1.7	1.5
	C_2	60-100	9.1	65.1	8.1	15.3	1.3	3.3
	C_3	100-150	15.3	63.7	7.3	14.5	1.5	3.5
12	A_P	0-25	65.7	30.3	1.3	2.1	2.5	13.3
	C_1	25-50	91.3	9.1	1.1	1.5	1.3	11.1
	C_2	50-100	81.1	15.7	1.3	1.7	1.7	9.7
13	A_P	0-25	51.7	19.1	10.1	20.7	1.1	5.2
	C_1	25-60	75.3	17.3	1.5	5.1	0.7	11.1
	C_2	60-150	77.3	17.1	2.5	2.5	0.9	13.7
14	A_P	0-25	79.3	15.1	1.5	3.7	1.5	35.7
	C_1	25-70	71.7	17.3	5.1	3.3	1.7	37.9
15	A_P	0-20	35.3	15.1	10.3	39.1	1.0	1.5
	C	20-75	77.1	15.3	2.5	2.1	1.1	30.3

Table (2) Chemical analysis of the studied soils

Pr. No.	Horizon	Depth	pH	EC ds/m	Soluble ions						
					Co3	٣HCO	CL	Ca	Mg	Na	K.
1	AP	0-30	7.9	1.3	–	2.5	4.1	5.1	1.9	7.1	0.5
	C1	70-30	7.8	1.5	–	2.5	4.3	4.5	1.5	8.1	0.3
	C2	70-110	7.9	3.1	–	2.7	25.8	7.3	9.3	25.9	0.3
	C3	150-110	8.0	2.9	–	3.0	19.1	7.1	8.1	27.3	0.2
2	AP	0-30	7.9	3.5	–	2.5	17.3	9.1	5.1	20.1	1.5
	C1	30-60	8.0	4.0	–	3.0	21.5	11.3	6.2	25.3	0.9
	C2	60-100	8.1	3.7	–	3.0	19.7	7.3	3.5	21.7	0.9
	C3	100-150	8.3	2.5	–	3.5	15.1	5.9	2.7	17.3	1.1
3	AP	25-0	7.8	1.0	–	2.0	3.5	5.2	3.7	7.3	1.5
	C1	70-25	7.9	1.5	–	2.1	2.5	4.5	5.1	5.7	1.3
	C2	100-70	7.8	1.9	–	2.3	4.5	5.1	3.7	6.1	1.7
	C3	150-100	7.8	2.1	–	2.0	5.1	4.9	3.9	8.1	1.3
4	AP	30-0	7.9	2.1	–	2.0	7.1	9.1	5.1	9.1	1.3
	C1	30-60	7.8	3.5	–	2.0	5.7	5.3	3.1	7.2	1.5
	C2	60-100	8.1	2.5	–	2.0	6.3	5.1	3.5	8.1	1.1
	C3	100-150	٨.٠	٣.٠	-	٣.٠	٢٤.١	8.1	8.7	27.1	0.9
5	AP	٣٠-٠	٧.٩	٢.١	–	٢.٥	٩.١	٢.٥	١.٧	١٧.١	١.١
	C1	30-60	٧.٨	٣.١	–	٢.٠	١٣.٥	٥.٧	٣.٥	٢٥.٣	١.١
	C2	60-100	8.0	٤.١	–	٣.٥	١٧.٣	٥.١	٥.١	١٧.٣	١.١
	C3	100-150	8.0	3.0	–	3.5	14.0	5.3	3.6	26.1	١.٧
6	AP	٠-٢٥	٧.٧	٢.١	–	٢.٠	١١.١	٩.٣	٥.١	٢١.٣	١.٥
	C1	٢٥-٥٠	٧.٩	٣.١	–	٢.٠	١٥.٣	٩.١	٩.٣	١١.٣	١.٧
	C2	٥٠-١٠٠	٧.٩	٢.٧	–	٢.٥	١٩.٧	٧.٣	٥.٣	٢١.٣	٢.١
7	AP	٠-٣٠	٧.٩	٢.١	–	٧.١	٨.١	٢.٥	٧.١	٢.١	١.٥
	C1	٣٠-١٦٠	٧.٨	٢.٥	–	٦.٣	٩.٣	٥.١	٧.٣	٢.٥	١.٧
	C2	١٦٠-١٥٠	٧.٩	١.٥	–	٧.٣	٧.١	٣.٥	٩.١	٣.١	١.٣
٨	AP	٠-٣٠	٧.٩	١.٥	–	٢.٥	٥.١	٣.٥	٥.١	٥.١	١.٥
	C1	30-60	٨.١	٢.١	–	٣.٠	٥.٣	٧.٣	٤.٥	٥.٣	١.١
	C2	60-100	٨.٣	٣.٥	–	٣.٥	٧.٣	٧.١	٧.٣	٧.٩	١.٣
	C3	60-150	8.1	3.0	–	2.7	6.1	5.1	7.3	19.3	١.١
٩	AP	٠-٣٠	٧.٨	١.٥	–	٢.٥	٥.١	٥.١	٢.٥	٥.١	١.٥
	C1	٣٠-١٠٠	٧.٩	٢.١	–	٢.٥	٥.٣	٥.٣	٢.٧	٣.١	١.٣
	C2	١٠٠-١٥٠	٨.٣	٣.٥	–	٣.٠	٥.١	٥.١	٢.٣	٥.٧	٠.٩
١٠	AP	٠-٣٠	٧.٩	١.٣	–	٢.٥	٥.١	٥.٧	٢.٥	٨.١	١.٥
	C1	٣٠-١٠٠	٨.٠	٢.٧	–	٣.٠	٥.٣	٥.١	٢.٧	١١.٣	٠.٩
	C2	١٠٠-١٥٠	٨.٣	٢.٥	–	٣.٥	٦.٧	٧.٣	٥.١	١١.٧	١.٣
١١	AP	٠-٢٥	٧.٨	٢.٠	–	٢.١	٩.٣	٨.١	٥.١	٥.٣	١.٥
	C1	25-50	٧.٩	٢.٥	–	٢.٣	٩.٥	٩.٣	٩.٣	١٥.١	١.١
	C2	50-90	٧.٩	٣.٠	–	٣.٣	٧.٣	٦.٣	٩.١	٢١.٣	١.٣
	C3	90-100	8.0	3.0	–	2.5	11.5	10.1	١١.٥	22.1	1.5
١٢	AP	٠-٣٠	٨.١	٣.١	–	٣.٠	١٥.١	١٥.٣	٥.١	١٣.١	١.٥
	C1	٣٠-١٠٠	٨.٢	٣.٥	–	٣.٥	١٧.٣	١٣.١	٥.٧	١١.٣	٠.٩
	C2	١٠٠-١٥٠	٨.٣	٥.١	–	٣.٥	٢١.١	٢٣.٣	٧.٣	٢٥.٣	٠.٠٧
١٣	AP	٠-٣٠	٨.٠	١.٥	–	٣.٠	٧.١	٣.٥	٣.٧	١١.٣	١.٥
	C1	٣٠-١٠٠	٨.١	٢.٥	–	٣.٥	٩.١	٤.٥	٣.٥	٢١.٣	٠.٧
	C2	١٠٠-١٥٠	٨.٢	٣.٠	–	٣.٥	٩.٧	٥.١	٤.٥	٢٥.١	٠.٩
١٤	AP	٠-٣٠	٧.٩	٢.٥	–	٣.٠	١٠.١	١٢.١	٧.٣	١١.٧	١.١
	C1	٣٠-١٠٠	٧.٩	٣.٠	–	٣.٠	٩.٣	١٥.٧	٥.٥	١٣.٣	١.٠
	C2	١٠٠-١٥٠	٨.٠	٣.٥	–	٣.٥	١١.٣	١٣.٩	٦.١	١٥.٩	١.٣
١٥	AP	٠-٣٠	٧.٩	١.٩	–	٣.٠	٧.١	٣.٥	٣.٥	١٩.١	١.٥
	C	٣٠-٦٠	٨.٠	١.٧	–	٣.٠	٩.٣	٣.١	٥.٣	١٥.٣	١.٣

These slickensides did not qualify it as a vertisols soil because its horizon thickness was less than 25 cm. Therefore, this studied soil profile can be classified as Fine montmorillonitic, thermic, Vertic Torrifluvents according to **Soil Survey Stuff (1998).** Also, the studied soil profils No. 6-8 can be classified as Typic Torrifluvent in the higher taxa and fine loamy, montmorlonitic in the family taxa.

III: The coarse Textured Recent Nile Alluvial soils were represented by the soil profiles Nos.9-13. All studied soils neither have diagnostic horizon (salic, gypsic and calcic) nor pedogenic feature (slickensides). Therefore, they were classified under Entisols soil order. The studied soil profiles Nos.9 to 11 have sandy loam texture whereas, their clay contents ranged between 13.7% to 23.1% within the control section layer (Table 2). Therefore, they were classified as coarse loamy, mixed, thermic, Typic Torrifluvents, (Table 3).

On the other hand, the dominant soil texture in the studied soil profiles Nos.12-13 is sandy to loamy sand, therefore they were classified as Typic Torripsamments in the higher taxa level and sandy, siliceous, thermic in the lower level of family taxa, (Table 3).

IV: The soils of subdeltaic Deposits were represented by the two studied soil profiles Nos. 14 and 15 and which had no diagnostic soil horizon. Their sand contents reached up to 97.0 %, therefore, they were classified as Typic Torrpsamments in the higher taxa level and sandy, siliceous, thermic in the lower level of family taxa (Table 3).

Table (3) Soil Taxonomy of the studied soil profiles

Pr.No.	Taxonomy Unit
1-4	Fine, montmorillonitic, thermic, Typic, Haplotorrerts.
5	Fine loamy, montmorillonitic, thermic, Vertic torrifluvents
6-8	Fine loamy, montmorillonitic, thermic, Typic torrifluvents.
9-11	Coarse loamy, mixed thermic, Typic torrifluvents.
12-15	Sandy, siliceous, thermic, Typic torripsamments.

Soil Series:

According to **Soil Survey Staff, (1998)** the tentative Soil Series in Monofia Governorate can be classified as follows, (Map 2):

1) Kafr El Sharfa series: This soil series included most of the soils in Monofia Governorate. It has clay texture through the whole soil profile and they were represented by studied soil profiles Nos. 1,2,3 and 4.

Taxonomic unit: Fine, montmorillonitic, thermic Typic Haplotorrerts

Representative Description: Kafr El Sharfa clay with nearly level-cultivated by most crops, the clay contents ranged between 35.1 to 51.8%.

Ap- 0 to 30 m: Very dark brown (2/2), clay, weak angular blocky structure, moderate effervescence.

C-30 to 150 cm: Dark brown (3/3), clay, strong angular blocky Structure, moderate effervescence, few soft calcium carbonate, strong slikensides at depth of 30-80 cm of soil surface.

Parent material: Recent Nile Alluvial**. Land form** is flood plain.

Drainage and Permeability: moderately well drained. Permeability saturated hydraulic conductivity was moderately low.

Map 2

The studied soil profile No. 3 can be a phase of this series, where it has clay loam at the surface Ap horizon over clay texture.

2) Kors series: clay textured with clay loam layer of thcikness 30-50 cm in the middle under Ap horizon , represented by the studied soil profile No. 5.
Taxonomic unit: Fine loamy, montmorillonitic, thermic Vertic Torrifluvents.

Ap- 0 to 50 m : Very dark brown (2/2), clay, with clay contents ranged from 35.0% to 45.0%, weak angular blocky structure, moderate effervescence.

C1- 50 to 100 : dark brown (3/4), clay with clay contents ranged from 25.0 to 30.0%, moderate subangular blocky structure, moderate effervescence.

C2 – 100 to 150 cm : Very dark brown, clay, weak subangular blocky tructure, moderate effervescence.

Parent material: Recent Nile Alluvial. **Land form** is flood plain.

Drainage and Permeability: moderately well drained and moderately low saturated hydraulic conductivity.

3) Bshamy series: soils have medium soil textured, cultivated, represented by studied soil profile No. 6.

Taxonomic unit: Fine loamy, mixed thermic, Typic Torrifluvents Ap-0 to 30cm. Dark brown (3/3), clay loam, weak angular blocky, weak effervescence.

C- 30 to 150 cm. Brown(4/4), clay loam, moderate sunangular blocky, weak effervescence, clay contents ranged between 25.5 to 33.3%.

Parent material and land form: Recent Nile Alluvial, Levee.

Drainag and permeability: well drained, moderately low saturated hydraulic conductivity.

Locaton: Bshamy , Elshohda District .

4) Sakiat series: depositional soils has sandy loam texture .
Taxonamic unit: coarse loamy, mixed, thermic, Typic Torrifluvents. represented by the studied soil profile No. 9.

Representative Descriptin: Sakit sandy loam is level soils cultivated

Ap- 0 to 30cm. Yellowish brown (5/6), sandy loam, friable, massive, weak effervescence.

C- 30 to 150cm. Light yellowish brownish (6/4), sandy loam, friable, massive, weak effervescence.

Parent material and land form : Recent Nile Alluvial, Levee.

Drainage and permebability: well drained, moderately high saturated hydraulic conductivity.

Location: Sakiat abo shria, Ashmon District.

The studied soil profiles Nos. 10 and 11 can be a phase of this soil series wherease they have clayey texture and clay loam, at the surface Ap horizon, respectively, (Table1.)

5) El-Bariania series: this soil is sandy textured in the whole soil profile, represented by the studied soil profile No. 12.

Taxonamic class : Sandy, silicous, thermic, Typic Torripsamments.

Representative Descriptin : El-Barinia sandy is level soils

Ap- 0 to 35 cm: Yellowish brown (5/6), sandy, single grain.

C- 35 to 150cm: Yello (8/6), sandy, single grain, weak effervescence.

Parent material and land form: Recent Nile Alluvial, levees.

Drainage and permeability: somewhat excess, very high saturated hydrolic conductivity.

Location: El-Bariania, Ashmon District about 100 m from Roseta branch.

The studied soil profile No. 13 can be a phase of this soil series wherease it has loamy texture, at the surface Ap horizon over sandy texture.

6- Kofor EL-Raml series: This soil is medium textured through the whole soil profile, represented by the studied soil profile No.14. The course sand is the dominant fraction ranged between 71.7 to 79.3 %

Taxonomic unit: sandy, siliceous, thermic, Typic Torripsamments.

Representative Description: This soil is subdeltaic and sloping.

AP 0-20 Cm: Brownish (4/4), loamy, loose, single grain, moderate effervescence.

C 20-150 cm: Yellow (8/6), sandy loam, single grain, moderate effervescence.

Parent material and Land Form: Old Nile deposition and subdeltac soil

Drainage and Permeability: somewhat excess and very high saturated hydraulic conductivity.

Location: Kofor EL- Raml – Kosina District

The studied soil profile No.15 can be a phase of this soil series whereas, it has a clay texture at the surface A_P horizon over sandy texture through the whole profile layers.

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الوحدات التصنيفية والسائدة والسلاسل الارضية التجريبية فى محافظة المنوفية

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اختير لهذا البحث خمسة عشر قطاعا أرضيا تمثل الاراضي المختلفة في محافظة المنوفية وقد قسمت طبقا Soil Survey Staff (1998) وكانت Typic Haplotorrerts Torrifluvents ، Vertic Torrifluvents ، Typic Torripsaments وطبقا لهذا البحث فإنه يوجد ستة Soil Series تجريبية لاراضي محافظة المنوفية وهي: كفر الشرفا – قورص– بشامي– البرانية– ساقية وكفور الرمل كـ Series تجريبية لاراضي محافظة المنوفية.

وفى المقابل كانت مستويات التقسيم المنخفضة:

Fine montmorillonitic, thermic, Typic Haplotorrerts. Fine loamy, montmorillonitic, thermic, Vertic Torrifluvents Fine loamy, mixed, thermic, Typic Torrifluvents and Sandy, Siliceous, thermic, Typic Torrifluvents.

وكانت اراضى سلسلة كفر الشرفا هى الاوسع انتشاراً فى محافظة المنوفية يليها اراضى سلسلة كورس، بينما كانت باقى السلاسل المقترحة تشغل مساحات ثانوية.

DOMINANT TAXONOMIC UNITS AND TENTATIVE SOIL SERIES FOR MONOFIA GOVERNORATE

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ABSTRACT

Fifteen soil profiles representing the different soils of Monofia Governorate were chosen for this investigation. The studied soils were classified according to Soil Survey Staff (1998). The high levels were Typic Haplotorrerts, Vertic Torrifluvets, Typic Torrifluvents, and Typic Torripsamments. Tentative Soil Series in Monofia soils were performed as follows: Kafr El-Sharfa, El-Barina, Kors Shubra, Bshamy, Sakiat and Kofor El-Raml series

Key words: Dominant Taxonomic, Tentative, Soil Series, Monofia, Representative Description, Parent material.

INTRODUCTION

Monofia Governorate is one of the Nile Delta Governorates located in the North of Cairo Governorate between the two Nile branches (Roseta and Demitta branches). The soils of Monofia Governorate has triagle shape, its base in the North beside El- Gharbia Governorate. The top of the triagle locates in the south beside Cairo Governorate. The base of the triagle is about 50 km, a height of about 60 km. The area of Monofia Governorate is 15142 km^2 i.e. about 365564 Feddan. The Monofia Governorate slopes are level and slope normally from east south to west north. According to **Soil Survey Studies (1960 s)** the soils were classified into two Great Groups, as the follows:

C- The first is the Recent Nile Alluvial soils which include the following soils:

I-Heavy textured soils including five soil types a namely:

1-Soils have deep heavy clayey textured and dark brown color.
2-soils have a clayey textured at the top and bottom of the soil profile, and, the middle is clay loam textured soil.
3- Soils have a clayey textured above loamy soil.
4-Soils have a clay texture with a depth reaching 120 cm from the surface above sandy loam or loamy sand.
5-Soils have clay loam texture in the surface soil above clay textured soil in the subsurface.

II- The medium textured included three soil types:

1-Soil have a clay loam or loamy through the whole profile.
2-Soils have clay texture in the surface above clay loam or loamy.
3-Soils have a loamy or clay loam texture above sandy soils.

III- Coarse Textured Soils included:

1-Soils have a sandy loam texture or loamy sand through the whole profile.
2-Soils have a clay texture in the surface soil above sandy loam or loamy sand.
3-Soils have a clay loam texture in the surface above loamy sandy or sandy loam.
4-Soils have a sandy texture through the whole profile.
5-Soils have a loamy or clay loam texture above sandy soil.

D- The second great group of subdeltaic Depositional soils include:

3. Soils have a sandy texture through the whole profile.
4. Soils have a clayey texture in the surface of the depth of 25 cm from the soil surface above sandy soil.

The soil series is the lowest category of the national soil classification system. The name of soil series or the phase of the soil series is the most homogenous classes in the system of taxonomy and the most common reference term used to name soil map unit.

The aim of this research is to classify the soils of Monofia Governorate to the tentative Soil Series.

MATERIALS AND METHODS

Based on **Soil Survey Studies (1960s)** fifteen soil profiles representing the different Nile deposits in Monofia Governorate were chosen and sampled according to **soil survey staff, (1962)**. The different physical and chemical analysis, particle size distribution, were carried out using the intrenational pipete method **(Jackson, 1965)**, soluble ions according to **Richards (1954)**. PH was determined in the saturated soil paste according to **Richards (1954)**. Total carbonate for theatudied soil profiles was determined using Collin's calcimeter. Soil Taxonomy was for the studied soil profiles performed according to **soil survey staff, (1998)**.

RESULTS AND DISCUSSION

Taxonomic units:

I: The heavy textured recent Nile Alluvial soils in Monofia Governorate represented by the studied soil profiles Nos. 1-4 had a wide cracks in the soil surface of a wide more than 5 cm and depth of more than 50 cm., strong slickensides at C1 and C horizon. The studied soils have high clay contents up to 51.8% (Table 1) such soil characteristics are similar to that of the Vertisols soil order according to **Soil Survey Staff, (1998).** These soils had neither any diagnostic soil horizon, salic, calcic nor gypsic horizons. The electrical conductivity values were lower than 30.0dS/mwith calcium carbonate contents lower than 15.0% and gypsum less than 5.0% (Table 2). On this basis, these soils were classified as Typic Haplotorrerts. According to **Ramadan, (1978)** the dominant clay mineral in these studied soils is smectite. Therefore they were classified in the family taxa as clayey, montmorillonitic, thermic, Typic Haplotorrerts, (Table 3).

II: The medium textured soils of the Recent Nile Alluvial soils in Monofia Governorate represented by the studied soil profiles Nos.5-8 have a medium soil texture, whereas, the clay contents ranged between 25.3to 33.5 % at the control section layer of profiles Nos. 6-8. They had neither diagnostic horizon (salic, gypsic and calcic) nor pedogenic feature (slickensides). The studied soil profile No.5 have a clayey texture in the surface horizons A_P and C_1 horizons, (Table 1) and moderate slickensides in the C_1 horizon.

Table (1) Some physical properties of the studied soils

Pr. No.	Horizon	Depth	Coarse sand	Fine sand	Silt	Clay	$CaCO_3$	Hydraulic Conductivity
1	A_P	0-25	3.5	23.9	19.3	47.3	1.5	0.37
	C_1	25-50	2.2	32.1	25.1	37.1	1.3	0.10
	C_2	50-100	1.3	15.7	25.3	51.8	2.1	0.2
	C_3	100-150	5.7	18.5	23.1	48.1	1.7	0.2
2	A_P	0-30	3.1	17.3	30.1	45.3	3.54	0.2
	C_1	30-60	2.5	17.1	35.3	40.0	1.7	0.1
	C_2	60-100	2.7	35.7	25.7	35.3	1.9	0.1
	C_3	100-150	3.5	18.1	33.9	40.1	2.1	0.2
3	A_P	0-20	5.1	47.1	12.5	35.3	2.5	0.2
	C_1	20-60	4.3	37.3	13.7	45.5	3.1	0.1
	C_2	60-150	2.5	25.1	21.1	46.7	2.7	0.1
4	A_P	0-25	3.5	23.1	25.1	45.3	2.5	0.1
	C_1	25-50	2.5	32.7	23.7	37.9	1.7	0.2
	C_2	50-100	1.5	15.3	30.1	47.3	2.3	0.1
	C_3	100-150	13.1	60.1	9.1	17.1	1.1	3.5
5	A_P	0-20	5.1	30.1	19.3	42.3	3.5	0.2
	C_1	20-50	3.3	35.3	27.7	30.1	1.7	0.3
	C_2	50-90	3.1	20.7	27.1	45.7	2.1	0.3
	C_3	90-150	4.5	20.1	21.1	41.5	1.3	0.2
6	A_P	0-25	3.5	51.7	13.1	28.3	3.5	0.3
	C_1	25-50	4.1	41.1	21.3	30.7	2.5	0.2
	C_2	50-100	4.5	45.3	17.1	29.3	3.1	0.2
	C_3	100-150	6.1	55.1	9.1	25.7	2.1	0.3
7	A_P	0-25	3.7	25.1	25.1	43.3	2.5	0.1
	C_1	25-50	5.3	37.7	19.1	33.5	2.3	0.1
	C_2	50-100	3.1	39.3	29.1	26.3	2.1	0.3
	C_3	100-150	3.0	27.1	41.1	25.5	1.7	0.3
8	A_P	0-25	2.5	45.3	19.1	27.3	2.3	0.2
	C_1	25-50	2.3	47.1	21.3	25.7	2.5	0.3
	C_2	50-120	3.5	53.7	13.1	25.3	1.7	0.3
	C_3	120-150	17.3	63.1	5.3	10.1	1.1	3.5
9	A_P	0-25	5.1	53.1	11.5	20.7	2.5	1.5
	C_1	25-50	3.5	61.7	9.3	21.5	3.7	3.1
	C_2	50-100	3.1	71.3	7.1	15.9	3.1	2.5
	C_3	100-150	2.9	73.5	3.1	17.1	1.9	2.3
10	A_P	0-25	5.5	31.3	19.1	39.3	1.5	0.1
	C_1	25-50	5.1	69.1	5.1	17.1	1.7	1.5
	C_2	50-100	13.7	65.5	3.5	13.7	1.3	1.7
11	A_P	0-30	5.1	39.7	21.1	30.3	2.5	1.3
	C_1	30-60	11.3	45.3	13.3	23.1	1.7	1.5
	C_2	60-100	9.1	65.1	8.1	15.3	1.3	3.3
	C_3	100-150	15.3	63.7	7.3	14.5	1.5	3.5
12	A_P	0-25	65.7	30.3	1.3	2.1	2.5	13.3
	C_1	25-50	91.3	9.1	1.1	1.5	1.3	11.1
	C_2	50-100	81.1	15.7	1.3	1.7	1.7	9.7
13	A_P	0-25	51.7	19.1	10.1	20.7	1.1	5.2
	C_1	25-60	75.3	17.3	1.5	5.1	0.7	11.1
	C_2	60-150	77.3	17.1	2.5	2.5	0.9	13.7
14	A_P	0-25	79.3	15.1	1.5	3.7	1.5	35.7
	C_1	25-70	71.7	17.3	5.1	3.3	1.7	37.9
15	A_P	0-20	35.3	15.1	10.3	39.1	1.0	1.5
	C	20-75	77.1	15.3	2.5	2.1	1.1	30.3

Table (2) Chemical analysis of the studied soils

Pr. No.	Horizon	Depth	pH	EC ds/m	Soluble ions						
					Co3	HCO٣	CL	Ca	Mg	Na	K.
1	AP	0-30	7.9	1.3	–	2.5	4.1	5.1	1.9	7.1	0.5
	C1	70-30	7.8	1.5	–	2.5	4.3	4.5	1.5	8.1	0.3
	C2	70-110	7.9	3.1	–	2.7	25.8	7.3	9.3	25.9	0.3
	C3	150-110	8.0	2.9	–	3.0	19.1	7.1	8.1	27.3	0.2
2	AP	0-30	7.9	3.5	–	2.5	17.3	9.1	5.1	20.1	1.5
	C1	30-60	8.0	4.0	–	3.0	21.5	11.3	6.2	25.3	0.9
	C2	60-100	8.1	3.7	–	3.0	19.7	7.3	3.5	21.7	0.9
	C3	100-150	8.3	2.5	–	3.5	15.1	5.9	2.7	17.3	1.1
٣	AP	25-0	7.8	1.0	–	2.0	3.5	5.2	3.7	7.3	1.5
	C1	70-25	7.9	1.5	–	2.1	2.5	4.5	5.1	5.7	1.3
	C2	100-70	7.8	1.9	–	2.3	4.5	5.1	3.7	6.1	1.7
	C3	150-100	7.8	2.1	–	2.0	5.1	4.9	3.9	8.1	1.3
٤	AP	30-0	7.9	2.1	–	2.0	7.1	9.1	5.1	9.1	1.3
	C1	30-60	7.8	3.5	–	2.0	5.7	5.3	3.1	7.2	1.5
	C2	60-100	8.1	2.5	–	2.0	6.3	5.1	3.5	8.1	1.1
	C3	100-150	٨.٠	٣.٠	-	٣.٠	٢٤.١	8.1	8.7	27.1	0.9
٥	AP	٣٠-٠	٧.٩	٢.١	–	٢.٥	٩.١	٢.٥	١.٧	١٧.١	١.١
	C1	30-60	٧.٨	٣.١	–	٢.٠	١٣.٥	٥.٧	٣.٥	٢٥.٣	١.١
	C2	60-100	8.0	٤.١	–	٣.٥	١٧.٣	٥.١	٥.١	١٧.٣	١.١
	C3	100-150	8.0	3.0	–	3.5	14.0	5.3	3.6	26.1	١.٧
٦	AP	٠-٢٥	٧.٧	٢.١	–	٢.٠	١١.١	٩.٣	٥.١	٢١.٣	١.٥
	C1	٢٥-٥٠	٧.٩	٣.١	–	٢.٠	١٥.٣	٩.١	٩.٣	١١.٣	١.٧
	C2	٥٠-١٠٠	٧.٩	٢.٧	–	٢.٥	١٩.٧	٧.٣	٥.٣	٢١.٣	٢.١
٧	AP	٠-٣٠	٧.٩	٢.١	–	٧.١	٨.١	٢.٥	٧.١	٢.١	١.٥
	C1	٣٠-١٦٠	٧.٨	٢.٥	–	٦.٣	٩.٣	٥.١	٧.٣	٢.٥	١.٧
	C2	١٦٠-١٥٠	٧.٩	١.٥	–	٧.٣	٧.١	٣.٥	٩.١	٣.١	١.٣
٨	AP	٠-٣٠	٧.٩	١.٥	–	٢.٥	٥.١	٣.٥	٥.١	٥.١	١.٥
	C1	30-60	٨.١	٢.١	–	٣.٠	٥.٣	٧.٣	٤.٥	٥.٣	١.١
	C2	60-100	٨.٣	٣.٥	–	٣.٥	٧.٣	٧.١	٧.٣	٧.٩	١.٣
	C3	60-150	8.1	3.0	–	2.7	6.1	5.1	7.3	19.3	١.١
٩	AP	٠-٣٠	٧.٨	١.٥	–	٢.٥	٥.١	٥.١	٢.٥	٥.١	١.٥
	C1	٣٠-١٠٠	٧.٩	٢.١	–	٢.٥	٥.٣	٥.٣	٢.٧	٣.١	١.٣
	C2	١٠٠-١٥٠	٨.٣	٣.٥	–	٣.٠	٥.١	٥.١	٢.٣	٥.٧	٠.٩
١٠	AP	٠-٣٠	٧.٩	١.٣	–	٢.٥	٥.١	٥.٧	٢.٥	٨.١	١.٥
	C1	٣٠-١٠٠	٨.٠	٢.٧	–	٣.٠	٥.٣	٥.١	٢.٧	١١.٣	٠.٩
	C2	١٠٠-١٥٠	٨.٣	٢.٥	–	٣.٥	٦.٧	٧.٣	٥.١	١١.٧	١.٣
١١	AP	٠-٢٥	٧.٨	٢.٠	–	٢.١	٩.٣	٨.١	٥.١	٥.٣	١.٥
	C1	25-50	٧.٩	٢.٥	–	٢.٣	٩.٥	٩.٣	٩.٣	١٥.١	١.١
	C2	50-90	٧.٩	٣.٠	–	٣.٣	٧.٣	٦.٣	٩.١	٢١.٣	١.٣
	C3	90-100	8.0	3.0	–	2.5	11.5	10.1	١١.٥	22.1	1.5
١٢	AP	٠-٣٠	٨.١	٣.١	–	٣.٠	١٥.١	١٥.٣	٥.١	١٣.١	١.٥
	C1	٣٠-١٠٠	٨.٢	٣.٥	–	٣.٥	١٧.٣	١٣.١	٥.٧	١١.٣	٠.٩
	C2	١٠٠-١٥٠	٨.٣	٥.١	–	٣.٥	٢١.١	٢٣.٣	٧.٣	٢٥.٣	٠.٠٧
١٣	AP	٠-٣٠	٨.٠	١.٥	–	٣.٠	٧.١	٣.٥	٣.٧	١١.٣	١.٥
	C1	٣٠-١٠٠	٨.١	٢.٥	–	٣.٥	٩.١	٤.٥	٣.٥	٢١.٣	٠.٧
	C2	١٠٠-١٥٠	٨.٢	٣.٠	–	٣.٥	٩.٧	٥.١	٤.٥	٢٥.١	٠.٩
١٤	AP	٠-٣٠	٧.٩	٢.٥	–	٣.٠	١٠.١	١٢.١	٧.٣	١١.٧	١.١
	C1	٣٠-١٠٠	٧.٩	٣.٠	–	٣.٠	٩.٣	١٥.٧	٥.٥	١٣.٣	١.٠
	C2	١٠٠-١٥٠	٨.٠	٣.٥	–	٣.٥	١١.٣	١٣.٩	٦.١	١٥.٩	١.٣
١٥	AP	٠-٣٠	٧.٩	١.٩	–	٣.٠	٧.١	٣.٥	٣.٥	١٩.١	١.٥
	C	٣٠-٦٠	٨.٠	١.٧	–	٣.٠	٩.٣	٣.١	٥.٣	١٥.٣	١.٣

These slickensides did not qualify it as a vertisols soil because its horizon thickness was less than 25 cm. Therefore, this studied soil profile can be classified as Fine montmorillonitic, thermic, Vertic Torrifluvents according to **Soil Survey Stuff (1998).** Also, the studied soil profils No. 6-8 can be classified as Typic Torrifluvent in the higher taxa and fine loamy, montmorlonitic in the family taxa.

III: The coarse Textured Recent Nile Alluvial soils were represented by the soil profiles Nos.9-13. All studied soils neither have diagnostic horizon (salic, gypsic and calcic) nor pedogenic feature (slickensides). Therefore, they were classified under Entisols soil order. The studied soil profiles Nos.9 to 11 have sandy loam texture whereas, their clay contents ranged between 13.7% to 23.1% within the control section layer (Table 2). Therefore, they were classified as coarse loamy, mixed, thermic, Typic Torrifluvents, (Table 3).

On the other hand, the dominant soil texture in the studied soil profiles Nos.12-13 is sandy to loamy sand, therefore they were classified as Typic Torripsamments in the higher taxa level and sandy, siliceous, thermic in the lower level of family taxa, (Table 3).

IV: The soils of subdeltaic Deposits were represented by the two studied soil profiles Nos. 14 and 15 and which had no diagnostic soil horizon. Their sand contents reached up to 97.0 %, therefore, they were classified as Typic Torrpsamments in the higher taxa level and sandy, siliceous, thermic in the lower level of family taxa (Table 3).

Table (3) Soil Taxonomy of the studied soil profiles

Pr.No.	Taxonomy Unit
1-4	Fine, montmorillonitic, thermic, Typic, Haplotorrerts.
5	Fine loamy, montmorillonitic, thermic, Vertic torrifluvents
6-8	Fine loamy, montmorillonitic, thermic, Typic torrifluvents.
9-11	Coarse loamy, mixed thermic, Typic torrifluvents.
12-15	Sandy, siliceous, thermic, Typic torripsamments.

Soil Series:

According to **Soil Survey Staff, (1998)** the tentative Soil Series in Monofia Governorate can be classified as follows:

1) Kafr El Sharfa series: This soil series included most of the soils in Monofia Governorate. It has clay texture through the whole soil profile and they were represented by studied soil profiles Nos. 1,2,3 and 4.

Taxonomic unit: Fine, montmorillonitic, thermic Typic Haplotorrerts

Representative Description: Kafr El Sharfa clay with nearly level-cultivated by most crops, the clay contents ranged between 35.1 to 51.8%.

Ap- 0 to 30 m: Very dark brown (2/2), clay, weak angular blocky structure, moderate effervescence.

C-30 to 150 cm: Dark brown (3/3), clay, strong angular blocky Structure, moderate effervescence, few soft calcium carbonate, strong slikensides at depth of 30-80 cm of soil surface.

Parent material: Recent Nile Alluvial**. Land form** is flood plain.

Drainage and Permeability: moderately well drained. Permeability saturated hydraulic conductivity was moderately low.

The studied soil profile No. 3 can be a phase of this series, where it has clay loam at the surface Ap horizon over clay texture.

2) Kors series: clay textured with clay loam layer of thcikness 30-50 cm in the middle under Ap horizon , represented by the studied soil profile No. 5.
Taxonomic unit: Fine loamy, montmorillonitic, thermic Vertic Torrifluvents.

Ap- 0 to 50 m : Very dark brown (2/2), clay, with clay contents ranged from 35.0% to 45.0%, weak angular blocky structure, moderate effervescence.

C1- 50 to 100 : dark brown (3/4), clay with clay contents ranged from 25.0 to 30.0%, moderate subangular blocky structure, moderate effervescence.

C2 – 100 to 150 cm : Very dark brown, clay, weak subangular blocky tructure, moderate effervescence.

Parent material: Recent Nile Alluvial. **Land form** is flood plain.

Drainage and Permeability: moderately well drained and moderately low saturated hydraulic conductivity.

3) Bshamy series: soils have medium soil textured, cultivated, represented by studied soil profile No. 6.
Taxonomic unit: Fine loamy, mixed thermic, Typic Torrifluvents Ap-0 to 30cm. Dark brown (3/3), clay loam, weak angular blocky, weak effervescence.

C- 30 to 150 cm. Brown(4/4), clay loam, moderate sunangular blocky, weak effervescence, clay contents ranged between 25.5 to 33.3%.

Parent material and land form: Recent Nile Alluvial, Levee.

Drainag and permeability: well drained, moderately low saturated hydraulic conductivity.

Locaton: Bshamy , Elshohda District .

4) Sakiat series: depositional soils has sandy loam texture .
Taxonamic unit: coarse loamy, mixed, thermic, Typic Torrifluvents. represented by the studied soil profile No. 9.

Representative Descriptin: Sakit sandy loam is level soils cultivated

Ap- 0 to 30cm. Yellowish brown (5/6), sandy loam, friable, massive, weak effervescence.

C- 30 to 150cm. Light yellowish brownish (6/4), sandy loam, friable, massive, weak effervescence.

Parent material and land form : Recent Nile Alluvial, Levee.

Drainage and permebability: well drained, moderately high saturated hydraulic conductivity.

Location: Sakiat abo shria, Ashmon District.

The studied soil profiles Nos. 10 and 11 can be a phase of this soil series wherease they have clayey texture and clay loam, at the surface Ap horizon, respectively, (Table1.)

5) El-Bariania series: this soil is sandy textured in the whole soil profile, represented by the studied soil profile No. 12.

Taxonamic class : Sandy, silicous, thermic, Typic Torripsamments.
Representative Descriptin : El-Barinia sandy is level soils
Ap- 0 to 35 cm: Yellowish brown (5/6), sandy, single grain.
C- 35 to 150cm: Yello (8/6), sandy, single grain, weak effervescence.
Parent material and land form: Recent Nile Alluvial, levees.
Drainage and permeability: somewhat excess, very high saturated hydrolic conductivity.
Location: El-Bariania, Ashmon District about 100 m from Roseta branch.
The studied soil profile No. 13 can be a phase of this soil series wherease it has loamy texture, at the surface Ap horizon over sandy texture.

6- Kofor EL-Raml series: This soil is medium textured through the whole soil profile, represented by the studied soil profile No.14. The course sand is the dominant fraction ranged between 71.7 to 79.3 %
Taxonomic unit: sandy, siliceous, thermic, Typic Torripsamments.
Representative Description: This soil is subdeltaic and sloping.
AP 0-20 Cm: Brownish (4/4), loamy, loose, single grain, moderate effervescence.
C 20-150 cm: Yellow (8/6), sandy loam, single grain, moderate effervescence.
Parent material and Land Form: Old Nile deposition and subdeltac soil
Drainage and Permeability: somewhat excess and very high saturated hydraulic conductivity.
Location: Kofor EL- Raml – Kosina District
The studied soil profile No.15 can be a phase of this soil series whereas, it has a clay texture at the surface A_P horizon over sandy texture through the whole profile layers.

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الوحدات التصنيفية والسائدة والسلاسل الارضية التجريبية فى محافظة المنوفية

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معهد بحوث الاراضى والمياه والبيئة – مركز البحوث الزراعية

اختير لهذا البحث خمسة عشر قطاعا أرضيا تمثل الاراضي المختلفة في محافظة المنوفية وقد قسمت طبقا Soil Survey Staff (1998) وكانت Typic Haplotorrerts، Typic Torrifluvents ، Vertic Torrifluvents ، Typic Torripsaments وطبقا لهذا البحث فإنه يوجد ستة Soil Series تجريبية لاراضي محافظة المنوفية وهي: كفر الشرفا –قورص– بشامي– البرانية– ساقية وكفور الرمل كـ Series تجريبية لاراضي محافظة المنوفية.