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DISTRIBUTION OF HUMIC AND FULVIC ACIDS IN ALLUVIAL AND CALCAREOUS SOILS

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ABSTRACT: *This study was carried out to study the content and vertical distribution of organic matter, humic and fulvic acids within different layers of soil profile so six soil profiles were taken from different locations. The first three profiles were taken from Kafer El-Sheikh Governorate varied in their salinity and alkalinity. These locations were Teba 1 Village and Teba 7 Village of El-Hamoul Center and Kafer El-Marazka Village of Kaleen Center. The other three profiles were taken from different three location of El-Amiria Center varied in their content of calcium carbonate ($CaCO_3$)The locations of the latter three profiles were located in Maryout Research Station, Hosha 13, 18 and El-Amiria (Alexandria Governorate). The first three soil profiles represented the alluvial soils and the others were represented the calcareous soils.*

The obtained data show that, the soil contents of humic acids were decreased with the increase of soil depth but the content of fulvic acid was increased with the increase of soil depth up to 80 cm and decreased at more depth. The content of both humic and fulvic acids in alluvial soil profiles was higher than that found in calcareous soil profiles. Also, the content of humic acids in alluvial and calcareous soils was higher than that of fulvic acids.The content of both total acidity and functional groups of humic and fulvic acids in alluvial and calcareous soils were decrease of with increaseing of the soil depth and generally the value of total acidity and function groups in fulvic acids were higher than those of humic acids.

Key words: *Humic acid, Fulvic acid, Distribution, Total acidity, Functional groups, Alluvial and calcareous soils.*

INTRODUCTION

The vertical distribution of organic matter (OM) within the soil profile is mainly a consequence of differences in OM inputs at different depths, vertical relocation and decay of OM. Above ground biomass leads to OM inputs at the soil surface, whereas roots and rhizodeposition lead to inputs at depth. Movement of OM in the soil profile is the result of different mechanisms, including bioturbation, percolation of dissolved OM and organo-mineral colloids, macropore transport of particulate OM and in arable soil, tillage operations (Amundson and Baisden, 2000).

Remaury1 and Benmouffok (1999) found an increase of fulvic acids content in deep ranker horizons and in the spodic horizons. A notable increase in humic acids was also observed in the dark spodic horizon and the origin of these high molecular weight organic substances in high-altitude ecosystems is discussed.

Abou Hussien (1999) studied the effect of cultivation period of banana plant grown on alluvial soil of El-Kanter El-Khairia, Kaliobiya Governorate on humic and fulvic acids and its vertical distribution within soil profiles. The obtained results showed that, the content of both humic and fulvic acids and also the ratio of HA/FA were decreased with the increase of soil depth. The contents of HA and FA and the ratio of HA/FA were more related with the cultivation period.

Donisa *et al.*, (2003) found that, the HA fraction mainly comprised large molecules, while the FA and hydrophilic were composed of small molecule. In the andosols the fractions of organic carbon extracted with pyrophosphate were significantly higher than in podzols and cambisols. . The fulvic fraction is dominating especially in the B-horizon of podzols and andosols while for cambisols the ratio HA/FA fraction is almost the same on the whole profile.

The aims of this study were to Study the distribution of soil organic matter and humic and fulvic acids therefore it was very necessary to make an attempt to Determine the chemical composition of humic and fulvic acids isolated from different layers of alluvial and calcareous soil profiles.

MATERIALS AND METHODS.

This study was carried out on the soil samples taken from six soil profiles. The first three profiles were taken from Kafer El-Sheikh Governorate varied in their salinity and alkalinity. These locations were Teba 1 Village and Teba 7 Village of El-Hamoul Center and Kafer El–Marazka Village of Kaleen Center. The other three profiles were taken from different three location of El-Amiria Center varied in their content of calcium carbonate ($CaCO_3$) The locations of the latter three profiles were located in Maryout Research Station, Hosha 13, 18 and El-Amiria (Alexandria Governorate). Soil samples of each soil profile were taken at soil depth (0-20, 20-40, 40-60, 60-80, 80-100,100-120, 120-140 cm). The soil collected samples were air dried ground to pass through a 60 mesh sieve and stored in plastic bags for chemical analysis. Total soluble salts (EC), soluble cations and anions, organic matter content (OM), cation exchange capacity (CEC), and soil reaction (pH) were determined according to Cottenie *et al* (1982). Calcium carbonate content (%) was determined volumetrically using the calcimeter method, (Black *et al*, 1965). The physical and chemical characteristic of the soil are shown in Tables (1 and 2).

Table (1). Some chemical properties of the studied alluvial soil profiles.

Location	Soil depth (cm)	E.C, dSm-1/ at 25°C	pH 1:2.5 Soil=water Suspension	Soluble ions, meq/l								CaCO₃ (%)	O.M (%)	CEC, meq/100g soil
				Cations				Anions						
				Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}			
Kafer El-Marazka Vallage	0-20	1.9	7.14	4.6	4.7	7.2	2.5	0	0.4	16.5	2.1	2.1	2.2	43.5
	20-40	2.3	7.15	6.4	5.8	8.2	2.5	0	0.4	20.5	2.1	1.5	20	38.5
	40-60	2.3	7.34	2.4	7.8	11.3	1.5	0	0.5	18.9	3.6	0.6	1.3	37.0
	60-80	2.3	7.37	6.2	9.2	12.5	1.0	0	0.7	18.7	3.6	0.6	1.8	34.5
	80-100	2.5	7.71	8.7	10.2	14.0	1.0	0	0.8	18.0	6.2	0.9	1.5	33.0
	100-120	3.1	7.78	8.7	16.1	15.6	1.5	0	0.8	23.1	7.1	0.3	1.3	26.0
	120-140	3.8	7.86	7.1	18.2	17.8	1.6	0	1.0	29.0	8.0	1.8	1.5	25.0
Teba 1 Village	0-20	28.9	7.60	92.0	31.2	163.5	2.3	0	1.5	195.1	92.4	1.5	2.5	53.0
	20-40	52.3	7.61	110.2	67.5	322.4	2.9	0	1.8	410.1	111.1	0.3	1.8	42.5
	40-60	53.7	7.61	113.4	90.5	328.6	4.5	0	1.0	413.6	122.4	1.8	1.3	47.0
	60-80	56.4	7.62	142.7	101.3	314.5	5.5	0	2.0	430.3	131.7	0.0	1.5	29.0
	80-100	59.1	7.54	171.8	121.6	291.2	6.4	0	2.2	443.5	145.3	0.0	1.5	25.5
	100-120	62.4	7.56	179.5	139.7	298.4	6.4	0	2.2	467.2	154.6	0.0	1.6	17.0
	120-140	63.5	7.72	198.3	159.2	270.9	6.6	0	2.1	473.3	159.6	0.0	1.5	15.5
Teba 7 Village	0-20	21.8	7.90	55.6	26.5	134.9		0	1.3	145.3	71.4	1.2	2.0	51.0
	20-40	22.9	7.91	59.5	31.6	135.8	1.0	0	1.6	153.7	73.7	0.0	1.4	38.5
	40-60	25.6	7.97	62.5	40.5	150.6	2.1	0	2.0	164.6	89.4	0.0	1.4	28.0
	60-80	26.0	8.03	90.8	50.1	116.7	2.4	0	1.6	165.7	92.7	0.0	1.7	26.0
	80-100	33.1	8.07	110.4	58.7	158.6	2.4	0	1.8	224.0	105.2	0.0	1.3	26.5
	100-120	35.5	8.12	119.5	59.4	171.5	3.3	0	2.0	231.4	121.6	0.0	1.6	14.5
	120-140	37.6	8.21	129.9	68.2	172.7	4.6	0	2.4	250.3	123.3	0.0	1.7	13.0

Table (2). Some chemical properties of the studied calcareous soil profie.

Location	Soil depth (cm)	E.C, dSm-1/ at 25°C	pH 1:2.5 Soil=water Suspension	Soluble ions, meq/l								CaCO$_3$ (%)	O.M (%)	CEC, meq/ 100g soil
				Cations				Anions						
				Ca++	Mg++	Na+	K+	CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}			
Hosha 13	0-20	10.3	8.02	45.3	12.1	44.6	1.0	0	2.0	58.4	42.6	16.7	1.2	39.5
	20-40	6.1	8.05	23.5	9.8	26.5	1.2	0	2.1	26.5	32.4	20.4	0.5	27.0
	40-60	6.1	8.13	26.7	9.8	23.5	1.0	0	2.3	26.2	32.5	22.9	0.5	14.5
	60-80	9.8	8.18	40.2	11.5	43.9	2.4	0	1.8	73.9	22.3	26.0	0.5	18.0
	80-100	8.6	8.16	35.6	10.2	37.9	2.3	0	1.9	48.7	35.4	32.1	0.4	13.5
	100-120	8.3	8.21	35.6	10.2	35.4	1.8	0	2.4	56.1	24.5	61.8	0.4	12.0
	120-140	9.1	8.24	50.3	11.8	27.1	1.8	0	2.6	60.0	28.4	62.9	0.3	13.5
Hosha 18	0-20	6.6	8.03	24.6	11.6	28.8	1.0	0	1.4	32.9	31.7	17.9	1.2	32.0
	20-40	7	8.07	27.8	12.2	29.4	0.6	0	1.4	37.2	31.5	20.4	0.5	25.0
	40-60	6.1	8.12	21.6	12.1	26.0	1.3	0	1.7	23.5	35.8	20.5	0.4	19.5
	60-80	8.6	8.17	37.8	13.5	33.2	1.5	0	1.6	48.5	35.9	21.6	0.4	19.0
	80-100	8.2	8.23	37.8	13.5	28.1	2.6	0	1.7	44.9	35.4	46.4	0.4	15.0
	100-120	8.5	8.25	40.1	14.6	28.7	1.6	0	1.8	46.5	36.7	48.2	0.3	15.5
	120-140	8.4	8.26	39.4	11.2	32.0	1.4	0	1.5	44.3	38.2	47.7	0.3	12.0
El -Amiria	0-20	8.9	7.90	33.4	9.2	45.6	0.9	0	1.2	49.2	38.6	14.0	1.2	39.5
	20-40	7.3	8.20	29.5	9.4	33.1	1.0	0	1.5	39.0	32.5	24.7	1.0	29.0
	40-60	8.1	8.22	34.7	9.7	35.0	1.6	0	1.6	42.6	36.8	29.1	0.3	14.5
	60-80	6.6	8.27	25.3	8.2	31.1	1.4	0	1.2	37.6	27.2	26.0	0.5	14.5
	80-100	4.7	8.36	17.2	7.2	21.6	1.0	0	1.1	30.7	15.2	43.3	0.3	13.5
	100-120	4.3	8.37	17.2	7.2	8.4	10.2	0	1.0	24.6	17.4	43.3	0.4	16.0
	120-140	9.5	8.92	35.6	11.4	45.7	2.3	0	1.3	54.3	39.4	45.7	0.3	16.5

Humic substances were isolated and fractionated from the above soil samples using the method described by Posner (1966) as following: 100 g portion of each samples were mixed with 500 ml of 0.5 *N* NaOH and also 1 ml of saturated $SnCl_2$ solution was added to prevent oxidation of organic matter. The mixture was shaken for 3 hours, and then left to stand overnight and the supernatant humic substance was isolated by centrifugation for 20 minutes at 6000 rpm. The isolated humic substances were fractionated by acidification of the supernatant to pH 1.5 with 1.0 *N* HCl. The acidic solution was left overnight. The acid-soluble fraction was the fulvic acid (FA), whereas the acid-insoluble fraction was the humic acid (HA) (Kononova, 1966).

The fulvic acid was separated from the humic acid by centrifugation of acid solution at 6000 rpm for 20 minutes. The isolated HA and FA were purified and analyzed for its content of total acidity and functional groups according to (Kukhareko, (1937), (Brooks et al, (1958), (Dragunova, (1958), (Chen et al, 1978), (Kononova, 1966), (Schnitzer and Khan, 1978) and (Holder and Griffith. 1983).

RTESULTS AND DISCUSSION

The presented data in Table (3) and Fig (1) show that the alluvial soil content (mg/kg) of HA and FA and its distribution within different layers of soil profiles. The data show that, the content of HA was decreased with increasing of soil depth. The highest HA content was found in Kafer El-Marazka Village soil profile followed by the samples of Teba 1 Village soil profile. This trend was in harmony with the soil content of OM. On the other hand, the alluvial soil content of FA was increased up to the depth of 60 to 80 cm and at more depth this content was decreased with increasing of soil depth. At the same depth of each soil profile especially in the upper layers the results concluded that, FA was more down movement compared with HA Calderan (1982).

The highest content of HA was found in the samples of Kafer El-Marazka Village soil profile followed by that found in the samples of Teba 1 Village soil profile. These data was more related with the soil content of OM. On the other, hand the highest content of FA was found in the samples of Teba 7 Village soil profile followed by that found in the samples of Teba 1 Village soil profile. These results may be attributed to the dissolved effect of high salinity of these soils for organic matter (Stevenson, 1994).

The recorded Table (4) and Fig (2) show that the content (mg/kg) of both HA and FA in different layers of the studied calcareous soil profile. The content was varied and this variation depended on soil location and soil depth. The three profiles of calcareous soils under study are characterized by low content of both HA and FA. These resultes are attributed to the high degree of soil organic matter decomposition under calcareous soil condition.

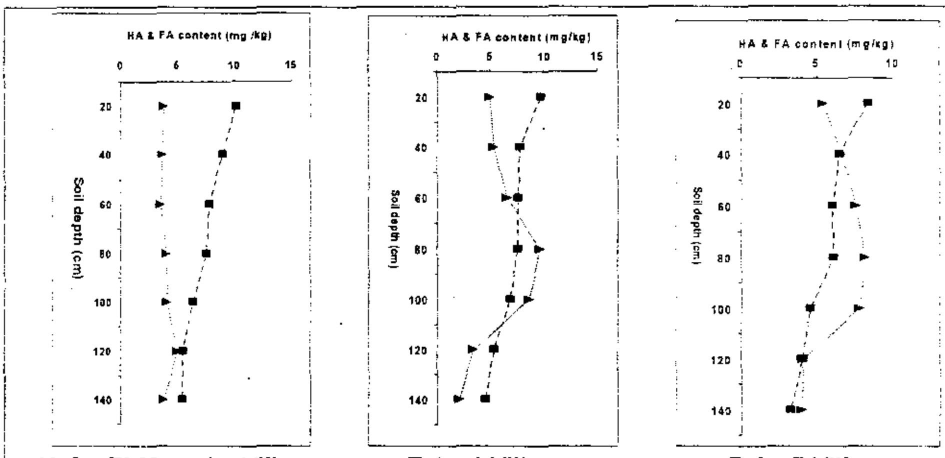
The content of HA was decreased with the increase of soil depth. The content of FA was decreased after that. This trend was found in the three soil profile under study. This migration of FA may be resulted from the high values of soil pH which converted soil organic matter to soluble humate (Calderan 1982, Stevenson, 1982 and 1994).

Table (3). Humic and fulvic (HA and FA) acids content and its distribution within different layers of alluvial soil profiles.

Location	Soil depth (cm)	Humic acid (HA)			Fulvic acid (FA)			HA/FA ratio
		mg/kg soil	g/100g soil	%of total OM	mg/kg soil	g/100g soil	%of total OM	
Kafer El -Marazaka Village.	0-20	10.06	0.00101	0.046	3.74	0.00037	0.017	2.69
	20-40	8.92	0.00089	0.045	3.71	0.00037	0.019	2.40
	40-60	7.77	0.00078	0.060	3.49	0.00035	0.027	2.23
	60-80	7.53	0.00075	0.094	4.05	0.00041	0.051	1.86
	80-100	6.29	0.00063	0.042	4.04	0.00040	0.027	1.56
	100-120	5.43	0.00054	0.042	5.04	0.00050	0.039	1.08
	120-140	5.38	0.00054	0.036	3.81	0.00038	0.025	1.41
Mean		7.34	0.00073	0.052	3.98	0.00040	0.029	1.89
Teba 1 Village	0-20	9.65	0.00096	0.039	4.90	0.00049	0.020	1.97
	20-40	7.74	0.00077	0.043	5.32	0.00053	0.030	1.45
	40-60	7.46	0.00075	0.057	6.41	0.00064	0.049	1.16
	60-80	7.50	0.00075	0.050	9.64	0.00096	0.064	0.78
	80-100	6.74	0.00067	0.045	8.60	0.00086	0.057	0.78
	100-120	5.31	0.00053	0.033	3.42	0.00034	0.021	1.55
	120-140	4.48	0.00045	0.030	2.06	0.00021	0.014	2.17
Mean		6.98	0.00070	0.042	5.77	0.00058	0.036	1.41
Teba 2 Village	0-20	8.28	0.00083	0.041	5.38	0.00054	0.027	1.54
	20-40	6.43	0.00064	0.046	6.56	0.00066	0.047	0.98
	40-60	5.99	0.00060	0.043	7.56	0.00076	0.054	0.79
	60-80	6.08	0.00061	0.046	8.12	0.00081	0.048	0.75
	80-100	4.50	0.00045	0.036	7.74	0.00077	0.060	0.58
	100-120	3.99	0.00040	0.035	4.00	0.00040	0.025	1.00
	120-140	3.20	0.00032	0.019	3.98	0.00040	0.023	0.80
Mean		5.50	0.00055	0.035	6.19	0.00062	0.041	0.92

Table (4). Humic and fulvic (HA and FA) acids content and its distribution within different layers of calcareous soil profiles.

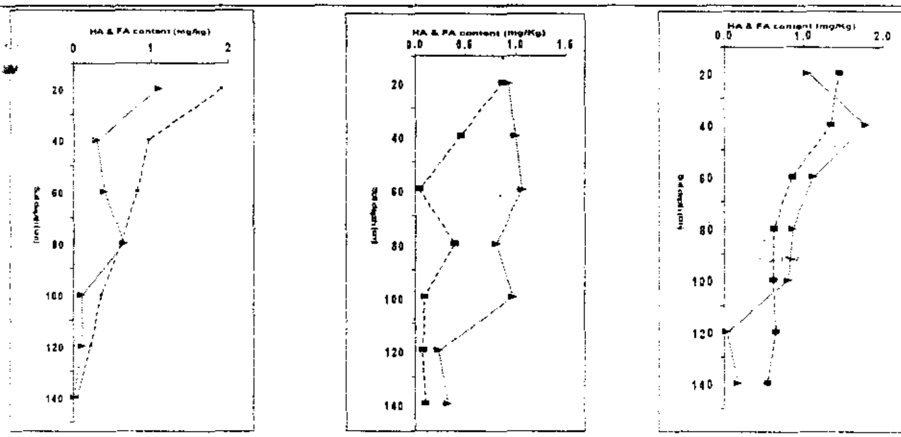
Location	Soil depthy (cm)	Humic acid (HA) mg/kg soil	Humic acid (HA) g/100g soil %	Humic acid (HA) %of total OM	Fulvic acid (FA) mg/kg soil	Fulvic acid (FA) g/100g soil %	Fulvic acid (FA) %of total OM	HA/FA ratio
Hosha 13	0-20	1.90	0.00019	0.0159	1.11	0.00011	0.009	1.72
	20-40	0.96	0.00010	0.0192	0.29	0.00289	0.577	3.33
	40-60	0.82	0.00008	0.0164	0.40	0.00403	0.805	2.04
	60-80	0.61	0.00006	0.0122	0.65	0.00647	1.294	0.94
	80-100	0.36	0.00004	0.0089	0.11	0.00108	0.269	3.32
	100-120	0.21	0.00002	0.0053	0.10	0.00103	0.257	2.08
	120-140	0.05	0.00001	0.0017	0.00	0.00003	0.009	18.81
Mean		0.70	0.00007	0.0104	0.38	0.00223	0.459	4.61
Hosha 18	0-20	0.87	0.00009	0.0072	0.92	0.00925	0.771	0.94
	20-40	0.45	0.00005	0.0090	0.99	0.00990	1.979	0.46
	40-60	0.04	0.00000	0.0010	1.06	0.01062	2.654	0.04
	60-80	0.39	0.00004	0.0097	0.81	0.00806	2.014	0.48
	80-100	0.09	0.00001	0.0023	0.97	0.00969	2.422	0.10
	100-120	0.07	0.00001	0.0024	0.23	0.00231	0.770	0.31
	120-140	0.10	0.00001	0.0033	0.32	0.00323	1.076	0.30
Mean		0.29	0.00003	0.0050	0.76	0.00578	1.669	0.37
El - Amiria	0-20	1.44	0.00014	0.0120	1.04	0.01036	0.864	1.39
	20-40	1.33	0.00013	0.0133	1.77	0.01767	1.767	0.75
	40-60	0.85	0.00008	0.0282	1.12	0.01119	3.730	0.76
	60-80	0.61	0.00006	0.0122	0.85	0.00849	1.698	0.72
	80-100	0.61	0.00006	0.0204	0.81	0.00805	2.684	0.76
	100-120	0.63	0.00006	0.0159	0.02	0.00022	0.054	29.49
	120-140	0.54	0.00005	0.0181	0.16	0.00162	0.541	3.35
Mean		0.86	0.00009	0.0171	0.82	0.00823	1.620	5.32



Kafer El-Marazka Village | Teba 1 Village | Teba 7 Village

Fig (1). Humic and fulvic acids content and distribution within different layers of alluvial soil profiles.

(---■---■---■---) Humic acid. (....▲....▲...▲...) Fulvic acid.



Hosha 13 | Hosha 18 | El- Amiria

Fig (2). Humic and fulvic acids content and distribution within different layers of calcareous soil profiles.

(---■---■---■---) Humic acid. (....▲....▲...▲...) Fulvic acid.

In most studied soil samples, the content of HA was higher than that of FA (Table 4). These resultes may be attributed to the high faster rate of soil organic matter humification under especially calcareous soil condition. The high content of HA was found in the samples of Hosha 13 soil profile followed by that of samples of Hosha 18 soil profile. On the other hand, the high content of FA was found in the samples of El-Amiria soil profile followed by that found in the samples of Hosha 13 soil profile. The vertical distribution of HA in these soil profiles was in harmony with the content of OM (Stevenson, 1982 and 1994). Generally the alluvial soil content of OM, HA and FA was higher than that found at the same soil depth of calcareous soil (Mcdonald *et al,* 2006) and (Peuravuori *et al,* 2001).

Data recorded in tables (5 and 6) show that the content of total acidity and functional groups (meq/g acid) of humic and fulvic acids isolated from different layers of alluvial and calcareous soil profiles. These data show that. The content of total acidity of FA was higher than that found in HA. This trend was found in all studied soil samples of alluvial and calcareous soil profiles. The increase in the total acidity with decreasing of molecular weight (FA) is constant with an increasing degree of oxidation and openness of the structure of low molecular weight fraction (Chen *et al,* 1977, Stevenson et al, 1994 and Abou Hussein (1999).

Similar results were obtained by Mishra and Srivastrava (1990). Higher acidity of fulvic acid than of corresponding humic acid attributable to higher amount of COOH and phenolic–OH groups. Also the higher content of total acidity and carboxyl groups of humic or fulvic acids may be attributed to the inherent difference in chemical composition and molecular weight of organic matter as a result of increasing oxidation (Chen *et al.,* 1977).

The total acidity of HA and FA in both alluvial and calcareous soil profiles was decreased with increasing of soil depth. These .The humification degree of soil organic matter was increased with the increase of soil depth. These results are in agreement with the findings of Sarmah and Bordoioi (1993) and Abou Hussien (1999). At the same depth of soil profiles, the content of total acidity of both HA and FA were from alluvial soil was lower than that found of acids isolated from calcareous soil. Also, these result indicate to the high degree of soil organic matter humification under alluvial soil conditions compared with that of calcareous soil. The high total acidity content of both HA and FA isolated from alluvial soil profiles was found in samples of Teba 1 Village soil profiles followed by that found in the samples of Teba 7 Village soil profiles. Also, according to this content, the three studied soil profiles of calcareous soil can be arranged as follows Hosha 13 > El-Amiria > Hosha 18.

Regarding to the isolated HA and FA contents of COOH (meq/g), the tabulated data (Tables 5 and 6) show that, this content was decreased with increasing of soil depth, also this content of FA was higher than that of HA at the same depth of each soil profile. These results were found in both alluvial and calcareous soil. The COOH group of HA and FA isolated from calcareous

Table (5). Total acidity and functional groups (meq/g) of humic and fulvic acids isolated from different layers of alluvial soil profiles

Location	Soil depth (cm)	Humic acid					Fulvic acid				
		Total acidity	COOH	Total OH	Phenolic OH	Alkoholic OH	Total acidity	COOH	Total OH	Phenolic OH	Alkoholic OH
Kafer El-Marazkha Vilaage	0-20	4.25	2.98	2.85	1.27	1.58	5.75	3.28	3.46	2.48	0.98
	20-40	4.12	2.98	2.71	1.14	1.57	5.65	3.15	3.31	2.50	0.81
	40-60	3.87	2.74	2.54	1.13	1.41	5.65	3.15	3.21	2.50	0.71
	60-80	3.67	2.61	2.44	1.06	1.38	5.30	2.97	2.91	2.33	0.58
	80-100	3.51	2.51	2.31	1.00	1.31	5.10	2.81	2.85	2.29	0.56
	100-120	3.41	2.44	2.20	0.97	1.23	5.12	2.72	2.77	2.40	0.37
	120-140	3.11	2.21	2.12	0.90	1.22	4.92	2.54	2.45	2.38	0.07
Teba 1 Village	0-20	4.75	2.97	3.75	1.78	1.97	5.94	3.00	3.98	2.94	1.04
	20-40	4.45	2.71	3.61	1.74	1.87	5.83	2.94	3.73	2.89	0.84
	40-60	4.31	2.65	2.58	1.66	0.92	5.68	2.84	3.53	2.84	0.69
	60-80	4.01	2.54	2.25	1.47	0.78	4.78	2.71	3.42	2.07	1.35
	80-100	3.84	2.44	1.83	1.40	0.43	4.50	2.54	3.21	1.96	1.25
	100-120	3.61	2.37	1.50	1.24	0.26	4.38	2.54	3.01	1.84	1.18
	120-140	3.12	2.01	1.42	1.11	0.31	3.75	2.31	2.54	1.44	1.10
Teba 7 Village	0-20	4.71	3.00	2.68	1.71	0.97	5.50	3.74	4.01	1.76	2.25
	20-40	4.42	2.84	2.47	1.58	0.89	5.38	3.63	3.97	1.75	2.22
	40-60	3.94	2.74	2.05	1.21	0.85	5.23	3.53	3.85	1.70	2.16
	60-80	3.88	2.21	1.93	1.67	0.26	5.19	3.51	3.49	1.68	1.81
	80-100	3.78	2.20	1.83	1.58	0.25	4.45	3.12	3.02	1.33	1.69
	100-120	3.41	2.11	1.50	1.30	0.20	4.21	3.03	2.75	1.19	1.57
	120-140	2.10	1.90	0.37	0.20	0.17	4.01	2.93	2.07	1.09	0.98

Table (6). Total acidity and functional groups (meq/g) of humic and fulvic acids isolated from different layers of calcareous soil profiles.

Location	Soil depth (cm)	Humic acid					Fulvic acid				
		Total acidity	COOH	Total OH	Phenolic OH	Alkoholic OH	Total acidity	COOH	Total OH	Phenolic OH	Alkoholic OH
Hosha 13	0-20	6.48	3.15	4.87	3.33	1.54	7.91	4.37	5.26	3.54	1.72
	20-40	6.01	3.00	4.61	3.01	1.60	7.84	4.45	5.01	3.39	1.62
	40-60	5.87	3.83	3.34	2.04	1.30	7.48	4.45	4.75	3.03	1.72
	60-80	5.38	3.41	3.00	1.97	1.03	6.55	3.21	4.58	3.34	1.24
	80-100	4.87	2.37	3.13	2.50	0.63	6.27	3.03	4.43	3.25	1.18
	100-120	4.51	2.31	2.78	2.20	0.58	5.14	2.91	3.26	2.23	1.03
	120-140	4.37	2.17	2.61	2.20	0.41	5.03	2.90	3.08	2.13	0.95
Hosha 18	0-20	4.65	2.42	3.37	2.23	1.14	5.63	3.28	4.18	2.35	1.83
	20-40	4.47	2.31	3.21	2.16	1.05	5.48	3.15	4.06	2.33	1.73
	40-60	4.35	2.12	3.11	2.23	0.88	5.37	3.15	3.36	2.22	1.14
	60-80	4.21	1.94	2.96	2.27	0.69	5.11	2.84	3.13	2.27	0.86
	80-100	4.03	1.84	2.88	2.19	0.69	4.97	2.61	3.08	2.36	0.72
	100-120	3.91	1.71	2.40	2.20	0.20	4.30	2.13	2.87	2.17	0.70
	120-140	3.81	1.66	2.21	2.15	0.06	4.01	2.41	2.01	1.60	0.41
El- Amiria	0-20	5.82	3.01	3.47	2.81	0.66	6.60	3.35	4.18	3.25	0.93
	20-40	5.74	2.94	3.31	2.80	0.51	6.43	3.21	4.08	3.22	0.87
	40-60	5.32	2.61	3.20	2.71	0.49	6.15	3.01	3.98	3.14	0.84
	60-80	5.13	2.54	3.00	2.59	0.41	6.05	3.30	3.23	2.75	0.48
	80-100	4.45	2.01	2.78	2.44	0.34	5.80	3.50	2.76	2.30	0.46
	100-120	4.35	2.15	2.37	2.20	0.17	5.75	3.40	2.61	2.35	0.26
	120-140	4.15	1.94	2.25	2.21	0.04	5.40	3.28	2.34	2.13	0.22

soil samples was higher than that found with HAs and FAs isolated from the samples of alluvial soil. The content of COOH group of HAs and FAs under study varied from soil profiles to another. So, according to this content, the three alluvial soil profiles took the order of soil profile of Kafer El-Marazkha Village > Teba 7 Village > Teba 1 Village for HA and was soil profiles of Teba 7 Village > Kafer El-Marazkha Village > Teba 1Village for FA. On the other hand, according to the content of COOH group, the studied three profiles of calcareous soil take the order soil profiles of Hosha 13 > El-Amiria > Hosha 18 for both HA and FA.

Isolated HA and FA of total-OH, phonolic-OH and alcoholic OH groups as recorded in Tables (5 and 6) show that, in all studied soil profiles, the content of these groups was decreased with increasing of soil depth. Also, this content which found with FAs was higher than that found with HAs isolated from the same sample. Also, the content of these groups of HAs and FAs isolated from calcareous soil samples was higher than the content found with HAs and FAs isolated from the samples of alluvial soil. Finnally it can be conculded that, the content of the previous three functional groups was varied from soil profiles to another which may resulted from the differences within these profiles as the content of OM, CEC, $CaCO_3$, EC, soluble ions and local conditions of each soil profile. These results are in argreement with the findings of Abou Hussien, (1991 and 1999), Abou El-Fadle, (1992) and Siweed, (2005) where they reported that, HA and FA content of total acidity and functional groups varied according to the isolation sources and extraction method.

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توزيع أحماض الهيومك والفالفيك فى الاراضى الرسوبية والجيرية

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الملخص العربى

إجريت هذة الدراسة بهدف دراسة محتوى والتوزيع الرأسى للمادة العضوية واحماض الهيومك والفالفيك فى طبقات القطاعات المختلفة وتم اختيار ستة قطاعات ، ثلاث قطاعات منهم ممثلة للاراضى الرسوبية من محافظة كفر الشيخ تم أختيارهم على أساس الاختلاف فى درجة الملوحة والقلوية وكان القطاع الاول والثانى من مركز الحامول (قرية طيبة ١ وقرية طيبة ٧) أما القطاع الثالث من مركز قيلن (قرية كفر المرازقة). أما بالنسبة للثلاث قطاعات الاخرى فكانت ممثلة للاراضى الجيرية وتم أختيارهم على أساس الاختلاف فى محتواهم من كربونات الكالسيوم فى ثلاث مناطق مختلفة من منطقة العامرية بمحافظة الاسكندرية وكان القطاع الاول والثانى منهم من محطة بحوث مريوط (حوشة ١٣ وحوشة ١٨) والقطاع الثالث من مركز العامرية.

ولقد وجد أن توزيع حامض الهيومك يقل دائما مع العمق أما بالنسبة لحامض الفالفيك فكان تزداد قيمته مع زيادة العمق حتى عمق ٨٠ سم ثم يقل بعد ذلك مرة أخرى . كما وجد أن محتوى الاراضى الرسوبية من حامض الهيومك وحامض الفالفيك أكبر من الاراضى الجيرية. وكان محتوى الارض الرسوبية والجيرية من حامض الهيومك اكبر من محتواها من حامض الفالفيك.

كما وجد أن محتوى الاراضى الجيرية من الحموضة الكلية والمجاميع الكلية لاحماض الهيومك والفالفيك أكبر مما فى الأراضى الرسوبية ، كما قل محتوى أحماض الهيومك والفالفيك من الحموضة الكلية والمجاميع الفعالة فى كل من الاراضى الرسوبية والجيرية مع العمق وأعلى القيم كانت فى الطبقات السطحية من القطاعات وأقل القيم فى أدنى طبقات القطاع وبصفة عامة كان محتوى حامض الفالفيك من الحموضة الكلية والمجاميع الفعالة أكبر من حامض الهيومك.