PEDOGEOCHEMISTRY OF HORTIC ANTHROSOL FROM COPOU GREENHOUSE – IASI (II)

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Abstract

The mineralogy of anthrosol from Copou greenhouse – Iasi is dominated by clay minerals that appears in a variety of types and occurrence forms, and has specific variations on profile. Amorphous clay minerals are subordinate to the crystalline, and their share is higher than in case of ordinary soils. Smectites, illlites and kaolinite are representative clay minerals, and subordinate may appear: halloysite, hydromicas, glauconite etc. Carbonates are limited as type, but very varied as occurrence forms. Are dominant the crystalline carbonates, calcite has the major share and subordinated may appear: dolomite, siderite and a variety of basic carbonates (generally amorphous). Iron oxides and oxy-hydroxides have relative low contents, the crystalline varieties are mainly represented by magnetite, and those amorphous by hematite, göethite and lymonite. The total content of organic matter is higher (compared with ordinary soils), and its dynamic has a particular character. Non-humic organic compounds have unexpectedly high contents and include a wide variety of compounds. In humus composition, dominants are huminic acids, but the fulvic acids are unexpectedly high. On profile, the fulvic acids contents increased to values comparable with huminic acids content – case of bottom horizons. Correlated with these variations the humus character is changed: from mull type humus – top horizons, to mull-calcic humus, and then moder type – bottom horizons.

Key words: hortic anthrosol from protected area, pedogeochemistry, pedogeochemical segregation, frangipane

Literature requires the absence of summarizing papers that to be directly addressed to the issues of the soils pedogeochemistry from protected areas. Studies from recent years, although different target cases, have allowed the general aspects on pedogenesis and pedogeochemistry of soils from protected areas (Filipov F. et al., 2004; 2008; Filipov F., 2005; Secu C.V., Patrichi C.V., 2007; Bulgariu D. et al., 2010): (**i**) frequent and intense changes of soils profile (especially in the top horizons); (**ii**) relative high variation of chemical-mineralogical components; (**iii**) formation at depth of 30–50 cm of compact horizon, with particular structure and chemical-mineralogical composition, that in some conditions can evaluated on proto-frangipane and even frangipane; (**iv**) high values of saturation degree of bases, of accessible phosphorus and of the ratio between huminic and fulvic acids; (**v**) particular dynamic of organic matter and distribution processes of macro- and micro-chemical elements; (**vi**) evolution of pedogeochemical processes in conditions of some "quasi-close systems", with thermal regime and almost constant humidity, but with high average values – under these conditions the decomposition and mineralization of organic matter arising faster and print of humification processes different mechanism compared with ordinary soils; (**vii**) fertilization with generally large doses of mineral and organic fertilizers which determined the sever changes of pedogeochemical processes dynamic and pedological characteristics of soils – by uncontrolled evolution of these processes, in some cases can be initialled degradation processes with faster evolutions and negative effects on soils quality.

Unlike other soils, the chemical-mineralogical composition of soils from protected areas is reflected in a lesser extent in the parental material composition. The antropic, frequent and intense modifications, determined changes of the "normal" pedogenesis and the initiations of some neo-pedogenesis processes that prints a particular aspect of topo-sequences from these soils, and of minerals associations and paragenesis, respectively

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(Secu C.V., Patrichi C.V., 2007; Filipov F. et al., 2008; Bulgariu D. et al., 2010).

Our studies, presented in this paper provide some new data related to the mineralogy and pedogeochemistry of anthrosol from Copou greenhouse – Iasi, issues less addresses in the literature. A special attention was paid to the evolution of chemical-mineralogical equilibriums, in the conditions of soils from protected areas, and the correlation between these and processes of pedogeochemical segregation, salinization and neo-pedogenesis , respectively.

MATERIAL AND METHOD

Our studies were performed on soils samples collected from two profiles from Copou greenhouse – Iasi, across the middle bay No. 16, about 50 cm (IS.1 profile) and about 1.00 m (IS. 2 profile), towards the heating register. The data related to the profiles localization, general characteristics, texture and physic-chemical conditions of antrosol were presented in a previous paper (Bulgariu D. şi colab., 2012).

Chemical-mineralogical composition of soils was determined on the basis of studies and analysis conducted by: (**i**) X-ray diffraction – power method, CuKα radiation, (40 kV, 30 mA), X-ray diffractometer Philips model (Whitting L.D., Allardice W.R., 1996); the results being interpreted in relation to data from Powder Diffraction File (Jenkins R. şi colab., 1988); (**ii**) IR spectrometry – pellet method in KBr (White J.L., Roth C.B., 1986), FT-IR Bruker Vertex 7.0 Spectrometer, in 350–4500 cm^{-1} spectral domain, and the results were processed by de-convolution spectra method (Zou M.-Y., Unbehauen R., 1995) with Opus 6.5 and ACDLab. Spec 5.25 software, and interpreted in relation to spectra of references materials from databases accessible on-line; (**iii**)differential thermal analysis – Netzsch TG.209 thermo-balance, Pt crucible, reference: α-Al_2O_3, normal atmosphere, 2.5^oC / min. (Tan K.H. et al., 1986); (**iv**) microscopic studies – optic microscope MEYJ model, on thin section (polyepoxydic resin), in natural and polarized light, scanning by transmission and reflexion Cady J.G. et al., 1986); (**v**) chemical analysis – performed on raw soil samples and mineral concentrates obtained by fractionation (isodynamic magnetic method and heavy liquid method) of soil samples (McBride M.B., 1986; Dean J.A., 1995; Jackson M.L. et al., 1996; Lăcătuşu R., 2000).

Non-humic organic compounds were extracted with dichloretane / methanol and fractioned on chromatographic column with silicagel (70-320 mesh), inactivated with n-hexane. Identification and determination of organic compounds from extracted fractions was performed by gas chromatography (GC-FID) with a HP 5972 chromatograph (Schnitzer M., Schuppli P., 1989; Swift R.S., 1996).

Humus was analyzed after soluble organic compounds (by successive extraction with toluene, 95 % ethylic alcohol and mixture toluene – ethylic alcohol 1:1, 10 mL / extraction), by separation with $Na_2P_2O_7$ 0.1 M–NaOH 0.1 M (pH=13) mixture and potentiometric titration in extract (Aiken G.R. et al., 1985; Pansu M., Gautheyrou J., 2003). The humus fractionation was done according with the method describe by Swift R.S. (1996). On extracted organic fractions have been performed chemical analysis and microscopic and IR spectrometry studies. In determining of the type and content of humus components were correlated the results of these analyzes.

RESULTS AND DISCUSSION

● Clay minerals appear in relative wide variety of types and occurrence forms, have an average of 44.54 % on the bay and characteristic variation on profile. Total content of clay minerals increases in the profile, and decrease with the distance from heating register. As dominant varieties are crystalline clay minerals (*tab.1*). Amorphous clay minerals are subordinated to crystalline, but their shape at the mineralogical composition of anthrosol is significant. There is a strong tendency of amorphous clay minerals to accumulate in Ahok(x) horizon, and a slow decrease with distance from heating register.

In the anthrosol from Copou greenhouse – Iasi, the clay minerals are three types of genetics: (**i**) primary clay minerals – formed by parental minerals weathering in other conditions than in greenhouse; (**ii**) secondary clay minerals from first generation – formed by transformation in greenhouse conditions of some primary minerals (feldspars, biotite, chlorites, etc.); (**iii**) secondary clay minerals from second generation – formed from primary clay minerals and pedogenetic minerals from first generation.

The clay minerals representative for the anthrosol from Copou greenhouse – Iasi are smectites, illites and kaolinite, subordined can appear: halloysit, hydromice, vermicullite, dickite, beidellite, glauconite etc.

The distribution and association way of smectites, illites and kaolinite on profile is different – the smectites have an accumulation tendency in the Ahok(x) horizon, and kaolinites and illites have an antagonist distribution towards to smectites; synchronous with smectites varied amorphous clay minerals.

Smectites (montmorillonite, subordinated: beidellite) have an average share on bay of 15.54 %, and manifest an accentuated accumulation tendency in Ahok(x) horizon. Montmorillonite: (**i**) appear as compact masses associated with illites, kaolinite and subordinate beidellite; (**ii**) in Ahok(x) horizon is frequently associated with silicates gels; (**iii**) can form: (**a**) deposits with unifying role in the inter-granular spaces; (**b**) compact deposits where are embedded primary minerals grains, (**c**) in the association with oolite aspect, (**d**) in the pseudomorphoses after lymonitic glauconite (top horizons); (**iv**) is well developed in Ahok(x) horizon and in bottom horizons, and is under represented in the top horizons; (**v**) can easily switch from colloidal phase in organic-mineral complexes (very sensitive equilibrium to changes of physical-chemical conditions from soil).

Illites (illite; subordinate: hydromicas, beidellite) have a close share to smectites, but antagonist distribution tends. Illite: (**i**) appear as spherical or lenticular aggregates associated with iron oxides and oxy-hydroxides and organic matter; (**ii**) are formed by weathering of potassium feldspars, biotite and muscovite (first generation) or by transformation other clay minerals (second generation); (**iii**) illite from first generation is well developed in bottom horizons (weak alkaline and weak reducing media); (**iv**) illite from second generation is better developed in the top horizons (weak alkaline and moderate oxidizing media); (**v**) by hydration can be transformed in montmorillonite; (**vi**) correlations illites – montmorillonite and illites – kaolinite indicate a cyclic reversibility of transformation and not a direct reversal of the three clay minerals in conditions of hortic antrosol from Copou greenhouse.

Table 1

Mineralogical composition of anthrosol from Copou greenhouse – Iasi. Clay minerals

Horizons#	ΔH; cm	TCM	CCM		ACM		Kaolinite		Smectites		Illites		OCCM
			$\%^{FF}$	$\%^{TCM}$	$\%^{FF}$	$\%^{TCM}$	$\%^{FF}$	$\%^{TCM}$	$\%^{FF}$	$\%^{TCM}$	$\%^{FF}$	$\%^{TCM}$	$\%^{TCM}$
IS.1 PROFILE													
Apk1	0 - 6	41.71	38.13	91.42	3.57	8.57	7.67	18.39	13.84	33.18	15.98	38.33	1.52
Apk2	6 - 14	40.35	37.08	91.90	3.26	8.09	7.50	18.59	14.01	34.72	14.68	36.39	2.18
Ahok(x)1	14 - 25	44.77	39.93	89.17	4.84	10.82	6.75	15.08	18.32	40.92	13.91	31.08	2.08
Ahok(x)2	25 - 48	47.70	39.98	83.81	7.71	16.18	3.42	7.17	21.71	45.51	12.65	26.53	4.59
BCk	48 - 56	44.26	40.29	91.05	3.96	8.94	6.78	15.32	17.03	38.48	15.78	35.65	1.58
ABk	56 - 62	47.67	43.33	90.90	4.33	9.09	8.48	17.79	16.48	34.56	17.50	36.71	1.81
Ck	62 - 75	50.73	47.25	93.13	3.48	6.86	9.83	19.37	15.44	30.44	21.19	41.76	1.53
Average on profile		*45.31*	*40.86*	*90.20*	*4.45*	*9.79*	*7.20*	*15.96*	*16.69*	*36.83*	*15.96*	*35.21*	*2.18*
Average on TH		*42.27*	*38.38*	*90.83*	*3.89*	*9.16*	*7.30*	*17.35*	*15.39*	*36.27*	*14.86*	*35.27*	*1.93*
Average on BH		*47.55*	*43.63*	*91.69*	*3.92*	*8.30*	*8.36*	*17.50*	*16.32*	*34.49*	*18.15*	*38.04*	*1.64*
IS.2 PROFILE													
Apk1	0 - 5	40.00	37.30	93.24	2.70	6.75	8.54	21.36	14.01	35.01	13.88	34.70	2.15
Apk2	5 - 12	40.55	37.50	92.46	3.05	7.53	8.33	20.56	12.19	30.06	16.39	40.43	1.40
Ahok(x)1	12 - 21	41.77	36.55	87.51	5.21	12.48	7.32	17.52	13.96	33.43	14.46	34.63	1.91
Ahok(x)2	21 - 40	48.60	42.33	87.10	6.26	12.89	4.61	9.49	21.31	43.84	14.40	29.63	4.13
BCk	40 - 60	45.13	39.52	87.56	5.61	12.43	7.98	17.68	13.10	29.03	17.48	38.74	2.10
Ck	60 - 75	46.61	42.86	91.95	3.75	8.04	11.40	24.45	11.85	25.44	19.01	40.78	1.27
Average on profile		*43.78*	*39.34*	*89.97*	*4.43*	*10.02*	*8.03*	*18.51*	*14.40*	*32.80*	*15.94*	*36.48*	*2.16*
Average on TH		*40.77*	*37.12*	*91.07*	*3.65*	*8.92*	*8.06*	*19.81*	*13.38*	*32.83*	*14.91*	*36.59*	*1.82*
Average on BH		*45.87*	*41.19*	*89.75*	*4.68*	*10.24*	*9.69*	*21.07*	*12.48*	*27.23*	*18.24*	*39.76*	*1.68*
SPAN													
Average on span		44.54	40.10	90.08	4.44	9.91	7.62	17.23	15.54	34.82	15.95	35.85	2.17
Average on TH		41.52	37.75	90.95	3.77	9.04	7.68	18.58	14.39	34.55	14.89	35.93	1.87
Average on BH		46.71	42.41	90.72	4.30	9.27	9.02	19.28	14.40	30.86	18.20	38.90	1.66
Average Ahok(x)2 horizon		48.15	41.15	85.46	6.99	14.53	4.01	8.33	21.51	44.68	13.53	28.08	4.36

#Notations according with SRTS-2003 (Florea N., Munteanu I., 2003). TCM – total content of clay minerals. CCM – crystalline clay minerals. ACM – amorphous clay minerals. OCCM – other crystalline clay minerals (appear subordinate to kaolinite, smectites and illites – see in text). $\%^{FF}$ – gravimetrical percents reported to fine fraction of soil (< 2.00 mm). $\%^{TCM}$ – percents from total clay minerals content. TH – top horizons. BH – bottom horizons.

Candites (kaolinite; subordinate: halloysite, dickite) have a subordinate share to smectites and illites and a distribution tends on profile similar illites, but antagonist smectites. On span, kaolinite has an average share of 7.62 %, and on profile, the kaolinite content varied similar with illites. Kaolinite: (**i**) appear as compact masses formed from granular aggregates, associated with montmorillonite and halloysite; (**ii**) kaolinite from first generation is associated with feldsprs and feldspatoides, and those from second generation is associated with montmorillonite; (**iv**) has higher share in bottom horizons (acid conditions, weak reducing), being frequently associated with dikite in the binder of soil aggregates (*tab. 1*).

● Carbonates are generally limited as type, but very varied as occurrence forms. The total content of carbonates varied in a relative large interval (*tab. 2*), have an average content on span by 4.93 % and on profile present an accumulation tendency in the bottom horizons. As varieties, dominants are crystalline carbonates, and the major share at the total content of carbonates has calcite. Subordinate can appear: dolomite, rhodochrosite and siderite (in bottom horizons); a mixes carbonate $Ca(Mg,Fe)(CO_3)_2$ (possible ankerite) and a large variety of basic carbonates (generally amorphous). Calcite: (**i**) appear as: (**a**) micro-granular aggregates associated with soluble salts or clay minerals in the matrix of soil aggregates; (**b**) normal granular aggregates formed, probably, by chemical precipitation or re-crystallization of calcite amorphous gels; (**ii**) in inter-granular spaces from Apk, BCk and Ck horizons appear low oolitic depositions (2–5 mm) associated with variable quantities of sulphates, amorphous silica and phosphates.

Siderite ($FeCO_3$) was identified only in bottom horizons, is on pedogenetic nature and appears as component of some spheluric formations, micro-nodules (with dimensions of 1–5 mm) associated with calcite, manganese oxides and amorphous silica. In these micro-nodules, the siderite has graduated transitions on chlorite, lymonite and hematite. They genesis is correlated with weak acid – weak reducing media and bicarbonate, or carbonatation of iron oxy-hydroxides from bottom horizons.

Table 2

Mineralogical composition of hortic antrosol from Copou greenhouse – Iasi

Horizons#	ΔH; cm	Carbonates				Silica (SiO_2)				Iron oxy-hydroxides			
		Total; $\%^{FF}$	Cryst.; $\%^{FF}$	Amorph.		Total; $\%^{FF}$	Cryst.; $\%^{FF}$	Amorph.		Total; $\%^{FF}$	Cryst.; $\%^{FF}$	Amorph.	
				$\%^{FF}$	$\%^{TCarb.}$			$\%^{FF}$	$\%^{TSi}$			$\%^{FF}$	$\%^{FeOx}$
IS.1 PROFILE													
Apk1	0 - 6	4,38	2.93	1.44	33.01	5.86	4.91	0.94	16.16	2.72	0.89	1.82	67.04
Apk2	6 - 14	4,10	3.08	1.01	24.74	5.33	4.01	1.32	24.85	3.04	0.72	2.32	76.19
Ahok(x)1	14 - 25	2,82	2.39	0.43	15.27	4.99	3.61	1.38	27.72	3.44	0.60	2.84	82.44
Ahok(x)2	25 - 48	2,19	1.88	0.31	14.35	7.61	2.15	5.45	71.65	3.85	0.21	3.64	94.45
BCk	48 - 56	8,94	7.65	1.29	14.45	6.25	2.28	3.97	63.47	2.91	0.67	2.24	76.95
ABk	56 - 62	4,25	3.44	0.80	18.91	2.88	0.89	1.98	68.84	2.02	0.18	1.83	90.72
Ck	62 - 75	10,69	9.60	1.09	10.21	5.85	3.74	2.11	36.05	2.63	0.75	1.87	71.14
Average on profile		*5,34*	*4.42*	*0.91*	*18.71*	*5.54*	*3.09*	*2.45*	*44.10*	*2.95*	*0.58*	*2.37*	*79.85*
Average on TH		*3,77*	*2.80*	*0.96*	*24.34*	*5.40*	*4.18*	*1.22*	*22.91*	*3.07*	*0.74*	*2.32*	*75.22*
Average on BH		*7,96*	*6.90*	*1.06*	*14.52*	*4.99*	*2.30*	*2.68*	*56.12*	*2.52*	*0.53*	*1.98*	*79.60*
IS.2 PROFILE													
Apk1	0 - 5	3,97	2.84	1.12	28.27	4.65	4.00	0.65	14.06	3.17	1.20	1.96	61.96
Apk2	5 - 12	3,76	3.12	0.63	16.80	4.88	3.27	1.61	33.05	2.28	0.98	1.30	57.01
Ahok(x)1	12 - 21	3,19	2.62	0.56	17.68	5.43	3.65	1.77	32.70	3.26	0.57	2.69	82.38
Ahok(x)2	21 - 40	2,58	2.32	0.25	9.88	7.69	2.54	5.15	66.97	3.52	0.32	3.19	90.72
BCk	40 - 60	5,39	3.58	1.80	33.46	5.59	3.10	2.48	44.40	2.13	0.76	1.37	64.39
Ck	60 - 75	8,21	6.97	1.23	15.06	7.37	4.61	2.76	37.46	2.48	0.98	1.49	60.25
Average on profile		*4,51*	*3.58*	*0.93*	*20.19*	*5.94*	*3.53*	*2.40*	*38.11*	*2.81*	*0.80*	*2.00*	*69.45*
Average on TH		*3,64*	*2.86*	*0.77*	*20.92*	*4.99*	*3.64*	*1.34*	*26.60*	*2.90*	*0.92*	*1.98*	*67.12*
Average on BH		*6,80*	*5.28*	*1.52*	*24.26*	*6.48*	*3.86*	*2.62*	*40.93*	*2.31*	*0.87*	*1.43*	*62.32*
SPAN													
Average on span		4,93	4.00	0.92	19.45	5.74	3.31	2.43	41.10	2.88	0.69	2.18	74.65
Average on TH		3,70	2.83	0.86	22.63	5.19	3.91	1.28	24.75	2.99	0.83	2.15	71.17
Average on BH		7,38	6.09	1.29	19.39	5.74	3.08	2.65	48.52	2.41	0.70	1.71	70.96
Average on Ahok(x)2		2,39	2.10	0.28	12.11	7.65	2.35	5.30	69.31	3.69	0.27	3.42	92.59

$\%^{FF}$ – gravimetrical percents reported to the fine fraction of soil. $\%^{TCarb.}$ – percents from total carbonates content. $\%^{TSi}$ – percents from total silica content. $\%^{FeOx}$ – percents from total iron oxides and oxy-hydroxides content. Cryst. – crystallized minerals. Amorph. – amorphous mineral. TH – top horizons (situated above of Ahok(x)2 horizon). BH – bottom horizons (situated below Ahok(x)2 horizon).

● Total content of silica has an average value of 5.74 % (*tab. 2*), and quantitative dominant shape has crystalline silica (quartz). Amorphous silica has unexpected higher contents, large variation limits and has a maximum value in Ahok(x)2 horizon (5.20 %). Amorphous silica: (**i**) is presented as: (**a**) colomorph aggregates, with frequently inclusions of clay minerals, iron oxides and oxy-hydroxides and organic matter; (**b**) pelicular depositions on the surface of soil aggregates; (**c**) spheroidal depositions (bottom horizons); (**d**) binder constituent of soil aggregates; (**ii**) is present as main component of some depositions with solid solution character: SiO_2-Al_2O_3 ± (Fe_2O_3, MPO_4, MCO_3); (**iv**) amorphous silica was probably formed by deposition from solution or colloidal forms, the dynamic of this process being controlled by local variation of pH. The absence of clear genetic relationship between amorphous and crystalline forms of silica suggest that the probable formation of silicate gel by silica leaching processes from authigenic minerals, silica-organic or organic minerals complexes, under a slightly alkaline pH, followed by rapid deposition (in top horizons) or slower (in bottom horizons, in conditions of weak acid pH).

● Iron oxides and oxy-hydroxides have lower contents compared with ordinary soils, although the extractable iron is higher. This shown that a significant quantity of iron is included in clay-iron-humic complexes composition. Dominant share have amorphous iron oxides and oxy-hydroxides, with an average content of span of 2.18 % and a higher value for the Ahok(x)2 horizon – cca. 92.59 % from total iron oxides and oxy-hydroxides content (*tab. 2*).

● Compared with ordinary soils, in the anthrosol from Copou greenhouse – Iasi, the total content of organic matter is higher (average on span: 8.86 %), and the distribution way on profile and its dynamic has a particular character.

Non-humic organic compounds have unexpected higher contents (*tab. 3*) and include a wide variety of compounds – polar organic compounds, with medium and small molecular mass, from mono- and di-carboxylic acids, aminoacids, phenolic acids, hydroxialdehydes and hydroxiketones, phosphoric esthers of organic acids, olygomer polypeptidesmono- and oligo-saccharides, etc. The particular note of organic matter from studied antrosol is given by the high content of phytic cids and phosphoric esthers of these – especially in case of Ahok(x) horizons.

Table 3

Organic components of anthrosols from Copou greenhouse – Iasi

Horizons[#]	ΔH; cm	TMO	Non-humic compounds[(1)]		Humus		Huminic acids		Fulvic acids	
			%[FF]	%[TOM]	%[FF]	%[TOM]	%[FF]	%[TOM]	%[FF]	%[TOM]
IS.1 PROFILE										
Apk1	0 - 6	9.65	0.10	1.03	9.55	98.97	8.16	84.56	1.34	13.93
Apk2	6 - 14	11.72	0.15	1.30	11.57	98.70	9.99	85.23	1.51	12.91
Ahok(x)1	14 - 25	9.85	0.12	1.27	9.73	98.73	6.92	70.31	2.73	27.71
Ahok(x)2	25 - 48	10.60	0.39	3.73	10.21	96.27	5.49	51.87	4.60	43.42
BCk	48 - 56	7.19	0.14	1.99	7.051	98.01	4.11	57.18	2.90	40.37
ABk	56 - 62	7.50	0.20	2.71	7.30	97.29	4.12	54.87	3.12	41.64
Ck	62 - 75	3.75	0.03	0.87	3.72	99.13	2.12	56.51	1.58	42.10
Average on profile		*8.61*	*0.16*	*1.84*	*8.45*	*98.16*	*5.85*	*65.79*	*2.54*	*31.73*
Average on top horizons		*10.40*	*0.12*	*1.20*	*10.28*	*98.80*	*8.36*	*80.03*	*1.86*	*18.18*
Average on bottom horizons		*6.15*	*0.13*	*1.86*	*6.02*	*98.14*	*3.45*	*56.19*	*2.54*	*41.37*
IS.2 PROFILE										
Apk1	0 - 5	10.79	0.91	8.41	9.89	91.59	8.47	78.55	1.37	12.72
Apk2	5 - 12	11.13	0.88	7.98	10.25	92.02	8.59	77.12	1.62	14.42
Ahok(x)1	12 - 21	9.47	0.14	1.50	9.34	98.50	6.73	71.07	2.54	26.76
Ahok(x)2	21 - 40	10.97	0.35	3.17	10.62	96.83	5.75	52.37	4.79	43.63
BCk	40 - 60	9.00	0.78	8.66	8.22	91.33	4.25	47.16	3.91	43.45
Ck	60 - 75	3.28	0.03	0.87	3.25	99.13	1.90	57.91	1.33	40.51
Average on profile		*9.11*	*0.65*	*6.61*	*8.59*	*94.90*	*5.95*	*64.02*	*2.59*	*30.25*
Average on top horizons		*10.46*	*0.65*	*5.96*	*9.82*	*94.04*	*7.93*	*75.57*	*1.84*	*17.96*
Average on bottom horizons		*6.14*	*0.81*	*9.29*	*5.74*	*95.23*	*3.07*	*52.54*	*2.62*	*41.98*
SPAN										
Average on span		8.86	0.41	4.22	8.52	96.53	5.90	64.91	2.57	30.99
Average on top horizons		10.43	0.38	3.58	10.05	96.42	8.15	77.80	1.85	18.08
Average on bottom horizons		6.14	0.47	5.57	5.88	96.68	3.26	54.36	2.58	41.68
Average Ahok(x)2 horizon		10.78	0.37	3.44	10.41	96.55	5.62	52.12	4.69	43.52

TOM – total organic matter. %[FF] – percents reported to the fine fraction of soil (< 2.00 mm). %[TOM] – percents form total content of organic matter. [(1)]Un-bonded compounds on humus (soluble).

In humus composition, dominants are huminic acids (*tab. 3*), but the fulvic acids content is unexpected high compared with ordinary soils. On profile, the content of fulvic acids increase, until at value comparable with huminic acids content – case of bottom horizons. Correlated with this variation is changed and the humus character: from mull type humus – top horizons, to calcic mull type humus and then morder type – bottom horizons.

In conditions from top horizons, the mineralization and decomposition processes of organic matter are very vigorous, resulting in a higher degree of maturation of humus (but its lower accumulation soil), the existence of relative reduced fraction of non-humic organic compounds and a strong accumulation of nutritive elements and nitrogen compounds (Lăcătuşu R., 2000; Filipov, F., 2005). In conditions of bottom horizons, the oxidation processes of organic matter are weak and arising relative slow, and its decomposition load to the formation of organic acids and then to CH_4, H_2S etc. As a results, the humification processes are slowly, being favoured by bitumization processes of fats, waxes and resins (Lăcătuşu R., 2000). In consequence, for bottom horizons of anthrosol from Copou greenhouse – Iasi, characteristic are relative reduced maturation degree of humus (morder type humus) and the existence of relative high and wide fraction of non-humic organic compounds.

CONCLUSIONS

Dominant mineral components of anthrosol from Copou greenhouse – Iasi are clay minerals. These appear in a relatively wide variety of types and occurrence forms, and present characteristic variation on profile. Representative clay minerals are smectite, illitele and kaolinite; subordinate may appear: halloysite, hydromicas, vermicullite, dickite, beidellite, glauconite, etc.

In the anthrosol from Copou greenhouse – Iasi, the total content of organic matter is higher than in ordinary soils (average: 8.86 %), and the distribution way on profile and its dynamic has a particular character. Non-humic compounds have unexpected higher content and include a wide variety of chemical compounds. The particular note of non-humic organic matter from studied antrosol is given by high contents of phytic acids and phosphoric esther of these, in case of Ahok(x) horizons. In composition of humus, dominant are huminic acids. On profile, the fulvic acids content increase until a comparable values with huminic acids content. Correlated with this variation is changed and the humus character: from mull type humus (top horizons), to mull calcic humus and then morder type humus (bottom horizons).

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