TYPES OF ECOSYSTEMS STARTING FROM PHYSICOCHEMICAL PROPERTIES OF HAPLIC LUVISOILS FROM THE FOREST PLAIN OF TIMIȘ FOREST DIRECTORATE

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ABSTRACT

Timiș County, a typical plain county, covered by 11% forest stands, has a highly fragmented territory. The studied area is enclosed as altitude in O1 subregion Timiș Plain, meadow and ground depressions oak stands. The investigations were focused on a surface of 7158,9 ha, 5491,3 ha in Lunca Timişului Forest District and 1667,6 ha in Timişoara Forest District. They were subjected to analysis of their physicochemical characteristics of Haplic Luvisoils, based on the analyses from management plan for forest plains, in productive correlation of forest species in compartments with soil profiles.

In order to analyze the synergistic effect of soil physicochemical characteristics on productivity, three soil classes were formed: A) Luvic Phaeozems (Ao-Bt-C), Luvic Phaeozems (Am-Bt-C) and Luvic Phaeozems (Am-BtGo-C); B) Stagnic Luvisoils (Aow-Btw-C) and C) Stagnic Luvisoils (Aow-El-Bt-C), on soils of Class A, a higher productivity of the stands is achieved, and on the soils of the other two classes by middle or inferior productivity Attempts were made to identify the main less favorable features of soil classes B and C (unbalanced water and air regimes, lower humus content, soil reaction, etc.) which has led to decline of forest stands productivity.

Starting from the data obtained from analysis, the studied areas were establish as forest site types, forests types, passing to their ecosystem types.

INTRODUCTION

Since the past several decades, the environment and ecosystems have undergone severe damage and degradation due to anthropogenic activities especially in agriculture (2). Within ecosystems, some agricultural plants like sunflower, can contribute to process of ecological restoration as a new environmental paradigm for a new kind of environmentalism (3,4).

The forest site or biotope is the place where biocenoses exists or the physical environment of the ecosystem. The site provides air and underground space. The site is composed by elements of landform, of rock and parent materials and elements of soil. The fundamental characters of site are ecologic specific ,phytocenotic amplitude and productive potential (quality).

The site in the ecosystem has a higher permanency and a pronounced autonomy than the biocenosis .Even when a biocenosis disappears, the site remains. As anecological unit the site is characterized by climate (local climate) criteria and edaphic criteria.By combining the elements of the site there are certain regimes of climate and edaphic elements(thermicregime,throphy,humidity etc),which reflect the site s ecological specificity.

As a result of this specific,each site has a certain capacity to maintain a

certain biocenosis,a capacity called phytocenotic ability, thus allowing for a certain type of vegetation and a certain productive potential.

Within the ecological framework provided by the favorable climatic conditions, the productivity of the forest vegetation depends on the favorable conditions of the soil (1) Water from the soil accessible for plants and soil trophicity are determinants of species and plant association productivity. But an important role is due to air in the soil, being demonstrated the correlation between the site class and the value of the soil air capacity (1).

Air insufficiency and soil aeration are caused either by a too loose disposition of particles and structural elements of the soil, or long-drown water excess or both (6). If soil reaction (pH value), determinant factor and ecological indicator, is strongly acidic, it will negatively influence the biological activity and nutrition processes, respectively the growth of trees.The content and quality of humus is a very important ecological determinant for soil trophicity and forest productivity (5), whose role has been increasingly highlighted in current research.

In the present paper we have proposed to analyze the physico-chemical characteristics of soils, which, in the idea of interaction, influenced the site classes of the analyzed stands.

MATERIAL AND METHOD

The undertaken investigations aimed forest plain of Timisoara Forest District. Project location of soil profiles were made in accordance with the forest management (8-11). Main profiles were located up to the parent rock (or 2 m depth) under average terrain and vegetation conditions of the relief unit.

After the main profile is made and the direction of advance is established, control profiles (60 cm deep) were digged. If the upper horizons do not fit, a main profile is made, and the change of the soil formation rock sau solification of rock is studied; Soil sampling was done concurrent with the description of forest vegetation. 12 soil profiles of haplic Luvisoils are analyzed.

Given the smaller site class of stands on Stagnic Luvisoils (Aow-El-Bt-C), the analysis of the characteristics was made comparative according to this criterion, some physical characteristics (horizon thickness, texture) being similar to all the profiles. Thus, three categories were analyzed: A Luvic Phaeozems (Ao-Bt-C), Luvic Phaeozems (Am-Bt-C) and Luvic Phaeozems (Am-BtGo-C); B) Stagnic Luvisoils (Aow-Btw-C) and C) Stagnic Luvisoils (Aow-El-Bt-C), taking into account the variation limits on the genetic horizons of the physicochemical characteristics of the profiles divided in the 3 categories.

The variation limits were established according to the study methodology for soil science (9), and the morphological thickness included after in the paper "Forest Sites" (5).

RESULTS AND DISCUSSIONS

Timiș County, a typical plain county, covered by 11% forest stands, has a highly fragmented territory. Banat region is geographical placed between the Balkans and Central Europe, between East and West. Therefore, it can be seen a complex interpenetration of geographical and ecological areas. Forest life communities have formed under southern, Balkans, Central Europe, Illyrian and northern influences, but Banat`s forest vegetation remains typical of the Carpathian type (1).

In Banat`s Plain cannot be considered as a well contoured subzone of pedunculate oak, because the oak stands are fragmented and localized in meadows and ground depressions and the transition to mixed forests of Turkey oak and Hungarian oak is very fast (1).

Table 1

Physicochemical characteristics of soils

Crt. nr	Management unit compartment Soil type ,subtype	Horizont (A,B,C)	Lavel (cm)	Humidity %	pH %	humus %	Carbo -nate %	Exchange base %	Exchange hidrogen %	Texture
1	U.P.III u.a.40A preluvosol molic Luvic Phaeozems (Am-Bt-C	Am	15	3.787	5.25	2406,000	-	12.6	7.125	l-*n
		Bt1	30	4.194	5.89	1.268	-	16.6	4.650	l
		Bt1/Bt2	80	5.361	6.08	0,827	-	20	4.275	l
		Bt2	120	5.366	6.15	0,993	-	20	3.750	l
2	U.P.IV u.a.10A Preluvosol moic-gleic Luvic Phaeozems (Am-BtGo-C);	Am	0-5	4.905	5.430	9.982	-	14	7.125	l-n
		BtGr	40-60	4.902	5.720	5.720	-	12.6	5.250	l-n
		CGr	80-90	5.551	6.070	6.070	-	17	4.125	l
3	U.P.IV u.a.54A Preluvosol moic-gleic Luvic Phaeozems (Am-BtGo-C);	Am	0-5	5.410	5.480	5.480	-	23.6	8.250	l-n
		BtGr	25-45	5.540	5.540	5.540	-	15	7.275	l-n
		CGr	80-100	6.170	6.170	6.170	-	22	4.5	l
4	U.P.VI u.a.28A Preluvosol tipic Luvic Phaeozems (Ao-Bt-C	Ao	0-10	4.644	5.6	7.279	-	20	7.515	l-n
		Bt1	20-30	4.518	5.65	1.654	-	15.6	5.625	l-n
		Bt2	80-100	3.638	5.02	0,9	-	11	9.525	l
5	U.P.VIII u.a.7C Preluvosol tipic Luvic Phaeozems (Ao-Bt-C	Ao	0-5	2.878	4.588	6.066	-	22	10.875	l-n
		Bt1	20-30	3.380	5.559	1.324	-	23	6.375	l
		Bt2	90-100	3.556	6.33	0.331	-	21	4.125	l
6	U.P.V u.a.43B Preluvosol stagnic (brun argiloiluvial pseudogleizat) Stagnic Luvisoils (Aow-Btw-C)	Ao	15	5.015	5.020	4.136	-	11	8.4	
		Btw	70	6.716	5.5	1.103	-	12.6	5.625	
7	U.P.VII u.a.11D Preluvosol stagnic, Stagnic Luvisoils (Aow-Btw-C)	Ao	0-10	6.421	4.78	3.143	-	15	10.125	n
		Btw1	50-60	6.862	5.94	1.434	-	17.6	5.775	l-n
		C	>100	7.091	6.15	0,551	-	20.6	4.5	l
8	U.P.VII u.a.28B Preluvosol stagnic Stagnic Luvisoils (Aow-Btw-C)	Ao	0-20	5.890	4.51	4.798	-	13,6	15,75	n
		Btw1	20-30	3.993	4.98	0,625	-	11	7.275	l
		Btw2	70-80	4.470	5.48	0,284	-	13.6	6.150	l
9	U.P.VIII u.a.68A Preluvosol stagnic Stagnic Luvisoils (Aow-Btw-C)	Ao	0-10	6.98	4.91	9.37	-	23,600	13,870	l-n
		Btw1	20-30	4.96	5.83	1.87	-	22.6	5.62	l
		Btw2	90-100	5.22	6.75	0,960	-	23	3.52	l
10	U.P.VII u.a.34 Luvosol stagnic Stagnic Luvisoils (Aow-El-Bt-C),	Ao	0-20	9.294	5	12.684	-	26	16.650	n
		Elw	20-30	6.599	5.24	2.482	-	20.6	8.625	l
		Btw1	60-70	5.969	5.45	0,938	-	20	6.750	l
11	U.P.VII u.a.55A Luvosol stagnic Stagnic Luvisoils (Aow-El-Bt-C),	Ao	0-20	7.963	6.56	13.732	-	20	4.275	n
		El	20-30	4.995	5.50	1.544	-	14.6	4.875	n
12	U.P.I u.a.71D Luvosol stagnic Stagnic Luvisoils (Aow-El-Bt-C),	Btw	70-80	5.094	7.3	1.103	-	25	1.650	l
		C	110-120	4.913	8.13	0,827	9.082	-	-	l
		Ao	0-5	2.731	5.127	7.555	-	26	10.125	n
		Btw1	20-30	3.357	5.648	2.757	-	22	6	l-n
		Btw2	90-100	3.365	6.258	0.276	-	25.6	4.125	l-n

Note: crt. nr. 5 and 12 belong O.S. Timișoara

Table 2a

Stand characteristics of analyzed compartments

Nr. crt.	Management unit compartment	genetical soil type,subtype	Altitude	Forest type	Site type	Stand composition	Site class	AverageAgeta
1	U.P.III u.a.40A Lunca Timis	Preluvosol molic Luvic Phaeozems (Am-Bt-C	100	6122 Meadow oak stand of plain region,superior	8512 Forest plain maedow mixed hardwood stand,high site quality, brown moist groundwater,gleyied or half gleic, high edaphic	9common oak 1hornbeam	2	120
2	U.P.IV u.a.10A Lunca Timis	Preluvosol molic-gleic Luvic Phaeozems (Am-BtGo-C);	90	6122 Meadow oak stand of plain region,superior	8512 Forest plain maedow mixed hardwood stand,high site quality, brown moist groundwater,gleyied or half gleic, high edaphic	7common oak 2european ash 1hardwood sp.	2	180
3	U.P.IV u.a.54A Lunca Timiș	Preluvosol molic-gleic Luvic Phaeozems (Am-BtGo-C);	90	6122 Meadow oak stand of plain region,superior	8512 Forest plain maedow mixed hardwood stand,high site quality, brown moist groundwater,gleyied or half gleic, high edaphic	7common oak 1small-leaved lime 1european ash 1hardwood sp.	2	160
4	U.P.VI u.a.28A Lunca Timiș	Preluvosol tipic Luvic Phaeozems (Ao-Bt-C	90	6324Meadow mixed hardwood,middle productivity	8511 Forest plain,maedow mixed hardwood stand,middle site quality,brown moist groundwater,gleyied or half gleic,middle-high edaphic	6european ash 3turkey oak 1hornbeam	3	35
5	U.P.VIII u.a.7C O.S Timișoara	Preluvosol tipic Luvic Phaeozems (Ao-Bt-C	90	6221Regular mixed hardwood plain forest,superior	8430 Forest plain mixed hardwood stand,high site quality,red-brown,high edaphic	10common oak	2	85
6	U.P.V u.a.43B Lunca Timis	Preluvosol stagnic (brun argiloiluvial pseudogleizat) Stagnic Luvisoils (Aow-Btw-C)	90	6122 Meadow oak stand in plain region,superior	8512 Forest plain maedow mixed hardwood stand,high site quality, brown moist groundwater,gleyied or half gleic, high edaphic	8common oak 2turkey oak	2	130
7	U.P.VII u.a.11D Lunca Timis	Preluvosol stagnic Stagnic Luvisoils (Aow-Btw-C)	100	6154 Oak stand with Agrostis alba, low productivity	8332Forest plain oak stand, low site quality, podzolic, ,strong pseudogleyed of depression ,low edaphic	10common oak	5	20
8	U.P.VII u.a.28B Lunca Timis	Preluvosol stagnic Stagnic Luvisoils (Aow-Btw-C)	100	7121 Plain regular turkey oak stand,superior	8512 Forest plain maedow mixed hardwood stand,high site quality, brown moist groundwater,gleyied or half gleic, high edaphic	9turkey oak 1common oak	1	65
9	U.P.VIIIu.a.68A Lunca Timis	Preluvosol stagnic Preluvosol stagnic Stagnic Luvisoils (Aow-Btw-C)	80	6123 Meadow oak stand of plain region,middle	8511 Forest plain,maedow mixed hardwood stand,middle site quality,brown moist groundwater,gleyied or half gleic,middle-high edaphic	10common oak	3	150
10	U.P.VII u.a.34 Lunca Timis	Luvosol stagnic Stagnic	100	6324Meadow mixed hardwood,middle	8511 Forest plain,maedow mixed hardwood	6common oak 2european	3	110

		Luvisoils (Aow-El-Bt-C),		productivity	stand,middle site quality,brown moist groundwater,gleyied or half gleic,middle-high edaphic	ash 2hardwood sp.		
11	U.P.VII u.a.55A Lunca Timis	Luvosol stagnic Stagnic Luvisoils (Aow-El-Bt-C),	100	6154 Oak stand with Agrostis alba, low productivity	8332 Forest plain oak stand, low site quality, podzolic, ,strong pseudogleyed of depression ,low edaphic	6common oak 3european ash 1hardwood sp.	3	5
12	U.P.I u.a.71D O.S Timisoara	Luvosol stagnic Stagnic Luvisoils (Aow-El-Bt-C),	100	6223 Mixed hardwood plain forest,middle productivity	8333 Plain forest oak stand ,middle site quality podzolic strong pseudogleyed of broad depression, middle edaphic	6common oak 3european ash 1hardwood sp.	3	35

Note: crt. nr. 5 and 12 belong O.S. Timișoara

Ecosystem type 6214 Oak and common hornbeam stand with *Arum-Brachypodium*
Ecosystem type 7132 Turkey oak stand with *Poa-Carex praecox*
Ecosystem type 6163 Pedunculate oak stand with *Agrostis-Carex brizoides*

Table 2b

Stand characteristics of analyzed compartments

Crt. Nr.	Management unit compartment	Genetical soil type,subtype	Altitude	Forest type	Site type	Stand composition	Site class	Average
1	U.P.III u.a.40A	Preluvosol molic	100	6122	8512	9ST 1	2	120
2	U.P.IV u.a.10A	Preluvosol moic-gleic	90	6122	8512	7ST 2FR.	2	180
3	U.P.IV u.a.54A	Preluvosol moic-gleic	90	6122	8512	7ST 1TE 1FR.	2	160
4	U.P.VI u.a.28A	Preluvosol tipic	90	6324	8511	6FR 3CE 1CA	3	35
5	U.P.VIII u.a.7C	Preluvosol tipic	90	6221	8430	10ST	2	85
6	U.P.V u.a.43B	Preluvosol stagnic (brun argiloiluvial pseudogleizat)	90	6122	8512	8ST 2 CE	2	130
7	U.P.VII u.a.11D	Preluvosol stagnic	100	6154	8332	10ST	5	20
8	U.P.VII u.a.28B	Preluvosol stagnic	100	7121	8512	9CE 1ST	1	65
9	U.P.VIII u.a.68A	Preluvosol stagnic	80	6123	8511	10ST	3	150
10	U.P.VII u.a.34	Luvosol stagnic	100	6324	8511	6ST 2 FR 2DT	3	110
11	U.P.VII u.a.55A	Luvosol stagnic	100	6154	8332	6ST 3FR 1DT	3	5
12	U.P.I u.a.71D	Luvosol stagnic	100	6223	8333	6ST 3FR 1DT	3	35

Note: crt nr.. 5 and 12 belong O.S. Timişoara

Table 3 presents the limits (classes) of the physicochemical characteristics variation on the three established classes (A, B, C) and genetic horizons.

The studied area falls from an altitude point of view in O1 sub-region, Timis Plain, Meadow oak stand and depression (zoning).

The investigations covered an area of 7158.9 ha, of which 5491.3 ha are located in Lunca Timisului Forest District and 1667.6 ha in Timisoara Forest District. From these areas the Luvic Phaeozems (Ao-Bt-C), Luvic Phaeozems (Am-Bt-C) and Luvic Phaeozems (Am-BtGo- C) and Stagnic Luvisoils (Aow-Btw-C) occupy 3232.7 ha, and the Stagnic Luvisoils (Aow-El-Bt-C) occupy 3926.2 ha.

Table 3

Variation classes of physicochemical characteristics

Profiles Nr.	Horizon	pH	Humus %	Base exchange me%	Exchange hidrogen me%	Total exchange capacity me%	Degree of saturation	Total Azot g%	Texture
A. Typical Molic Preluvosol, Luvic Phaeozems (Ao-Bt-C), Luvic Phaeozems (Am-Bt-C)									
1, 2, 3, 4, 5	A	moderately acidic	medium-big	small medium	small medium	medium-small	medium	big-medium	l-n
	Bt1	moderately acidic	medium-big	medium-small	small medium	medium-very small	medium-eubasic	very small-small	l-n, l
	Bt2	moderately acidic	medium-big	medium	small medium	medium-extrem small	eubasic-oligobasic	very small	l
B. Preluvosol stagnic Stagnic Luvisoils (Aow-Btw-C)									
6, 7, 8, 9	Ao	strongly acidic	medium-big	small	medium-big	medium-big	medium-oligobasic	medium-big	l-n, l
	Btw1	moderately-strongly acidic	exrem small-small	small-medium	small	smoll-medium	medium	very small	l, l-n
	Btw2	Moderately-weak acidic	extrem small-very small	small-medium	small-very small	medium-small	eubasic-medium	very small	l
C. Luvosol stagnic Stagnic Luvisoils (Aow-El-Bt-C),									
10, 11, 12	Ao	moderately-weak acidic		medium-big	medium-big	medium-big	mesobasic-eubasic	very big-big	n
	Btw1	moderately acidic		small-medium	slall	small-medium	mesobasic-eubasic	small-very small	l-n, l
	Btw2	moderately-slightly alkaline		very small-small	small	small	mesobasic-eubasic	very small	l

The physicochemical characteristics of Haplic Luvisoils from the analysis reports from management plans for the forest plain area (Table 1) were investigated in correlation to the site class of stands of the compartments in which the main profiles were located (tab. 2a, 2b).

Analyzing the data presented in Table 3 we can see the following pursuant to classification according to morphological thickness, all the analyzed soils fall into very deep soil category;

- the water and air regimes are unbalanced for Stagnic Luvisoils (Aow-El-Bt-C), compared to the other luvisoils (which also determined the division by classes);

- soil texture in class A is sandy-loamy in the horizon A and mostly sandy in the horizon A of the other classes;

Soil reaction is moderately acidic in all Class A horizons; class B soils have a strongly acidic reaction in the Ao horizon and moderately strong acid in the Btw1 horizon; Class C soils have a moderately acidic reaction in the first two horizons and moderately weak acid in Btw2;

- the humus content varies, in the A horizon, between medium and big in the first two horizons of Class A soils; this variation is maintained only in A horizon

B class, in the other horizons ranging from small to extreme small; in Class C soils, the humus content is medium in horizon A and small-very low in other horizons;

- the amount of exchange bases enters the middle-low class for all the analyzed soils, with one exception;

- the exchangeable hydrogen varies between the small and medium classes for all Class A horizons; for the other two classes it varies from small to large in the Ao horizon, being small in other horizons;

- the cationic exchange capacity is medium to low, with some exceptions

- the degree of saturation in the bases is mesobasic-eubazic in class A soils; in the other classes it is mostly mesobasic;

- the total nitrogen content is high in horizon A in the Class A and Class C soils and medium in Class B soils; In the lower horizons the total nitrogen content varies between small and very small in all classes.

CONCLUSIONS

Analyzing the data presented above, compared to the three classes can be found the following significant differences:

- class A soils are richer in humus than soils in other classes;

- soil reaction is moderately acidic in all A-class horizons, in the other classes ranging from strongly acidic to moderately acidic (class B), moderately acidic, moderately weak acid (class C);

- the degree of saturation in the bases is mesobasic-eubasic in class A soils; in the other clases majority for the most part mesobasic;

the total nitrogen content is high in the A horizon in Class A soils (but also in Class C soils);

- water and air regimes are unbalanced for Stagnic Luvisoils (Aow-Btw-C) Stagnic Luvisoils (Aow-El-Bt-C), (classes B and C) compared to other Luvisoils.

In conclusion, unbalanced water and air regimes in Stagnic Luvisoils (Aow-Btw-C) Stagnic Luvisoils (Aow-El-Bt-C), (classes B and C) in synergic action with other less favorable features of these soils (lower humus content, soil reaction, saturation in bases) lead to a medium or low productivity of stands, compared to the superior productivity of stands on Class A soils.

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