

THE STUDY OF THE SOILS WITHIN 'TOROC' PERIMETER-DEJ (JUD.CLUJ) WITH A VIEW TO THE ECOLOGICAL RECONSTRUCTION OF THE AREA

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Abstract. *The purpose of the thesis is to analyze the edaphic conditions within 'Toroc' -Dej perimeter to determine to what extent the soil existing here can influence both from an ecological and an economical point of view the process of ecological reconstruction of the area. The surface taken into study is part of the production unit V Dej. The total surface of the production unit is of 1603.4 ha and is distributed in 14 types of forests which are made up of forest planning units with different surfaces. For the study of the types and sub types of soil from the perimeter taken into study there have been undertaken studies in the field and also in the laboratory, there have been opened 4 soil profiles, from which were taken and analyzed samples in the laboratory. As a result of the physical and chemical analyses, the following types and sub types of soil were identified within Toroc perimeter: typical Preluvosol (El, ti), typical Prelusovol with stabilized slides (El ti al), Prelusovol epihipostagnic (El st), chalky Regosol with stabilized slides (RS ka).*

Keywords: typical preluvosol, epihipostagnic preluvosol, chalky regosol

INTRODUCTION

Taken into consideration that lately, at a global level, the afforested regions have considerably diminished, almost all the states of the world develop important programmes in order to rebuild the degraded, grubbed lands as well as to afforest new surfaces (Milasan et al. 2011).

It is important that the ecological reconstruction of certain zones to be made varying with their demands and the mingling of the classical methods with the modern ones in the process of ecological reconstruction is of utmost importance (Jordan III et al. 1987).

The areas affected by different forms of degradations are abandoned most of the times giving the opportunity to some stereotypical distressing landscapes to make themselves at home, fact that requires a new strategy to approach the fields affected by negative phenomena, the implementation of forests cultures of trees and shrubs being a viable variant which may have a major positive impact (Wang Xianpu, 1995).

In order to establish the species used in the process of the ecological reconstruction of the degraded lands the study of the structural and qualitative characteristics of the arboretum within the production unit in which the perimeter taken into study lies shows a special importance because it facilitates the formation of a general idea concerning the state, structure, stability, bioproductive, bio protective and bioregenerative capacity of the forests in the area. At the same time appreciating the dynamics of the development of the arboretum and the tendencies of their further development. At the same time, the analysis of the edaphic conditions of the studied perimeter is a necessity because it can be determined to what extent the soil existing here can influence both ecologically and economically the development of the species that are to be planted (Clapa, 2007; Costandache et al., 2001; Dirja, 2000; Dumitru et al. 1999).

MATERIAL AND METHOD

The purpose of the thesis is to analyze the edaphic conditions within Toroc-Dej perimeter to determine to what extent the soil existing here can influence both ecologically and economically the development of the species that are to be planted with the purpose of the ecological rebuilding of the area.

The surface taken into study is part of the production unit V Dej, the constitutive forests of the unit being under the administration of the Ministry of the Environment, the Forests Department, through its territorial unit the Forestry of Dej which belongs to Romsilva Branch R. A. Cluj.

The surface taken into study lies in the zone of the Toroc balneal complex and is part of the Forest Range 16 Chiejdului Valley. The total surface of the production unit is of 1603.4 ha and is distributed in 14 bodies of forest which are made up of forest planning units with different surfaces.

In order to study the types and sub types of soil from the perimeter taken into study, studies have been undertaken in the field and in laboratory:

-4 profiles of soil were opened and described, of which tests were gathered and analysed in laboratory. The profiles were placed in representative zones of the searched space so as the most representative types and sub types of soil should be described.

-in the case of the profiles, the tests were gathered on pedogenetical horizons, both in natural placement(unmodified), as well as in modified placemnt.

-the gathering of the soil tests in natural placement to characterize certain physical and hydrophysical characteristics was done in metal cylinders of known volume, at the momentary humidity of the soil.

-the gathering of the tests in modified placement, for the physical-chemical characterization, was done in bags on each genetical horizon.

-the research of the ecopedological conditions and the morphological description of the researched soil was done according to “ The Romanian System of Taxonomy of Soils”(2003), and “The Methodology of the Elaboration of Pedological Studies”(vol. I, II, III) elaborated by I.C.P.A. Bucharest in 1987.

RESULTS AND DISCUSSION

The surface of the production unit has in its structure 45% of preluvosol soil, 44% of luvosol type, 1% districambosol and 10% being represented by the Protisols class. (Tab. 1).

Following the physical and chemical analyses,there have been identified the following types and sub types of soil within Toroc perimeter:typical Preluvosol (El ti),typical Preluvosol with stabilized slides (El ti al), epihipostagnic Preluvosol (El st),chalky Regosol with stabilized slides(RS ka),**typical Preluvosol (El ti)**.

Typical Preluvosol has the profile Ao-A/B-Bt-B/C (Tab. 2).

-the texture varies on profile,being medium argilaceous clay at the surface and in the deep structure and clayey clay in the rest.

-the content in humus suddenly decreases,being middle on the surface and then extremely low;

-the content in total N,very little,gradually decreases on the profile;

-the content in P is extremely small on the entire profile;

- the value of the pH raises on the profile,the soil having a weakly acid pH then neutral and mildly alkaline in the depth;
- SB raises on the profile,but all the values are small;
- SH has small and very small values;
- T has medium values on the whole profile;

Table 1

Class	Type	Code	Sub type	ha	%
Luvisols	Preluvosol	2201	typical	625.4	39%
		2207	lithic	16.1	1%
		2209	stagnic	80	5%
	Total type of soil			721.5	45%
	Luvosol	2401	typical	416.9	26%
		2405	lithic	128.3	8%
		2407	stagnic	160.3	10%
Total type of soil				705.5	44%
Cambisols		3305	lithic	16.1	1%
Protisols	Litosol		rendzina	128.3	8%
			gleizat	32	2%
Total type of soil				161.3	10%
Total of production units				1603.4	100%

Table 2

Horizons Depth (cm)	Ao 0-21	A/B 21-47	Bt 47-70	B/C 80- 100
Coarse sand% 2,0-0,2 mm	2.63	0.32	0.29	3.34
Fine sand % 0.2-0.02mm	30.32	22.78	21.86	26.12
Coarse dust %0,01-0,002 mm	2.30	6.25	5.81	7.08
Fine dust % 0,01-0,002 mm	21.23	10.85	13.19	18.14
Clay % <0,002 mm	43.52	59.80	58.85	45.32
CH%	8.42	9.73	6.19	6.39
CO%	12.63	14.6	9.28	9.58
Humus%	3.12	1.17	-	-
Total N%	0.138	1.104	-	-
pH(H ₂ O)	6.44	6.91	7.16	7.72
P-Al ppm	2	1	-	-
Mobile K-Al ppm	140	85	-	-
Exchange bases me/100 g soil	18.5	20.1	22.3	23.7
Exchange Hydrogen Ah me/100 g soil	3.05	2.11	1.23	1.17
Cationic exchange capacity me/100 g soil	19.10	26.18	27.37	29.0
Saturation degree in bases %	69	73	81	86

Typical Preluvosol (El ti al) -with stabilized slides

This type of soil is characterized through the following (Tab. 3):

- texture varies with the profile,being argillaceous clay at the surface and clayey clay in the depth;
- the content in humus decreases suddenly,being small at the surface and then very small;

- the content in total N is small ,decreases on the profile, being very small;
- the content in P is very small and after that very small;
- the content in K is big and decreases to medium on profile;
- the value of the pH raises on profile,the soil having a neutral pH and weakly alkaline in the depth;
- SB big values at the surface and medium in the depth;
- SH has small and very small values;
- T has medium values on the whole profile.

Table 3

Profile 2 Toroc - Typical Preluvosol (El ti al) (with stabilized slides)

Horizons Depth(cm)	Ao 0-23	A/B 24-33	Bt 35-76
Coarse sand % 2,02-0,2 mm	1.38	0.75	0.39
Fine sand % 0,2-0,02 mm	26.22	30.63	24.1
Coarse dust % 0,02-0,01 mm	6.55	6.75	5.9
Fine dust % 0,01-0,002 mm	20.53	15.33	14.05
Clay % <0,002 mm	45.32	46.54	55.56
CH%	10.61	12.74	11.52
CO%	15.92	19.11	17.28
Humus%	2.87	1.29	-
Total N %	0.109	0.53	-
Ph (H2O)	7.02	7.15	7.55
P-Al ppm	4	1	-
K-mobile Al ppm	324	134	-
Exchange bases me/100 g soil	29.6	31.2	19.6
Exchange Hydrogen Ah me/100 g soil	3.5	3.01	1.53
Cationic exchange capacity me/100 g soil	33.10	34.21	21.13
Saturation degree in bases %	89	91	93

Table 4

Profile 3 Toroc-Epihipostagnic (El st)

Horizons Depth(cm)	Ap 0-20	Aow 21-29	A/Bw 0-10	Btw 30-40	Bt 70-80
Coarse sand % 2,0-0,2 mm	6.22	8.47	4.88	4.26	5.47
Fine sand % 0,2-0,02 mm	29.58	25.78	25.17	21.13	20.33
Coarse dust % 0,02-0,01 mm	8.60	9.80	7.95	5.9	7.1
Fine dust % 0,01-0,002 mm	15.10	14.95	12.20	11.05	12.50
Clay % <0,002 mm	40.50	41.00	49.80	57.66	54.60
CH%	6.67	6.58	10.21	10.67	9.56
CO%	10.05	9.87	15.32	16.0	14.34
Humus%	2.57	1.69	0.95	-	-
Total N %	0.121	0.102	0.089	-	-
pH(H2O)	7.01	7.18	7.35	7.44	7.81
P-Al ppm	7	3	2	-	-
Mobile K-Al ppm	231	156	95	-	-
Exchange bases me/100 g soil	12.1	16.8	16.9	17.4	17.6
Exchange hydrogen Ah me/100 g soil	3.58	2.18	2.05	1.93	1.89
Cationic exchange capacity me/100 g soil	15.17	21.18	22.64	23.45	24.01
Saturation degree in bases %	77	78	82	85	91

Epihipostagnic Preluvosol (El st)

Epihipostagnic Preluvosol (Tab.4) is characterized by the following physical and chemical features:

- texture varies on profile ,being argilaceous clay in horizon A and clayey clay in A/B and B;
- the content in humus decreases suddenly ,being small at the surface and then very small;
- the content in total N is small,decreases on profile ,being very small;
- the content in P is very small and then extremely small;
- the content in K is big and decreases to medium and small on profile ;
- the value of the pH raises on profile ,the soil having a neutral pH and weakly alkaline in the depth;
- SB small values at the surface and medium in the depth;
- SH has small and very small values;
- T has small values at the surface and then medium;
- The saturation degree in bases show an eubasic soil.

Chalky Regosol (RS ka) cu stabilized slides.

Chalky Regosol is characterized by the following physical and chemical features: (Tab.5.):

- texture varies on profile:sandy clay,fine sandy clay and clayey clay;
- the content in humus decreases suddenly,being medium at the surface and then small;
- the content in total N is medium on the entire profile;
- the content in P is very small and then extremely small;
- the content in K is big and decreases to very small on profile;
- the pH value raises on profile,the soil having a neutral pH and weakly alkaline in depth;
- the carbonates have small values at the surface and medium in depth;
- the saturation degree in bases show a soil saturated in bases.

As it results from the effected analyses preluvosols,which dominate in the studied perimeter,have a slightly shorter profile compared to the other soils with which it is found in complex,because it is met on the southern slopes that are better warmed or on a micro landscape with good drainage and with rich parental material in basic elements. It presents a succession of horizons of Ao – Bt – C type. There are luvisols morphologically characterized by : *the presence of ocric or mollic A horizon (Ao,Am) followed by the intermediary argic horizon (Bt) having colours with values of over 3,5 at the materials in humid state ,starting from the superior part and the saturation degree inbases (V %) over 53%.Despite the fact that they are spread in more humid and colder areas,because of the specific formation conditions, the typical preluvosols have physical-chemical and biological features which are favorable to the growth of plants.*

The humification is moderate and the quantity of resulted humus is medium(2-4%).The humus from these soils is made up of approximately the same proportion from humic and fulvic acids. Due to the mother-rocks,generally rich in calcium ions, the humus is well saturated in basic cations being of forestry mull type,accumulated in an Ao horizon.

The surface of the production unit has in its structure 45% preluvosol, 44% luvosol, 1% districambosol and 10% Protisol.

Following the physical and chemical analyses,in the Toroc perimeter taken into study,there have been identified the following types and sub types of soil: typical

Preluvosol (El,ti),typical Preluvosol with stabilized slides (El ti al),ephipostagnic preluvosol ,chalky Regosol with stabilized slides.

The preluvosols represent a succession of horizons of Ao-Bt-C,the pH is neutral towards weakly alkaline, the humus process is moderate and the resulted humus quantity is medium and the soil profile is weakly texturally differentiated,the maximum content of clay being registered at the level of Bt horizon.

The Preluvosols present physical-chemical and biological features that are favourable to the growth of plants.

Table 5

Profile 4 Toroc -Chalky Regosol (RS ka) with stabilized slides

Horizons Depth(cm)	Ao 0-15	A/C 21-34	Ck 35-90
Coarse sand % 2,0-0,2 mm	0.24	0.87	0.69
Fine sand % 0,2-0,02mm	46.89	70.49	12.10
Coarse dust % 0,02-0,01 mm	6.41	1.96	9.65
Fine dust % 0,01-0,002 mm	7.52	7.31	12.04
Clay% <0,002mm	38.94	19.37	65.52
CH%	8.1	5.52	12.1
CO%	12.15	8.28	18.15
Humus %	2.53	0.97	-
Total N%	0.247	0.154	-
pH(H ₂ O)	7.25	7.68	8.01
Carbonates	0.5	3.2	4.3
P-Al ppm	5	2	-
Mobile K-Al ppm	206	34	-
The saturation degree in bases %	100	100	100

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